DESIGN AND CONSTRUCTION OF AN INFARED SPARK ISOLATOR FOR CAR SECURITY

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A PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR OF ENGINEERING (B. ENG.) DEGREE IN THE DEPARTMENT OF ELECTRICAL / COMPUTER ENGINEERING, SCHOOL OF ENGINEERING AND ENGINEERING TECHNOLOGY, FEDERAL UNIVERSITY OF TECHNOLOGY MINNA, NIGER STATE.

NOVEMBER 2004.

DECLARATION

I Onyekpe Sabastine, with registration number: 98/7216EE, hereby declared that this project work was written and wholly presented by me, under the close supervision of Engr. Attah during 2003/2004 academic session, and to the best of my knowledge, it has never been presented else where before now.

CERTIFICATION

This is to certify that this project work was carried out by Onyekpe Sabastine 98/7216EE for the Award of Bachelor of Engineering in electrical and computer engineering, Federal University of Technology, Minna, Niger State, Nigeria.

ENGR. ATTAH
PROJECT SUPERVISOR

10th Dec., 2004
DATE

ENGR. M. D. ABDULLAHI
HEAD OF DEPARTMENT

31/10/2005
DATE

DR. T.O. AKINBULERE
EXTERNAL EXAMINER

DATE

DEDICATION

I dedicated this project work to the Almighty God for his loving kindness and tender mercies over my life, and also to my parents Mr. and Mrs. Theophilus Irabor Onyekpe and the entire family, expecially to my late brother, Mr. Evaristus Onyekpe.

ACKNOWLEGEMENT

I am very grateful to the Almighty God for his divine grace and mercy over me throughout the course of my study.

My special thanks go to my parents Mr. & Mrs. Theophilus Irabor Onyekpe and also to my loving brothers and sisters Augustine, Miss Priscilla, Late Mr. Evaristus, Miss Loretta, and Miss Magdalene. For their special love, caring and support rendered to enhance my success in life.

My profound gratitude goes to my able, diligent and hearted supervisor, Engr. Attah for his absolute monitoring of this project work, his assistance in term of knowledge and advice to make my project work a success.

My special gratitude goes to the Head of the department, and the entire staff of the department for their work, knowledge and advice rendered to make my degree course a success.

Finally my special appreciation is extended to all my friends that stood by me and encouraged me throughout the degree course, especially in my project work, they are very many to mention, Engr. Alex Ofomata, Engr Hassan Christian Musa,Engr.Ahmadu Musa, Mr. Femi Adebayo, Mr. Chucks Gabriel Akpibor. May them never be left out or forsaken in Jesus name.

ABSTRACT

This project work is on the design and construction of an infrared spark isolator for car security. It provides an Infrared (electronic) security system design to isolate the current that goes to the spark plug that generate heat for combustion. It has the ability to delay for some time configured to get out sight of the robbers before isolating the spark supply to the plug, which eventually brings the car to stop. The design includes a stable multi-vibrator which take care of the switching in the transmitter, inverting operational amplifier that inverts the output of the receiver, monostable multi – vibrator that produces pulses to the Delay flip – flop, which takes care of the switching in the receiver, monostable multi-vibrator that produces pulses to the Delay flip-flop, which takes care of the switching in the receiving circuit that in turn isolates the spark. It is made up of two 555 timers, operational amplifier, delay flop-flop, infrared transmitter and received.

TABLE OF CONTENT

CHAPTER ONE

1.1 INTRODUCTION

In order to avert the incessant and alarming rate of car stolen incidence a car anti – theft system must be installed inside the cars. The system can be a wireless alarm, a combinational lock e.t.c. Which just puts an alarm at a simple touch of the car as well as a simple configuration of the lock system. However in this case, the system would be an infrared means, since the wireless alarm type could be deceptive and consequently result in the Luke warmness of the car owner. The infrared means does not involve any physical contact between the car and the car owner, hence the spark isolator system.

The spark isolator system is designed and constructed by the electrical and computer engineer, and has the ability to isolate the spark produced by the spark plug, thus putting off the car system after sometime, say 25 seconds. It allows the car to run after a few second with the aim of safeguarding the interest of the car owner, (i.e. Life) from robbery attack and consequently swift recovery of the stolen car with a little help of the security agents.

1.2 LITERATURE REVIEW

Early in the 17th century, the concept of car security made a narrow progress until the renaissance when Kenneth Cora ham in 1908 in the Willows has Toad saying at the sight of Marineth or of his first car "The pretty of motion, the real way to travel". Silk in 1984, has pointed out the similarity between Toad's enthusiasm for the motor – car, and the futurist manifesto indeed, the advertising of Henry Ford during the late 16th and 17th century.

During this time, car security emerged as a distinct engineering disciplin3e concerned with engineering description of a car security was based on direct observation and coincides with the rise of mechanistic rationalism.

However, the enthusiasm of Toad based on car security made him to become a joy rider. Toad however said, there cannot be any harm to a car that is secured technically even though it is quite un-altered or unattended to while being taken away by car thief, with the remote help and other means. An Hungarian being at his dinner who listened with great interest how he recovered the car, he slowly walked round the car, inspecting slowly and musing deeply. I wonder, he said to himself if this sort of cars stop easily after a few seconds, hardly knowing how it came about, he found he had hold of the handle and was turning the steering of an already assumed missing car. As the familiar sound broke forth, with the old passion seized on Toad and completely mastered his body and soul as if in a dream he found himself, somehow, seated on the drivers chair, as if in a dream he pulled lever and drove the car back to the former place of resistance as if in a dream. All sense of right and wrong fears all, fears of subsequent occurrence secured temporarily suspended.

Consequently, in collaboration with Toad's enthusiasm after a brush with the criminal justice and panel systems, the pastomine police magistrate's and justice's clock and a dungeon of pirresian gloom – Toad escape dressed as a washer woman and added car – jacking to his crime. Car jacking is a practice of taking a car from the owner whilst they are in it, by force. Some would argue that increase security of cars has lead to the displacement of crime from car park in the craft skills of a car thief. Toad, however, used artifice rather than force. He heard a car on the road and imagines himself getting a lift and being driven up to Toad's hall. It is the same car that had been stolen before but his distinguished fools the owner who is affected by distressed himself into passenger seat.

