DESIGN AND CONSTRUCTION OF AN AUTOMATIC CAR IMMOBILIZER

BY

ALIYU ASIMAU ONYECHE

2003/15318EE

A THESIS SUBMITTED TO THE DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING, FEDERAL UNIVERSITY OF TECHNOLOGY MINNA,

IN PARTIAL FULFILLMENT FOR THE AWARD OF BACHELOR OF ENGINEERING (B.ENG) DEGREE.

NOVEMBER, 2008

DEDICATION

This project is dedicated first to almighty Allah, who has given me the enablement and has seen me through up to this level of my life. Also, to my belove parents, Mr. Aliyu Tijani and late Mrs. Aliyu Zainab (May her soul rest in peace, Amen), and to my brother Mr. Aliyu Razak for their support and need ability and willingness up to this time, may Allah give you more grace and increase your caring ability (Amen).

DECLARATION

I ALIYU ASIMAU ONYECHE declare that this work was done by me and has never been presented elsewhere for the award of a degree. I hereby relinquish the copyright to the Federal University of Technology, Minna.

ALIYU ASIMAU ONYECHE	ENGR. A. S. RAJI
(Name of student)	(Name of Supervisor)
(Signature and Date)	(Signature and Date) Nov. 13, 2008
ENGR. (DR.) Y.A. ADEDIRAN	
(Name of H.O.D)	(Name of External Supervisor)
(Signature and Date)	(Signature and Date)

ACKNOWLEDGEMENT

I give thanks to almighty Allah whom of his infinite mercy gives me the strength and wisdom for making this project a successful one.

My special appreciation goes to my lovely father, Mr. Aliyu Tijani, my brothers and sisters and to the following families. Mr. and Mrs. Tijani, and Mrs. Raheed, Mr. and Mrs. Ibrahim for their moral and financial support before, during and after the project. May Allah reward you all with his paradise (Amen).

My sincere appreciation goes to my project supervisor, Engr. A.G. Raji for his most helpful advice and useful suggestion. May Allah reward you with his paradise (Amen).

Finally, my acknowledgement goes to all my lecturers, colleagues, neigbhours, friends and well wishers for their inspiration and impartation of wisdom, which has brighten my vision and has broadly contributed to the success of this project. May Allah bless you all abundantly (Amen).

ABSTRACT

This project,car immobilizer is design to protect a car from starting by using an electromechanical switch as a device which prevent an unauthorise operator from starting the car,due to the fact that the time delay,the connectivity and other mechanizm involued in the operation of the imobilization are known only to the car owner. Problem encountered is due to the choice of transistor used,which makes the holding current small,because of the large resistance use has load .The problem is solved using a large load transistor with high collector current gain. The design of this project,car immobilizer is a way of securing vehicles (car) from an intruder because of the difficuity in operation.

Table of Contents

LIST OF FIGURES

FIGURE

CHAPTER ONE

1.0 INTRODUCTION:

Car theft is a common phenomenon these days owning to the high cost of cars. At most times the owners of such stolen cars can not afford to replace them.

However, the use of electronics car anti-theft has become a necessity due to the ugly trend. These days most car security system come with the car from manufacturer, and at times are brought off the shelf and installed by the car users. Since lives, houses and business can be secured, so should properties such as car should be secured. The security of the car should not stop having insurance documents, because other means can be employed for protecting or preventing the car theft.

As an electrical and computer engineer, this was a motivation in using the knowledge of either electronics or computer skill to combat this problem. A better solution towards this problem is to use an automatic switch to immobilize a car. The automatic switch is to confuse an unauthorized person.

This project title "Design and Construction of an automatic car immobilizer".

1.1 DEFINITION OF PROJECT

A car immobilizer is an electronic device that is designed to disallow the starting of a car. It could also be called a starter motor immobilizer and it finds usefulness in the protection of a motor car against unauthorized operation, for example theft. It was built around the brake pedal of the car. The brake pedal has to be pressed for at least five seconds before voltage is applied to the coil of the relay. Since the thief or the intruder does not know this, he or she will try

everything to get the car started. Since it is only the coil to sort of protection activated? which voltage is not applied, all other electrical functions will work normally, but it is just impossible to get the car started.

One of the advantages of the security system is that the car appears to function normally but it does not start unknowingly to the thief or intruder that the ignition of the switch has to be on when the voltage is applied to the coil of the relay. The conclusion of the theft will be has it broken down or is there some

1.2 AIMS/OBJECTIVE OF PROJECT:

This project as a whole is designed to meet certain aims and objective which include:

i. To generate a single pulse using the IC timer.
ii. To provide a time delay.
iii. To disallow the starting of a car (immobilization).
iv. To confuse the intruder or the thief.

1.3 METHODOLOGY

This project is designed to enable the car theft not to be able to steal the car. It relies on the use of electromechanical switch to put power on the ignition of the car.

