THE DESIGN AND CONSTRUCTION OF AUTOMATIC SECURITY LIGHT AND AN ALARM SYSTEM

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DEDICATION

This report is wholly dedicated to God Almighty without whom there will be no breath in my lungs and the strength to have successfully completed five years of intense training and this final year project. I owe You my life and utter gratifulness.

How can I forget my Mother, Mrs. Patience Oyom: my backbone and friend, I owe you what I'll never be able to repay even in the next 10 lives. For your love, support and undivided attention to see me become the best in life, I will forever be grateful. I love you mom!

To my only brother, Kingsley Oyom: life would have been really meaningless, humorless and a lot harder without you. I love you and truly appreciate the man you have become. Thank for your every loving effort to making me a better person.

Finally, this work is dedicated to the loving memory of my **Former Supervisor, Mr. Fred Alohan** who passed on months before this work could be completed. I will not forget your gentle correction and the time you spared to attend to me. May you rest in peace.

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To my friends, Bummi, Hannah and Theophilus: We have been through thick and thin together which made our friendship grow stronger with bond that cannot be easily broke. I love you all just to say the least and you will always have a place in my heart. Keep shinning at the top and never forget God in all your endeavours.

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To my classmates of Electrical/Computer Engineering, Federal University Of Technology Minna: I remember how I constantly bothered you to tutor or clarify studies i did not understand: thank you very much for your patience. I had a pleasant time learning.

Oyom Joycelyn .N.

DECLARATION

This is to certify that this project titled "Design and Construction of Automatic Security Light and An Alarm System" was carried out by OYOM JOYCELYN N. under the supervision of ENGR M.S. AHMED and submitted to the Department of Electrical and Computer Engineering of Federal University of Technology, Minna, for the award of Bachelor of Engineering (B.ENG) degree in Electrical and Computer Engineering.

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ABSTRACT

To totally eliminate or eradicate the sabotage of electrical paraphernalia and electricity wastage will be impossible just to say the least; this project is targeted at reducing light misuse while properly securing a building using the alarm system.

The automatic security light and alarm system as the name suggest, is a system that includes an automatic security light which comes on only during the night and automatically switches on the alarm at the door. The security light brightens the already darken environment to expose anything that was hidden hence scare off any trespasser. Nevertheless, the alarm system will be triggered off in advent of determined intruders who defile the security light. Furthermore, there is a switch that controls the alarm system to come on or off even if the bulb is on at night.

The scope of the project involves only one door.

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CHAPTER ONE

1.0 INTRODUCTION

The aim of this project is to minimize electricity wastage while being able to protect homes, companies and any infrastructure where it will be installed. The main function of any security is to deter, make it difficult for the vandals to enter the property and/or facilitate the apprehension of such criminals and this project has no different purpose than this.

The automatic security light and alarm system is a two in one security system considering the increased criminal activities over the years. The automatic security light will be light sensitive and this makes the device to light up only during dark hours. In other words, it will come on when it is dark and during the day, it automatically switches off. This is very useful in electricity conservation and reduces the security risks as most thieves avoid light in the night.

The alarm system is an afterthought considering the fact that there are still thieves who are resolved to stealing with or without security light. As earlier mentioned, the goal of this project is to increase safety. It functions in such a way that at the slightest human contact with a metal handle of a door, an alarm goes off. With less difficulty, the security guard or the police can detect where exactly to go for a chase or an arrest as the case maybe.

This project will be thoroughly done to achieve maximum security.

1.1 BACKGROUND INFORMATION

Security involves activities aimed at protecting or preventing a country, person or building from being harmed, damaged, destroyed, lost or badly treated.

In a society where crimes have become the order of the day, man has no other option than to find ways to safeguard his life and property in such a way that it deters criminals or help in the apprehension of the same.

Undoubtedly, most crimes are done in the topmost secrecy which darkness at night provides even without payment. According to research and records in criminology, it has been repeatedly confirmed how light has increasingly reduced the risk of vandalism. This is partly accredited to the psychology that criminals do not want to be seen or caught, consequently the demand and invasion of security lights into the market after surviving critics and skeptics alike.

Ever since the use of security lights in Nigeria, little or no concern has been paid to the conservation of energy. This is very evident when security lights are left on during the day where it is extremely insignificant. This has lead to electricity misuse, thus wastage. And with a growing population and economy, it has become a matter of necessity and an issue of urgent attention in the health, education and technological sectors that money should not be wasted not to mention the high standard of living that has reduced so many to a continuous state of poverty.

Irrecoverable millions of dollars have been sunk in the power and energy sector with little or nothing to show for it mainly because of political abuse of power. This amongst other reasons including vandalism of expensive electrical equipments have made Nigeria a country that is yet to efficiently provide electricity for its entire population even in a growing world of technology know-how. It is therefore ridiculous to waste the little that is left.

Apparently the foundation of light mishandling in electricity is greatly attributed to laziness and forgetfulness which as humans are inevitable. Yet not enough excuse for such ridiculous waste.

1.2 AIM AND OBJECTIVES

1) Generally, the objective is to provide a sense of well-being and reduces the risks of heart attacks, high blood pressure in patients of anxiety
2) To conserve light energy in form of electricity
3) To reduce money wastage on floodlights and continuous light misuse
4) To reduce light pollution, that is, the inefficient, uneconomical use of light, that sends light wastefully toward the sky or light that provides so much glare you can't see anything else
5) To deter criminals or aid in their apprehension
6) As an alarm, it aims at alerting the security guard or even police of any possible intruder
7) When further developed it could be used to show which door or entrance, the intruder is currently at when the alarm goes off
8) If further developed, can be used in automatic street lights

1.3 SCOPE OF WORK

For a building to be termed 'secured', all points of entry like windows, doors and gates including roofs and undergrounds must be properly fortified. Also, the guards on duty will have to be alert at all times and being well equipped in case of any eventualities. To achieve this much security, it requires time for planning and development even in developed countries. This is nearly impractical as Nigeria is yet to have world renowned technology know-how not to talk about the time for planning or knowledge for design and construction.

And having taken into consideration the duration of this project, its scope will be to properly fortify an entrance for example door or window. Therefore, this project is built for one door only. Further work can be done to expand its functionalities to include several numbers of windows, doors and gates.

1.4 METHODOLOGY

This project entails two different yet related aspects: the security light and the alarm system. The security light only comes on when there is darkness, which in turn activates the alarm system. Also, there is a switch to activate or deactivate the system. Hence, phasal construction which includes:

Phase 1: the power system unit

Phase 2: the light activated switch unit

Phase 3: the alarm system unit

Phase 4: the reset

CHAPTER TWO

LITERATURE REVIEW

2.1 SECURITY

A popular term used to mean "*something that produces a sense of protection against loss, attack or harm*"[1]. Security has different forms depending on it's functions but the basic form of any security started with the advent of keys and locks.

KEY

Key (mechanics), in mechanics, small part fitting a prepared recess cut in two joined parts or components, and thus employed to lock these parts together. Keys are most commonly used to lock wheels or gears firmly in their axles. Such a key is often composed of a thin strip of metal that fits tightly into a transverse groove cut in the axle shaft and into a parallel groove in the inner diameter of the wheel hub. Some keys are designed to prevent any play between wheel and axle, and others allow the wheel to slide along the axle but not to turn relative to it, although when sliding motion is needed, engineers usually prefer to use a splined (ridged) shaft. Instead of separate keys, the several splines machined on the shaft fit into corresponding grooves in the hub.

The term *key* is also applied to the inserted locking device, a small, shaped cut of metal, used to move or release a bolt or catch in a complementary mechanism

LOCK

Lock (fastening device), mechanical device used for fastening doors, chests, and lids, consisting essentially of a bolt guarded by a mechanism released by a key or a combination.

The simplest form of lock is a ward lock, which is essentially a bolt containing a notch known as a talon. The bolt is moved backward or forward by engaging a key in the talon. A back spring attached to the bolt holds it in place once it is released by the key. The tumbler or lever lock, similar to the ward lock, contains one or more pieces of metal of different heights, known as tumblers, levers, or latches, which intercept the bolt and prevent it from being moved until the tumblers are raised or released by the action of an appropriate key. The so-called pin-tumbler cylinder lock, or Yale lock, introduced about 1860 by the American inventor Linus Yale, was the first device to employ a small, flat key in place of a large, cumbersome one. The Yale lock consists essentially of a cylindrical plug placed in an outer barrel. The plug is rotated by a key and in turn moves the bolt of the lock by means of a cam. In order to rotate the plug the inserted key must raise five pins of different sizes into corresponding holes in the plug. Five similar pins are contained in the upper part of each of the holes. If the pins are not raised to the circumference of the plug, the plug cannot be turned. The most common form of cylinder lock used in the home is the so-called night latch, operated by a key from the outside and a knob from the inside. Another type of lock that is increasing in use is the magnetic lock, which is essentially the same as a cylinder lock, except the pins need a suitably magnetized key to bring them into alignment to allow the plug to be turned.

Of the various types of locks that are not operated by keys, the dial, or combination, lock is the most common. A set of tumblers, or wheels, is actuated by a spindle that can be rotated by a graduated dial on the outer end of the lock. Spinning the dial according to the proper combination arranges the tumblers so that the bolting mechanism is released. Combination locks of intricate design, incorporating various electronic safeguards, are produced for safes and bank vaults, and can have more than 100 million changes of combination. The combination locks are sometimes safeguarded by a time lock, which only allows the vault to be opened at certain specific times.