The following quotes illustrated Toad's auto – determinism. Toad dearly believed that the very beauty of the car caused him to steal them when his friend prevented him buying after much encounter with criminals.

Nevertheless ten years after wind in the willow was first published the commissioned for police of the metropolis noted… Larcenies of motor cars and Vans have been frequent. These again are in large measures due top this case is an improvement in the system registration which might be so arranged as to make disposal of a stolen car entirely difficult as stated by the Metropolitan in 1912 – 1919.

The commission exhortation to motorist could come from the home office publicity for car crime prevention in 1992 and 1993. The blame is put on the owner no mention is made of joy riders. The term was known by then (Partridge in 1084).

In 1921, the commission again return to car crime since the implementation of the new system of registration has not yet had the desired purpose, he proposed that if the insurance companies and the under writers would combine to put their assurance on strict terms, much of this crime and other kind would be avoided.

In similar trend, Uliase Aidvovanchi, a megistrate blamed Chaufferors for 75% of stolen car based on the observation made by Flower and Jones (1974 – 1981) who said owners of cars complained bitterly that chauffuers took car without their consent. Furthermore, Perttifer and Turner 1984 (219 ; 220_ quote an article titled "get after chauffers" in life magazine 1906 which suggested the public handing in Madison Square of improper security for cars. The article concluded: " is homicide by automobile so much less than homicide with guns?" Williams Fabricus, also made similar part in his security epic poem which imagine an alien untutored in the ways of the car driving without security system.

1.3 PROJECT MOTIVATION

The analysis of the aim of this project "Design and construction of infrared spark isolator for car security "

These are:

1. To develop a simple low cost system aimed at easing the prevailing financial constraints faced by numerous car owners who intend to install such security in their car.

2 To stimulate the interest of up – coming students to take up research work in electrical related field, particularly in mechanical engineering, automobile.

3. To express and demonstrate the relevance of electrical engineering to the automobile industries.

4. To reduce the rate of car theft in the society, since other measures has been broken by the criminals.

1.4 PROJECT OUTLINE

1. Chapter one of this project introduces the principles behind the operation of the project. The chapter tells us the aim and objective of this project and the relevant modules that made up the entire system as well as its mode of operations. This chapter also gives the review of the related works and researches carried out by other people who in their endeavor contributed immensely to the development and appreciation of car anti – theft systems.

2. Chapter two presents detailed design and calculation of the spark isolator incorporating a d.c power source (supply) use as the power source to the transmitter module, receiver as well as other parts of the circuit. This chapter also deals with several modules of the entire system with relative block diagram that illustrates the working principles of the spark isolator.

3. Chapter three gives detail on the construction of the hardware, testing, observation, preventing, measure taken, Result and the discussion of results.

4. Chapter four gives the recommendation and the conclusion of the entire work. The reference is also in this chapter.

CHAPTER TWO

2.0 DESIGN ANALYSIS

The advert of the modern day car security system has provided safety to the life of car owner, productivity, high patronage and the elimination of fear of loosing expensive cars to theft.

This chapter gives a complete description of the various modules used in the design and construction of the "spark Isolator". The theoretical background of each module is extremely dealt with.

The block diagram below illustrates the "Infrared Spark Isolator System".

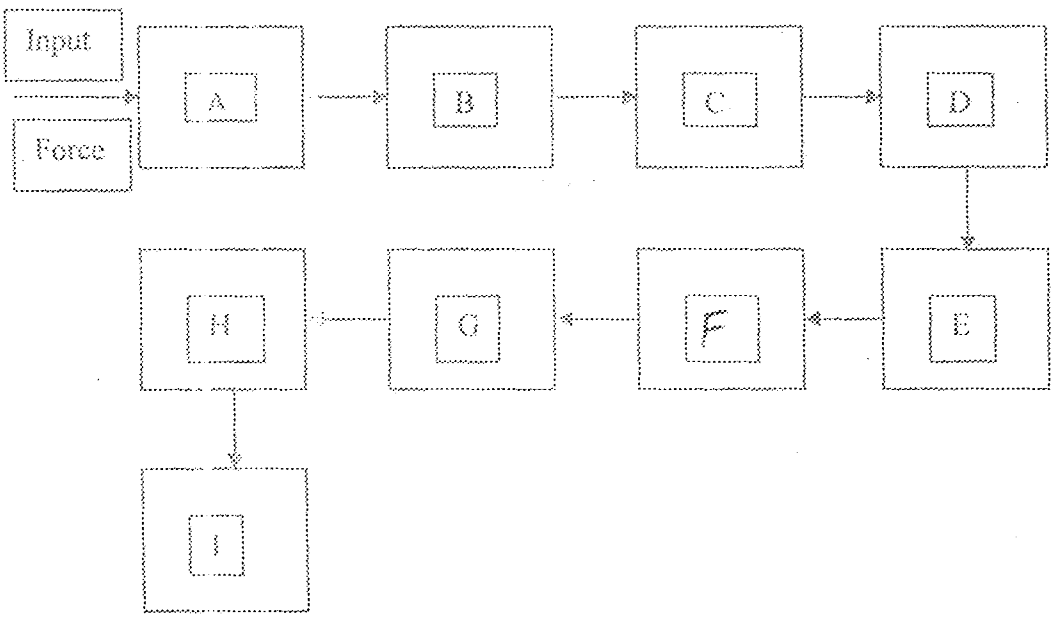

Figure 2.1 The Block Diagram Of The Spark Isolator Circuit.

Key

A – Transmitting module

B – Receiving module.

C – Comparator module

D – Inverting module

E – Time constant module

F – Pulse generating module

G – Delay module

H – Switching module

I – Spark plug.

The nine sub-system of the spark isolator circuit are completely described by the block diagram in figure 2.1. The power supply to the circuit is from a d.c (direct current source). This is simply obtained from the battery used in driving the entire car system. Thus, it is the power – house of the entire system of the spark isolator.