With this project installed in an automobile, cars would not be moveable except correct procedures are carried out. This includes the turning of the key starter and then stepping on the

brake for a period of time, for example four to five seconds, before one applies pressure on the accelerator. This whole process puts the ignition coil in an enable state; initially it was disabled.

This device makes use of an astable multivibrator which flashes indicating that the key starter has been turned to the start position. Note that whenever this is turned without accelerating, one can make use of the radio system. The voltage that feeds the radio is the one that feeds the Vcc of the astable.

Afterwards, pressing the brake for five seconds makes one be able to make the voltage going to the brake light, the voltage to be compared with a regulated voltage source which is from the radio point. The voltage obtained after regulation is 5volts. When this is compared with the 12V of the brake light the output of the comparator goes low, triggering the 555 timer which is set on a monostable mode which inturns fires the SCR (Silicon Control Rectifier) so that it would latch the electromagnetic device which continues the line of the ignition coil to power supply.

At this instance, one can accelerate and the car will start.

1.4 PROJECT SYNOPSIS

Chapter one of this project reports gives introduction to general principle and importance of the project, its advantages and aim/objectives of the project.

Chapter two explained the literature review.

Chapter three of this project deals with design analysis, principles of operation, the power control unit, the signal generation and time delay of the system.

Chapter four is the construction, testing, results and precautions of the project.

Chapter five contains conclusion and recommendation of the project.

CHAPTER TWO

2.1 LITERATURE REVIEW:

Car security wouldn't have been thought necessary. At a time cars were non-existent and when they were eventually made, there was no much need for security systems, since stealing of car was not a problem. Event of 1896 and beyond changed all that. Cars became neutral target for thieves being valuables, reasonably easy to resell and processing a built-in gate way system. Some study claim that a car gets broken into every twenty seconds in the United State[1]. Nigeria and in fact Minna it's envious have not been left out of the cases of car theft. Since all these insecurity act of stealing and hijack of automobiles are problems, both the manufacturer and the users are faced with the challenges of making it secured against thieves and unauthorized person.

2.2 METHOD USED:

The first measure used by the manufacturers is the use of ignition key and car door lock. Since only the car user or authorized person had access to the car, it makes it secured against any intruder. As time provided, this method does not ensure adequate securities of the car in the car since wire can bridge to start the car in the absence of key and most car door locks can be picked by the intruder.

Various methods have been used by car users which include disconnection of battery chaining of the stirring wheel etc. All these methods as well as the previous ones do not ensure adequate security of the car. Men of the underworld have designed means of beating all security measures and make away with the vehicle. Another disadvantage of this method is that it does not provide any security if the car is snatched at gun point

Due to the advent of technologies today, there are various manufacturers. This security system makes use of various principle and method. Although all these methods provide better security for the car, it does not guarantee 100% security. Intruders in most cases were able to discover limitations and short-comings of all these security gadgets and still able to make away with cars.

When Thyristor, integrated circuits (ICs) and other electronics components were invented. It was considered a revolution small, fast, reliable and effective; it quickly replaced the vacuum tube[2]. Desirable electrical construction becomes realizable. Most designs that had to be constructed in enormous surface could have been done on surface as small as a breadboard. This invention, among other developments also had a significant impact on construction of car security system. As technology improves better security will be designed that will provide better security of life and property of car users.

2.3 THEORETICAL BACKGROUND

This is the theory behind some of the electronic components such as comparator, voltage regulators, Thyristors, 555 timer IC and Relay.

2.3.1 COMPARATORS

Here an operational amplifier (LM741) was used as the comparator. However, this doesn't work in some cases. For example, when a TTL-Compatible output is needed. An op amp used as a comparator may not meet circuit requirements. TTL stands for "Transistor-Transistor Logic" and it represents a widely applied digital family of parts that are used in many products and systems.

Special comparator ICs are available. They are better for joining the analog and digital worlds. They provide a logic state output that indicates the relative state of two analog voltages, one of which is often a fixed reference. Comparators can signal when a voltage exceeds a reference, when a voltage is less than a reference, or when a voltage is within a specified range. Comparators ICs must change output states rapidly. They are optimized for high gain, wide bandwidth and a fact slow rate. The switching time of a digital signal usually must be very fast [3].

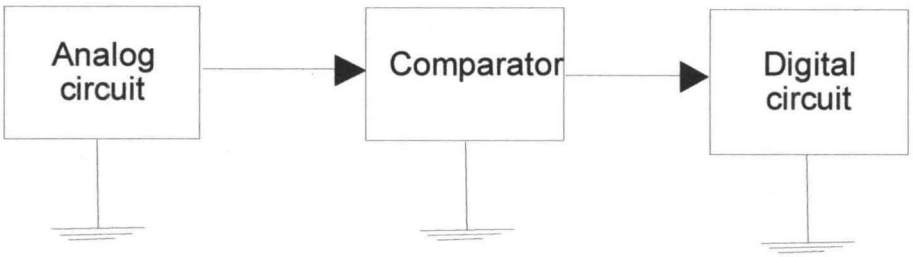


Figure2.1 Showing the Joining of Analog Circuit and Digital Circuit.

