# DESIGN AND CONSTRUCTION OF INFRARED SECURITY ALARM

BY

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# DEDICATION

I am dedicating this project to the Almighty Allah (S.W.T) and also to my beloved and noble parents: Mallam Muhammad Ahmad Ndako and Hajiya Aminat Yusuf. Also to my beloved sisters: Hauwa, Zainab, Rahmat and Aisha. May allah (S.W.T) continue to guide and protect them and grant them Aljanatul Firdaus.

# DECLARATION

I Muhammad Abubakar Sadiq declare that this work was done by me and has never been presented elsewhere for the award of a degree. I also hereby relinquished the copyright to the Federal University of Technology, Minna.

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I must register my sincere thanks to my beloved and noble family for their financial and moral supports.

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This report will be incomplete if I fail to acknowledge my friends such as Abdulmumin Abdullahi, Muhammad Ibrahim all others too numerous to mentioned as well as all my well wishers for their sincere love and prayers during my stay in the university

# ABSTRACT

This project "design and construction of infrared security alarm" is a project designed to detect and sound an alarm in any case of unauthorized visitor, a bugler, or an intruder, or any object entering into a premises, home or private apartment through the section of an infrared sensor, that involves both a transmitter and a receive. By interrupting the light rays, or beam of light from the infrared transmitter to the infrared receiver, the system get activated into an alarm stage. The sensor as a device is a guaranty to provide a high level of vigilance to a household owner, security guards and other relevant authorities even when asleep, especially at night.

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# CHAPTER ONE

# Introduction

## 1.1 General Introduction

The increasing need for securing of lives and properties in our society, and the deteriorating rate of the security system have made it necessary for us to device means for proving security for both our lives and properties against intruders.

The purpose of the security system is to monitor what is happening around our homes, offices and safes both when we are around and not.

Over the years, man has been struggling to improve this security by devising different security measures against intruders. This securities measures range from the use of high fences with barbed wires, dogs in the house and employment of security personnel.

The infrared security alarm is used to sound on alarm when an intruder or an object enter into the prohibited area and breaks a projected continuous pulse of infrared beam crossing the room, institution, home, safe etc.

The infrared security alarm comprises of a source of infrared radiation used as a transmitter, and a receiver consisting infrared sensor that is sensitive to infrared rays. The infrared beam between the transmitter and the receiver is invincible to the human eye. If the beam is interrupted, an alarm is produced.

This particular form of security is important because it detects the presence of the unsuspecting intruder and alerts the house owner, business man, police and other relevant authorities concerned.

## 1.2 Aims and Objectives

The alarming rate of crime all over the world has led to the quest of finding means of security. The aim of this project is to show that the security of our homes, business institution can be improved using simple and sensitive electronic circuit that uses infrared to detect the presence of an intruder and to sound the alarm. When burglars are detectable, crime rate will definitely reduce and the society would be the better benefactor.

## 1.3 Methodology

In analyzing this project, the following processes, design and construction were taken.

- Analyzing the problem
- Writing out the brief about the project
- Carrying out research
- Writing a specification
- Working out the possible solution
- Selecting the desire solution
- Giving details of the design

While in carrying out the construction, the processes taken are as follow

- Designing the circuit diagram
- Getting the components

- Testing the component
- Building the circuit on a bead board
- Transferring the circuit onto a vero board
- Testing and inspection of the circuit

## 1.4 Scope

The infrared security alarm is a form of security intended to sound an alarm when an intruder or an object enters into a prohibited area and breaks a projected continuous pulse of infrared beam crossing a room, institution, home, safe etc. when the alarm is triggered, it simultaneously triggers a counter which automatically reset the alarm after a pre determined fixed time.

## 1.5 Application of Infrared System

The most common application of the infrared system is in the area of security, and its application ranges from automatic door opener, light switches in hall ways, stairways and areas that increase safety for the public. With the ease of installation and low susceptibility to interference from other forms of radiation, such as heaters or windows, the infrared detectors are best.

Some of the exciting and useful applications of the infrared technology are [1].

- In the field of infrared astronomy where new and fascinating discovers are being made about the universe.
- Medical infrared imaging which is a very useful diagnostic
- Infrared cameras are useful for police and security work as well as fire fighting

- Used in military for detection and trapping of ships, air craft, missiles, surface vehicles and personnel, sub marine detection and range finding
- Infrared is used to detect heat loss in building and in testing electronic system
- Infrared satellites are used to monitor the earth's weather, to study vegetation pattern and to study geology and ocean temperatures.

## 1.6 Project Outline

- Chapter one centers on the introducing what the project is about, the objectives, methodology, scope and application of infrared.
- Chapter two discusses on the literature review, historical background, theoretical background, and the block diagram of the system.
- Chapter three is the design and construction of the project.
- Chapter four includes testing and packaging.
- Chapter five includes conclusion and recommendation.

# CHAPTER TWO

# Literature Review

## 2.1 Historical Background

In the year 1800 Sir William Herschel made a very important discovery. He was interested in learning how much heat passed through the different colored filters he used to observe the sun, and notice that filter of different colours seem to pass different levels of heat.

Herschel thought that these colours themselves might contain different levels of heat, so he devised a clever experiment to investigate his hypothesis.

Herschel directed sun light through a glass prism to create a spectrum the "rain bow" which is created when light is divided into its colour and measured the temperature of each colour. He used three thermometers with blackened bulb (to better absorb the heat) and placed the bulb in each colour while the others were placed beyond the spectrum as control samples. As he measured the temperatures of the violet, blue, green, yellow, orange and red light, he noticed that all the colours had temperatures higher than the controls and the temperature of the colours increases from the violet to the red part of the spectrum.

