DESIGN AND CONSTRUCTION OF MULTI-TRIGGERED SECURITY ALARM SYSTEM

BY

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DEDICATION

This work is especially dedicated to the almighty God, the Alfa, the Omega, the beginning and the end. I also dedicate this project to my father Mr. Michael U. Abajara and my caring mother Mrs. Agnes Abajara whose effect to reach the level I am to day will remain fresh in my memory of life

DECLARATION

I ABAJARA CHRISTIANA AMORE declare that this work was done by me and has never been presented else where for the award of a degree. I also here by relinquish the copy right to the federal university of technology Minna.

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AKNOWLEDGEMENT

My profound gratitude goes to Almighty God for His protection and unfailing love on me during the course of my first degree program. It seemed as if it was not going to be but today it is obvious why I should be thankful to the Almighty God.

Also use this opportunity to thank my parents mr. and mrs. Abajara for their love, moral, spiritual and financial support through out my course of study. I can not forget my brothers and sisters mr. Williams Abajara, mr. Moses Abajara, miss. Theresa Abajara, mrs. Anna Ibiteye and mrs. Esther Mayowa for their encouragement since I started this adventure.

Am also greateful to my project supervisor mr. Nathaniel Salawu, a dynamic, hard working, intelligent and God fearing person. I appreciate his understanding, patience and guidance through out the period of supervising this project.

ABSTRACT

The design and construction of a multi-triggered security alarm system is described in this project. The project is intended to produce an audible alarm tone in an audio speaker. This project produces three output from each chamber as each unit is activated. The unit includes touch/fire and intrusion. The out puts depends on the capacitance between the body and the touch point, the rise in temperature due to fire and the interruption of light falling on the light sensor.

On touching the touch point connected to the input pin of 555 timer, it becomes grounded by the capacitance between the body and the touch point, this triggered the IC and produces an audible tone in the speaker. Burning which is an oxidation process contains negative ions which can also draw the IC to zero volts here by triggering the alarm unit.

The intruder unit uses a light dependant resistor which is constantly supplied with light. When an intruder interrupts this light, voltage drop across LDR increases, this sets the out put pin to go high there by triggering the alarm unit.

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CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

The use of security systems is not an exception in ones life because it is mandatory to every human. The anxiety of ones life or property been lost to armed robbers is in a man's heart. Numerous security devices had been developed to protect a country, building or person against attack and danger. Alarm systems are one of such security system in use and it is designed in such a way that immediately it senses danger it sends information to users in the form of visual signals or audio.

The necessity for a multi-triggered security alarm arises from the common burglar cases and fire outbreak in our homes, offices, markets, industries and so on from time to time. Many ways can be used to detect the presence of a thief, taking a thorough observation of a simple electrical circuit using a light dependent resistor (LDR). When the light is intruded the alarm unit will be supplied with power hence switching on the alarm unit. If the temperature of the fire unit is high there will be a pool negative electrons formed around the IC 555 timer which also sets the alarm unit into conduction.

In addition, the system is designed such that when one touches the plate, the alarm unit is triggered which waits for a time determined by R (resistor) and C (capacitor) combination connected to the 555 timer. In contrast, it should be noted that the multi-triggered security alarm system does not stop

this disastrous occurrence but to give information about its occurrence. The above alarm system comprises of the following sections; the intruder section, touch and fire section, control unit, alarm indicator unit and power supply unit.

The installation of a multi-triggered security alarm system in public, offices, industries and residential buildings will drastically reduce the rate at which lives and properties are lost, since it provides users with an immediate warning against theft and fire outbreak.

1.2 AIMS AND MOTIVATION

The aim of this project focuses on the construction and design of a multi-triggered security alarm system. It would work when the plate is touched, when the light is obstructed and when there is a temperature rise in the environment.

Secondly to design a system that will be affordable to Nigerians, easy to maintain and simple to operate. This is achieved because the operation protocol is very instinctive and reliability factor taken into consideration in designing the security system

1.3 METHODOLOGY AND PROGECT LAYOUT

The method used in this project work is where the inputs of the systems which are touch, intrusion of light beam and fire chamber comes first to provide necessary signals to activate the system. Therefore without the above named inputs there will be no output. This project was built using integrated circuits (IC) and discrete

components. The circuit is designed such that it can be placed where beam of light from a light source always falls on the light dependent resistor.

The circuit diagram of the transmitter is a 555 timer circuit having the timing components (R2, R3, C2) chosen to give a suitable operating frequency. The output of IC1 is connected to a transistor switch which energizes or switch on the relay. The relay is a 9V relay. The activation of the relay depends on the timer circuit.

The relay feeds the alarm circuit, a 555 timer IC2 and D882 NPN transistor is used for the alarm unit. The output of the IC2 is coupled to a speaker through an NPN D882 transistor.

1.4 PROJECT OUTLINE

The security system designed in this project is a very useful system used in detecting fire outbreak and presence of an intruder. This project thesis outlines the design processes and techniques involved in the multi-triggered security alarm system.

Chapter One introduces the project as a whole. It talks about the general view of the multi-triggered security alarm system. Chapter Two gives the literature review and theoretical background of the multi-triggered alarm system. It also talks about previous works of others and difficulties that limit performance of the entire security system. Chapter Three cover the detailed work involved in the system design. This includes the circuit analysis, operating principle of the security system, selection of Components and the diagrams of stages that make up

the security system. Chapter Four discusses the steps involved in the construction and testing of the project. It puts more light on how the breadboard construction and soldering procedure are carried out on the Vero board. Results and discussion of results are also included in this chapter. Lastly, Chapter Five summarizes the work involved in the entire project, problems encountered, conclusion reached and recommendations.