KEY AND LOCK MECHANISM

The above diagram shows the way a key opens its corresponding lock. When the key is inserted into the lock, its grooves raise spring-loaded pins of corresponding sizes. This permits the key to turn the cylindrical plug and open the lock. Only a key with grooves that exactly correspond to the size of the pins will permit the plug to rotate in the lock barrel.

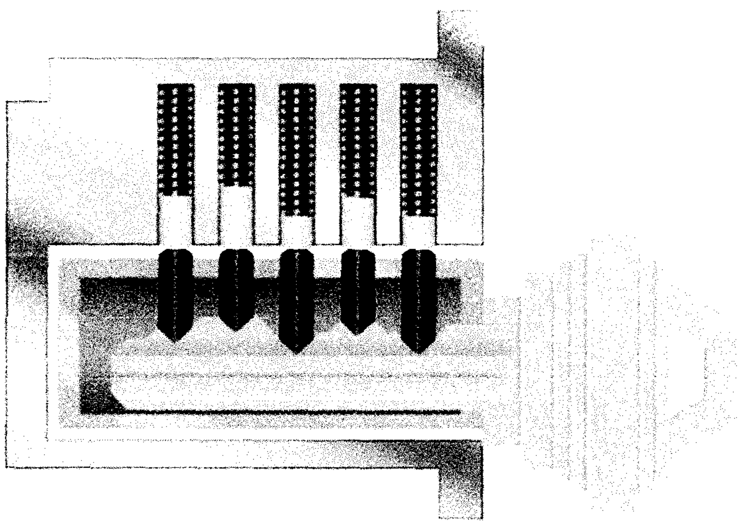

Figure 2.1 Key and Lock Mechanism

PROBLEMS WITH THE KEY AND LOCK MECHANISM

The key and lock system were very effective in historical times but with the dawn of technology, this system of security has becomes less and less competent to provide security against state-of-the-art techniques of robbery. Most burglars can break through doors with a key and lock mechanism within a tinkle of an eye and do whatever it is they want to do without being caught. This has over the years increased crime rates with very few apprehension of such criminals. A distressing thought that has left many crippled with fear and unrest in their homes and offices.

For this reason scientists and engineers have and are still cracking heads to bring a solution to. This project titled automatic security light and alarm system attempts to reduce burglary rates in offices and homes and/or aid in the arrest of such culprits. To achieve this the appropriate brightness of a security light is incorporated with effective sound of an alarm system.

2.2 LIGHT

Light is a form of energy visible to the human eye that is radiated by moving charged particles.

Scientists have learned through experimentation that light behaves like a particle at times and like a wave at other times. The particle-like features are called photons. Photons are different from particles of matter in that they have no mass and always move at the constant speed of about 300,000 km/sec (186,000 mi/sec) when they are in a vacuum. When light diffracts, or bends slightly as it passes around a corner, it shows wavelike behavior. The waves associated with light are called electromagnetic waves because they consist of changing electric and magnetic fields.

Illumination or Electric Light produced by means of any of a number of devices that convert electrical energy into light. The types of electric lighting devices most commonly used are the incandescent lamp, the fluorescent lamp, and light-emitting diodes, the various types of electric-discharge vapor lamps and electric arc (an electric arc: a type of continuous electric discharge, giving intense light and heat, formed between two electrodes in a gas at low pressure or in open air. It was first discovered and demonstrated by the British chemist Sir Humphry Davy in 1800).

2.2.1 NATURE OF LIGHT

To understand the nature of light and how it is normally created, it is necessary to study matter at its atomic level. Atoms are the building blocks of matter, and the motion of one of their constituents, the electron, leads to the emission of light in most sources.

2.2.2 BEHAVIOR OF LIGHT

Light behavior can be divided into two categories: how light interacts with matter and how light travels, or propagates through space or through transparent materials. The propagation of light has much in common with the propagation of other kinds of waves, including sound waves and water waves.

1) Interaction With Material

When light strikes a material, it interacts with the atoms in the material, and the corresponding effects depend on the frequency of the light and the atomic structure of the material. In transparent materials, the electrons in the material oscillate, or vibrate, while the light is present. This oscillation momentarily takes energy away from the light and then puts it back again. The result is to slow down the light wave without leaving energy behind. Denser materials generally slow the light more than less dense materials, but the effect also depends on the frequency or wavelength of the light. Under certain laboratory conditions, scientists can slow light down. In 2001 scientists brought a beam of light to a halt by temporarily trapping it within an extremely cold cloud of sodium atoms.

Materials that are not completely transparent either absorb light or reflect it. In absorbing materials, such as dark colored cloth, the energy of the oscillating electrons does not go back to the light. The energy instead goes toward increasing the motion of the atoms, which causes the material to heat up. The atoms in reflective materials, such as metals, re-radiate light that cancels out the original wave. Only the light re-radiated back out of the material is observed. All materials exhibit some degree of absorption, refraction, and reflection of light. The study of the behavior of light in materials and how to use this behavior to control light is called optics.

a) Refraction

Refraction is the bending of light when it passes from one kind of material into another. Because light travels at a different speed in different materials, it must change speeds at the boundary between two materials. If a beam of light hits this boundary at an angle, then light on the side of the beam that hits first will be forced to slow down or speed up before light on the other side hits the new material. This makes the beam bend, or refract, at the boundary. Light bouncing off an object underwater, for instance, travels first through the water and then through the air to reach an observer's eye. From certain angles an object that is partially submerged appears bent where it enters the water because light from the part underwater is being refracted.

The refractive index of a material is the ratio of the speed of light in a vacuum to the speed of light inside the material. Because light of different frequencies travels at different speeds in a material, the refractive index is different for different frequencies. This means that light of different colors is bent by different angles as it passes from one material into another. This effect produces the familiar colorful spectrum seen when sunlight passes through a glass prism. The angle of bending at a boundary between two transparent materials is related to the refractive indexes of the materials through Snell's Law, a mathematical formula that is used to design lenses and other optical devices to control light.

b) Reflection

Reflection also occurs when light hits the boundary between two materials. Some of the light hitting the boundary will be reflected into the first material. If light strikes the boundary at an angle, the light is reflected at the same angle, similar to the way balls bounce when they hit the floor. Light that is reflected from a flat boundary, such as the boundary between air and a smooth lake, will form a mirror image. Light reflected from a curved surface may be focused into a point, a line, or onto an area, depending on the curvature of the surface.

c) Scattering

Scattering occurs when the atoms of a transparent material are not smoothly distributed over distances greater than the length of a light wave, but are bunched up into lumps of molecules or particles. The sky is bright because molecules and particles in the air scatter sunlight. Light with higher frequencies and shorter wavelengths is scattered more than light with lower frequencies and longer wavelengths. The atmosphere scatters violet light the most, but human eyes do not see this color, or frequency, well. The eye responds well to blue, though, which is the next most scattered color. Sunsets look red because when the Sun is at the horizon, sunlight has to travel through a longer distance of atmosphere to reach the eye. The thick layer of air, dust and haze scatters away much of the blue. The spectrum of light scattered from small impurities within materials carries important information about the impurities. Scientists measure light scattered by the atmospheres of other planets in the solar system to learn about the chemical composition of the atmospheres.

2) How Light Travels

a) Diffraction and Interference of Light

The first successful theory of light wave motion in three dimensions was proposed by Dutch scientist Christian Huygens in 1678. Huygens suggested that light wave peaks form surfaces like the layers of an onion. In a vacuum, or a uniform material, the surfaces are spherical. These wave surfaces advance, or spread out, through space at the speed of light. Huygens also suggested that each point on a wave surface can act like a new source of smaller spherical waves, which may be called wavelets that are in step with the wave at that point. The envelope of all the wavelets is a wave surface. An envelope is a curve or surface that touches a whole family of other curves or surfaces like the wavelets. This construction explains how light seems to spread away from a pinhole rather than going in one straight line through the hole. The same effect blurs the edges of shadows. Huygens's principle, with minor modifications, accurately describes all forms of wave motion.

b) Interference

Interference in waves occurs when two waves overlap. If a peak of one wave is aligned with the peak of the second wave, then the two waves will produce a larger wave with a peak that is the sum of the two overlapping peaks. This is called constructive interference. If a peak of one wave is aligned with a trough of the other, then the waves will tend to cancel each other out and they will produce a smaller wave or no wave at all. This is called destructive interference.

In 1803 English scientist Thomas Young studied interference of light waves by letting light pass through a screen with two slits. In this configuration, the light from each slit spreads out according to Huygens's principle and eventually overlaps with light from the other slit. If a screen is set up in the region where the two waves overlap, a point on the screen will be light or dark depending on whether the two waves interfere constructively or destructively. If the difference between the distance from one slit to a point on the screen and the other slit to the same point on the screen is an exact number of wavelengths, then light waves arriving at that point will be in step and constructively interfere, making the point bright. If the difference is an exact odd number of half wavelengths, then light waves will arrive out of step, with one wave's trough arriving at the same time as another wave's peak. The waves will destructively interfere, making the point dark. The resulting pattern is a series of parallel bright and dark lines on the screen.

Instruments called interferometers use various arrangements of reflectors to produce two beams of light, which are allowed to interfere. These instruments can be used to measure tiny differences in distance or in the speed of light in one of the beams by observing the interference pattern produced by the two beams.