The block diagram illustrate the process involve in recovering a stolen car within the shortest possible time with little intervention of the police. This is achieved by depressing the SPST switch connected to the transmitting module. This then causes the LED (infrared LED) to be energized, emitting infrared rays that is received by the infrared receiver. It must be noted that the fast switching – on of the infrared LED is as a result of the darlington pair connection of the circuits.

The receiver infrared component, on receiving the emitted rays from the transmitter, it modulates and then sends the modulated signal to the time constant via the inverting module, usually of the CMOS inverter. Subsequently, the time constant module via the pulse generator (Monostable mode connected, 555 timer) which energize the delay module that further energizes the switching module before it finally de – energize the spark plug, releasing the required spark for continuous combustion, hence, it goes off after the preset time, with respect to the delay module.

2.1 POWER MODULE

This module supply the desired voltage required to drive the entire system of the spark isolator. It is obtained as part of the output voltage from the car battery that energize the spark plug and other systems that made up the motor car.

2.2 TRANSMITTING MODULE

This module generates the infrared rays required to drive the receiving module and subsequently the subsystem of the spark isolator. It consist of SPST switch, darlington pair, coupling capacitor as well as the infrared transmitter. It is made of an oscillator, usually configured in an astable mode to continuously generate the require pulses. When the SPST (Single Pole Single Switch) is depressed, the output of the astable connection switches on the infrared LED via the switching transistor. The figure below illustrates the transmitting module of the spark isolator system

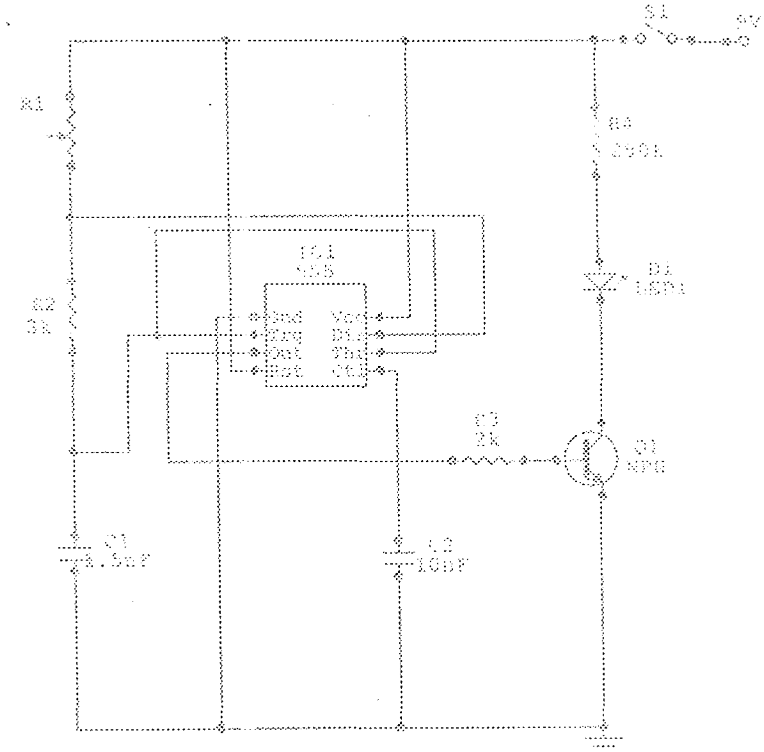

Figure 2.2 The Transmitter Module Of The Spark Isolator

DESIGN / CALCULATION

For the transmitter module, from the expression below,

$f = 1.44 / (R_1 + 2R_2) C_1$ 2.1

Where,

f – The frequency of transmission

R_1 – The variable resistor

R_2 – The fixed resistor

C_1 – capacitor

R_1 varies within the range of 5 K ohms to 3.3 M ohms, for the design purpose, we choose.

R_1 = 10 k ohms

R_2 = 3 k ohms

For a frequency of 60 kHz,

We have,

$60 = 1.44 / (R_1 + 2R_2) C_1$

$1.44 = 60 \times (R_1 + 2R_2) C_1$

$C_1 = 1.44 / (60 \times (10 + 2 (3)))$

$= 1.44 / (60 \times 16)$

$= 1.44 / 960$

$= 0.0015$ mF

Hence, for a 60 KHz transmission, a capacitor of 1.5 mF is required with R_1 and R_2,

10 k ohms and 3 K ohms respectively.

Neglecting the resistance of the infrared emitting diode,

$I_{IRED} = (V_{CC} - V_{IRED}) / R_4$ --2.2

Where,

I_{IRED} – The current through the infrared emitting diode.

V_{IRED} – The voltage across the infrared emitting diode.

Vcc – Maximum collector Voltage

$I_{IRED} = (9 - 1.12) / 280 = 0.028114 = 28.14$mA

A small current (i.e. base current) that triggers the much larger current in the collector - emitter function of the transistor Q1 can be calculated.

$I_B = (V_B - V_{BE}) / R_3$--2.3

Where,

V_{BE} - The voltage across the base emitter,

But V_{in} = 2/3 Vcc

= 2/3 x 9 = 6

V_{BE} = 0.7v

I_B =(6 – 0.7)/ R_3

I_B = (6 – 0.7)/ 2 = 2.65mA

2.3 RECEIVING MODULE

This module is infrared receiver; it receives the modulated infrared rays. It has a TTL output that is high with no signal and low when there is signal from the transmitter infrared LED. The figure below illustrates the infrared receiver of the spark isolator

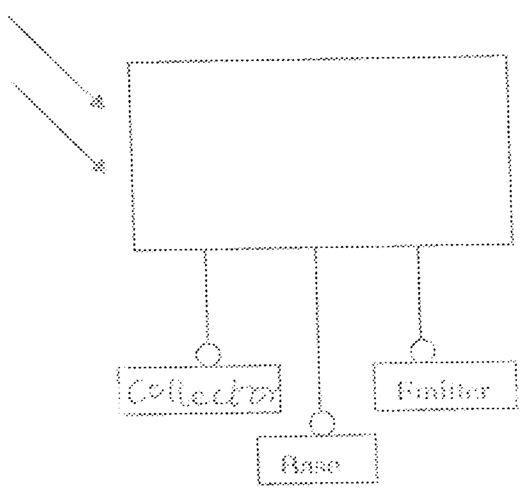

Figure 2.4 The Receiver Module Of The Spark Isolator Circuit

2.4 VOLTAGE COMPARATOR MODULE

Voltage comparator as the name implies is a circuit that compares the magnitude of two analogue voltages between the inverter and non – inverter input to produce a logic 1 output. It is similar to differential amplifier operating in an open loop mode. However, because of its high gain, the output is normally saturated in either high or low state depending on the relative amplitude of the two analog input voltages. With conditions, the computer provides a logic state output which is indicative of the amplitude relationship between two analogue signals. Figure below shows the voltage comparator f the spark isolator.