CHAPTER TWO

2.0 LITERATURE REVIEW

In its easiest form, a system that senses the presence of a burglar and the growth of fire automatically can save lives and properties by allowing the proper remedies to be taken. Modern security industries had indeed, through years of research programs have now improved significantly the security alarm system. [3]

The integrated circuits, generally called ICs are used in this modern day circuits. These chips are designed for different purposes, but can be used for a customized work in designing as long as the chip configuration and parameters are known.

Burglar alarms had their beginnings in the United States more than 150 years ago when Augustus Pope of Somerville, devised a system of protecting doors and windows using magnetic switches or contacts [3]. Wired to a battery and a bell, the switches closed if an intruder opened one of the doors or windows. This set off the bell that was usually located in the bedroom awakening the homeowner. With the help from contacts in the developing electrical industry, security alarm was refined and developed by Holmes; he also installed the first electric burglar alarm in 1858. [3]

Continual improvements to the security system were made some of these improvements are still features of burglar alarm system at certain times, switches to control the house lights and enunciators with coloured tags that indicated the status of each door and window. Storage cabinet for valuable, current – carrying

foil lined the cabinet and detector switches were also built. Two other inventions in the 1870s [3] made significant contributions towards the increasingly sophisticated ways in which security alarms could be used.

Thomas Edison's improvements to the telegraph and Alexander Graham Bell's invention of the telephone both represented developments that were utilized in the setting up of a central monitoring system in New York through which the location of alarm signals could be identified quickly. [3] As popular grew and cities increased in size, such monitoring systems became increasingly regarded as essential to ensure a quick response to alarms in homes and businesses.

New alarm systems continued to come into use, each one considered more advanced and complex that its predecessors. They include intricate arrangements of conductive lead foil to protect windows, the use of magnetic/mechanical switches for doors that were also laced with wire and almost-invisible trip wire to catch and trap the unwary. Each alarm circuit had its own direct wire to the central office, necessitating the construction of the first Homlmes monitoring station on the top floor of a New York City building to accommodate the thousands of direct wires that darkened the sky as they converge in the station.[3]

It was not until the middle of the twentieth century that alarm sensors and controls entered the electronics era. [3] Advances during the 1970s resulted in such innovations as microwave and ultrasonic motion sensors as well as alarm

Controls with entrance and exit delays. The use of discrete components and ICs was also incorporated into the security alarm.[2] to acquire a more reliable output, digital dialers and passive infrared motion detectors also developed in the 1970s and are still widely used today. The increased combination of automation with alarm controls is another recent development, with home networks now able to incorporate communication, entertainment, security, convenience, and information systems. Special wiring enables the remote control and programming by home owners of many automated home electronic devices, including the security system. Sensor control and communication technology continues to advance, all the many advances have brought the home security alarm a long way. This is because its beginnings in the creative hands Augustus Pope and Edwin Holmes come into existence more than one and a half centuries ago.

2.1 A few alarms design in literature are mentioned below:-

1. **Latching Burglar Alarms**: This makes use of relay latching circuit. The input terminals are connected to parallel wired, normally open switches or wire type security switches stretched across a window that closes a ball contact circuit when the wire is pushed or pulled. When a security switch closes the series battery circuit the relay pulls in on set of contacts closes the alarm bell circuit, while that second set "latches" the battery circuit. In this system even if the security switches are opened, the alarm, which is usually concealed, continues sounding unit, and the reset button is pushed. [1]

ii. **Anti – Theft Car Alarm**: - This alarm unity is mounted somewhere in the car where it will be difficult to find and removed. The switch is located under the dashboard where the driver can reach it, but where a thief will not easily find it. When the ignition is turned On with the switch closes whether by using the key or by "hot" wiring the circuit will be activated.

iii. **Infra-Red Alarms**: - Just like the anti-theft car alarm, the infra-red alarm was a different design based on specific functions required of it. One of the various types simply consists of an infra-red sensor which detects intrusion by motion and heat. It could further be incorporated with a transmitter which sends a signal to a receiver (could be located some distance of up to 1500ft – 457.2m from the infra-red sensor), which now sounds the alarm. This form of alarm systems are commonly used in military installations. [1]

iv. **Professional Burglar Alarm:** - This operates based on circuit breaker. The alarm is triggered when the protective circuit is opened. It is usually used to protect windows or glass area. Once triggered, it can only be turned off by the opening of the master switch. [1]

v. **Speed Limit Alarms**: This is a wireless portable device /unit adaptable with most internal combustion engines. This circuit is designed to alert the vehicle driver when he has reached the maximum speed unit. It eliminates the need to look at the speedometer and tachometer reducing the risks of instruction from driving. There is a strict relationship between the revolution per minutes (RPM) and speed of a vehicle, the system monitors

the RPM and starts giving a beep when the maximum speed is reached. Its outstanding features are that fact that no connection is necessary from circuit to engine. [1]

vi. **Industrial Alarms:** - This alarm comes in three versions the 12v dc Grey bell is affordable home security, when every any vehicle develops a fault. This is ideal for use in security system and complies with the requirements of BS4737 intruder alarm systems in buildings[1]. The unit must be mounted within a bell enclosure when used in external environments of BS5839 fire detection and alarm system in buildings. The unit must be mounted within a bell enclosure when used in external environments of BS5839 fire detection and alarm systems in buildings. The 240V ac Grey bell is an extremely effective signaling unit for use in industrial environments. The design avoids the need for mechanical contacts resulting in greater reliability efficiency and longer operating life. All units may be ceiling or wall mounted, with flush or surface wiring and requires no final setting up adjustment. A chip holds the movement to a high polycarbonate base and a twist lock mechanism holds the gong in position. [1]

vii. **Intrusion Detection Alarm System:** The intrusion detection alarm system provides effective and affordable home security whenever any vehicle, intrusion detection as unexpected guest approaches protected property. This perimeter intrusion detection system alerts you of arrival. It is simple to operated yet technically sophisticated and is completely wireless. It is ideal