Holography is another application of interference. A hologram is made by splitting a light wave in two with a partially reflecting mirror. One part of the light wave travels through the mirror and is sent directly to a photographic plate. The other part of the wave is reflected first toward a subject, a face for example, and then toward the plate. The resulting photograph is a hologram. Instead of being an image of the face, it is an image of the interference pattern between the two beams. A normal photograph records only the light and dark features of the face and ignores the positions of peaks and troughs of the light wave that form the interference pattern. Since the full light wave is restored when a hologram is illuminated, the viewer can see whatever the original wave contained, including the three-dimensional quality of the original face.

c) Diffraction

Diffraction is the spreading of light waves as they pass through a small opening or around a boundary. Young's principle of interference can be applied to Huygens's explanation of diffraction to explain fringe patterns in diffracted light. As a beam of light emerges from a slit in an illuminated screen, the light some distance away from the screen will consist of overlapping wavelets from different points of the light wave in the opening of the slit. When the light strikes a spot on a display screen across from the slit, these points are at different distances from the spot, so their wavelets can interfere and lead to a pattern of light and dark regions. The pattern produced by light from a single slit will not be as pronounced as a pattern from two slits. This is because there are an infinite number of interfering waves, one from each point emerging from the slit, and their interference patterns overlap one another.

2.2.3 MEASURING LIGHT

A) Brightness

Scientists use the units candela and lumen to measure the brightness of light as perceived by humans. These units account for the different response of the eye to light of different colors. The lumen measures the total amount of energy in the light radiated in all directions, and the candela measures the amount radiated in a particular direction. The candela was originally called the *candle,* and it was defined in terms of the light produced by a standard candle. It is now defined as the energy flow in a given direction of a yellow-green light with a frequency of 540 x

10^{12} Hz and a radiant intensity, or energy output, of 1/683 watt into the opening of a cone of one steradian. The steradian is a measure of angle in three dimensions.

The lumen can be defined in terms of a source that radiates one candela uniformly in all directions. If a sphere with a radius of one foot were centered on the light source, then one square foot of the inside surface of the sphere would be illuminated with a flux of one lumen. Flux means the rate at which light energy is falling on the surface. The illumination, or luminance, of that one square foot is defined to be one foot-candle.

The illumination at a different distance from a source can be calculated from the inverse square law: One lumen of flux spreads out over an area that increases as the square of the distance from the center of the source. This means that the light per square foot decreases as the inverse square of the distance from the source. For instance, if 1 square foot of a surface that is 1 foot away from a source has an illumination of 1 foot-candle, then 1 square foot of a surface that is 4 feet away will have an illumination of 1/16 foot-candle. This is because 4 feet away from the source, the 1 lumen of flux landing on 1 square foot has had to spread out over 16 square feet. In the metric system, the unit of luminous flux is also called the lumen, and the unit of illumination is defined in meters and is called the lux.

b) Speed of Light

Scientists have defined the speed of light in a vacuum to be exactly 299,792,458 meters per second (about 186,000 miles per second). This definition is possible because since 1983, scientists have known the distance light travels in one second more accurately than the definition of the standard meter. Therefore, in 1983, scientists defined the meter as 1/299,792,458, the distance light travels through a vacuum in one second. This precise measurement is the latest step in a long history of measurement, beginning in the early 1600s with an unsuccessful attempt by Italian scientist Galileo to measure the speed of lantern light from one hilltop to another.

The first successful measurements of the speed of light were astronomical. In 1676 Danish astronomer Olaus Roemer noticed a delay in the eclipse of a moon of Jupiter when it was viewed from the far side as compared with the near side of Earth's orbit. Assuming the delay was the travel time of light across Earth's orbit, and knowing roughly the orbital size from other observations, he divided distance by time to estimate the speed.

English physicist James Bradley obtained a better measurement in 1729. Bradley found it necessary to keep changing the tilt of his telescope to catch the light from stars as Earth went around the Sun. He concluded that Earth's motion was sweeping the telescope sideways relative to the light that was coming down the telescope. The angle of tilt, called the stellar aberration, is approximately the ratio of the orbital speed of Earth to the speed of light. (This is one of the ways scientists determined that Earth moves around the Sun and not vice versa.)

In the mid-19th century, French physicist Armand Fizeau directly measured the speed of light by sending a narrow beam of light between gear teeth in the edge of a rotating wheel. The beam then traveled a long distance to a mirror and came back to the wheel where, if the spin were fast enough, a tooth would block the light. Knowing the distance to the mirror and the speed of the wheel, Fizeau could calculate the speed of light. During the same period, the French physicist Jean Foucault made other, more accurate experiments of this sort with spinning mirrors.

Scientists needed accurate measurements of the speed of light because they were looking for the medium that light traveled in. They called the medium ether, which they believed waved to produce the light. If ether existed, then the speed of light should appear larger or smaller depending on whether the person measuring it was moving toward or away from the ether waves. However, all measurements of the speed of light in different moving reference frames gave the same value.

In 1887 American physicists Albert A. Michelson and Edward Morley performed a very sensitive experiment designed to detect the effects of ether. They constructed an interferometer with two light beams—one that pointed along the direction of Earth's motion, and one that pointed in a direction perpendicular to Earth's motion. The beams were reflected by mirrors at the ends of their paths and returned to a common point where they could interfere. Along the first beam, the scientists expected Earth's motion to increase or decrease the beam's velocity so that the number of wave cycles throughout the path would be changed slightly relative to the second beam, resulting in a characteristic interference pattern. Knowing the velocity of Earth, it was possible to predict the change in the number of cycles and the resulting interference pattern that would be observed. The Michelson-Morley apparatus was fully capable of measuring it, but the scientists did not find the expected results.

The paradox of the constancy of the speed of light created a major problem for physical theory that German-born American physicist Albert Einstein finally resolved in 1905. Einstein suggested that physical theories should not depend on the state of motion of the observer. Instead, Einstein said the speed of light had to remain constant, and all the rest of physics had to be changed to be consistent with this fact. This special theory of relativity predicted many unexpected physical consequences, all of which have since been observed in nature.

2.3 ELECTRICITY

Electricity consists of charges carried by electrons, protons, and other particles. Electric charge comes in two forms: positive and negative. Electrons and protons both carry exactly the same amount of electric charge, but the positive charge of the proton is exactly opposite the negative charge of the electron. If an object has more protons than electrons, it is said to be positively charged; if it has more electrons than protons, it is said to be negatively charged. If an object contains as many protons as electrons, the charges will cancel each other and the object is said to be uncharged, or electrically neutral.

Electricity occurs in two forms: static electricity and electric current. Static electricity consists of electric charges that stay in one place. An electric current is a flow of electric charges between objects or locations.

2.3.1 ELECTRIC CURRENT

An electric current is a movement of charge. When two objects with different charges touch and redistribute their charges, an electric current flows from one object to the other until the charge is distributed according to the capacitances of the objects. If two objects are connected by a material that lets charge flow easily, such as a copper wire, then an electric current flows from one object to the other through the wire. Electric current can be demonstrated by connecting a small light bulb to an electric battery by two copper wires. When the connections are properly made, current flows through the wires and the bulb, causing the bulb to glow.

Current that flows in one direction only, such as the current in a battery-powered flashlight, is called direct current. Current that flows back and forth, reversing direction again and again, is called alternating current. Direct current, which is used in most battery-powered devices, is easier to understand than alternating current. Most of the following discussion focuses on direct current. Alternating current, which is used in most devices that are "plugged in" to electrical outlets in buildings.

Other properties that are used to quantify and compare electric currents are the voltage (also called electromotive force) driving the current and the resistance of the conductor to the passage of the current. The amount of current, voltage, and resistance in any circuit are all related through an equation called Ohm's law.

2.3.2 CONDUCTORS AND INSULATORS

Conductors are materials that allow an electric current to flow through them easily. Most metals are good conductors.

Substances that do not allow electric current to flow through them are called insulators, nonconductors, or dielectrics. Rubber, glass, and air are common insulators. Electricians wear rubber gloves so that electric current will not pass from electrical equipment to their bodies. However, if an object contains a sufficient amount of charge, the charge can arc, or jump, through an insulator to another object. For example, if you shuffle across a wool rug and then hold your finger very close to, but not in contact with, a metal doorknob or radiator, current will arc through the air from your finger to the doorknob or radiator, even though air is an insulator. In the dark, the passage of the current through the air is visible as a tiny spark.

2.3.3 MEASURING ELECTRIC CURRENT

Using electric meters, electric current is measured in units called amperes (amp). If 1 coulomb of charge flows past each point of a wire every second, the wire is carrying a current of 1 amp. If 2 coulombs flow past each point in a second, the current is 2 amps.

Voltage

When the two terminals of a battery are connected by a conductor, an electric current flows through the conductor. One terminal continuously sends electrons into the conductor, while the other continuously receives electrons from it. The current flow is caused by the voltage, or potential difference, between the terminals. The more willing the terminals are to give up and receive electrons, the higher the voltage. Voltage is measured in units called volts. Another name for a voltage produced by a source of electric current is electromotive force.

Resistance

A conductor allows an electric current to flow through it, but it does not permit the current to flow with perfect freedom. Collisions between the electrons and the atoms of the conductor interfere with the flow of electrons. This phenomenon is known as resistance. Resistance is measured in units called ohms. The symbol for ohms is the Greek letter omega, Ω.