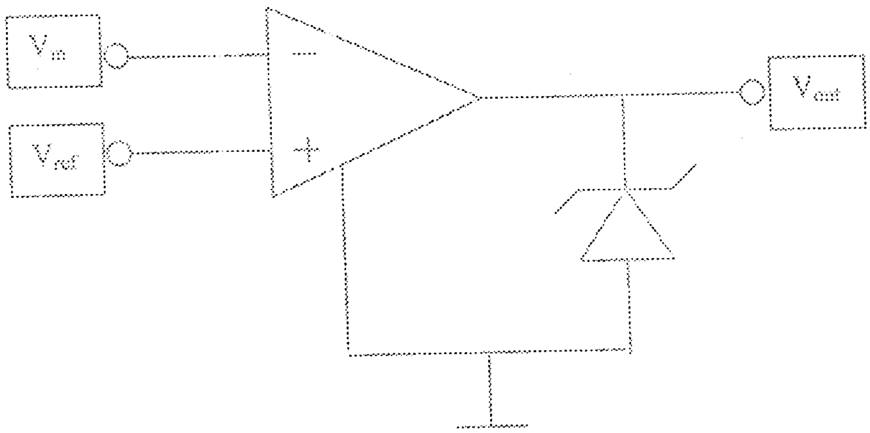

Figure 2.4 The Comparator Module For The Spark Isolator Circuit

2.5 INVERTING MODULE

This module invert the output of the TTL receiver which input was initially active low, on receiving signal from the transmitting module. The figure shows the inverting module of the spark isolator.

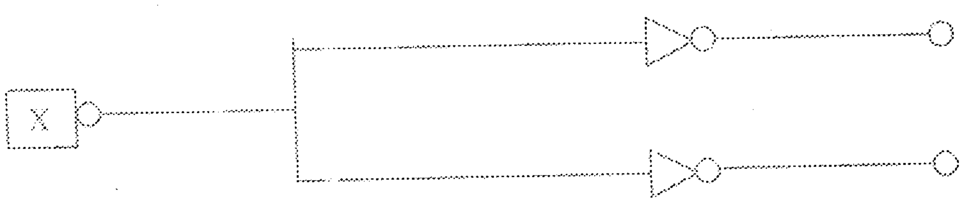

Figure 2.4 The Inverting Module Of The Spark Isolator

2.6 TIME CONSTANT MODULE

This module is made up of capacitor, two resistors and a diode. The capacitor changes through one of the resistor and discharges through the other resistor, while the diode prevent quick discharge of the capacitor of the buffered signal thereby ensuring a good pulse duration required to drive the pulse generator. The figure below shows the time constant module of the spark isolator.

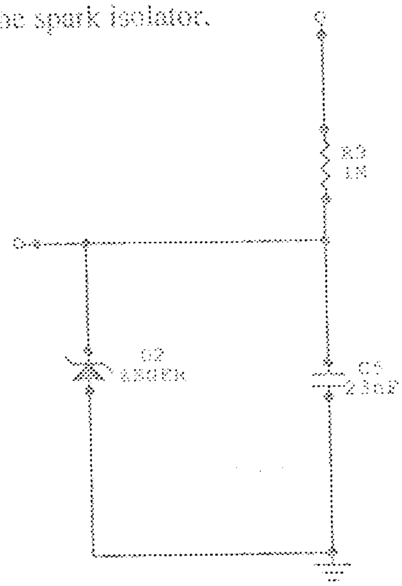

Figure 2.5 Time Constant Module Of The Spark Isolator.

The time duration used in the course of this design is calculated as:

$T = 1.1\ R_9C_5$

R_9 = 1Mohm's, C_5 = 23microfarrad

$T = 1.1 \times 1 \times 10^6 \times 23 \times 10^{-6}$

= 25.3 seconds

2.7 PULSE GENERATOR MODULE

This module generates the pulses required to drive the switching module via the delay module. It is constructed to reconstruct the jiggered signal received by the receiver to activate monostable mode. The figure below illustrates the pulse generator module of the spark isolator.

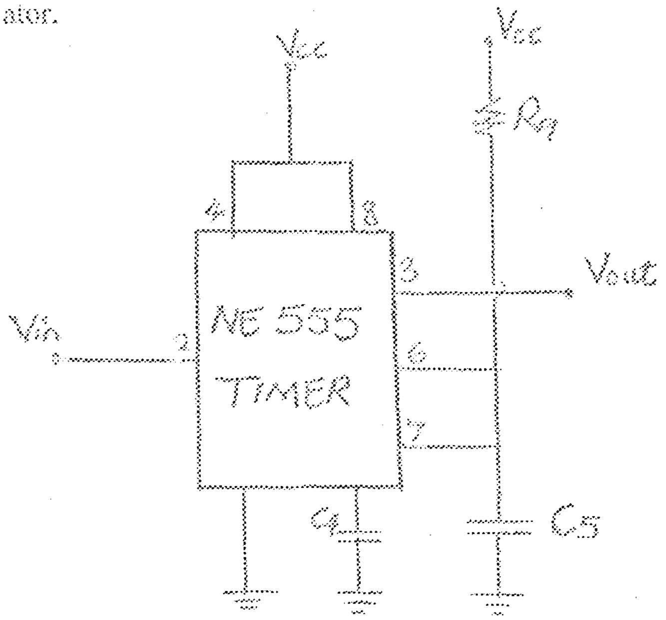

Figure 3.7 The Pulse Generator Module Of The Spark Isolator.

2.8 DELAY MODULE

This module, as the name implies, delays every pulse coming from the pulse generator for a configured period of the time duration via the pulse generator. Say 25sec. before getting to the switching module. It helps in accomplishing the main aim of this project. The figure below illustrates the delay module of the spark isolator.