for monitoring your drive-way, yard, and house. The system consists of two basic components, an infrared sensor detects the presence of a vehicle or person through heat and motion and then immediately transmits via a 300mHz radio signal to the receiver in the house which sounds the alarm. It has an exceptional range of up to 1500ft(457.2m). The sensor/transmitter is a special military version. Its military colour of green is to blend it directly in outdoor installation. It is completely weather proof, includes mounting hardware, and operates in temperature below 4.4 ^{0}C. It mounts easily on a tee or fence in the garage at a pool entrance or anywhere security is desired. The sensor has an adjustable field of view with a 30feet (9.1m) detection zone and is powered by a 9v battery. The battery can last over a year since the circuit draws just 0.05 milliamps. The receiver/alarm unit is plugged into a standard electrical outlet inside the house. Upon receipt of the alarm transmission signal form the sensor unit the receiver unit sounds its alarm and activates a LED light for five seconds and then reset itself. The receiver has a volume control for the alarm and terminal board for connection of an optional external siren.[1]

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CHAHPTER THREE

3.0 DESIGN IMPLEMENMTATION

3.1 CIRCUIT OPERATION

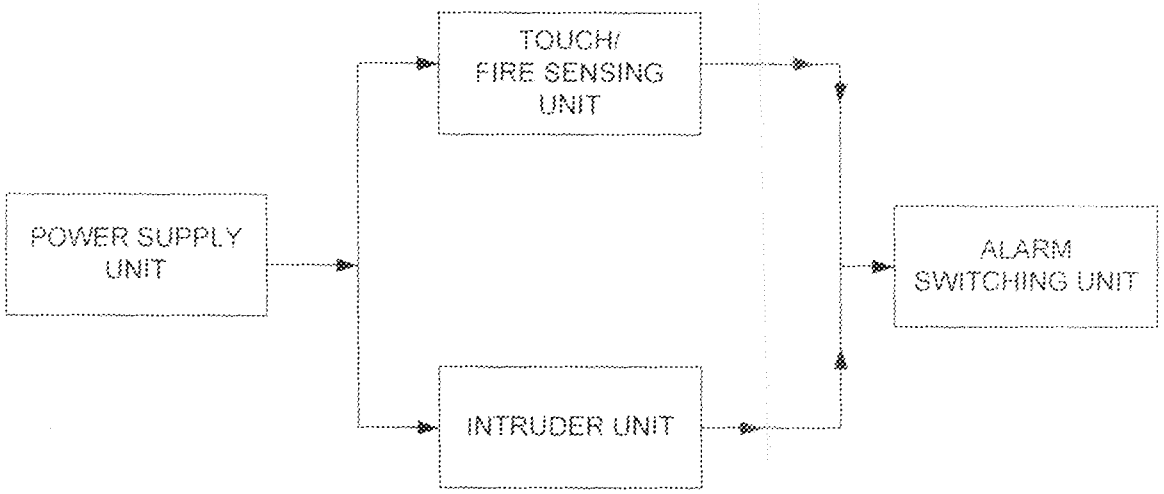


Fig. 3.1 BLOCK DIAGRAM

The power supply unit consists of a 240/12V stepdown transformer and bridge rectifier whose output is filtered and regulated at 9V dc. The touch/fire sensing unit is but around a 555 timer IC connected is in a monostable mode. The touch and fire sensing ability is made possible at pin 2 of the IC which is the trigger pin. This pin would make the output of the 555 timer to go high when ever it senses a voltage level that is less than 1/3 the supply voltage. This high output is what triggers the alarm unit. When somebody touches or comes in contact with pin 2 of this IC. It is triggered because, the body being so large compared to the surface area of pin 2 serves as ground. A capacitance is formed between this pin and the body whose voltage level is below 3 volts. The high output is monostable

and would last only for the time period determined by capacitor and resistor network connected to the IC. Period is determined by a capacitor and resistor network connected to the IC. In the case of fire which involves oxidation process, atmospheric oxygen molecules (O_2) are oxidized to oxygen ions O^{-2}. These negative ions form a pool of negative charge around pin 2 which causes it to trigger, since the negative pool of charge falls below volts which is less than 1/3 the supply voltage specified by the manufacturer.

The intruder sensing unit makes use of a photo sensor whose resistance varies proportionally with light intensity. Its [4] resistance has a negative temperature coefficient such that, the higher the temperature the smaller its resistances and vice – versa. In this design light from daylight or security light is made to incident on the sensor, as an intruder approaches he or she shades away some of the incident light making the resistance of the sensor to rise. This increase in voltage is compared with another reference voltage with the help of an operational amplifier, whose output is made to go high. The high at its output then activates the alarm switching unit.

The alarm switching unit consists basically of an NPN transistor which drives a relay connected at its collector terminals whenever a high appear at its base. Whenever the relay is driven or activated its normally open contacts become closed contacts to the oscillator responsible for generating the tone of the alarm. The generated tone signal is further amplified and then fed to a loud speaker.

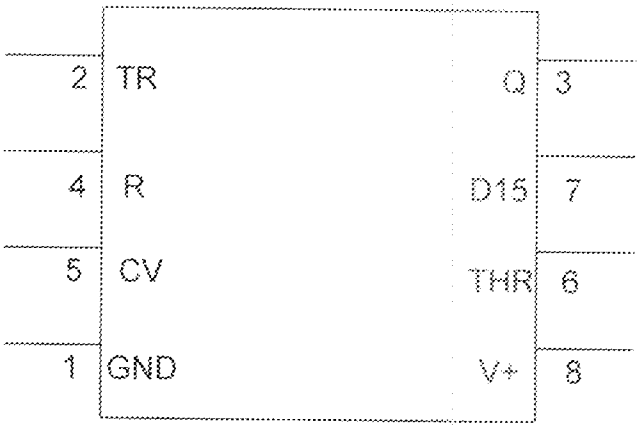


Fig 3.2 Schematic symbol of the 555 timer [8]

Table 3 : Usage of the pin connection of 555 [8]

Number	**Name**	**Purpose**
1	GND	Ground low level
2	TR	A short pulse high → on the trigger started timer
3	Q	During a timing interval, the output stays at +Vcc
4	R	A timing interval can be interrupted by applying a reset pulse to low (0V)
5	CV	Control voltage allows access to the internal voltage divider (2/3 Vcc)
6	THR	The threshold at which the interval ends
7	DIS	Connected to capacitor whose discharging time will influence the

Continued

		timing interval
8	V+, Vcc	The positive supply voltage which must be 5V and 15V high level.