A good conductor is one that has low resistance. A good insulator has a very high resistance. At commonly encountered temperatures, silver is the best conductor and copper is the second best. Electric wires are usually made of copper, which is less expensive than silver.

The resistance of a piece of wire depends on its length, and its cross-sectional area, or thickness. The longer the wire is, the greater its resistance. If one wire is twice as long as a wire of identical diameter and material, the longer wire offers twice as much resistance as the shorter one. A thicker wire, however, has less resistance, because a thick wire offers more room for an electric current to pass through than a thin wire does. A wire whose cross-sectional area is twice that of another wire of equal length and similar material has only half the resistance of the thinner wire. Scientists describe this relationship between resistance, length, and area by saying that resistance is proportional to length and inversely proportional to cross-sectional area.

Usually, the higher the temperature of a wire, the greater its resistance. The resistance of some materials drops to zero at very low temperatures. This phenomenon is known as superconductivity.

Ohm's Law

The relationship between current, voltage, and resistance is given by Ohm's law. This law states that the amount of current passing through a conductor is directly proportional to the voltage across the conductor and inversely proportional to the resistance of the conductor. Ohm's law can be expressed as an equation, $V = IR$, where V is the difference in volts between two locations (called the potential difference), I is the amount of current in amperes that is flowing between these two points, and R is the resistance in ohms of the conductor between the two locations of interest. $V = IR$ can also be written $R = V/I$ and $I = V/R$. If any two of the quantities are known, the third can be calculated. For example, if a potential difference of 110 volts sends a 10-amp current through a conductor, then the resistance of the conductor is $R = V/I = 110/10 =$ 11 ohms. If $V = 110$ and $R = 11$, then $I = V/R = 110/11 = 10$ amp.

Under normal conditions, resistance is constant in conductors made of metal. If the voltage is raised to 220 in the example above, then R is still 11. The current I will be doubled, however, since $I = V/R = 220/11 = 20$ amp.

2.4 TECHNOLOGY OF ELECTRIC LIGHT

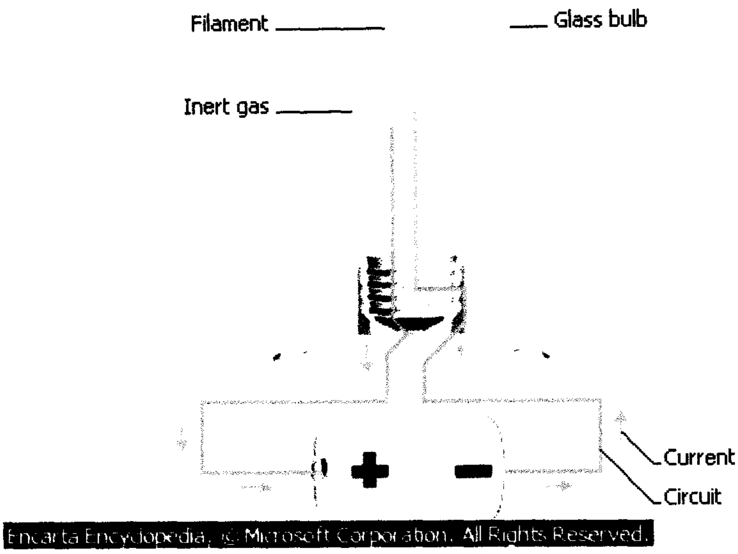

Figure 2.2 Technology of Electric Light

If an electric current is passed through any conductor other than a perfect one, a certain amount of energy is expended that appears as heat in the conductor. Inasmuch as any heated body will give off a certain amount of light at temperatures above 525° C (977° F), a conductor heated above that temperature by an electric current will act as a light source. The incandescent lamp consists of a filament of a material with a high melting point sealed inside a glass bulb from which the air has been evacuated, or which is filled with an inert gas. Filaments with high melting points must be used because the proportion of light energy to heat energy radiated by the filament rises as the temperature increases, and the most efficient light source is obtained at the highest filament temperature. Carbon filaments were employed in the first practical incandescent lamps, but modern lamps are universally made with filaments of fine tungsten wire (*Tungsten*), which has a melting point of 3422° C (6192° F). The filament must be enclosed in either a vacuum or an inert atmosphere; otherwise the heated filament would react chemically with the surrounding atmosphere. Using an inert gas instead of a vacuum in incandescent lamps has the advantage of slowing evaporation of the filament, thus prolonging the life of the lamp. Most modern incandescent lamps are filled with a mixture of argon or krypton and a small amount of nitrogen.

Radical changes in incandescent lamp design have resulted from substituting compact fused-quartz glass tubes for glass bulbs. These new, stronger-walled bulbs have made tungsten-halogen lamps, a variation of the incandescent lamp, possible. Tungsten-halogen lamps use the regenerative cycle of halogens to return evaporated tungsten particles to the filament, thus extending the life of the bulb. The high temperatures required to take advantage of halogen's regenerative cycle made this idea impossible until the walls of the bulb could be made stronger by the introduction of quartz. These bulbs are filled with a mixture of argon and halogen (usually bromine) gases along with a small amount of nitrogen.

2.4.1 HISTORY OF ELECTRIC LIGHT

The earliest experiments in electric lighting were conducted by British chemist Sir Humphry Davy, who produced electric arcs and who 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 of the 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. [1]

2.4.2 LIGHT POLLUTION

It's a myth that brighter lighting automatically provides better security. Security. Safety. Peace of Mind. These are words often used to sum up what 500watt Halogen Security Floodlights offer. Unfortunately, they also offer glare, dazzle, light pollution and light trespass. They can run up a very high electricity bill in a distressingly short time, and have a bigger carbon footprint than a herd of elephants.

Anyway, light pollution is 'any adverse effect of man-made light including sky glow, glare, light trespass, light clutter, decreased visibility at night, and energy waste'. [2]

"Light pollution is the inefficient, uneconomical use of light, use that sends light wastefully toward the sky or light that provides so much glare you can't anything else."

Why is light pollution bad?

1) It wastes huge amounts of money/energy: In the UK alone, it is estimated that street lighting throws £100m of unnecessary light into the night sky every year due to the poor design of many streetlight fittings. The proliferation of badly designed and overpowered domestic lighting is also adding to the growing waste. Popular, but usually inappropriate, 500w and 300w halogen 'insecurity' floodlights use 10x the power needed, and provide poorly directed and dazzling light as well. Generating all of this wasted power creates huge quantities of carbon (IV) oxide and other greenhouse gases.

2) It's unsafe: Contrary to popular belief, bright dazzling lighting does not make it easier to at night and its sometimes responsible for road accidents. The human eye is more comfortable and efficient in lower, more even light levels, so lower wattage and better light direction is more important than simple, wasteful brightness, and provides safer light levels to navigate or intruders by.

2.5 ALARM AND ALARM SYSTEMS

An alarm is defined as a signal indicating an abnormal or deviating condition, or a combination of conditions that requires the operator's attention. [3] Further, the alarm should require a physical or cognitive response. [4] [5] [6]

It is important to remember that the alarm system not only alerts the operator about different deviations. Instead, the whole aim of an alarm system needs to be considered when in the design. That is:

1) Alert the operators about a deviation,
2) Inform the operator about the nature of the deviation
3) Guide the operator's initial response, and
4) Confirm, in a timely manner, if the operator's response corrected the deviation. [7]

Theoretical Framework

Alarms and alarm systems are essential operating aids in the control room. The operators need help to detect, interpret and understand important operational information since they are not fully observant all the time, they are not omniscient and they can make mistakes. An alarm system should help the operators to diagnose faults and correct them.

2.5.1 ALARM DESIGN THEORY

Ergonomic design of control centers and alarm systems are presented in different standards and guidelines, e.g., ISO-11064 and NUREG-0711. [8]. The standards emphasize a human-centered design approach which should be iterative and integrated with the engineering design process. Further, the design process should include different situations, tasks and risk analysis, and the users should be involved.

Four recurrent alarm system design principles are found in the literature:

1) Alarm systems should be designed to meet the operators' needs and operate within their cognitive and physical capabilities.
2) The purpose of the alarm system and its contribution to protection should be clearly identified.
3) The performance of the alarm system should be assessed during design and commissioning.
4) The design of alarm systems should follow a structured methodology.

An alarm system should be usable and effective under all operating modes and working situations. To be able to develop a usable alarm system, the alarms need to be justified. This implies that the role of the operator needs to be identified, including the changes of the role in different operating conditions. For a usable alarm system, the following characteristics of the output information need to be met:

1) It is relevant to the operator's role at the time.
2) It informs about the system state and the cause of the alarm.
3) It indicates clearly what response is required.
4) It is timely and is presented at a rate the operator can handle.
5) It is easy to detect and understand.[3][6][9]

Several studies have been performed to set guidelines for an ideal alarm system. For example, EEMUA (1999) has presented a number of important characteristics for an individual alarm.

