DESIGN AND CONSTRUCTION OF AN AUTOMATIC SECURITY LIGHTING SYSTEM

BY

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MARCH, 2000.

CERTIFICATION

I certify that this project research was carried out by MR. MOMOH JIMOH TIJANI and that it has met the minimum standard deem acceptable by the department of Electrical/Computer Engineering, Federal University of Technology, Minna, Niger State.

ENGR. SHEHU AHMED
SUPERVISOR

3/4/2012
DATE

DR. (ENGR.) Y.A. ADEDIRAN
HEAD OF DEPARTMENT

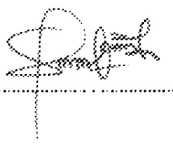
6/4/12
DATE

EXTERNAL EXAMINER

6/4
DATE

DECLARATION

I do solemnly declare that this project was solely undertaken by me under the supervision of Engr. SHEHU AHMED, Department of Electrical and Computer Engineering, Federal University of Technology, Minna during 98/99 session.



M.J. TIJANI (STUDENT)

2-5-2000

DATE

DEDICATION

TO

GOD

for his divine provisions and tolerance

My DAD, MR M. J. KACHIWA

whose parental love remains evergreen and his spiritual guidance abides always.

My lovely Mum, MRS. M. J. HAWAWU

whose inspiration is the foundation of my career.

ACKNOWLEDGEMENT

- My profound gratitude goes to God for his unflinching love, mercy, provision and for seeing me through all odds and obstacles I encountered during the period of my academic endeavour.

- I am very much indebted to all my departmental lecturers; Prof. Ajose, Dr. Adediran, Engr. S.N. Rumala, Engr. Shehu Ahmed, Miss Elizabeth Onwuka, Engr. Danjuma, Engr. Adufoju and others for their enhancement on my academic excellence.

- Much thanks to my Project Supervisor, Engr. Shehu Ahmed whose thoughtful advice, constructive criticism and suggestions has led to the significant presentation of this work.

- Special acknowledgement is gratefully given to my parents who have taken it upon themselves to shoulder all my educational responsibilities. May almighty Allah in his supreme mercy reward them abundantly.

- I wish to recognize with thanks these personalities Mr Jonah Raji (Electrical department F.U.T., Minna) and Mr. Musa Abdullahi (NGSSEB, Minna) for their encouragement and financial backing during this period.

- I register my deep gratitude to my brothers, M.J. Aliyu, M.J. Razak, M.J. Wahab and my sisters M.J. Habibat, M.J. Rafatu and M.J. Sadiya for their patience, understanding and prayers.

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- My sincere greetings to my friends, Muhammed, Sule, Yahaya, Abdullahi, David, Ganiyu, Adenoh, Yahaya O. (ABUTH), Salawu, Idris, Ismaila, George and my entire school mates for their sense of honour, we came together as friends but we lived as brothers.

- The names of the dignitaries I'm personally indebted to are too many to mention here due to lack of space, to the entire people whose demonstration of love, support and royalty on my carrier remain rare and unprecedented. I say thank you all, may Almighty God continue to shower his infinite mercy on you.

ABSTRACT

The need for reducing crimes and hazardous acts that occurs during the hours of darkness and reducing the involvement of mankind in power switching operation has led to the philosophy that brought about automatic security lighting system.

This project is a detail design and construction of security lighting system, which is a solar illumination system that responds to light and darkened condition, and therefore triggers on and off the circuit. The system switches itself "ON" when ever the light level in its surrounding falls to certain level and also switches "OFF" when the light level rises to a predetermine level independent of human intervention.

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CHAPTER ONE

GENERAL INTRODUCTION

Many years dated back, switching systems were basically on manual operations, which required an operator. The discovery of light dependent devices live photoresistors, photocell and phototransistors which responds to light intensity can be applied to reduce the involvement of man kind in power switching operation. As a result of these man made error is reduced and life becomes more comfortable to live. In the past, bulky power component and hence large control current were used in switching, components like switch gear, contractor, bulk control were only not found to be less reliable, occupy much space, considerable high initial cost and high cost of maintenance, but are also prone to adverse electrical hazard since they operate on high current.

Subsequent research in the field of electronic engineering has led to the invention of miniaturized components such as integrated circuit and semi conductor devices which need to operate on a low voltage to control a heavy load current with high reliability factor and at a cheaper rate.

Among thousands of control system to assist man kind independent of human intervention, security lighting system is aimed at designing and constructing electrical circuit to put ON light at the night and OFF in the day time.

This design work is essentially useful in a car park garage, turning ON/OFF of street light, even it can be used as burglar safety device to deceive the underworld men to eliminate crime and hazardous acts that occur during the hours of darkness especially when the sole occupant of a house is not around for some times.

Eeonomically, the project equally assist mankind to ensure no wastage of energy even if one forgets to switch OFF the lighting system of a house in the morning before going out, hence the NEPA bill will be reduced.

1·1 AIMS AND OBJECTIVES

- This project is aimed at reducing the involvement of mankind in power switching operation.
- To ensure that discreet components are used in place of bulky power components to control a heavy load current.
- To ensure no energy wastage and hence reduction of NEPA bill.
- To develop an inexpensive system.