After noticing this pattern, Herschel decided to measure the temperature just beyond the red portion of the spectrum in region apparently devoid of sunlight. To his surprise, he found that this region has the highest temperature of all. Herschel performed further experiments on what he called "calorific rays" that existed beyond the red part of the spectrum and found that they were reflected, refracted, absorbed and transmitted just like

visible light. What Sir William has discovered was a form of light (or radiation beyond the led light).

These "calorific rays" were later renamed infrared radiation (the prefix infra means "below").

Herschel experiment was important not only because it led to the discovery of infrared but because it was the first time that someone shows that there were forms of light that we cannot see with our eyes [1].

The primary source of infrared radiation is heat or thermal radiation. This is the radiation produced by the motion of atoms and molecules in an object [1].

The infrared radiation exists in the electromagnetic spectrum that extends from wavelengths of 0.75 to 1000 microns [1 micro is $10^{-6}$ meters]. These wavelengths are longer than wavelength of visible light to be detected by the human eye; but shorter than wavelengths commonly used in radio communication.

We perceive infrared as heat unlike visible light, in the infrared world, everything with a temperature above absolute zero emits heat. Even cold objects like ice cubes emits infrared and of importance to this project, the human body whose radiation is strongest at a wavelength of $1.4 \times 10^{-6}$ micron. The higher the temperature, the greater the infrared radiation emitted.

## 2.2 Types of Detectors

### 2.2.1 Photoelectric detectors

Photoelectric beam sensors transmits a beam of infrared light to a remote receiver creating an "electric fence". These sensors are often used to cover openings such as doorways or hall, acting essentially as a trip wire. Once the beam is broken or interrupted, an alarm signal is generated. Photo electric beam sensors consist of two components. A transmitter and receiver. The transmitter uses a light emitting diode (LED) as a light source and transmit a consistent infrared beam to a receiver. The receiver consist of a photo electric cell that detect when the bean is present. If the photoelectric cell fails to receive at least 90% of the transmitted signal for as brief as 75 milliseconds (time of intruder crossing the bean), an alarm signal is generated. The beam is modulated at a very high frequency which changes 1,000 times per second in a pattern that collates with the receives expectation to guard against a bypass attempt by using a substitute light source. In order to bypass the sensor, the angle of the bean and modulated frequency would have to be matched perfectly [2].

### 2.2.2 Ultrasonic Detectors

The active ultrasonic sensor is a motion detective device that emits ultrasonic sound energy into a monitored area and reacts to a change in the reflected energy pattern. Ultrasonic sensors use a technique based on a frequency shift in reflected energy to detect intruders. Ultrasonic sound is transmitted from the device in the form of sound energy. The sound uses air as its medium and travels in a wave like motion. The wave is reflected back from the surroundings in the room/hallway and the device hears pitch characteristics of the protected

environment. When an intruder enters the room, the wave pattern is disturbed and reflected back more quickly, thus increasing the pitch and signaling an alarm. [2]

### 2.2.3 Microwave detectors

Microwave sensors are motion detection devices that transmit designated area/zone with an electronic field. A movement in the zone disturbs the field and set off an alarm. Microwave sensor may be used in exterior and interior applications. Although, very little power is used, the system provides enough energy for a detector to project a signal up to 400 feet in an uninterrupted line of sight. The detection of intrusion is directly related to the Doppler frequency shift principle. Most sensors are tuned to measure the related the Doppler shift between 20Hz and 120Hz. These frequencies are closely related to the movement of humans. Objects that fail to produce a signal or produce signal outside the tuned frequencies are ignored. Objects that falls within the range cause the sensor to generate an alarm signal [2].

### 2.2.4 Infrared Detectors

Passive infrared detectors can be used to sense the entry of an intruder into an area. They can be mounted on the wall or ceiling and can be set to cover rooms of various sizes. Flush mounted or disguised sensors are also available. Some detectors have features designed to minimize activation by small pets.

Passive infrared sensors are passive, that is, the sensor does not transmit a signal, the sensor head simply registers impulse sectors/zones, each defined with specific boundaries. Detection occurs when an emitting heat source (thermal energy) cross a sector boundary.

Passive infrared sensors detect electromagnetic radiated energy generated by sources that produce temperatures below that of visible light. Passive infrared sensors do not measure the amount of infrared energy per se, but rather the change of thermal radiation. Passive infrared see or detect infrared hot images by sensing the contrast between the hot image and the cooler background. The passive infrared wave length is subdivided into two major range detection categories: one covers near infrared energy (e.g. thermal energy emitted by TV remote control devices), and the other covers the far infrared energy (e.g. thermal energy emitted by people). It is this latter category which is employed in security applications. Infrared energy is measured in microns, with the human body producing energy in the region of 7-14 microns. Most passive infrared sensors are focused on this narrow band width. When the radiation change captured by the passive infrared exceeds a certain pre-set value, the thermal sensor produces an electrical signal which is sent to a built-in processor for evaluation and possible alarms [2].

One disadvantage of using infrared security system is that they require direct line of sign. These beams cannot pass through walls or people. This limited the effectiveness of such a system in certain situations. These cannot be used to send signals to control unit because they are unreliable.

It is possible to conceal the unit inside walls; however, a hole must be left so that the infrared be beam can pass through. However, it is very easy for bunglers to identify where the light is coming from if visible light sensors are used. This allows the intruder to avoid the beam quite easily. For this reason, it is recommended that infrared security system be used in combination with other forms of security to make sure that the property is completely protected. [3].

## 2.3 Theoretical background

In the design and construction of an infrared security alarm the basic components used to achieve the set objective are 555 timer IC, voltage regulator, HEF4060 counter, diodes, resistors, capacitors, and the sounder.

### 2.3.1 555 Timer IC

The 555 timer IC is an 8 pin timer IC providing the functions of control, triggering, level sensing, discharge and power output.[4] Like all IC timers, the 555 rely upon external capacitor and resistor to determine the off-on time interval of the output pulses. The 555 timer has two basic operational modes.