1) Timely – presented at the right time.
2) Relevant – for the operators, not a false alarm.
3) Unique – not a duplicate of another alarm.
4) Prioritized – helps the operators to focus their attention.
5) Understandable – speaks the operator's language.
6) Diagnostic and advisory – indicates what has happened, what actions are needed.
7) Manageable – not too many alarms. [7]

2.5.2 PROBLEMS FACING THE ALARM SYSTEM

Several analyses has shown that many problems with alarm systems have been identified and reported years ago, but still problems exist in real settings. The suggested design processes in ISO-11064 and NUREG-0711 [8] provide a more structured approach and emphasize that alarm system issues are dealt with early in the design process and in a systematic way. A general problem today is that the alarm system design work starts too late. Although ergonomic design processes can facilitate the work, it is important to coordinate the work with the alarm system with the regular engineering process of the control room. However, in some buildings, alarm systems are still regarded as a separate system with its own design. This leads to problems with inconsistencies between the alarm system and the control system. Therefore it is important that the alarm system design process corresponds to the design process of the control system.

Furthermore, it is difficult to evaluate the need for different alarms when the technical system is not decided. A proper task allocation and task analysis is needed to understand which tasks the operator needs to deal with and how the operator should manage these situations.

A general complaint from many industries is that the existing alarm system design recommendations are too general to apply. Though, some facilities had worked with these general guidelines and by considering them, they had developed their own alarm style guides or alarm philosophies. These documents were then regarded as very significant in further work. This shows that general guidance is very important, but the facilities need to adapt them to their own conditions.

Since many aspects of an alarm system need to be designed late in the design process, the flexibility of the alarm system in crucial. For example, it should be easy to change level of priority and set-points, to define different operating modes and to implement logical suppression even in late design stages. A problem today is that alarms to a great extent are used to present informative messages. This leads to problems with huge numbers of alarms and alarm flooding in disturbances. An alarm should always require some kind of action (mentally or physically) of the operator. For that reason, another recommendation is that the designer has an objective alarm definition, since the definition might vary depending on type of product, type of users and type of use context.

It is important to focus the alarm system design process on the work tasks performed by the operators. The alarm system itself should guide the operator, thus the main aim cannot be to present the cause of an alarm. Sometimes, the operator's primary task is to mitigate the consequences rather than to understand and correct the underlying cause. If the aim of an alarm system is considered in the design, it will probably lead to better alarm messages. Today, problems exist with ambiguous or irrelevant information. Many alarm systems alert and inform the operators, but few systems guide the operators. This area is of special significance when improving the performance of the alarm system. [7]

CHAPTER THREE

DESIGN AND IMPLEMENTATION

3.1 OPERATIONAL PRINCIPLE & BLOCK DIAGRAM

The automatic security light and alarm system is based on the theory that a security light will spontaneously come on once a sensor detects darkness and immediately activate the alarm system. The alarm is triggered off only when an intruder touches a metal at the door with two switches for alarm reset and total system reset.

BLOCK DIAGRAM

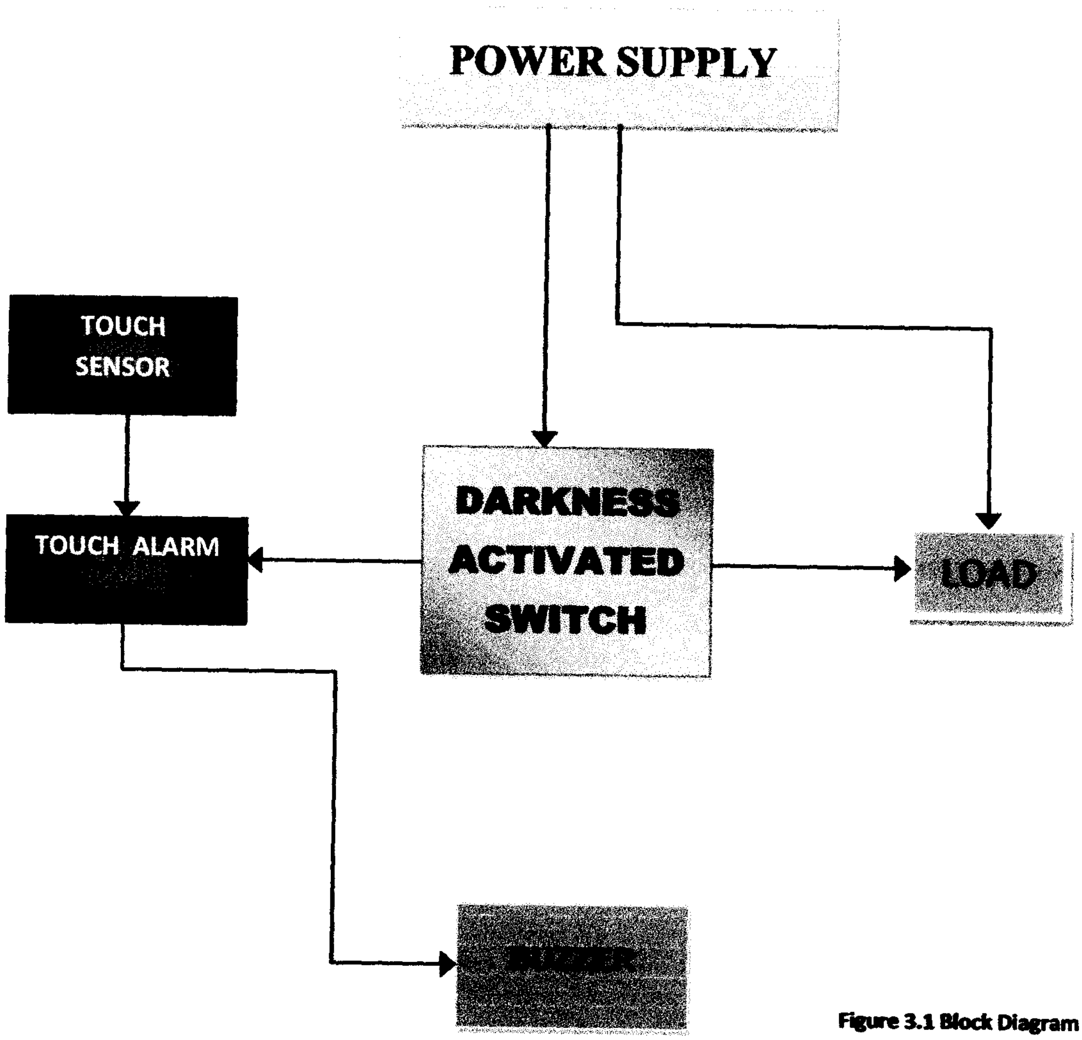

Figure 3.1 Block Diagram

3.2 CONSTRUCTION

It is important to note that the project design was first constructed on a breadboard to ensure that it is properly working before it was transfered and soldered to the vero board. The design is specially divided into:

a. Power system circuit
b. The light activated switch circuit
c. The alarm system circuit
d. The latch circuit
e. Reset

3.2.1 Power System Circuit

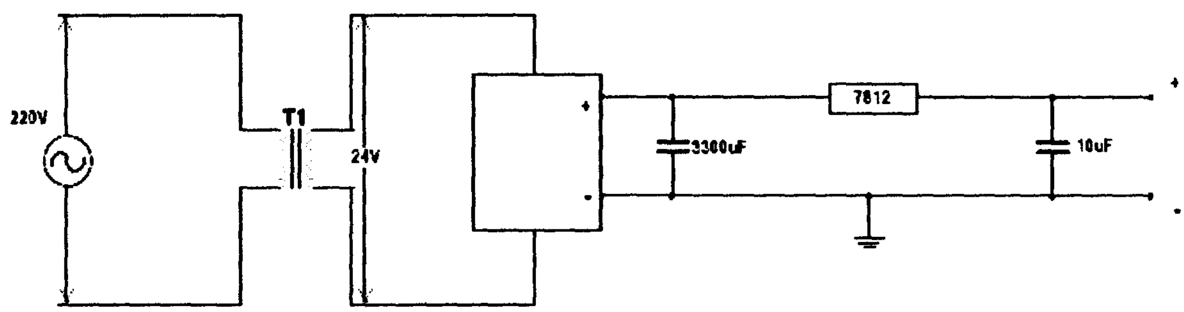

Figure 3.2 Power System Circuit

The power circuit is designed to step down the PCHN voltage of 220 volts to 24volts which is needed to feed the circuit. To achieve accurate results, the following devices were used:

1) **Transformer:**

A transformer is a static (or stationary) piece of apparatus (or device) by means of which electric power in one circuit is transformed into electric power of the same frequency in another circuit. It can be used to raise or lower the voltage in circuit but with a corresponding decrease or increase in current.

The transformer used in this project is a step-down transformer. This was used to lower the voltage from 220 volts to 24 volts.

2) **Bridge rectifier:**

This is a circuit which employs one or more diodes to convert AC voltage into pulsating DC voltage and was used in the power circuit.

3) **Filtering capacitor:**

The DC signal produced, contains fluctuations or pulsation called ripples which are present in the output voltage supplied by the rectifier. To remove these ripples, a filtering capacitor was employed although there is no filter that gives an output voltage as ripple free like a DC battery but it approaches it so closely that the power supply performs well.

NOTE: the dielectric voltage of the capacitor must be greater than the input voltage capacitor (rectifier voltage).