1·2 LITERATURE REVIEW

Security systems are becoming increasingly automated, particularly with respect to sensing and communicating hazards and vulnerabilities, and to a lesser but still considerable extent, with respect to response and action.

This situation is true in both crime related applications, such as intruction detection devices and fire protection alarm and response (extinguishing) system.

Security lighting is often referred to as road lighting or public lighting, which includes lighting of pedestrian walkways, subways and buildings. The provision of the security lighting acts as crime deterrent.

One of the reference to any security lighting was in 1405 when Aldermen of city of London, England were made responsible for ensuring that every house adjoining the high way provided a lit candle in lanterns from dusk until 9p.m. since then the technology of the security lighting has made great advances particularly in view of the recent development of new light source and the increased density of fast moving traffic.

One design approach is based on the principal of 'silhouette vision" with the lighting being arranged so that the surrounding surfaces appear lit, with any vehicle, pedestrian and objects appearing on the silhouette.

The first controller to put security lighting ON and OFF was the lamp higher which went around lighting gas lamps. For many years, the cheapest and most reliable systems have been the dial time switch. This is a clock driven by a synchronous electric motor. The solar dial is set compensating and allows for the daily variation in switching ON and OFF times.

The disadvantage of solar dial time switch is that its automatic switching of security lighting was based on average day light condition and it need resetting after every power cut.

This is a very strong argument for a switching device controlled by ambient day light conditions which for example switch lights ON where there is a fog or when it gets dark early because of overcast sky.

The modern photoelectric cells fulfill this requirement and it is being used extensively for new security lighting. A photoelectric cell can be seen generally on top of lamps controlling individual lamp, but it is often wired to a relay which in turn switches many lights.

1.3 PROJECT OUTLINE

This project report consists of four chapters for ease of comprehension.

Chapter one is the general introduction under which a brief history or literature of security lighting system, and the aims and objectives were discussed. Also contained in this chapter were previous problems encountered by early designers and approaches towards solutions.

In Chapter two, the theory leading to the design of automatic security lighting system is given in brief detail, it also gives the detail design analysis, functions of components used and design calculations.

Chapter three includes construction and testing while chapter four concludes the report and recommends follow-up that may be necessary for improvement on this project. Also included in this chapter are the relevant test consulted.

CHAPTER TWO

SYSTEM DESIGN

This chapter deals with the theory leading to the design and construction of security lighting system, detail design analysis, functions of the components used, design calculations and how the components were brought together to form the entire system. The design is into two units.

i) Control unit and ii) power supplies unit. The control unit controls the operation of the circuit while the power supply unit provides the required dc voltage for the normal operation of the circuit.

2.1 THE CONTROL UNIT

The function of the control unit is to control the operation of the circuit.

2-1-2 THE SENSORY TECHNIQUE

The main function of a sensory circuit is to detect and indicate when a certain preset resistance is exceeded. In this regard, the light dependent resistor should be strategically located in order to obtain accurate and precise sensing.

In order for the sensing to occur the variable resistor is first set at a given resistance RV. As the light intensity increases Rp of the photo resistor as well as the potential across it drops. This process continues until the potential across the Rp with respect to Rv is low enough to allow current to pass and trigger the switching circuit, thus activating the whole system.

2-1-3 THE LIGHT DEPENDENT RESISTOR (ORP 12)

This device is employed in this project to convert incident radiation to an electrical signal. Its performance is given by t he ratio of the electrical output expressed as a voltage to the radiation input expressed as incident energy. The ratio is expressed as responsitivity and is expressed in V/m. In the darkness the resistance of the device is high, when light falls on it, electronpairs are generated. Its resistance decreases as the intensity of light increases and the resistance increases with decrease in light.

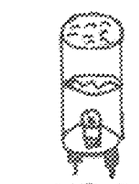


FIG 2.0
LDR

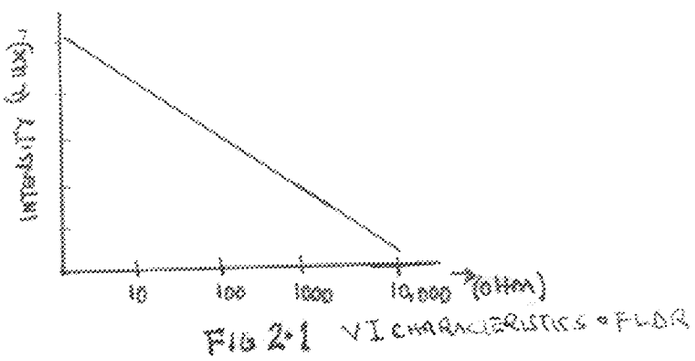


FIG 2.1 VI CHARACTERISTICS OF LDR

Light dependent resistor.

Technical Specification.

Peak spectral response 530nm

Cell resistance at 10 Lux 9 K

At 1000 Lux 1M

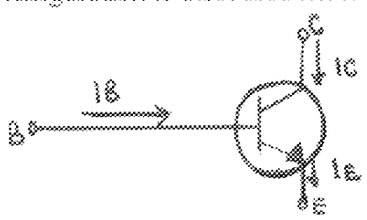
Maximum voltage d.c or a.c peak 320v

Typ-resistors rise time 18ms

Typ.resistance fall time 120ms

2.14 TRANSISTOR CONFIGURATIONS

There are three circuit for which transistors can be operated. These are the common emitter mode (CE) , common-Base (CB), and common-collector (CC). The term common is used to denote the electrode that is common to the input and output. The transistor offers a high current gain in the common emitter mode. Therefore common emitter configuration is discussed here.