#### 2.3.1.1 Monostable mode

In the monostable mode, the 555 acts like a monostable multibrator. A monostable is said to have a single steady state, i.e the off state. When it is triggered by an input pulse, the mono-stable switches to its temporary state. It remains in that state for a period of time determined by an RC circuit, it then turn to its stable state. Monostable multivibrator are used for turning some circuit or external component on or off for a specific length of time and they are also used to generate delays.

The trigger input is initially high (about $^1/_3$ of $V_+$), when a negative going trigger pulse is applied to the trigger input the threshold on the lower comparator is exceeded. The lower comparator therefore sets the flipflop. The capacitor now begins to charge though the external resistors, as soon as the charges on the capacitor equals 2/3 of the supply voltage, the

upper comparator triggers and resets the control flip flop. That terminates the output pulse which switches back to zero.

The time required for the 555 timer to generate its output pulse is dependent upon the external capacitor and resistor given by:

$$T = 1.1 \times R \times C \tag{2.1}$$

### 2.3.1.2 Astable mode

An astable multivibrator is simply an oscillator. The astable multivibrator generates a continuous stream of rectangular off-on pulse that switch between two voltage levels.

In the astable mode, both the trigger and the threshold inputs (pin 2 and 6) to the two comparators are connected together and to the external capacitor. The capacitor charges toward the supply voltage though the two resistors $R_1$ and $R_2$. The discharge pin (7) connected to the internal transistor is connected to the junction of those two resistors.

When power is first applied to the circuit, the capacitor will be uncharged; therefore both the trigger and threshold inputs will be near zero volts. The lower comparator sets the flip flop causing the output to switch high. That also turns off transistor $T_1$ and allows the capacitor to begin charging through $R_1$ and $R_2$. As soon as the charge on the capacitor reaches $^2/_3$ of the supply voltage, the upper comparator will trigger causing the flip flop to reset, and that causes the output to go low. Transistor $T_1$ also conducts. The effect of $T_1$ conducting causes resistor $R_2$ is effectively connected to ground through internal transistor $T_1$. The result of that is that the capacitor now begins to discharge through $R_2$.

The frequency of the pulses and their duty cycles are dependent upon the RC network values given by:

$$F = \frac{1}{[(0.693 \times C \times CR1 + 2R2)]} \quad (2.2)$$

The frequency F is in Hz, $R_1$ and $R_2$ are in ohms and C in farads. The time duration between pulses is known as period and usually designated t. The pulse is on for $T_1$ seconds, then off for $T_2$ seconds the total period (t) is $t_1 + t_2$ and is related to the frequency by the relationship.

$$F = {}^{1}/_{t} \text{ or} \quad (2.3)$$

$$t = {}^{1}/_{f} \quad (2.4)$$

The time internals for the on off portions of the output depends upon the values of $R_1$ and $R_2$. The ratio of the time duration when the pulse is high to the total period is known as duty cycle and is given by:

$$D = {}^{t_1}/_{t} = \frac{(R_1+R_2)}{(R_1+2R_2)} \quad (2.5)$$

Where

$$t_1 = 0.693(R_1 + R_2)c$$

And $t_2 = 0.693 \times R_2 \times C$

### 2.3.2 Transistor

A transistor is a three terminal device with two pn junctions. They provide the power gain that is needed for most electronic applications. They can also provide both current and voltage gains [5]. There are two basic types of transistors: the PNP and the NPN.

The current relationship of the transistor is given as:

$$IE = I_C + I_B \tag{2.6}$$

Where

$IE = Emitter\ current$

$I_C = collector\ current$

$I_B = Base\ current$

The current gain of the transistor is given by:

$$\beta = \frac{I_C}{I_B} \tag{2.7}$$

Where

$\beta = current\ gain\ between\ the\ collector\ and\ the\ base$

## 2.4 Choice of Components

In most engineering designs, the choice of components is one of the major factors that influence the design. The following factors were considered in carrying out the design for the project.

- Complexity of the system
- Types of components needed
- Availability of component
- Cost of component
- Reliability of the system

➢ Cost effectiveness and marketability

The above factors were considered for this project so as to make it a reliable, portable and affordable one.

## 2.5 Block Diagram of the System

The block diagram of this particular work comprises the following units.

- Power supply unit
- Infrared transmitter unit
- Infrared receiver unit
- Oscillator
- Counter
- Loudspeaker
- Reset