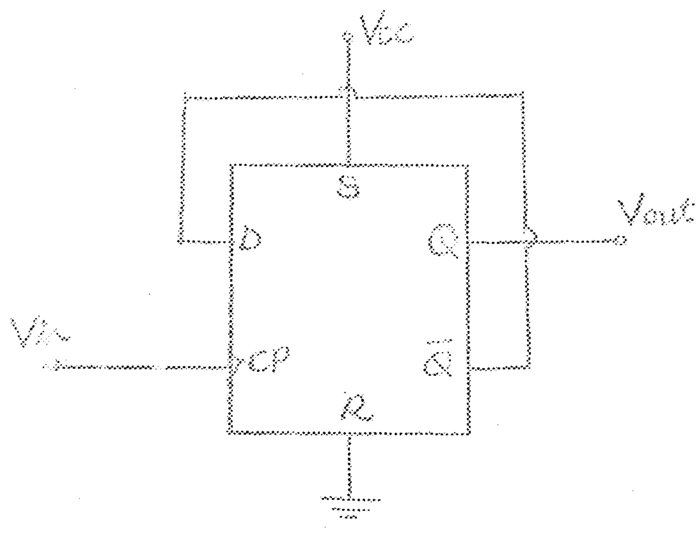

Figure 3.8 The Delay Of The Spark Isolator

2.9 SWITCHING MODULE

The switching module as the name implies makes and breaks the connection of the electrical current through the relay. This module interfaces the entire system with the spark plug inside the engine system. Without this module, the aim of the project would not be achieved. The module in receiving signal from the delay module, it switches on the transistor when it receives signal from the base via its parallel combination of resistors R_5 and R_6, which switches from the initial cut – off region to the saturation region and subsequently energizes the relay via the relay coil. The relay in turn energizes the spark plug. The figure below illustrates the switching module of the Spark Isolator.

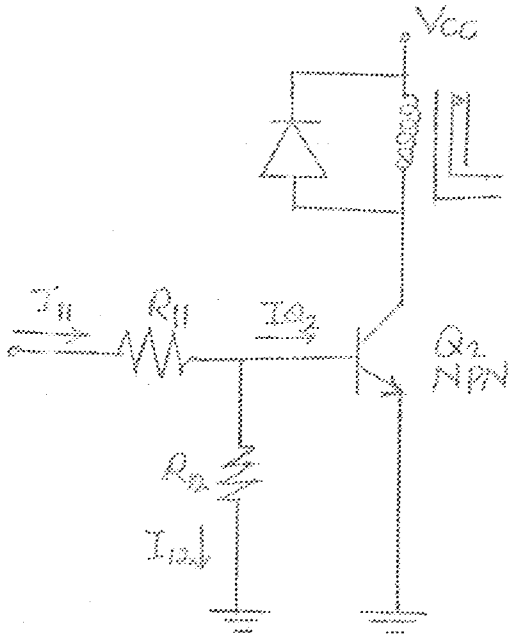

Figure 3.9 The Switching Module Of The Spark Isolator

<u>CALCULATION</u>

Characteristic of Q3 (2N2222A)

I_{cmax} – The maximum collector current of the transistor.

I_B - The base current of the transistor

V_{BE} – Voltage across the base and the emitter

V_{CE} – Voltage across the collector and the base

R_L - The relay resistance

R_L = 410 ohms, this was obtained when measured the relay resistance with digital multi - meter as the coil resistance of the relay.

V_{CC} = 12V , from the car battery

From ohm`s law,

$I_C R_L = V_{CC}$ 2.4

$I_c = V_{CC} / R_L = 12 / 410 = 0.029A$

Icmax = 0.8A

$V_{BB} = 2V$

$V_{BE} = 0.8v$

$I_{B\,MAX} = 0.02A$

ß = =40

$I_{B\,MIN} = I_c / B = 0.029 / 40 = 0.000725A$

The current necessary through R_{12} to ensure cut – off for an over driven switch (by the thumb rule) is equal to $2I_{Bmin}$

$I_{12} = 2\,(0.000725) = 0.00145A$

Applying Kirchorff`s Voltage law

$I_{12}\,R_{12} = V_{BB} - V_{BE}$ 2.5

$R_{12} = (V_{BB} - V_{BE}) / I_{12}$

$= (2 - 0.6) / 0.00145 = 9.65$ ohm's

$= 0.965$KOhm's

$= 1$Kohms

From Kirchoff's voltage law, on this input with $I_{11} = I_{Bmin}$ we get

$I_{11} R_{11} = V_{in} - V_{BE}$ --2.6

$R_{11} = (V_{in} - V_{BE}) / I_{11}$

$= V_{in} - V_{BE} / V_{BMIN}$

Therefore,

$R_{11} = (8 - 0.6) / 0.000725$

$= 10206$ ohms

$= 10$Kohms

Hence, a 10Kohm's resistor is placed at the Delay flip – flop output which forms a voltage divider with 1K ohms resistor connected to the base of transistor Q2 with respect to ground.

2.10 CIRCUIT OPERATION

By pressing the switch, the infrared transmitter LED in the transmitting module emits modulated infrared rays. These rays are received by the infrared receiver module and buffered. The receiver IC has a standard TTL output; the output with no signal is logic 1. The inverter module, on receiving the buffered signal inverts the receiver output to the pulse generator via the time constant module. The pulse generator removes any form of jaggered wave to clearly construct the signals and subsequently activate the delay module which in turn energizes the switching module after a few seconds, depending on the time duration configuration, hence isolate the spark.

CHAPTER THREE

3.1 CONSTRUCTION

In the hardware construction, the overall system was broken into modules for easy construction, testing and trouble – shooting.

These include:

i. Transmitting module

ii. Receiving module

iii Comparator module

iv Inverting module

v Time constant module

vi Pulse generating module

vii Delay module

viii Switching module

ix Spark isolating module

MODULE ONE: TRANSMITTING MODULE

This module was built on the Vero board. It consists of a coupling capacitor that provides the link between the switch and the entire system. The emitter, base and collector of the transistor Q1, of this module were determined by the digital multi – meter. Connected between the collectors is the infrared transmitting LED. It gets energized when the switch button is depressed with subsequent emission of infrared rays. Connected to the base of Q1 is a resistor to protect the entire transmitting module from thermal runaway, a phenomenon that result to over heating of the base of Q1 in the sudden rise of the base current.