IB = BASE CURRENT
IC = COLLECTOR CURRENT
IE = EMITTER CURRENT

Fig. 2.10 COMMON EMITTER MODE OF TRANSISTOR

From the above diagram the emitter of the transistor has a connection which is common to both the collector and the base or input and output circuit respectively. The input signal is applied between the base and the emitter and the output signal is taken out from the collector and emitter circuit. The ratio of the collector to base current is called the gain of the transistor B.

$$IE = IB + IC \qquad Ic = \beta IB$$

$$IE = IB + \beta IB = IB(1 + \beta)$$

2.1.5 VOLTAGE DIVIDER NETWORK

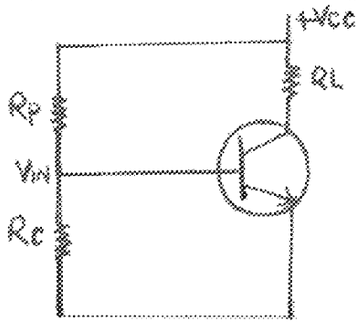


FIG 2.3 VOLTAGE DIVIDER CIRCUIT

Fig. 2.3 shows a circuit for a voltage divider network Rp and Re forms a potential divider across Vcc. The voltage drop Vin across Re biases the emitter as Vcc biases the collector. By voltage divider theorem.

$$V_{in} = \frac{RC}{Rc + Rp} \cdot VCC$$

2.1.6 THE TRANSISTOR SWITCH

For this design, a bipolar junction transistor is used, the reason is that the BJT which is a current operated device offers a high current gain in the common-emitter mode. The objective here is to use a small switching signal (low base current of transistor) to switch a high collector current. In this ways a transistor can be used as an electronic switch as illustrated in Fig. 24.

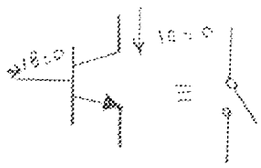


FIG 2.4 (a)

OPEN SWITCH

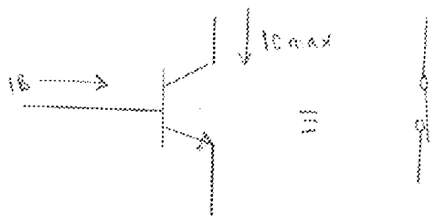


FIG 2.4 (b) CLOSED SWITCH

Fig. 24 OPEN AND CLOSED SWITCH

To study the characteristics of the transistor as a switch, it is necessary to consider two modes of operation. The OFF state and ON state. Consider the circuit of fig. 2.5 (a) and the collector characteristics of fig. 2.5 (b). The load line corresponding to the load resistance RL is shown on the characteristics.

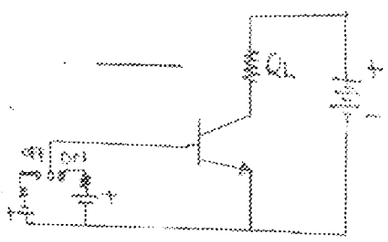


Fig. 2.5(a) TRANSISTOR CIRCUIT

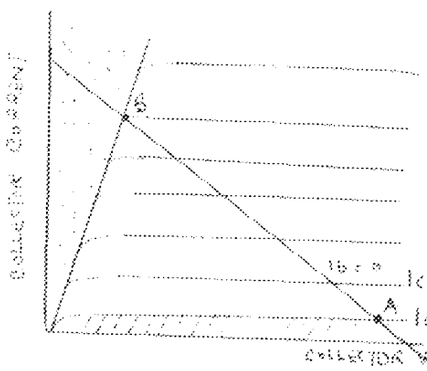


Fig. 2.5(b) VI CHARACTERISTICS

FIG 2.5

THE OFF CONDITION

With the base current at zero, the collector current will be collector to emitter leakage current ICEO. If a reverse voltage is applied to the base, the collector current is reduced to the collector to base leakage current ICBO. This current is very small, when the base emitter junction of the transistor is reverse biased the transistor is said to cut off and it is in the shaded region of Fig.2.6 (b) with the load resistance RL, the operation will be at A.

THE ON CONDITION

As the base current is increased, the collector current increases and the operating point moves along the load line and eventually reaches point B. The further increase of base current will not result in any more increase of collector current and the transistor is said to be saturated. The collector to emitter voltage will have fallen to a very low value known as the collector saturation voltage Vce sat. Thus in ON condition both junctions of the transistor are forwarded biased and the current flowing through the resistance will be Vcc-Vce sat/RL. The saturation region is shown dotted in Fig.2.6 (b).