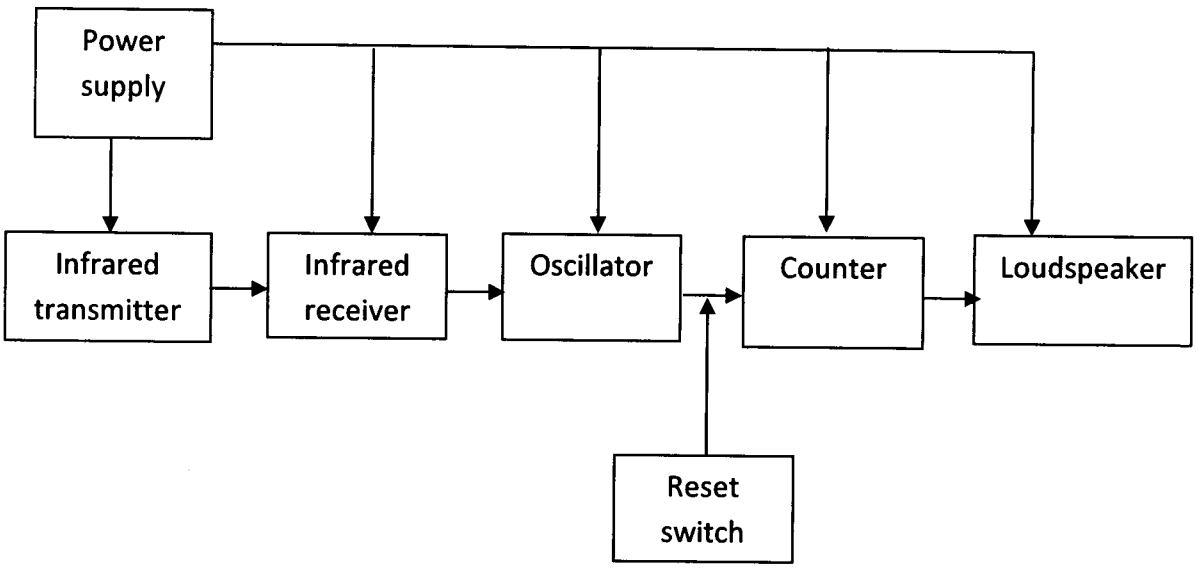



**Figure 2.1 Block Diagram of Infrared Security Alarm**

# CHAPTER THREE

# Design and Implementation

## 3.1 System Analysis

The infrared intrusion detection system comprises the following sub-systems:

- Power supply
- Infrared signal generator
- Infrared signal detector
- Audio alarm generator/30 seconds timeout delay generator

## 3.2 Power Supply Unit

The system power supply is derived from a 220v/12v, 0.5A step down transformer, a full-wave bridge rectifier and a 7806 regulator as shown in figure 3.2 below.

The low voltage AC was rectified into a pulsating DC of 100Hz pulse. The DC was then smoothened by a capacitor evaluated from the expression:

$$C = {}^{I_t}/_{\Delta c} \qquad (3.1)$$

Where I = maximum load current

V = maximum A.C ripple voltage

$$t = {}^{1}/_{2F} \qquad (3.2)$$

The peak rectified DC voltage was deduced from the expression;

$$V_{DC} = Vrms\sqrt{2} - 1.4 \tag{3.3}$$

$$= 12\sqrt{2} - 1.4$$

$$= 15.6v$$

The value of the capacitance was influenced by the load peak current and the maximum allowable ripple voltage on the DC supply before regulation.

The load current was taken as the transformers maximum current i.e 0.5A. The maximum ripple voltage was determined by the minimum regulator input voltage required to sustain regulation. The minimum regulator input is 8v (i.e Vout +2v overload). On a 15.6v DC input, this translates into a peak-peak ripple voltage of 15.6 – 8v = 7.8v

$$C = \frac{I_t}{\Delta v} = \frac{0.5 \times \frac{1}{2 \times 50}}{7.8}$$

$$C = \frac{0.005}{7.8}$$

$$C = 641\mu f$$

This capacitance value is the minimum required to maintain system operation at the worst case specification. However the capacitor used in this work was increased to 2200 $\mu f$. The 6v regulated output was stabilized by a 16v 2200 $\mu f$ capacitance and noise filtered by 0.47 $\mu f$ capacitor.

### 3.2.1 Power on indicator

A power on indicator was provided. An LED was used to show AC power availability. The LED is operated on a forward current of about 5mA by the choice of the current limiting resistor as shown in the figure 3.1 below.

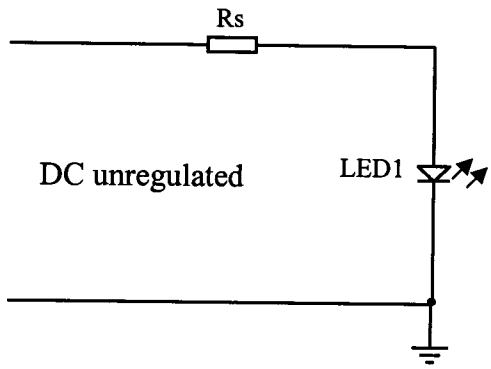



Fig 3.1 power on indicator

$$V_{DC} = 15.6v$$

$$I_{LED} = 0.005A$$

$$V_{LED} = 1.7V$$

$$R_s = \frac{V_{DC} - V_{LED}}{I_{LED}} \qquad (3.4)$$

$$= \frac{15.6 - 1.7}{0.005}$$

$$= \frac{13.9}{0.005}$$

$$R_S = 2.78\Omega$$

A 2.2k $\Omega$ resistor was used for this work

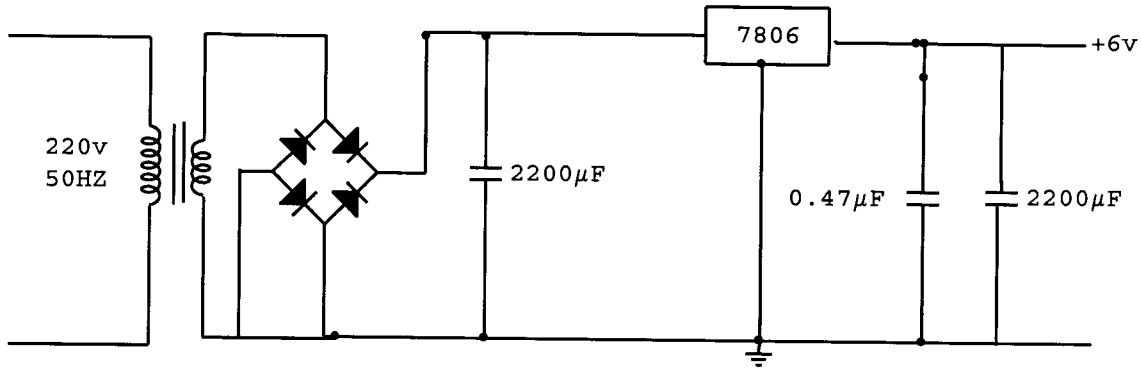



Fig 3.2 power supply unit

## 3.3 Infrared Generator

In order to provide a break-beam intrusion/motion detector system, a light source was required. The light source was built around an infrared transmitter/oscillator and designed around the 555 timer configured in the astable mode for 50% duty cycle operation as shown in the diagram below.