DESIGN CONSIDERATIONS

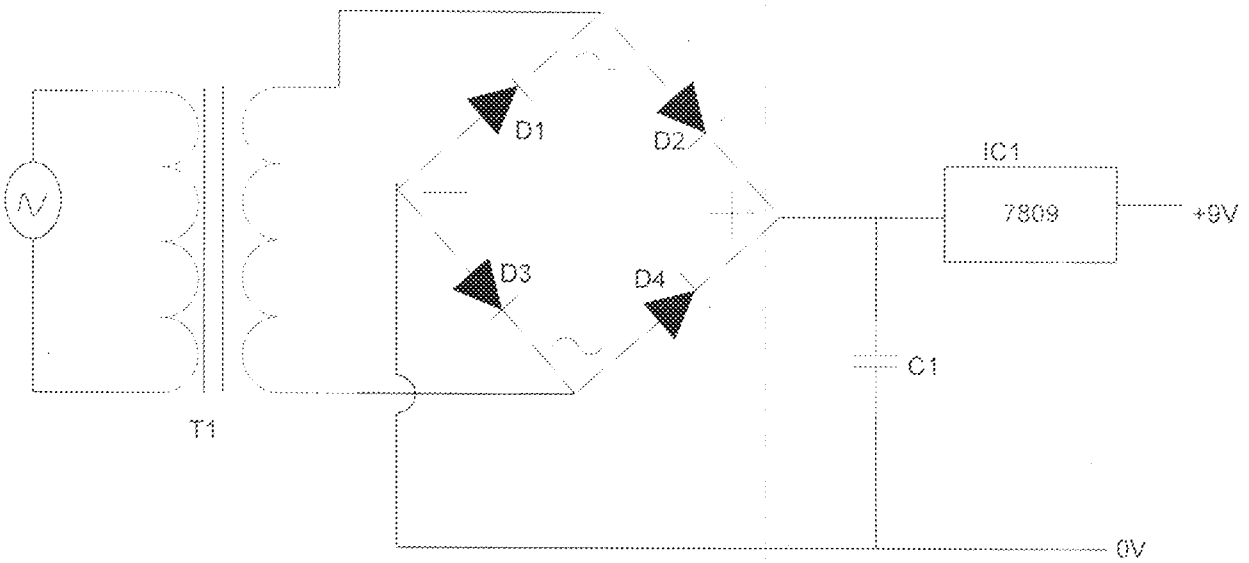


Fig 3.3 Power Supply Unit [6]

In this design a regulated 9V dc power supply is required to power the system. 9V positive regulator LM 7809 was chosen for this purpose. For this regulator to function properly as a regulator the input voltage should be about 3 volts higher than the required output, so a 240/12V stepdown transformer for T1 is suitable.

Peak value of transformer output Vpeak = Vrms x √2----------(1)

Output of transformer = 12Vrms

∴ Peak Value Vp = 12 x √2 = 16.97 = 17V

This is inputed to the full wave bridge rectifier formed by D1, D2, D3 and D4. Since Vpeak = 17V. The PIV rating of the diodes should be greater than 17. The value IN4001 with PIV rating of 100V was chosen

Output Voltage of bridge rectifier, Vdc = Vpeak - 2Vd---------- (2)

Where Vd = Voltage drop across diode =0.6 for silicon diode

∴ Vd = 17 – (2 x0.6) = 15.8V

A filter capacitor C1 acts on V_{dc} to suppress the ripple to very small level.

For a ripple factor of 1%

The filter capacitor is given by

$$C = \frac{Idc}{4\sqrt{3} \times f \times \gamma \times Vp} \qquad (3)$$

Where I_{dc} = Output dc current

F= frequency of transformer voltage.

γ = ripple factor

Vp = peak secondary voltage.

For a dc current rating of 0.5A

$$C\frac{0.5}{4\sqrt{3}\times 50\times 0.01\times 17} = 2.83 \times 110^{-3}$$

$$= 283\times 10^{-3} f$$

$$= 2830\mu f$$

The minimum value of capacitance required to achieve this is 2830μf but this is not a standard value. The nearest standard value = 3300μf.

The voltage rating must exceed Vp, so the value of 3300μf 25V was chosen.