BASIC CIRCUIT FOR THE TRANSISTOR SWITCH

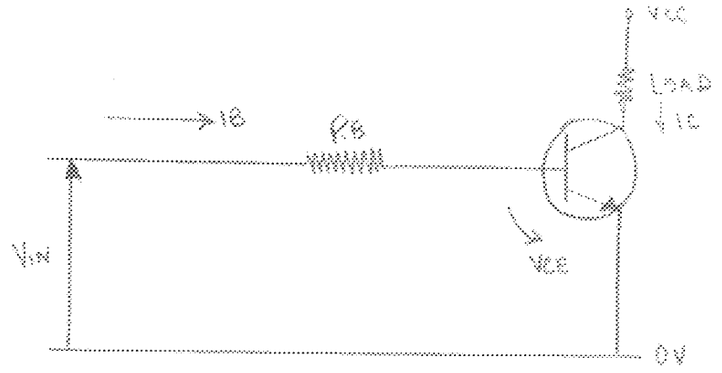


Fig. 2.6 BASIC CIRCUIT FOR TRANSISTOR SWITCH

Vcc is the supply voltage

Vin is the switching signal voltage

VBE is the base emitter voltage approximately equal to 0.6 for silicon transistors

IB is the base current

IC is the collector current

RB is the base resistance

In common emitter mode, the current gain hfe = IC/IB

$$VIN = IBRB + VBE$$

$$IBRB = VIN - VBE$$

$$RB = \frac{Vin - VBE}{IB}$$

$$Hfe = B = \frac{ICV}{IB.}$$

$$IB = \frac{IC}{Hfe}$$

$$Ic = \frac{Vcc - Vce(sat)}{RL}$$

$$Ic = \frac{Vcc}{RL}$$

DESIGN OF 2N3055 TRANSISTOR

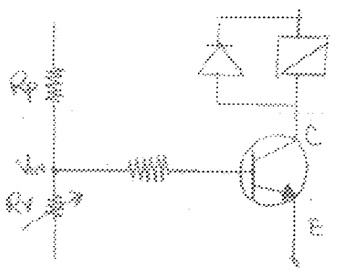


FIG. 27 2N3055 TRANSISTOR SWITCH

$$Ic = \frac{Vcc}{RL} = \frac{12}{400} = 30MA$$

Given B = 50

$$B = \frac{IC}{IB}$$

$$IB = \frac{IC}{B} = \frac{30}{50} = 0.6MA$$

$$VIN = \frac{Rc + RV}{Rc + Rv + Rp} \quad Vcc$$

The dark resistance of the ORP-12 = 1M.
The bright resistance = 500Ω.

For the transistor to be ON, the resistance of the ORP-12 is about 500Ω. The preset resistance value RV = 6K

$$\text{In ON STATE, Vin} = \frac{6K + 18K}{6K + 18K + 500} \times 12$$

$$= \frac{24}{24.5} \times 12 = 11.755V$$

IN THE OFF STATE

The resistance of the ORP in the darkness is about 1M.

$$Vin = \frac{18K + 6K}{18K + 6K + 1M} \times 12 =$$

$$= \frac{24}{1024} \times .12 = 0.28125V$$

$$VIN = VB + VBE$$

$$VIN = IBRB + VBE$$

$$RB = \frac{VIN - VBE}{IB}$$

$$= \frac{11.755 - 0.6}{0.6mA} = 18.59K$$

RB is chosen to limit the current flowing into the base of the transistor and it is chosen to be 18K.

2.7 THE VARIABLE RESISTOR

The variable resistor used is a form of resistor with a suitable mechanical feature that enables variations of its resistance to maximum rated value. It can be turn either left of right and it is called presetting which is used to preset the voltage range within which the transistor operates.

For this project the variable resistor is used to adjust the sensitivity of the light dependent resistor.

2.8 RELAY

A relay is a switch operated by an electromagnet, when an appropriate current flows through the coil a magnetic force displaces the armature in turn causing the switch contact to open or close. The position of the switch contact when the coil is energized is known as the normal position. ~~There are two type of evasive is known as the normally position.~~ There are two type of relay contacts namely, the normal open and normally close contact. In the normally open type, the switch provided by the contact is initially open (OFF) and becomes closed when the relay is energized, the normally close type symbolize a switch that is initially closed (ON), but opens (OFF) when the relay is energized.

2.2.1 POWER SUPPLY UNIT

Most electronic devices and circuits require a d.c source for their operation. This provides the necessary Dc voltages and currents to transistor or IC circuitry within the system. Since most transistor circuits operate at low voltage levels, they are particularly adaptable to battery supplies. However, for most circuits, batteries are too expensive to be considered for continuos use.

Since the most convenient and economical source of power is the domestic a.c supply. It is advantageous to convert this alternating voltage (usually 220Vrms) to a dc voltage usually smaller in value.

The primary function of the power supply is to provide the required d.c voltages and current as efficiently as possible by converting the a.c line voltage to a smooth, constant d.c voltage. This process is called rectification.

The power supply unit comprises basically of the transformer, rectifier, filter and the regulator.

BLOCK DIAGRAM OF REGULATED P S U

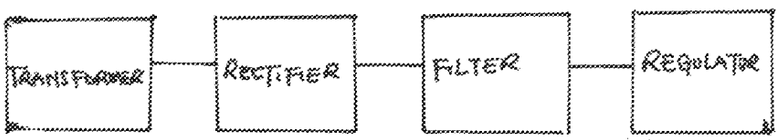


Fig Block Diagram of Regulated PSU

2.2.2 THE TRANSFORMER

The transformer is an energy conversion device employed in this project for voltage transformation. The input to the primary winding is 240 a.c 50Hz supply, the transformer steps down this voltage to a low level at the secondary winding as required for the operation of the circuit.