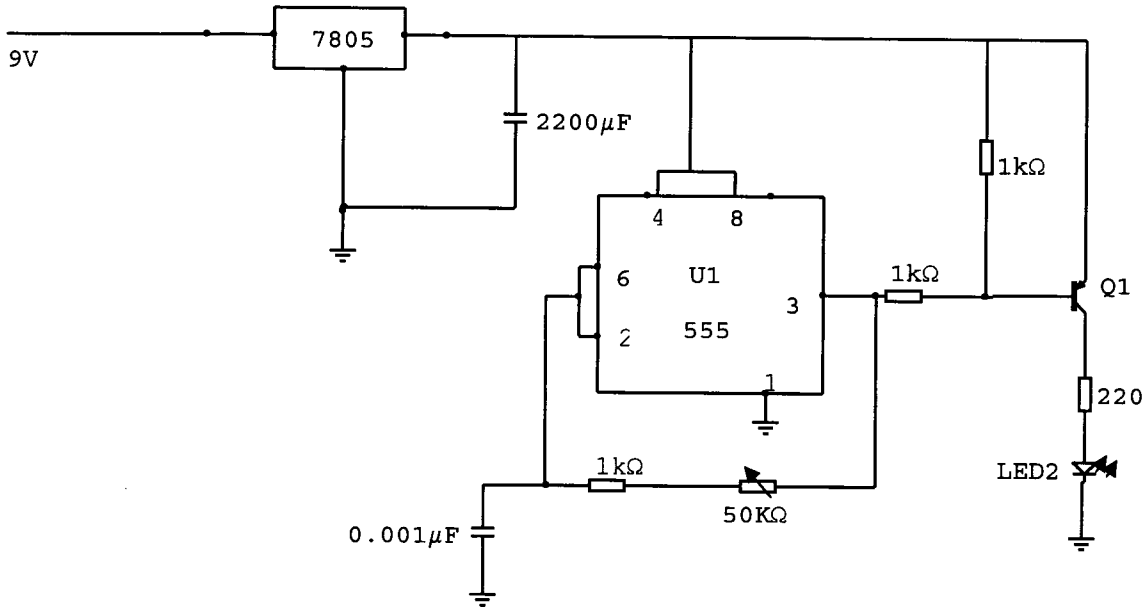



Fig 3.3 Infrared Generator

The 555 was configured as a 50% duty cycle square wave oscillator. The power to the oscillator was derived from a 9vDC battery through a 7805 regulator. The 9v input supply was stabilized by a 2200$\mu f$ capacitor.

By tying pins 2 and 6 together, the 555 was run with a 50% duty cycle output. The output frequency is given by the expression.

$$F = \frac{1.45}{(R_1+2R_2)C} \tag{3.5}$$

Where

R = Resistance from output pin (3) to pins 6 and 2.

C = Capacitance from pin 6 and 2 to ground

C has a capacitance value of 0.001 $\mu f$, and R was realized using series combination of 1$k\Omega$ and 50k $\Omega$ adjustable resistor in the feedback lop,

The generated frequency was radiated through a PNP transistor buffer whose collector load is the infrared led as shown below.

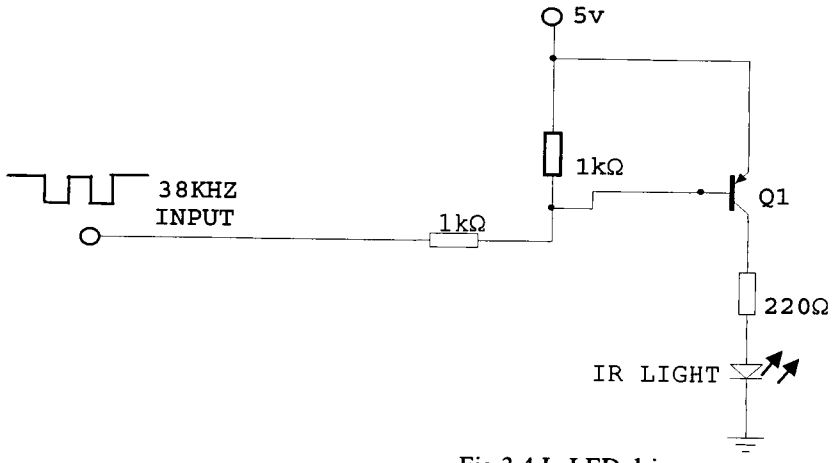



Fig 3.4 $I_R$ LED driver

The current through the emitter diode was fixed by a 220$\Omega$ resistor. Infrared diodes can handle typically up to 0.5A pulse at a current of about 1.05v using a 220 $\Omega$ current limiting resistor, gives:

$$I = \frac{V - V_F}{R} \tag{3.6}$$

$$I = \frac{5 - 1.05}{220}$$

$$I = \frac{3.95}{220}$$

$$I = 0.018A$$

## 3.4 Infrared Detector Unit

In order to detect the presence of an intruder and activate the audible alert subsystem, an infrared sensor with a frequency of 38 KHz was used. The sensor was configured as shown below