3.3 INTRUDAL SENSING UNIT

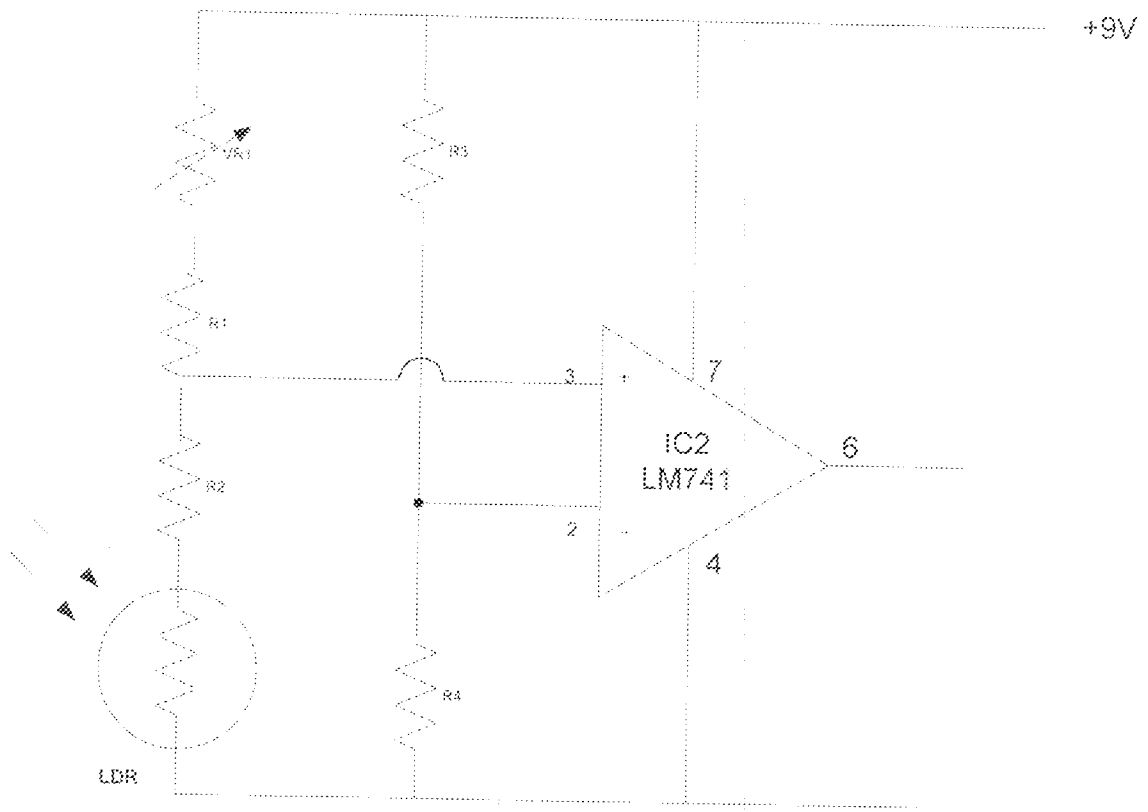


Fig. 3.4 Intruder Sensing Unit [7]

This circuit is centered around IC2 and Op amp acting as a comparator. The voltage at pin 2 fixed by the stiff voltage divided network of R_3 and R_4 are chosen of the same value of 18KΩ each so that the voltage at pin 2 is about 4.5V. another voltage divider is formed at pin 3 basically by VR1 and LDR1, but this time a flexible one. The value of VR1 [4] is adjusted such that when light rays are incident on LDR its resistance falls to a level that the voltage drop across it in

series with R2, as just less than a equal to 4.5V. As soon as the incident light is interrupted the resistance of LDR1, would rise and the voltage drop across it also rises above 4,5V, since the Voltage at the positive input is now greater. The output of the Op amp at pin 6 goes high to trigger on the alarm [7] unit. The LDR used has a resistance of 0Ωom in very bright light and a dark resistance of about 100KΩ variable resistor VR1 was used to form a variable voltage divider for the network.

The values of R1 and R2 are not critical, they are included to present short circuiting of the power supply should in case VR1 is varied to 0Ω under bright light when the resistance of LDR is also zero, the values selected for R1 and R2 are 2KΩ and 1Ω respectively.

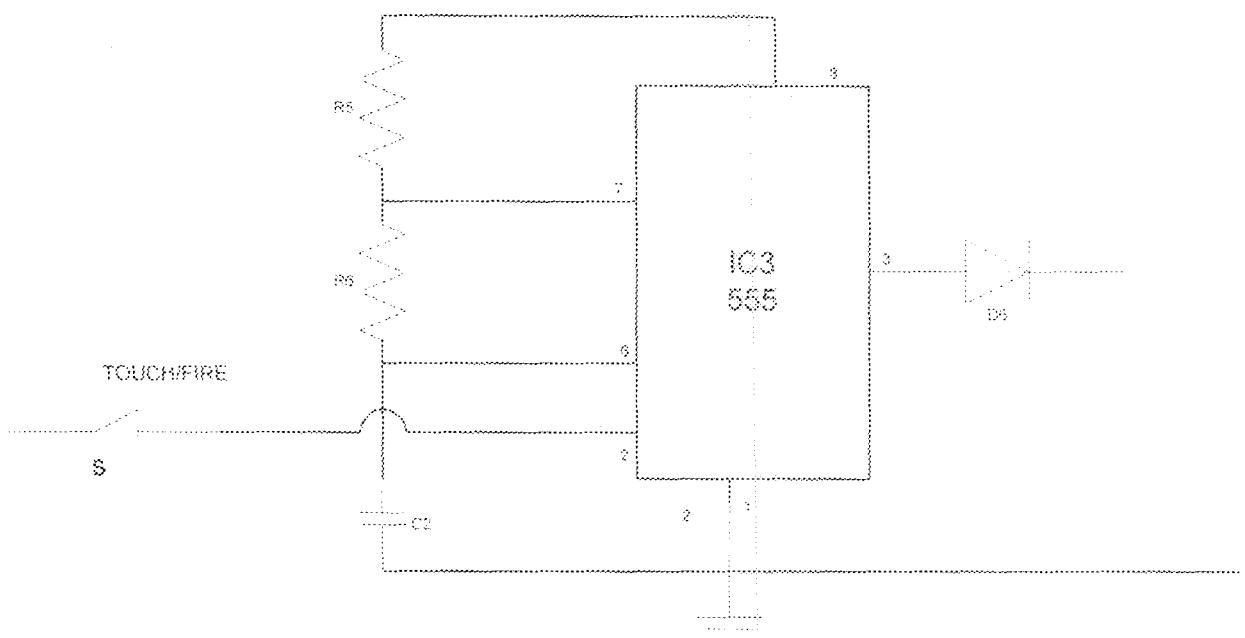


Fig. 3.5 Touch/fire sensing unit

IC3 is connected in the monostable mode and has a delay period of about 1 second such that, the output pin 3 would remain high and thus drives the alarm for 1 second after each trigger. The monostable timing period is given by