The charge lost dQ in time T_r is $I_{dc}T_r$

$$\therefore \; V_{r(p-p)} = \frac{dQ}{C} = \frac{I_{dc}T_r}{C} = \frac{V_{dc}}{f_r C R_L}$$

The triangular ripple has an rms value given by $V_{r(rms)} = \frac{V_{r(p-p)}}{2\sqrt{3}}$

$$\therefore\ V_{r(rms)} = \frac{V_{r(p-p)}}{2\sqrt{3}} = \frac{V_{dc}}{2\sqrt{3}\, f_r\, CR_L}$$

$$\therefore\ \gamma = \frac{V_{r(rms)}}{V_{dc}} = \frac{1}{2\sqrt{3}\, f_r\, CR_L}$$

Now, iff_r is the frequency of the ripple voltage. for halfwave rectifier;

$$\gamma \cong \frac{1}{2\sqrt{3}\, f_r\, CR_L}$$

It can be further proved that

$$\gamma = \frac{1}{2\sqrt{3}\, f_r\, CR_L} = \frac{I_{dc}}{4\sqrt{3}\, f\, C}\left\{\frac{1}{V_{ip}} - \frac{1}{V_{dc}}\right\}$$

It is seen form the above that ripple increases with increase in load current.

Incidentally, $V_{dc} = V_{ip} - \frac{V_{r(p-p)}}{2}$

where V_{ip} = peak output voltage

Substituting the value of $V_{r(p-p)} = \frac{V_{dc}}{f_r\, CR_L}$, we get

$$V_{dc} = V_{ip} - \frac{V_{dc}}{2\, f_r\, CR_L} \text{ or } V_{dc} = \frac{V_{ip}}{1 + \frac{1}{2\, f_r\, CR_L}}$$

$$\therefore\ V_{dc} = V_{ip}\left\{\frac{2fCR_L}{1 + 2fCR_L}\right\} = \frac{V_{ip} - {}^{I_{dc}}/_{4fC}}{1 + {}^{I_{dc}}/_{4fCV_{ip}}}$$

where V_{dc} = DC voltage and I_{dc} = DC current

4) **Voltage regulator:**

The main purpose of a voltage regulator is to keep the terminal voltage of DC supply constant even when:

a) ac input voltage to the transformer varies (deviations from 220V are common);

b) The load varies.

To achieve a stable 12volt output, a 12volt regulator was utilized called 7812 regulator.

3.2.2 The Light Activated Switch Circuit

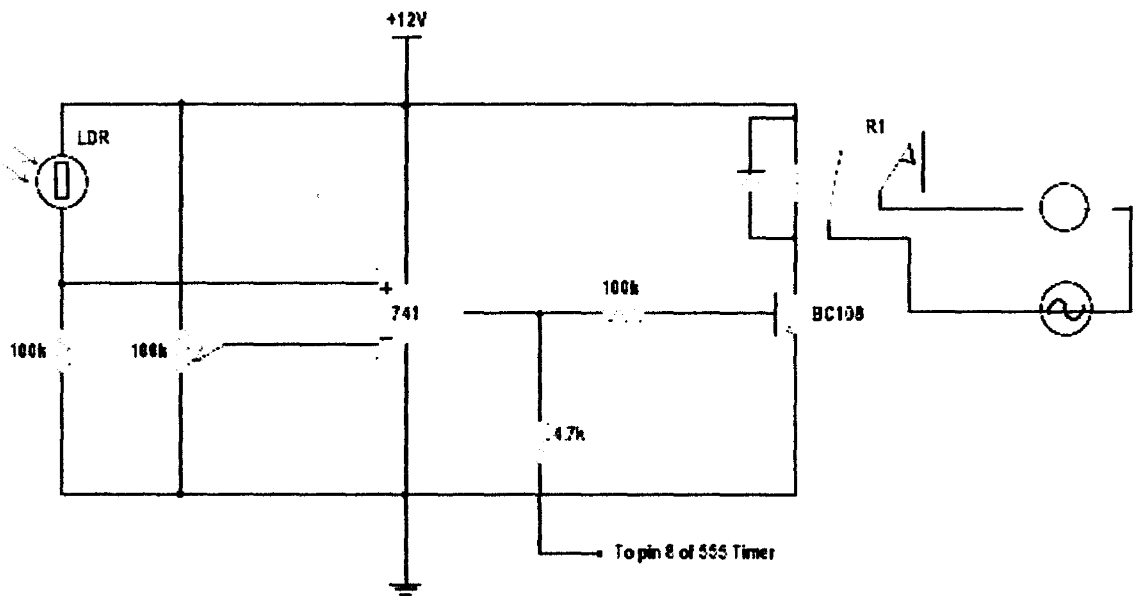

Figure 3.3 The Light Activated Switch Circuit

This is the circuit responsible for the automatic security light. There are devices used in the circut and are responsible in making the security light work properly. These are:

a) Sensor

The sensor is responsive to changes in the quantity to be measured, for example, temperature, position, or chemical concentration. But for the benefit of this project, the sensor used is one for detection of darkness.

A sensor is made up of a Light Dependent Resistor (also called an LDR which is a transducer that varies in resistance according to light intensity) in series with a fixed resistor which will result in a voltage divider network. This connection produces the variation in voltage either across the fixed resistor or LDR; since V=IR where I is constant.

Mathematically, the voltage network can be expressed as:

$$V_2 = \frac{R_2}{R_1+R_2} V_T$$

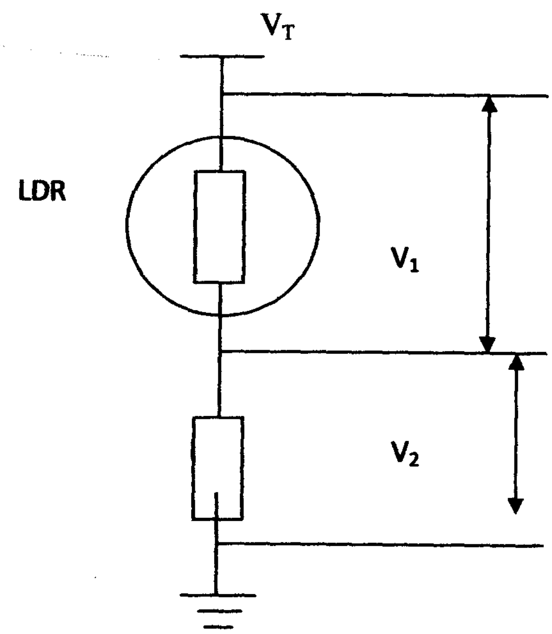

Figure 3.4 Sensor

B) Comparator

The comparator is made up of 741 operational amplifier. This is used to compare two voltage values as shown belown:

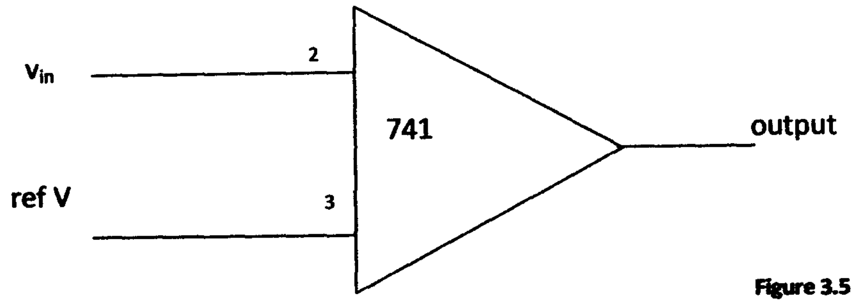

Figure 3.5 Comparator

Here, the reference voltage is set at pin 3 which is the inverting input while the voltage at pin 2 is non-inverting voltage. The reference voltage is set using a variable resistor of 100kΩ while the input voltage is obtained as V_2. That is;

$$V_{OUT} = A_O V_{in}$$

Where A_o = Open loop and voltage gain usually is 20000 or more.

Hence, $V_{in} = V^{+} - V^{-}$

Where V^{+} is non-inverting voltage while V^{-} is inverting voltage

These are the possible results:

1) When V_{in} is greater than reference voltage; output is low.
2) When V_{in} is equal to reference voltage; output equal to zero.
3) When V_{in} is less than reference voltage; output is high.

However, to get a noticeable result, the output from the comparator is fed into the relay driver.