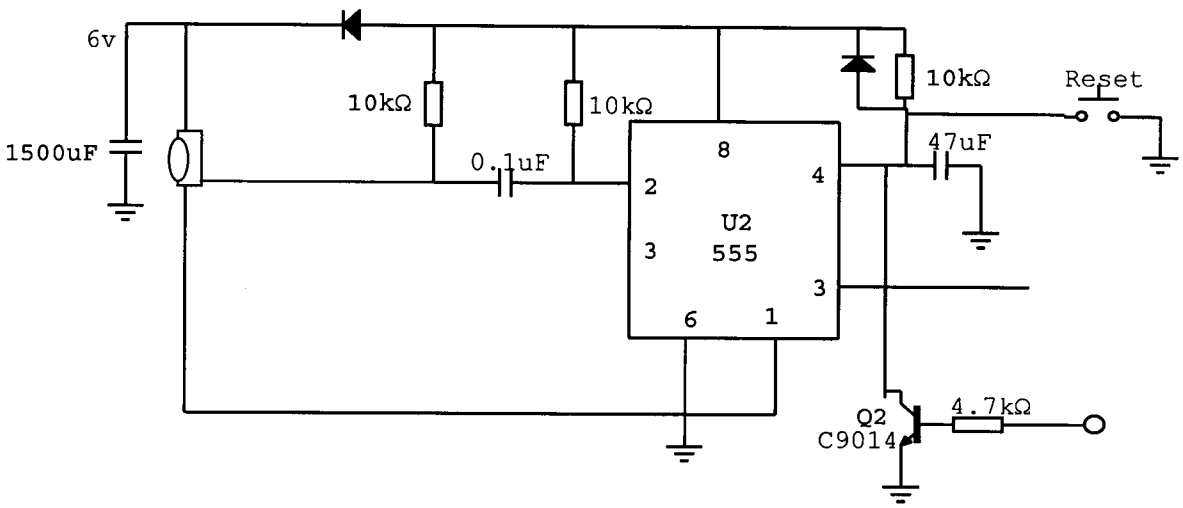



Fig 3.5 TSOP 1738 infrared detector

A TSOP 1738 38KHz infrared receiver was wired to a 555 configured for S-R flip flop mode. Pin 2 is the active low set input, while pin 4 is the active low reset input.

At power up, the astable is reset by the RC combination on pin 4. The supply to the sensor was decoupled by a diode and $1500\mu F$ capacitor.

When the infrared beam incident on the sensor is unbroken, i.e no beam discontinuity, the sensor's input is high, and the 555 is untriggered when a beam discontinuity is detected the sensor switches low momentarily and then high. The high to low transition pulls *the voltage on pin 2 below* $1/3V_{cc}$, setting an internal flip flop. Pin 3 of the 555 then switch high.

The high logic on pin 3 enables a frequency generator as shown below.

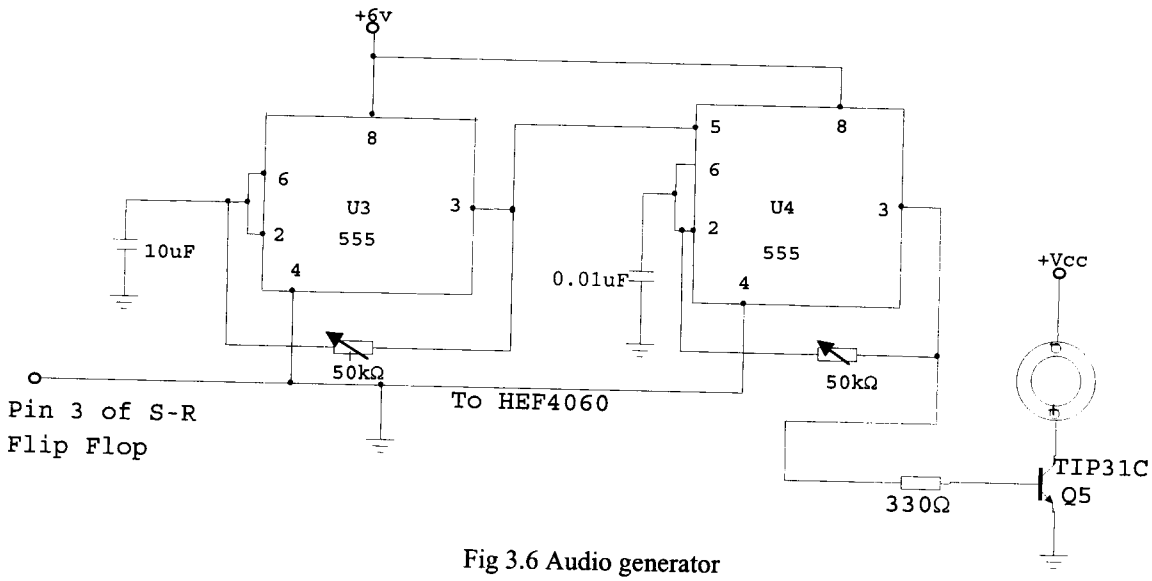



Fig 3.6 Audio generator

Two 555 timers were used in the audio generator circuit. The high frequency output of $U_4$ was modulated by the low frequency output of U3 , to create a unique tone. The audio output from U4 triggers a TIP31C device whose collector load was an audio sounder as

shown above. The reset inputs of both 555 timers were driven by the output logic on pin 3 of the S-R flip flop. Whenever the S-R flip flop is set, the two audio generators are enabled, and a sound is generated over the buzzer.

Simultaneously, a HEF4060 30-seconds timer is enabled by the high output on pin 3 of the flip flop pulling the counters reset pin to ground and the frequency output of $U_3$ clocking the HEF4060 device.