$T = 1.1RC$ (4)

Where $R = R_5 + R_6$

$C = C2$

If R5 and R6 are chosen as 100KΩ and 1KΩ respectively then by making C subject of the formula

$$C = \frac{T}{1.1R} = \frac{1}{1.1R}$$

Where R = 100KΩ + 1KΩ = 101KΩ

$$C = \frac{1}{1.1 \times 101 \times 10^3} = 9.0 \times 10^{-6} f = 9\mu F$$

But the value = 10μf

D6 prevents the output of the intruder sensing unit from interfering with the touch/fire sensing unit. Switch S2 is used to activate or deactivate the touch sensing ability while switch S3 activates or deactivates the fire sensing

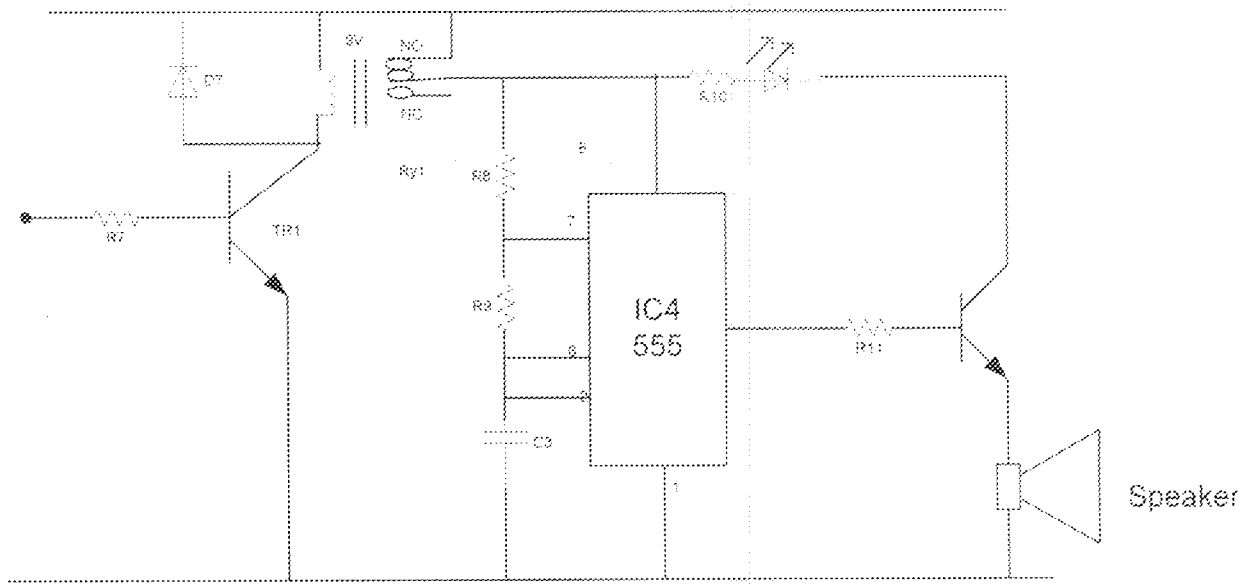


Fig 3.6 The Alarm Switching Unit[9]

Under no trigger condition the base of TR1, is held low this reverse biased for NPN. When a sensing unit detects a high at the base of TR1, it turns it on. Relay Ry_1 is activated and its normally open terminals are closed and current is supplied to the Alarm tone generator of IC4 Coil resistance of $Ry_1 = 200\Omega$.

For a switch TR1, must be driven into saturation Data sheet specification for TR, BC548 NPN silicon type:

$V_{CEO} = 110V$

$V_{CBO} = 75V$

$I_C = 0.6A$

hfe = 200typical

f_t=300MHz

P = 0.5W

$$Icsat = \frac{Vcc}{Rc} \qquad (5)$$

$$= \frac{9}{200} = 0.045A$$

$$I_{bsat} = \frac{Ic}{Ib} \qquad (6)$$

$$= \frac{0.045}{200} = 2.29 \times 10^{-4}A$$

$$R_{bsat} = R_7 = \frac{Vb - Vbe}{Ib} \qquad (7)$$

$$= \frac{9 - 0.6}{2.25 \times 10^{-4}} = 37333.3\Omega$$

But to guarantee saturation the base current of transistor is overdriven by a factor 10, therefore the value of the overdriven base resistance becomes Rb overdriven

$$= \frac{337333.3}{10} = 3733.3\Omega$$

$=3.7K\Omega$

But nearest available standard value = 4.7KΩ

D_7 acts as a free wheeling diode to TR1, from damage.

The tone generated by the alarm unit is dependent on the values at R8, R9 and C3 connected to IC4 as an astable multivibrator.

The frequently of oscillation is

$$= \frac{1}{T}$$

Where T is the period of Oscillation given

$$\therefore F = \frac{1}{1.1RC} \qquad (9a)$$

and T = 1.1RC (9b)

where R = R8 +R9

C =C_3

R_8 and R_9 are chosen as 1KΩ and 10KΩ respectively.

So, R= 1KΩ+10KΩ = 11KΩ

It is desired that the tone of the alarm should have a frequency of 800Hz

The required value of C3 for this frequency is

$$C = \frac{1}{1.1Rf} \qquad (10)$$

$$C = \frac{1}{1.1 \times 11 \times 10^3 \times 800}$$

$$=1.03\times 10^{-7}F$$

$$=0.103\times 10^{-6}F$$

$$\approx 0.1 \times 10^{-6}F$$

∴ A capacitor of value 0.1μF was chosen.

The output of this oscillator is fed to TR2 for amplification so that a loud speaker can be driven.

For a collector current of 0.5A and transistor β of 60 connected in the common collector mode.