C) Relay

The relay driver stage comprises of a resistor known as base resistor, transistor and a relay as shown below:

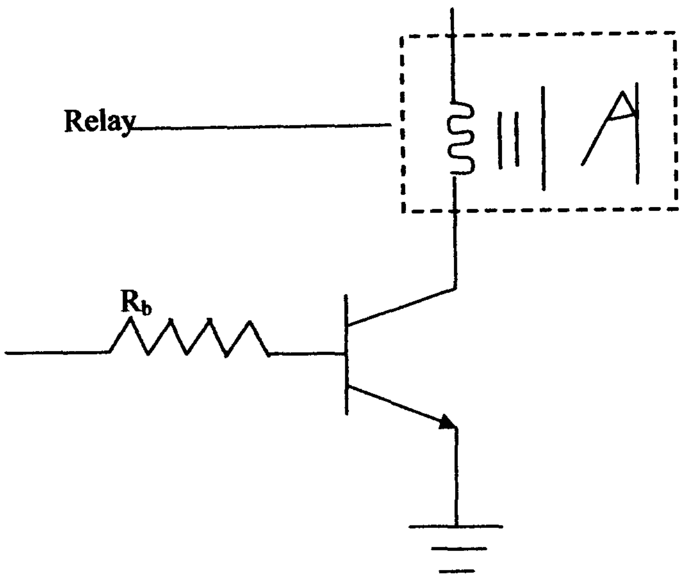

Figure 3.6 Relay

In this stage, R_b limits the current passing through the transistor since the current has minimal value so as to have higher current passing from the collector to the emitter in case of NPN transistor. Given:

$$V_{cc}^{+} = 12v$$

$$V_{be} = 0.6v$$

$$V_{ce} = 0v$$

$$V_{in} = 5v$$

$$H_{fe} = 300$$

$$V_{cc}^{+} = I_c R_c + V_{ce}$$

$$V_{in} = I_b R_b + V_{be}$$

$$H_{fe} = {}^{I_c}/_{I_b}$$

$$R_b = V_{in} - {}^{V_{be}}/_{I_b}$$

Where,

I_c = Collector current

I_b = Base current

V_{in} = Input voltage

V_{ce} = Collector emitter voltage

V_{cc} = Positive voltage

H_{fe} = Current gain

From eqn 1;

$$12 = I_c R_c + V_{ce}$$

$$12 = I_c(400) + 0$$

$$I_c = 30mA$$

From eqn 3;

$$I_b = {}^{30mA}/_{300} = 100\mu A$$

From eqn 2;

$$5v = 0.6 + (100\mu A \times R_b)$$

$$R_b = {}^{4.4}/_{100\mu A} = 44K\Omega$$

$R_b = 47K\Omega$ (preferred value)

3.2.3. The Alarm System Unit

The alarm system acts as a notifier to the security guard or police of an intruder and will not stop until it is put off. To achieve this, a 555 timer was used.

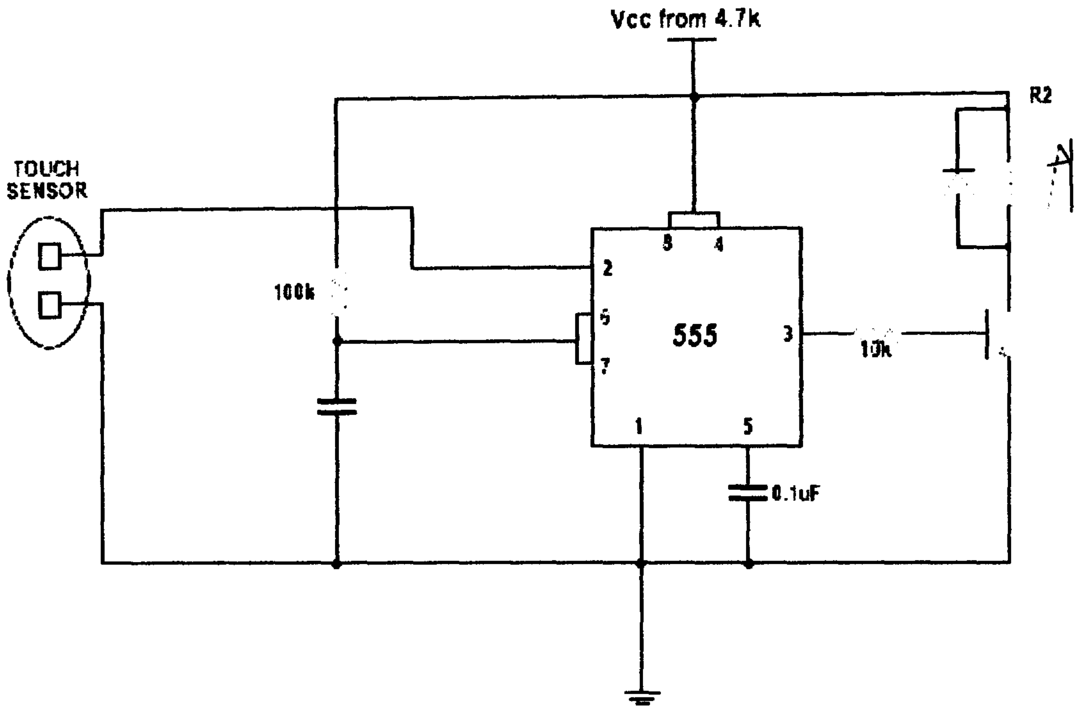

Figure 2.7 The Alarm System Unit

555 TIMER

This is used as touch activating circuit. This is acchieved by using the monostable mode of connection. The V_{cc} used to power this section is obtained directly from output of the operator. This is shown in the systematics below:

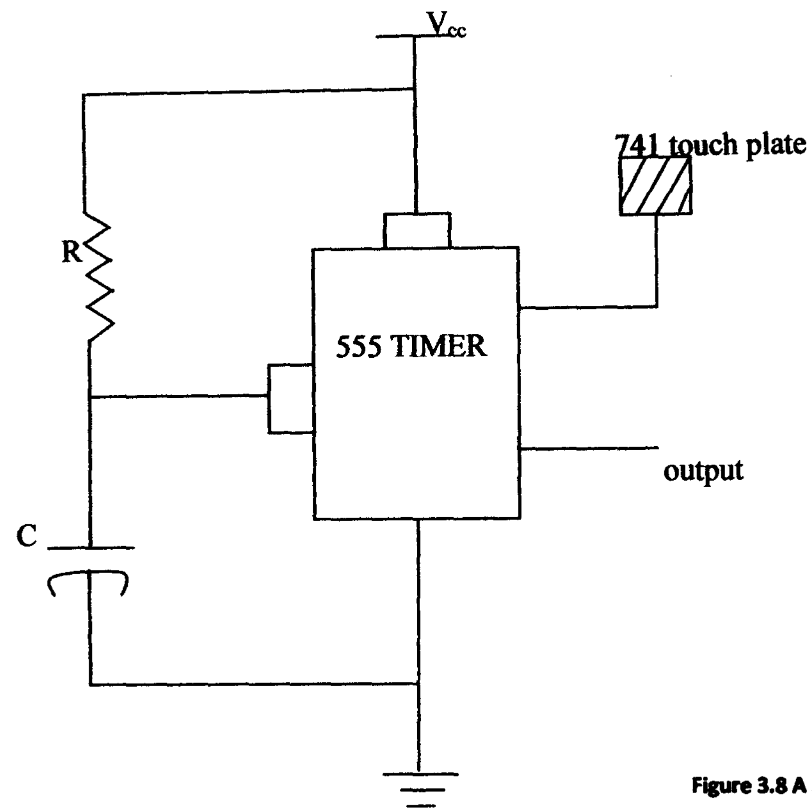

Figure 3.8 A 555 Timer

The monostable produces a high at the output when there is human contact with the touch plate. This output does not stay high forever but becomes low after a particular period of time which is calculated with the mathematical expression:

$$T = 1.1 \times R \times C$$

$$R = \frac{T}{1.1 \times C}$$

Using T= 1sec and C= 10uf, R becomes

$$R = \frac{1}{1.1 \times 10UF} \cong 100\ K\Omega$$

3.2.4 The Latch Circuit

To successfully complete the circuit for the alam, there must be a latching thus producing an alarm from the buzzer as shown in figure 6 below:

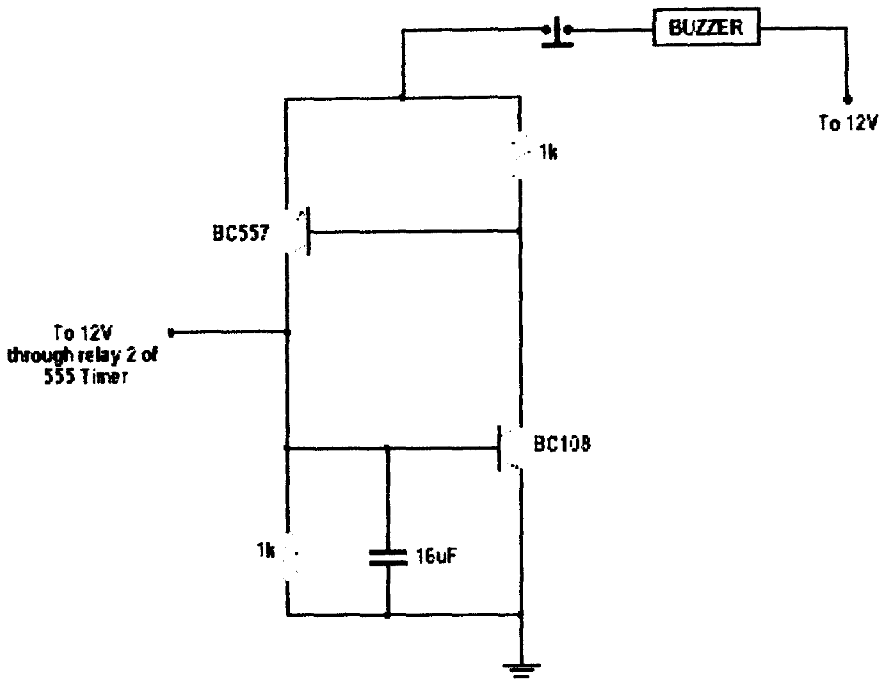

Figure 3.9 The Latch Circuit

3.2.5 Reset

The reset button or switch is simply as the name suggest; a switch used to set the alarm back to zero or normal. Also there is a total system reset which is just a button away for the security guard.