MODULE TWO: RECEIVING MODULE

This module receives and modulates the transmitting module. It is an infrared receiver IC, whose TTL output with no signal is logic "1" and vice – versa. This is built on a separate Vero – board.

MODULE THREE: COMPARATOR MODULE

This module compares the input signal from the receiver with a reference voltage formed by the voltage divider by the variable resistor VR2

MODULE FOUR: INVERTING MODULE

This module inverts the logical low output of the infrared receiver to logical high. The output thus serves a dual purose function which includes driving the LED (light emitting diode) that indicates the presence of signal from the receiver output driving of the time constant circuit.

MODULE FIVE: TIME CONSTANT MODULE

This module consist a resistor R and a capacitor that charge s through R1 and a diode that prevent the fast discharge of the capacitor through, its output drives the pulse generating module.

MODULE SIX PULSE GENERATING MODULE

This module receives the Jiggered edges produced by the modulated infrared data. This module is wired in a monostable mode; with pulse duration connection across its output further reconstruct a single clean pulse to activate the bi – stable latch that includes delay.

MODULE SEVEN: DELAY MODULE

This module as the name implies, is meant to delay the output of the pulse generator before getting to the switching module and subsequently isolating the spark plug within the possible time interval.

MODULE EIGHT: SWITCHING MODULE.

This module consist of voltage divider network formed by resistor R1 and R2 connecting to the base of the transistor Q2 and delay connected to its collector as a load. It is this module that de- energizes the spark – plug.

MODULE NINE: SPARK PLUG MODULE

This module carries the signal (current) from the switching module to the spark – plug which generates spark (Heat) for combustion in the car system.

3.2 TESTING AND OBSERVATION

1 With the aid of the digital multi – meter, the transistors Q1 and Q2 base collector and emitter was identified. The LED (infrared LED) polarity was also identified. The transisitorQ1 was connected to the infrared LED between its collectors. To the base of Q1, a resistor was collected to protect the entire transmitting unit from thermal runaway.

2 The receiver (infrared LED) pin was tested and identified and subsequent component like the CMOS inverter pin was also identified with the help of the digital multi meter

3 By virtual observation, the IC's pins configuration was fully and clearly identified.

4 The digital multi – meter was also used to identified the normally open and normally close of the relay, thus making construction easier.

5 With the aid of a measuring tape, back saw, plywood, wooden casing of the system was constructed, and made rigid by the use of nails.

3.3 PREVENTIVE MEASURES TAKEN

Quite a number of preventive measures were taken in the design and construction of this project work. This was done to ensure that the system worked well and the components were not damaged in the process of construction.

i. The ICs were mounted on each IC socket already soldered to the Vero – board to ease the replacement of any faulty IC

ii. Proper soldering was applied. Stray solders work careful removed to avoid short – circuit and bridging. High grade soldering lead was used, and the heat of the soldering iron was regulated to avoid damage to the components.

iii. The values of circuit components were ensured to be very close to their calculated values.

iv The circuit design was made to be easy to understand, noting method used in previous designs, so as to save time and prevent too much experimentation with components.

v Having made all necessary connections, proper care was taken to avoid bridging of line by thorough examination of the connection holes and the non – connecting holes. This was to ensure that there were proper connections between components.

3.4 CONSTRUCTION TOOLS USED

Most of the construction tools used during the modeling and hard ware construction are;

(1) Project/ Vero board and insulated copper wire (used as jumpers): These components was in building part of the prototype model for test before the circuit was finally transferred to the Vero board permanently

(2) Soldering- iron and lead was used in soldering of all the components on the Vero board

(3) Digital multi Meter: this is a digital electronic derives that was used to carry out series of test on continuality or open- circuit between two lines(wires) it was also employed in measuring voltage, resistance, current values, and in determining the base, emitter and collector of the transistor used in this project.

(4) Precision screw Driver: because of the various shape and size this tools was employed in regulating the frequency of the transmitter and receiver, thereby ensuring adequate communication between the remote and the receiver motor car.

3.5 PACKAGING

The complete receiving unit was housed in a wooden case with the following dimensions:

Height =10cm

Length = 20cm

Width = 11.5cm

The transmitted meter was cased in a wooden case with the following dimension

Height = 3cm

Length = 17cm

Width = 6.5cm

With a wooden cover, which was covered by force fitting provisions, were made for socket to feed in the voltages and signals of the unit and were mounted on the one force of the housing to provide neat and easy connection. The Vero board was screwed on a wooden base laid at the bottom of the housing. The sides of the housing were given some little opening for the indicator transmitter and receiver to be visible.

3.6 RESULT

At the end of the hardware construction the entire circuit was tested and was working well. When the switch was closed, the infrared transmitter pointing at the receiving circuit, light bulb representing the spark – plug was on indicating that heat for being generated by the spark plug for combustion. As soon as the switch was opened, the spark plug continued to generate heat, and eventually stopped at the configured timing (25 seconds)

3.5 DISCUSSION OF RESULT

From the simulation of the circuit using the Cathode Ray Oscilloscope (CRO) , it was revealed that the spark isolator circuit was mostly pulse generating system that operates based on certain frequency range whenever the transmitter module via its SPST switch is depressed. These pulses appeared when the TTL infrared IC receives infrared signal and further strengthen and reconstructed, thereby enhancing the efficient working principle of the circuitry.

The Spark Isolator was really in a working principle for25 seconds delay that enable the current to flow to the spark plug to generate heat for combustion which enable the car system to work for the time configured.

CHAPTER FOUR

4.2 CONCLUSION

Having test – run the hardware, it was observed that the aim of this project was successfully realized, thus proving that the " spark isolator" can be designed and constructed base on the principle of electromagnetic wave, i.e. without any electrical contact between the transmitter module, infrared receiver, comparator, inverter, pulse generator, Delay flip – flop and switching mechanism. The low operating voltage of the system 12v dc (direct current) is usually obtained from the car battery, and the low power consumption of the system allows the efficient functioning of other parts of the car without causing any effect.