Another role of the transformer is isolation of the output terminal of the supply from mains.

2.2.3 RECTIFIER:

The purpose of the rectifier is to convert the ac voltage to a pulsating D.C voltage. The turn ON-OFF switching characteristics of the semi conductor diode lead its use for this action. There are basically two types of rectification namely half wave and full wave rectification.

FULL WAVE RECTIFICATION

It is the most frequently used circuit for electronic d.c power supplies. It required four diodes but the transformer used is not a Centre-tapped and has a maximum voltage of Vsm. The full bridge rectifier is available in three distinct physical forms.

1: four discreet diodes

2. One device inside a four terminal case

3: as part of an array of divides in an IC.

During the positive input half cycle, the terminal M of the secondary is positive and N is negative as shown separately in fig2.9(a). Diodes D1 and D3 become forward biased (ON) whereas D2 and D4 are reverse biased (OFF). Hence current flows along MEABCFN producing a drop across RL.

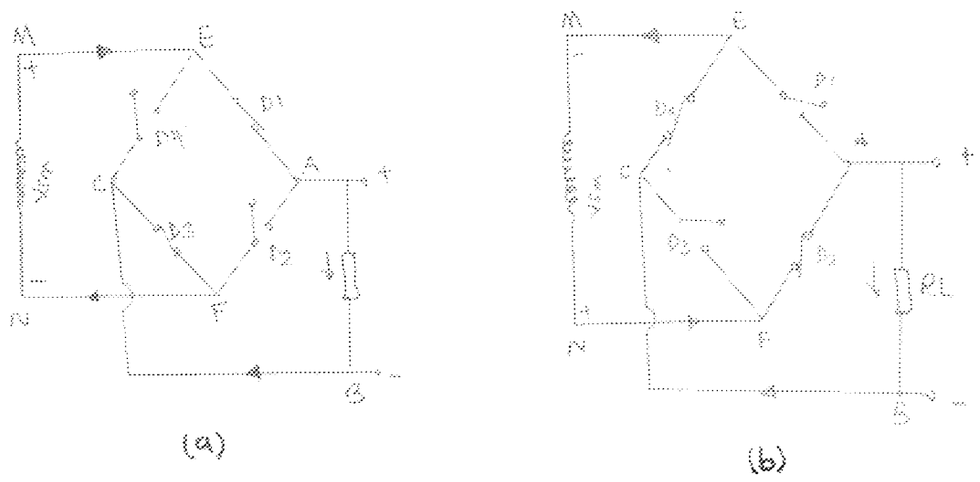


FIG. 2.10 (FULL BRIDGE RECTIFIER)

During the negative input half cycle, secondary terminal N becomes positive and M negative. Now, D2 and D4 are forward biased circuit current flows along NF ABCEM as shown in fig2.9(b). Hence we find that current keep flowing through the load resistance RL in the same direction AB during both half cycles of the ac input supply. Consequently, point A of the bridge rectifier always acts as an anode and point C as cathode. The output voltage across RL is as shown in Fig2.9(b) its frequency is twice that of the supply frequency.

ADVANTAGES OF BRIDGE RECTIFIER

1. no Centre-tap is required on the transformer
2. much smaller transformer and used
3. it is suitable for high voltage application
4. Has less Piv rating per diode.

2·2·4 FILTER

The ouput of a rectifier contains a large proportion of unwanted a.c component in addition to the desired dc voltage. The unwanted signal known as the ripple can be minimized or eliminated by employing a filter, which comprises of suitable connected capacity, indictors and sometimes resistors. The power supply filter may be considered as a low pass filter which reduces the amplitudes of all alternating components in the rectified wire fonn and passes the D.C or zero frequency. A measure of the effectiveness of a filter is given by the ripple factor "r" which may be defined as "r" = $\frac{Vrms}{Vdc}$

Vd'c

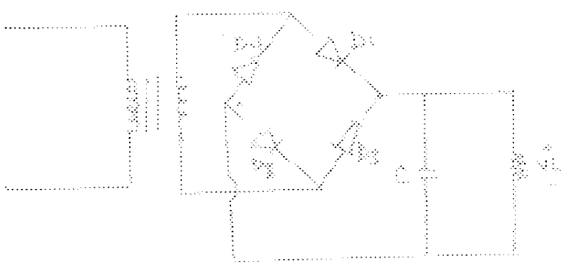


FIG 2·11 FILTER CIRCUIT

2.25 REGULATOR:

The simple system comprising of a transformer, rectifier and a filter is normal unregulated and it is called unregulated power supply. The line voltage at the output of a power supply often fluctuate by as much as 10 to 12% causing the output voltage of the filter to vary. Current drawn by supply load may have wide range of values. In addition, the temperature may change. These effects tend to change the output voltage. For this design a 12v regulator is connected between the filter and the load, designed to maintain nearly constant output voltage for the anticipated variation in the input voltage. The load current and temperature, an important figure of merit is the voltage regulation. This is the percentage change in the output voltage resulting form a specified change in either the input voltage or the load current. In general