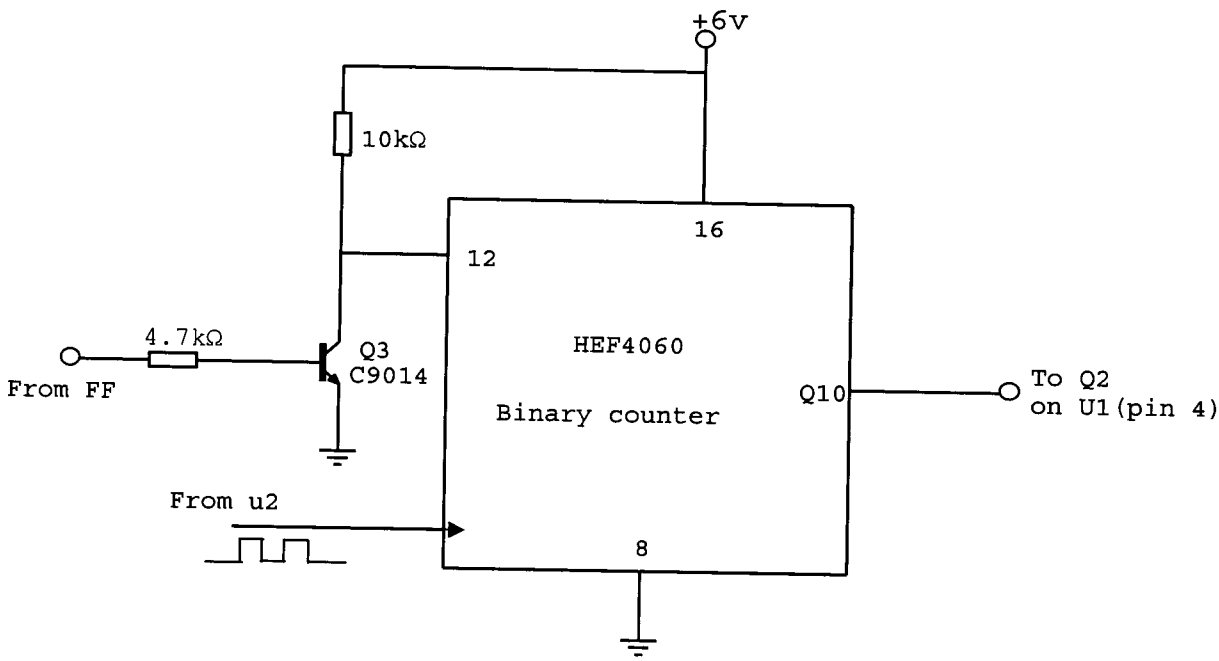
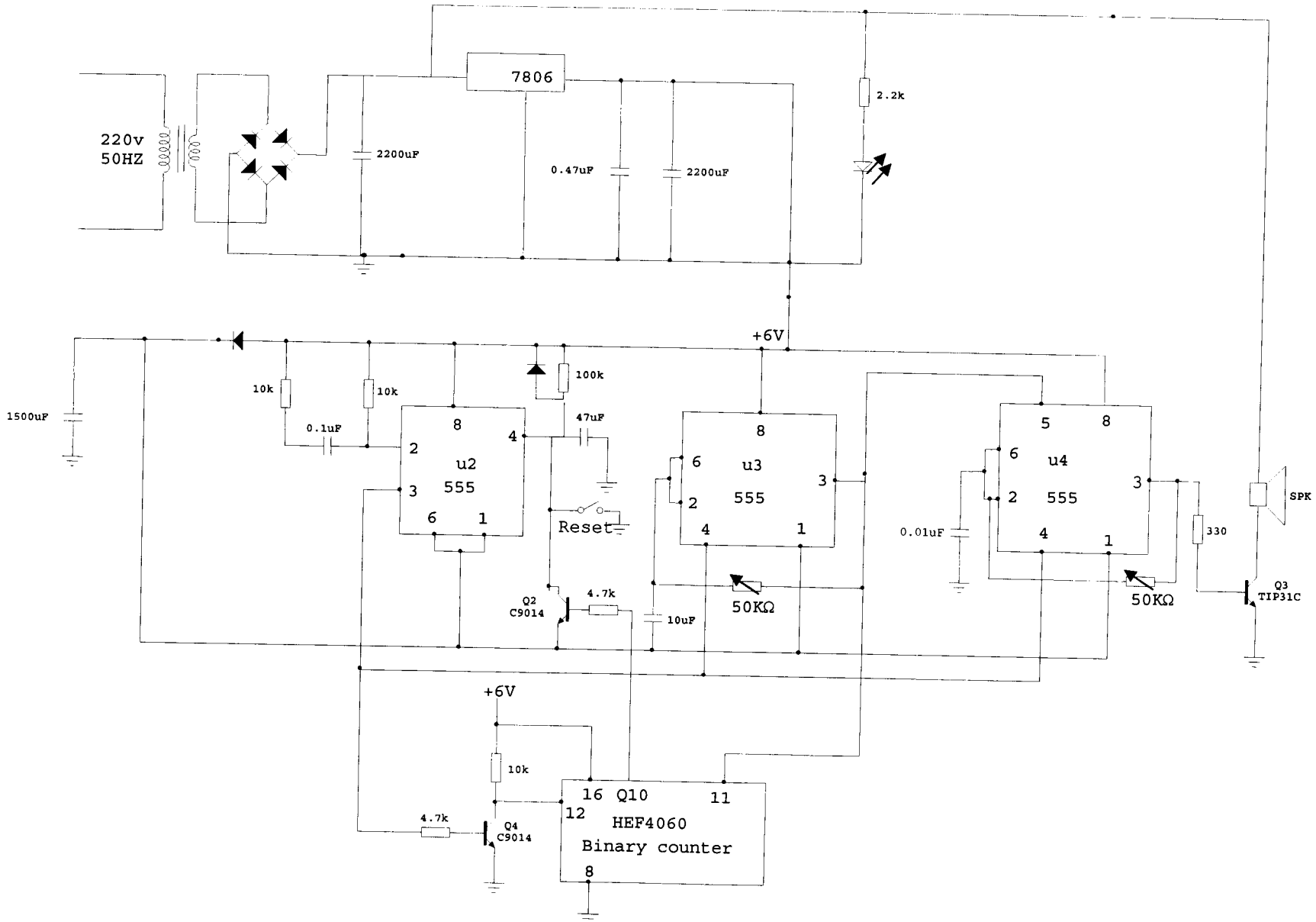



Fig 3.7 HEF4060 30-second delay timer

When the flip flop switches its output high, Q3 is forward biased and the reset input on HEF4060 is pulled to ground, i.e. reset disserted. The frequency output of $T_2$ then clocks the counter.