I_b = base current = $\frac{Ic}{\beta+1}$ (11)

$$\frac{0.5}{60+1} = \frac{0.5}{61} = 8.2 \times 10^{-3}\text{A}$$

Required base resistor $R_b = \frac{Vb-Vbe}{Ib}$ (12)

$\frac{9-0.6}{8.2\times10^{-3}}=1024.4\Omega$

But nearest standard value $=1000\Omega$

$=1K\Omega$

3.4 COMPONENTS USED

CAPACITOR

A capacitor essentially consists of two conductivity surfaces separated by a layer of an insulating medium called dielectric. The purpose of a capacitor is to tore electric energy by electrostatic stress in the dielectric. The transient flow of electrons give rise to the chagrining current which are established between the plates of a capacitor.

The property of a capacitor to store electricity is called its capacitance. The capacitance of a capacitor is defined as the amount of charge required to create a unit p.d between its plates.

DIODE

It is a two – terminal device consisting of a P-N junction formed either Germanium or Silicon crystal. The P region is referred to as cathode.

A P-N junction is one –way device offering low resistance when forward – biased as behaving as in insulator when reversed biased

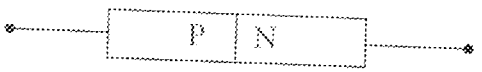
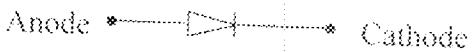


Fig. 3.7 Circuit symbol



Schematic symbol

LIGHT EMMITING DIODE

It is a forward – biased PN junction which emits visible light when energies. Fig 3.7

Shows the working principle of a LED.

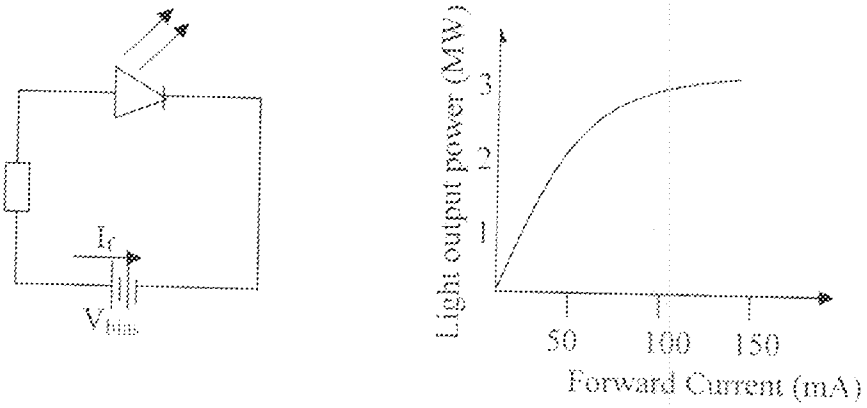


Fig. 3.8: Working principle of LED

RESISTOR

Resistors are passive components which have the ability to oppose the flow of electricity. Light Dependent Resistor (LDR) are resistors which depends on light when light falls on it, voltage drop reduces and when light falling upon it is obstructed voltage drop increases.

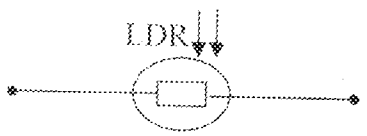


Fig. 3.9 Light Dependent Resistor

Transistor

Transistors are active devices, which consists of two back –to-back P-N junctions give rise to three regions, emitter, base and collector.

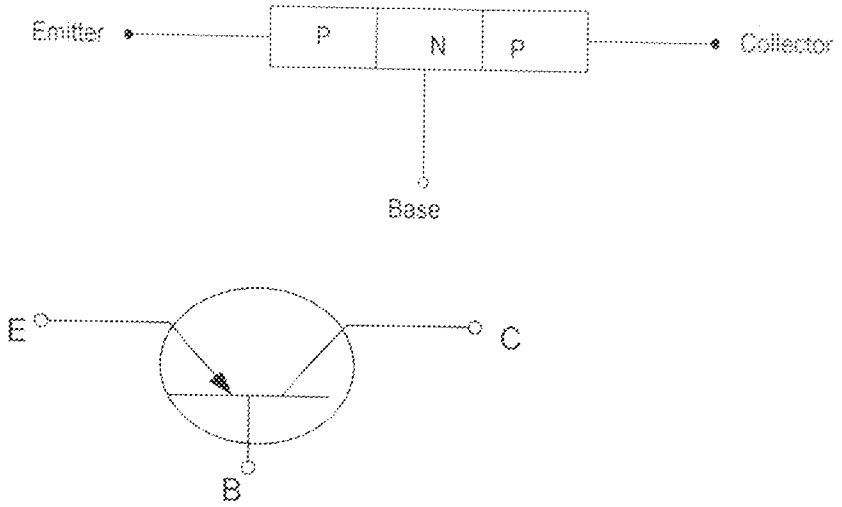


Fig 3.10 Schematic Symbol of Transistor

7809 IC VOLTAGE REGULATOR

This is a regulator that produces a fixed positive output voltage. It is representative of three terminal devices that are available with fixed positive output voltage of 9V.

STANDARD CONFIGURATION OF 7809 IC REGULATOR.