3.3 THE COMPLETE CIRCUIT DIAGRAM

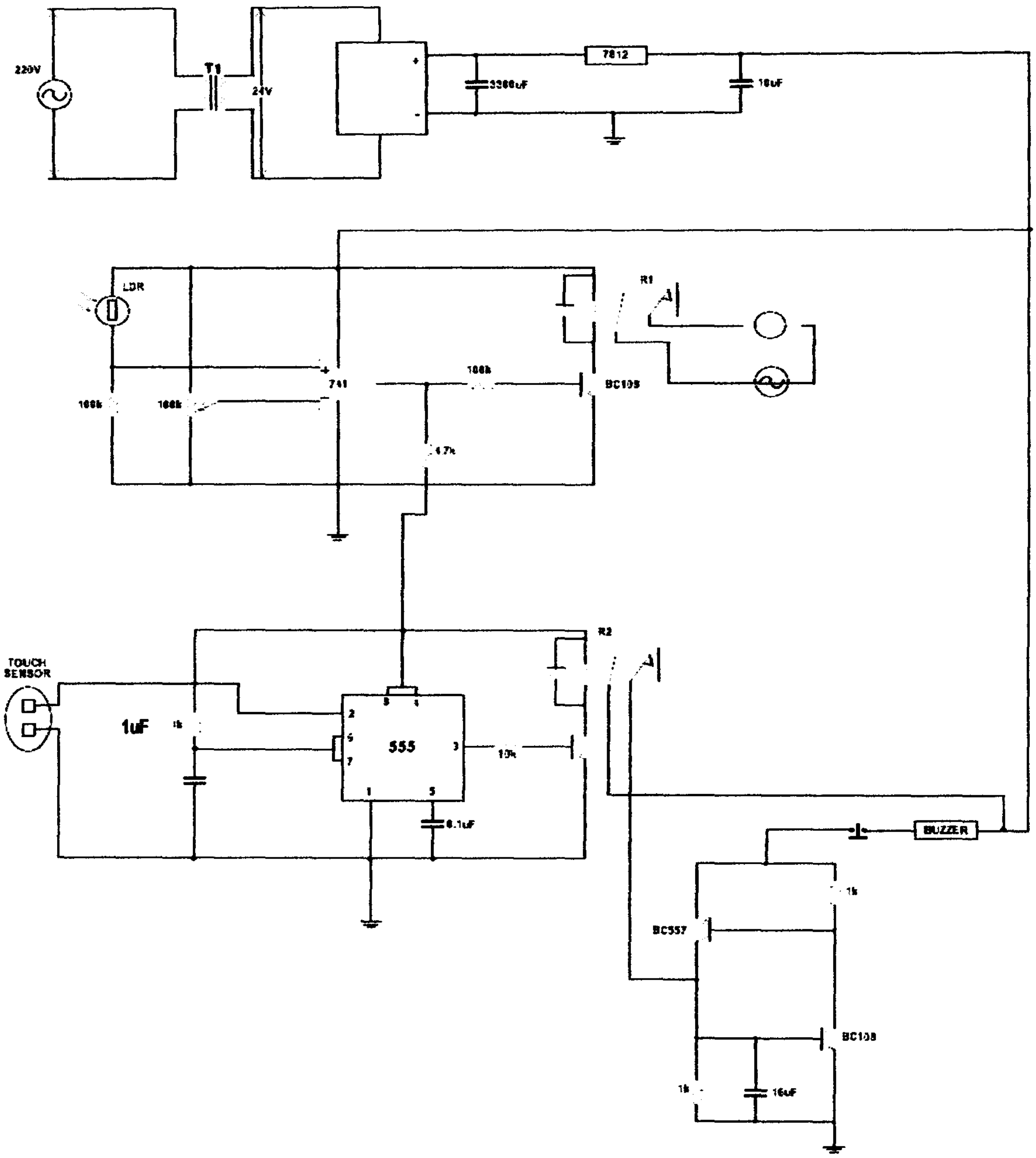

Figure 3.10 The Complete Circuit Diagram

3.4 COMPONENTS' LIST

S/NO	COMPONENT	RATED VALUE
1	Bridge rectifier	
2	Capacitor	3300µf
3	Voltage regulator (7812)	
4	2 Capacitors	10µf
5	Operational amplifier (741)	
6	Resistors	100k, 10k, 2.2k
7	Transistors	BC 108, BC 547
8	Diodes (IN 4001)	
9	Relays (2)	12volts
10	555 Timer	
11	Buzzer	
12	Variable Resistor	100k
13	Lamp holder	
14	Switches	
15	LED	
16	Central tap Transformer	12volts
17	LCD	

CHAPTER FOUR

TEST, RESULTS AND DISCUSSION

After completing the construction on the vero board, tests were carried out to ensure the proper functioning of the work and test its reliability. Based on the results discovered, the project will be worked upon to readdress any weakness that is not comforming to the operational theory.

Since this project involves a security light and an alarm system, it is only fair enough to test if the light is working properly, coming on only when it is dark and if the alarm can only be triggered off when there is a physical contact with the metal. Also to make certain that the alarm switch is accurate in switching off and/or on the alarm without affecting the security light. To realize this, three appartus were used.

1) Multimeter: was used to test the voltage in the lampholder before a bulb was inserted so as to avoid the bulb blowing up. The project was connected to a power source, switched on and placed under sunlight. The multimeter was set to read the AC voltage and placing the two(2) pins of the multimeter into the corresponding pins of the lampholder, a valuable reading of 2volts was taken. This voltage is not enough to power a bulb.

Next, was to take an analysis in darkness with the project connected to a source and switched on. This produced a reading of 231volts which is enough to power a bulb. Hence, proving that the security light is working appropriately.

2) Bulb: trusting that the voltage produced in the circuit will cause no damage, a bulb was inserted into the lampholder and under sunlight, the bulb did not lit but with the slightest darkness, the light came up with full glow.

3) Buzzer: according to the working principle, once the light comes on, the alarm is activated but with the aid of a switch, the alarm can be switched off or on even if its late at night and the security light is on. Nevertheless, once the alarm system is switched on, any contact with the metal will trigger the alarm and will only go off when the reset button is pressed.

The alarm was tested with the project connected to the power source and switched on.

TEST 1: the alarm switch was off under sunlight and the wire touched.

Result: The bulb did not come on and there was no alarm

Discussion: the bulb did not lit because there was sunlight, hence could not automatically trigger on the alarm.

TEST 2: with the alarm system switched off it was taken into darkness and the wire touched.

Result: This produced no output that is, an alarm even though the bulb came on as a result of the sensor sensing darkness.

Discussion: This was so because the alarm switch was off.

TEST 3: with all other conditions in Test 1 kept constant except for the alarm system being switched off, (that is, in this test, the alarm system was switched on) another test was carried out.

Result: there was no output from the alarm and from the bulb.

Discussion: This is because there was light.

TEST 4: with same conditions in Test 2 except for the alarm system being off (that is, in this test, the alarm system was switched on) yet another test was made.

Result: This time there was a responsive output from the alarm as well as the bulb.

Discussion: This means that even though the light comes on and at the same time triggers the alarm, there will be no output with the switch off.

4.2 TROUBLESHOOTING

a) if the system is switched on in darkness but the bulb light does not come as well as the alarm when switched on and the wire touched, check the power source, it might be faulty.

b) in case the system's power source is working appropriately but produces no output in the bulb and alarm under normal working conditions, check to make sure the system's switch is on.

c) if the alarm goes off and the bulb does not lit: check and make sure the bulb is fixed properly to the lampholder and there is no contact loss.

d) if the bulb comes on under normal working conditons but it is not bright enough or blinking, make sure the bulb is connected properly to the lampholder. If it persist, the bulb is faulty therefore needs a change.

e) under normal working conditions the alarm does not go off when there is contact with the wire and the bulb is on. Switch on the alarm system and make contact, there will an output both in the bulb and in the alarm.

CHAPTER FIVE

CONCLUSION

Automatic security light and alarm system was designed to meet the security demands of our society without being offensive to both the user and/or neighbours. To accomplish this, devices like 555 timer, LDR, resistors, transistors, capacitors of various ranges, etc were used in strict adherence with the design circuit.

The design circuit was built on a breadboard to ascertain functionality of individual components and the proper functioning of the entire circuit before permanently soldering to a veroboard. Furthermore, appropriate tests were carried out with a bulb and buzzer to ensure that the circuit produces accurate response or output under different working conditions.

Nevertheless, to say this project was successful without initially giving problems would be a tall tale. The major problem encountered was that the voltage needed to aid the normal operation of the latch circuit is 12volts therefore the 7volts given out by the 555 Timer was not enough to put latch circuit into continous action when applied to the gate. Thus, a relay was used to connect the gate to 12volts supply directly.

5.2 RECOMMENDATIONS

First and foremost, it will become unsatisfying if this project does not challenge creative minds to further improve on the work done. As a result of the completion of this project, it was noted that there is still room for improvement. Due to time constrain, some of them were not put in consideration. In light of this reason, i recommed an expansion of the project to include several doors. The circuit design should also include corresponding LEDs to indicate which door there was an alarm. This definitely means that a different transistor value will be used and the same applies to the supply voltage.

Also, due to the fact that there exist false alarms in the real world, consideration or provision should be made to entail this conspicuous reality in such a way that it does not entirely stop system from being a security device.

Further work can be done on the bulb or security light to stop blinking when the alarm is triggered. This will help reduce total darkness when an alarm goes off. These suggestions are definitely subject to scrutiny depending on the purpose of reconstruction.

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