Clocking continues and the audio alarm, until Q10 goes high. The high logic on Q10 forward-biases $Q_2$ wired to the reset input of the flip flops. This action resets the flip flop and disables the audio generator. At the same time, the HEF4060 is forced into reset by $Q_3$

coming out of forward bias into cutoff. The system remains in this ideal state until the next beam discontinuity is detected.




**Complete diagram of infrared receiver circuit**

# CHAPTER FOUR

# Test and Results

## 4.1 Testing and Packaging

Having determined the components value and ratings needed for the construction of the burglar alarm system in chapter three it is the aim of the chapter to carry out the practical outlook of the circuit. This is however achieved sequentially as outlined below

The first approach was to draw out the circuit diagram attempting to choose the common points at convenient position as shown in the circuit diagram above.

## 4.2 Soldering Technique

There are different type of electronic circuit board, these include;

- The early days aluminum sheeting chassis
- Printed circuit board (PCB)
- Vero board and strip boards.

Among all these, the Vero board was used not only because it avoids difficulties of separate wiring but also consists of an insulating base of plastic with thin conducting strips of tinned copper rails along the surface readily made, which facilitate neat soldering of components, unlike the printed circuit board which requires special preparation, though rnore convenient in complicated circuit.

All the components needed are gathered from electronics spare shops and were tested individually to confirm their characteristics and suitability. The plan of the proposed circuit was drawn on plain paper and laid on board. It is now convenient to lay components on the paxelin side of the Vero board, inserting the legs of each into the boles at the appropriate

position. Normally components are laid parallel to the board and are carefully soldered to it from the copper rails side.

Considerable care is taken to avoid dropping solder between strips as this may cause short circuit. Also to avoid dry joint or excessive heat which can damage components, soldering iron is maintained at reasonable temperature, using heat shunts and soldering fluids to achieve a perfect shining and solid joint. Jumper wires are used where components legs are short, although this is avoided as much as possible. Also, when a component is laid along a rail, the point is cut between the legs of such component to avoid shorting out.

## 4.3 Circuit Testing

At the end of the components laying, tests were carried out to ensure that the component where not damaged by heat and continuity was tested on the rails as well as on components to ensure that soldered joints were solid. Having confirmed these, the power supply output was tested with a voltmeter set on D.C range. Therefore the circuit was connected to supply and final testing was carried before it was coupled together in readiness for packaging.

## 4.4 Packaging

Before presenting any item to the general market, adequate consideration, needs to be taken to make the equipment not only reliable but to entice the people. In the construction of the burglar alarm therefore, some factors were considered in designing the package. These factors include the following;

- Compatibility
- Durability
- Cost

- Accessibility

- Ventilation

The first three factors are considered relatively to the material that will be used for the casing while the last three depended entirely on the level of designer's skill. Since the alarm will be expected to be set for operation at all time and to earn the users confidence, it must be compatible so that no part may be easily damaged by people or animal. Also it has to be provided with durable, fire proof and corrosion free material so as to secure its longetivity, hence the components are enclosed in a small case. Furthermore, while other factors were considered, its affordability was also very important. Low cost material was used for the casing, the casing of the alarm system is made in simple detachable top cover, this is to allow for easy accessing components and for easy trouble shooting.

# CHAPTER FIVE

## Conclusion

The burglar alarm is an electrical device that can be employed to alert owners of household, private apartment or premises in case of an intruder, burglar or an unwanted visitor entering into the premises. The device is a small compatible unit made sensitive by the blockage of infrared rays caused by the passage of any intruder, thus, a form of light energy is converted into electrical energy and finally to sound energy which alerts the user whenever an entrance is made. The entire system can basically be divided into three stages thus;

The power supply unit, the electronic switching circuit and the alarm circuit the power unit consist of 220v/12v, 0.5A step down transformer and a bridge rectifier circuit with a filter arrangement to provide the supply to energize the circuit. The electronic switching is the heart of the system and consists of the sensor (infrared sender and receiver), integrated circuit. This unit is responsible for the conditional operation of the alarm t, depending on whether somebody is passing or not the alarm sound an audible alarm that alert the user when an intruder gains entrance.

The housing unit seems to be the best as it is made of corrosion resistant material, durable and heat conductive material. Also its compatibility will make the device less prone to untimely damage which may be caused by human or animal.

This project is a manifestation of idea that had been conceived for long and has been realizable through self motivation and with contributed ideas of people. Although some problems and difficulties were encountered during the course of this project work, these mainly were finance and the unavailability of exact component and the high cost of the available ones. Notwithstanding much effort was made to see that the project was successful.

The project work has really helped to boost my morale in electrical /electronic not only in that it forced me into consultation of several books, website, journals, but also has subjected me to some logical thinking, thus, developing an idea for self production which I believe is a move to self employment.

## 5.1 Recommendation

In order to achieve high sensitivity of this burglar alarm system it is recommended that the infrared sensor sender and receiver should be installed directly only in strategic areas. The system can work 24 hours when it is powered.

The sensor cards must be well hidden and protected from intentional or unintentional damage caused by human or by animal and other rodents, while short-circuited sensor cards or poor positioning will result to false alarms.

This project work is recommended to be preserved in the department for further development as new technologies arise. This particular project has its limitation in that it becomes un-operative whenever power supply is off. Therefore, a means of back-up supply needs to be provided from a rechargeable battery.

Finally, since this project had been successful, I hereby recommend its use in every household premise, garage, livestock farm, laboratories and other private apartments

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