$$\text{Regulation} = \frac{\Delta V_L}{V_L} \times 100\%$$

DESIGN OF POWER SUPPLY UNIT

For a full wave bridge diode rectifier.
Vmax = Pear output voltage of the rectifier
Vdc = average dc of output voltage rectifier
Vrms = Rms value of transformer secondary

$$Vmax = \sqrt{2}\, Vrms$$

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

$$= 16.97v$$

$$Vdc = 2\pi \times Vmax$$

$$= \frac{2}{3.142 \times 16.67}$$

$$= 10.8v$$

Assuming a ripple voltage of 0.0386

$$C = \frac{Idc}{4\sqrt{3}\, fr\, Vmax}$$

$$= \frac{0.5}{4\sqrt{3} \times 50 \times 0.0386 \times 16.97}$$

$$= 2203\mu F$$

Piv = Pear inverse voltage rating of the diodes
Piv $\geq$ 2 Vmax
Piv $\geq$ 2 x 16.97
$\geq$ 33.93v

For the full bridge diode rectifier employed in this project a diodes of 50v piv rating are used.

Idc = average dc output current of the rectifier
Idc = 1.2A
= 1.2A

Therefore a step-down transformer rating of 240/12v single phase is employed.

2.2.6 POWER INDICATOR

Power indication is to indicate the availability of power supply to the control current. The light emitting diode operates on lower voltage compared to the control voltage. In order to reduce or drop the 12 volts to a value suitable for the operation of the light emitting diode a resist should be connected in series.

$$Rd = \frac{Vs - V_{LED}}{I_{LED}}$$

$$Vs = I_{LED}\,RD + V_{LED}$$

$$RD = \frac{Vs - VLED}{I_{LED}} \quad \Omega$$

RD is the series resistor connected to the L.E.D
I_{LED} - is the current flowing through the LED
Vs is the control voltage

From data book,

$V_{LED} = 2v$
$I_{LED} = 20mA$

for RED LED

$$RD = \frac{12 - 2}{20mA} = \frac{10 \times 10^{3}}{20}$$

$$RD = \frac{1000}{20} = 500\Omega$$

FIG 2.12

2.2.7 PRINCIPLE OF OPERATION OF THE SYSTEM

240 A.C supply at a frequency of 50Hz is being fed at the input of a step dawn transformer. This voltage is transform to 12v ac supply at the ouput. This voltage is rectified by diodes D1, D2, D3 and D4. The rectified output voltage of 12 Vdc is filtered by a 2200 f capacitor C to obtain a ripple free 12vdc. The output from the filter network is regulated to a voltage 12v dc.

The regulated 12v dc is used to power the control circuit. The light dependent resistor and other resistors are used to vary the voltage supplied to the swatching transistor. The LDR is a photoconductive device whose resistance appears very high (virtually open circuit) in the darkness but in the presence of light its resistance decreases.

Coupling the transistor and the light dependent resistor together, we have effectively a LDR "switch" controlling a transistor "switch" which control a relay. With insufficient light, not enough current can flow into the base to turn the transistor ON, or you can adjust the control to shunt (bypass) most of the current keeping the transistor OFF

When sufficient light is present, the resistance of the light dependent resistor decreases and allows enough current to flow into the base of a t ransistor so it can turn ON.

The RB (resistor) provides little protection against excessive base current, which could burn out the transistor. The base current has to be 1/100 of the collector current to turn the transistor full ON. The relay current is 30mA, so as to be full ON.

CHAPTER THREE

CONSTRUCTION AND TESTING

This chapter deals with how the various components that make up the project are connected. The individual unit that make up the lighting system were constructed one after the other starting from the power supply unit (consisting of transformer, rectifier, filter and regulator) and followed by the control unit that controls the operation of the circuit.

The construction of security lighting system was initially done on a breadboard. This is because it offers temporary and solderless connection of circuit components. Its remarkable flexibility gives room for easy correction of mistakes made in the course of connecting the component parts.

In accordance with modern techniques, the breadboard connection was first done in modules. Stiff copper wires were used to extend the short terminals of some components to ensure proper connection and easy error detection. The copper wires were also used as lines for components that were practically placed apart.

3.1 THE SYSTEM CONSTRUCTION

The final system construction came to be after the necessary modifications were made. The entire system was removed from the breadboard to vero board in modules.

The power supply unit was first removed, and finally the conurol unit. The units were transferred and soldered on to the veroboard. Propen soldering techniques were employed in order to eliminate cold solder joint. The connecting wires were insulated to avoid any occurrence of short circuit.

The soldering was done taking into consideration certain precautions. They include:-

1) Training the leads of the component to allow for easier and faster soldering.
2) Using little but enough solder for any joint (the joint must be strong enough for proper contact.)
3) Heat sink was used to conduct heat away from active component during soldering.

Other precautions taken in the arrangement of the component are:

- It was ensure that various components were properly spared apart within the casing to ease maintenance in the future.
- The transformer was well bolted to the casing to avoid vibration.
- The veroboard was checked repeatedly to ensure a proper representation of the circuit and in case where mistakes occurs, a de-soldering jump was used to help remove and correct the mistakes.

The completely solder system is mounted on a wooden surface and a plastic insulation is placed between the soldered side of the vernboard and the wooden surface to prevent short circuit enabled by fallen conducting materials like screws. A wooden casing is employed and proper earthling techniques are applied to eliminate any possibility of an electric shock.