4.1 RECOMMENDATION

As an electrical and computer engineer I desire to integrate and demonstrate the e relevance of electrical engineering in other field of discipline. For instance because of the obvious Luke warmness deception induced by the alarm security type, the need to improve on this was my desire.

Further more, I want upcoming students to improve on this to be able to arrest such criminal by designing a system that can release high voltage as soon as the car goes off while the criminals are still in the car and thus receive shock to remain unconscious for some time to get them caught with little help from the security men.

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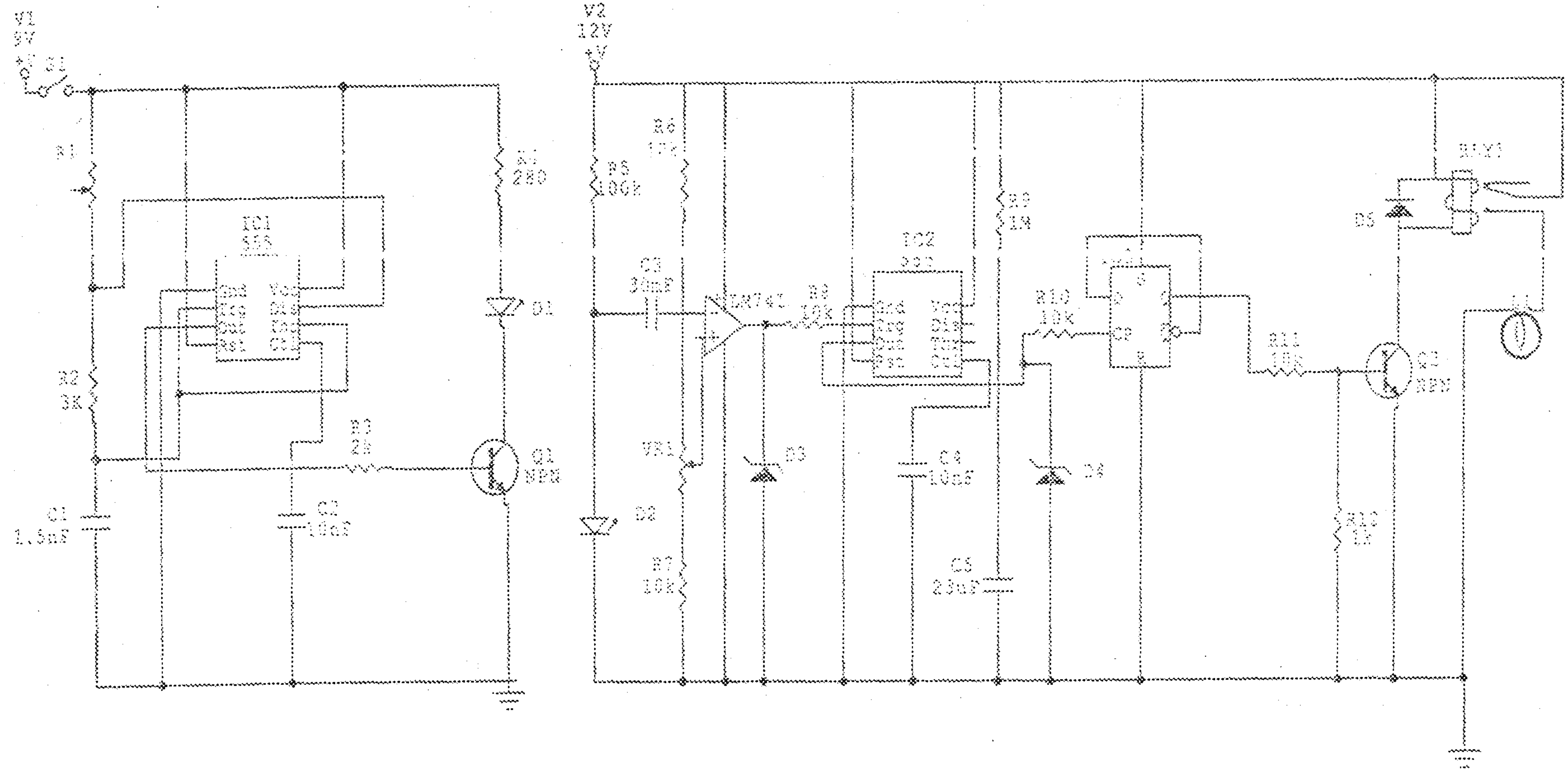
APPENDIX