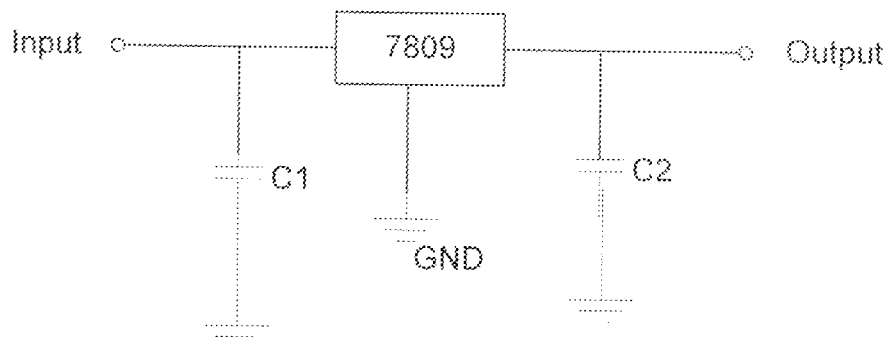


Fig 3.11: 7809 IC regulator

CHAPTER FOUR

TEST AND RESULT

4.1 CONSTRUCTION

After the complete design on paper, the components were sourced from market. Resistor values were identified with help of their colour codes. Capacitor values and polarity were identified. Variable resistors and all other components such as light dependent resistors, light emitting diodes, switches, transistors relays, and transformers e.t.c. were tested to ascertain that they were in good working condition.

The components were first connected on a bread board with aid of jumper wires, and it was tested to have satisfactory output. The components were then transferred to the vero board and soldered permanently. The casing was sourced from wooden sheets were cut and fastened into a rectangular form, and performed appropriately so that switches, power plug and indicator light as well as LEDs can be fastened.

4.2 TESTING AND RESULTS

The circuit was connected and the power switch was put on touch, fire and intruder switch, switches were activated and tested. The response of each unit was as expected.

CHAPTER FIVE

CONCLUSION

5.1 RESULTS OBTAINED AND PROBLEMS ENCOUNTERED

This project work provides an electronic security system designed to operate when touched, senses fire and intrusion, and also has the ability to delay operation to meet up different circumstances. The results obtained were as desired and some problems encountered during construction include the unavailability of exact design value in the market and power failure. Despite all the problems encountered the aim of the project was achieved

5.1 IMPROVEMENTS/RECOMMENDATION

Improvement could be done on this project by incorporating battery as an alternative source of power supply.

Since this project has been logically designed to be able to rescue all possible approaches of theft and fire outbreak, to give maximum protection of lives and properties, it is hereby recommended to house users and industrial premises

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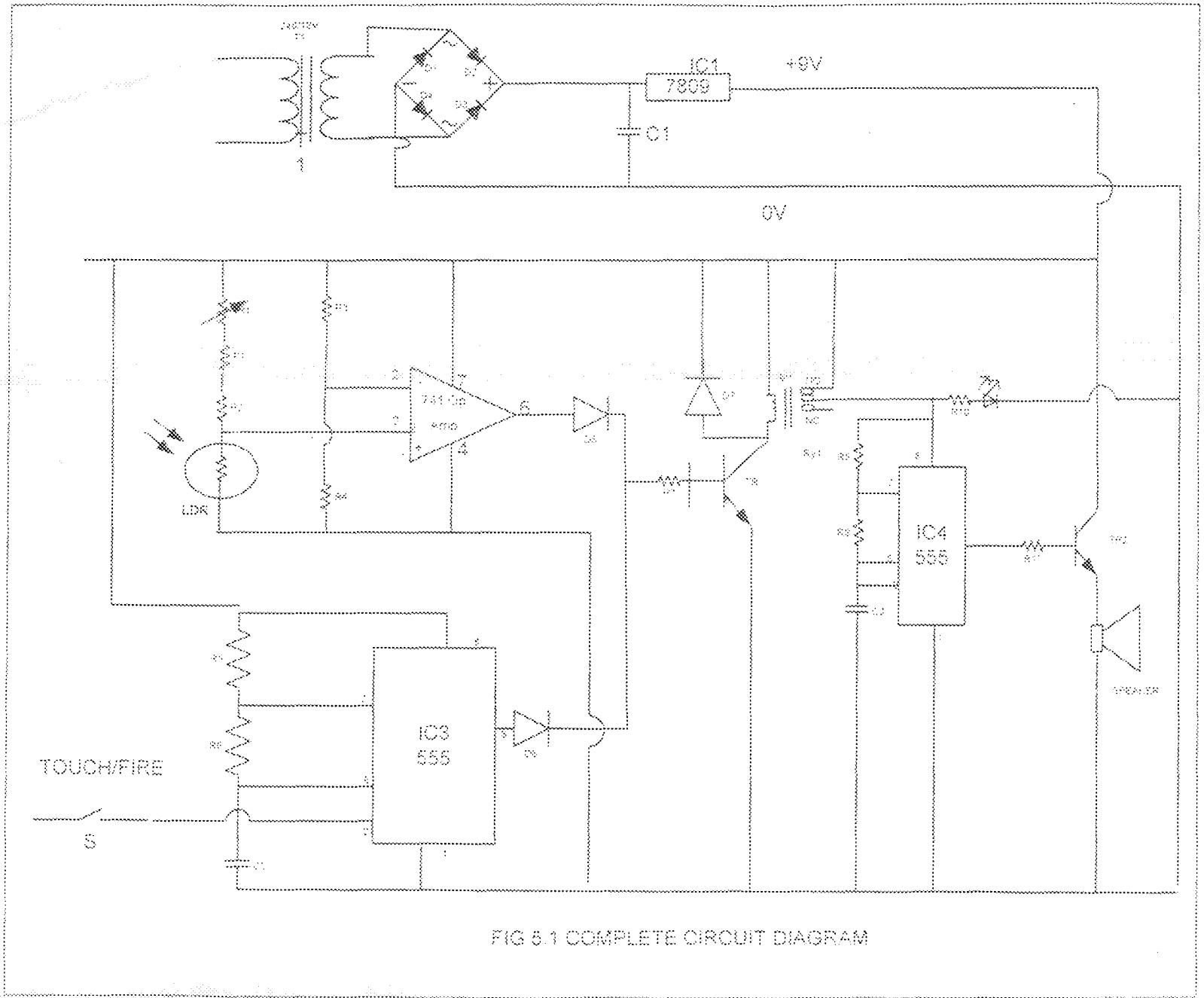

FIG 5.1 COMPLETE CIRCUIT DIAGRAM