CONSTRUCTION OF THE CASE

The case consists of plywood, where the constructed circuit is kept. It is design in such a way that an opening is made where the LDR is projected to sense the environmental condition.

The case measures about 23 x 15 x 9 cm^2. It is purely made of wood with hole at the tops where the sensor is placed. Another hole is made where the code that carried a.c to the primary side of the transformer passes through.

The casing is easy to cut into desire shape and fitting of various components is also convenient. It is constructed to allow for ventilation as part of it is perforated to allow heat sink to dissipate heat to the outside environment.

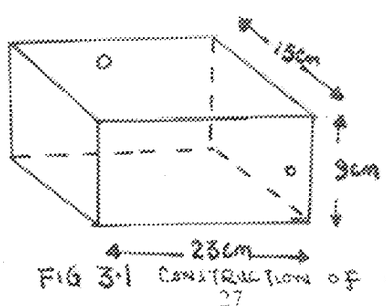


FIG 3.1 Construction of case

3.2 TESTING

The testing of automatic security lighting system was also carried out in modules, after the modular testing, the complete system was finally tested. The power supply unit was tested to ensure that 12v d.c fed the control circuit.

However, the system is connected to A.C mains, the head of the light dependent resistor was covered to decrease the amount of light intensity which inturn causes the relay to be energized and the contact click ON the normally closed contact relay and lit the bulb. As the light intensity is increased by removing your hand from the head of, the LDR, the relay is de-energized thereby clicking OFF the contact of the relay and inturn switching OFF the bulb.

CHAPTER FOUR

CONCLUSION

Conclusively, the design of security lighting system like any other control system deserves careful planning and implementation. At least the project has been successfully design and constructed after all effort has been made as much as possible to overcome mistakes irrespective of problems encountered.

The project appears simple, the simplicity in the outlook is as a result of careful selection of components. In ancient times, the first generation computer was large and occupies much space, but as a result of subsequent inventions, simpler and much compatible systems have been developed.

Several factors were taken into considerations in the choice of component. Selections in the design and construction were based on availability, reliability, cost effectiveness and durability. The lightweight nature of the model, which is as a result of compactness, does not only ease maintenance but equally make the project cheaper.

The circuit can form the basis of all sort of automatic controller, the uniqueness of this thesis is that it has a wider application in the field of electronic engineering such as in automatic garage door opening mechanism, room lighting, alarm bell and street lighting controller.

4.1 RECOMMENDATIONS

1) Since this project has wide scope of applications, it is therefore recommended that changing some components to suite a particular purpose can make modification. For instance it can be used as street light controller by incorporating contractors to switch the whole streetlight. It can be applied as car security by removing the sensor and replace it with 1M resistor and joining the output of the circuit to the cable going to the ignition this is done via a switch such that when the switch is off, there will be no supply to ignition.

2) In view of the cost conurol, many students are not financially buoyant enough to carry out expensive and nice projects, it is recommended therefore that the Federal governments should come to students aid in financing projects.