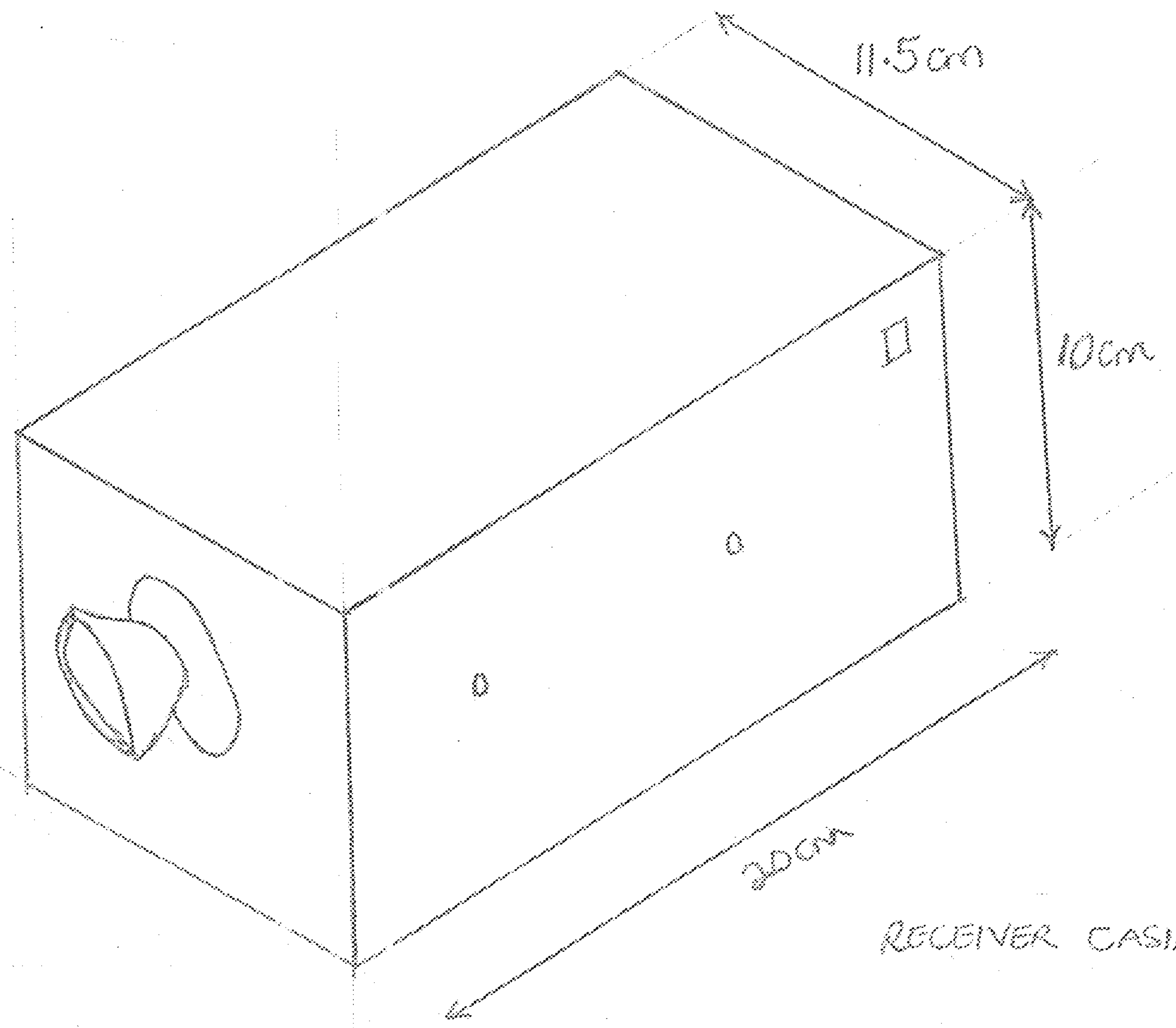
PART LIST

ITEM NUMBER	DESCRIPTION	TYPE
R1	10KΩ	VARIABLE RESISTOR
R2	3KΩ	FIXED RESISTOR
R3	2KΩ	FIXED RESISTOR
R4	280Ω	FIXED RESISTOR
R5	10KΩ	FIXED RESISTOR
R6	10KΩ	FIXED RESISTOR
R7	10KΩ	FIXED RESISTOR
R8	10KΩ	FIXED RESISTOR
R9	1MΩ	FIXED RESISTOR
R10	2KΩ	FIXED RESISTOR
R11	10KΩ	FIXED RESISTOR
R12	1KΩ	FIXED RESISTOR
C1	1.5nF	FIXED CAPACITOR
C2	10nF	FIXED CAPACITPOR
C3	30mF	FIXED CAPACITOR
C4	10nF	FIXED CAPACITOR
C5	23µf	FIXED CAPACITOR
IC1	555 TIMBER (ASTABLE MULTVIBRATOR)	OSCILLATOR

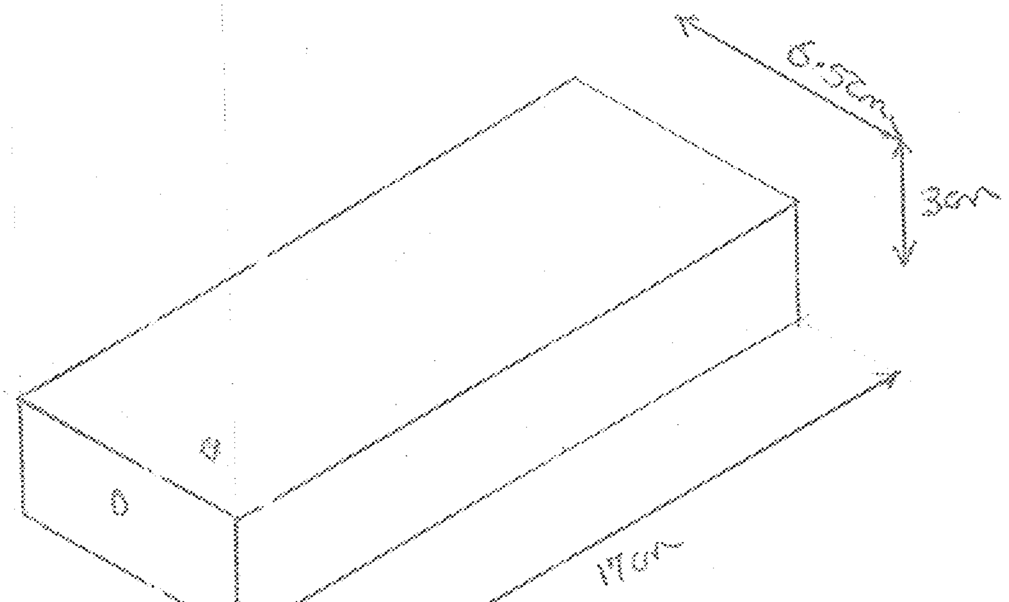
IC2	LM741	OPERATIONAL AMPLIFIER.
IC3	555 TIMBER (MONOSTABLE MULTVIBRATOR)	OSCILLATOR
IC4	4013BE	DELAY FLIP-FLOP
D.C VOLTAGE SOURCE	12V	CAR BATTERY
D.C VOLTAGE SOURCE	9V	DRY CELL
MISCELLENEOUS	VERO BOARD	
CASE	WOODEN CASE	
WIRE	CONECTING WIRE	
D1		INFRARED TRANSMITTER
D2		INFERED RECEIVER
D3	5.6V	ZENER DIODE
D4	5.6V	ZENER DIODE
D5	2V	



INFRARED SPARK ISOLATOR CIRCUIT DIAGRAM



RECEIVER CASING



TRANSMITTER CASING