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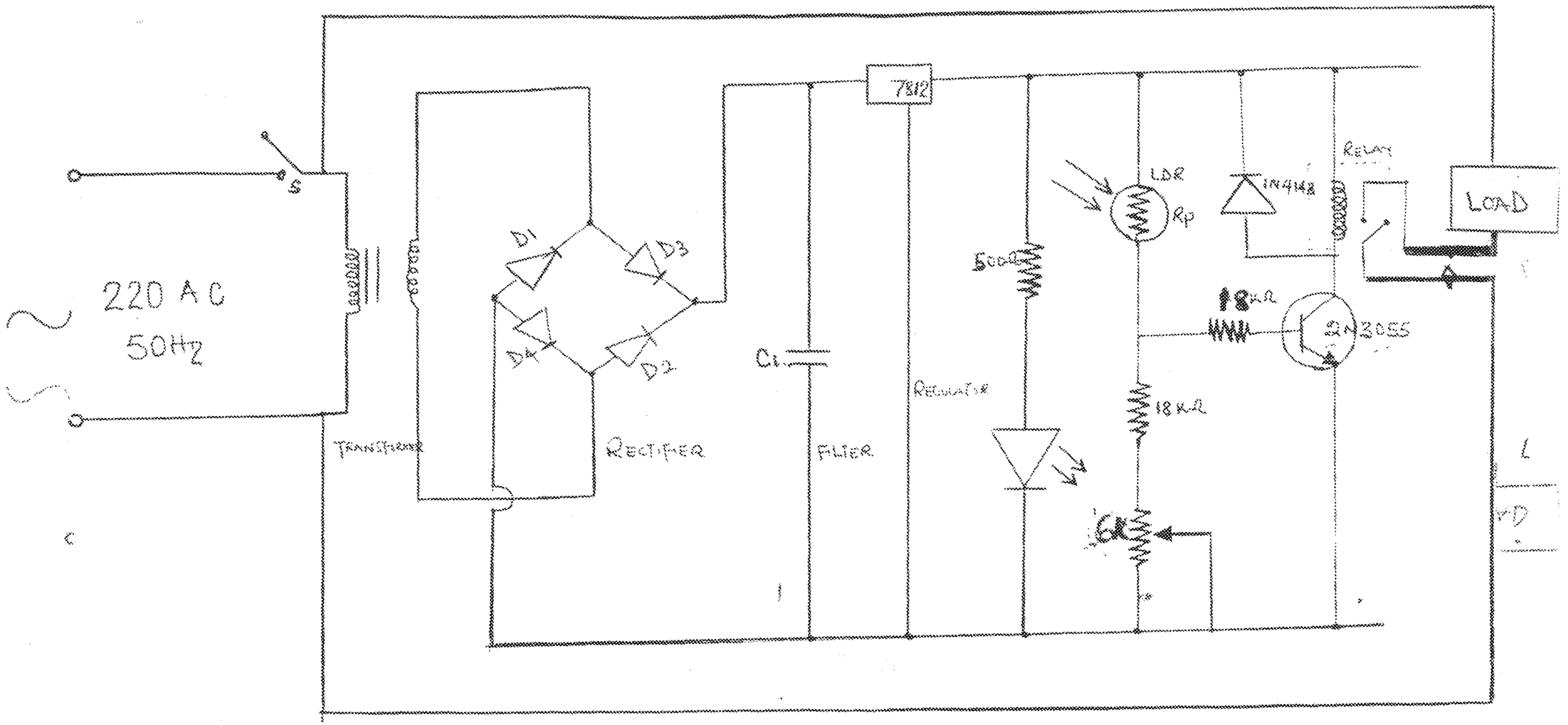
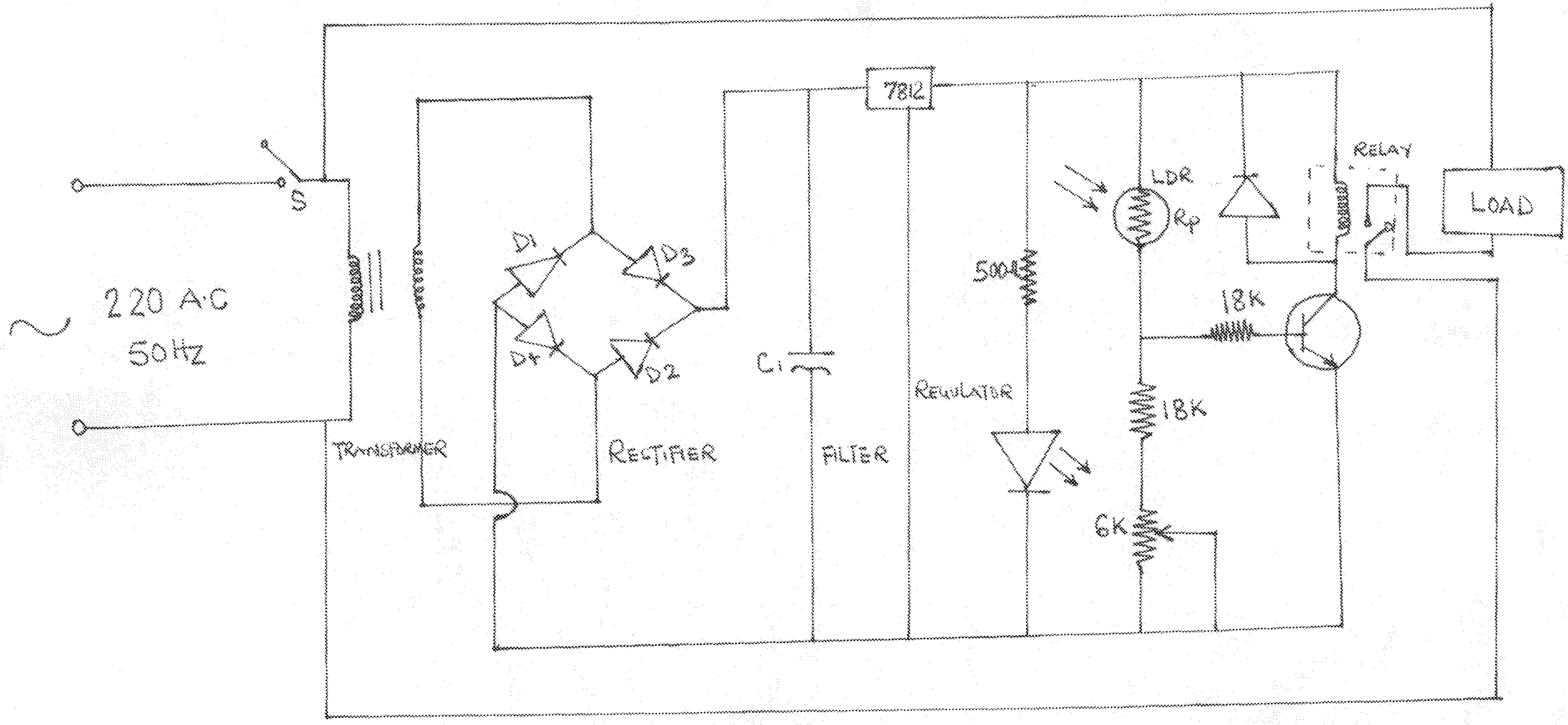


CIRCUIT DIAGRAM OF AUTOMATIC SECURITY LIGHTING SYSTEM



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