2.3.2 VOLTAGE REGULATORS

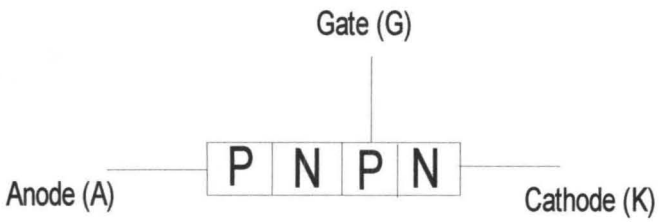
This is a circuit that is connected between the power source and a load which provides a constant voltage despite variation in input voltage or output load. There are different kinds of voltage regulators for example LM7805, LM7809 etc.

2.3.3 RELAY

A Relay is a remotely controlled electrical switch that controls power to load by energizing an isolated input circuit. It is the simplest and basic remote control device. The input circuit of all relay are electrically isolated from the output circuit. The input circuit can be closed or remotely at long distances, from the load either by manual switch or other relay.

When the relay coil is energized, the electromagnet attracts the armature against the tension of the return spring causing the normally open contact to make a break before making sequence, e.g. when the electromagnet is de-energized, the return spring pulls the armature open, and the upper normally closed are closed.

3.4 THYRISTORS (SCR)



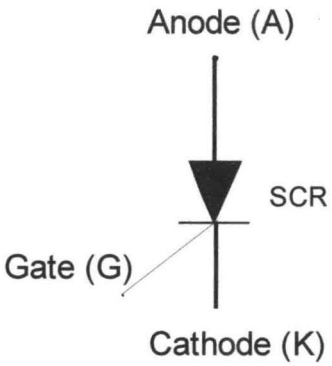


Figure2.2a Symbol of Thyristor

Figure2.2b Circuit Symbol of Thyristor

Thyristors is also known as Silicon control rectifier is four layers. Three junctions or three terminals (Anode, Cathode and Gate) device. It is a switching device which is probably the most important circuit element after the diode and transistor. The schematic structure and circuit diagram of the Thyristor are shown in fig2.2a and fig2.2b above.

A. OPERATION OF THYRISTORS

In the normal operation of a Thyristors load is always connected in series with the anode. The anode is always kept at the positive potential with respect to the cathode. The following should be noted.

i. Thyristors has two states: either it does not conduct or if conduct heavily. It act has as a switch without any other stage in between.

ii. There ate two conventional ways of turning on Thyristors, the first method is to keep the gate open and make the supply voltage equal to the break over voltage.

iii. Thyristors may be turned off by many methods. To turn off a Thyristor process many problem than the turning on because once the device is on the gate losses more controls. There are many method but only two are widely accepted:

a. Anode current interruption:- This is the method of reducing the anode current below a minimum value called holding current, after which the thyristor turns off. It could be achieved by opening the line switch.

b. Forced Communication:-This method is employed where by a capacitor is in parallel with a thyristor, is being discharged to turn off the thyristor.

B. APPLICATION OF THYRISTORS

The main application of thyristor, as a power control device. The ability of a thyristor to control large current in load by means of small gate current makes this device useful in switching and control [4].

i. Used in rectification

ii. Power control

iii. Speed control of DC shunt motor

iv. Also as an over light defector

3.5 THE 555 IC TIMER

In NE555 IC timer has become very popular with circuit designers because of its low cost and versatility. It is available in the 14-pin and in-line package and the 8-pin mini-DIP.There is also an NE556,which contains two timers in a 14-pin DIP and the NE558 which is a quad timer in a 16-pin DIP.

3.5.1 THE FUNCTION OF THE INPUT AND THE OUTPUT PIN

A. INPUTS PIN OF 555 IC TIMER

Trigger Input: When 1/3Vs (active low) this makes the output high (+Vs).It monitors the discharging of the timing capacitor in an astable circuit .It has a high input impedances.

Threshold Input: When 1/3Vs (active low) this makes the output high (+Vs). It monitors the discharging of the timing capacitor in an astable circuit. It has a high input impedance.

Threshold Input: When 2/3Vs (active high) this makes the output low (0V). It monitors the charging of the timing capacitor in astable and monostable circuit. It has a high input impedance

.

Reset Input: When less than 0.7V(active low) this makes the output low (0V),overriding other inputs. When not required it should be connected to +Vs. It has an input impedance of about.

Control Input: This can be used to adjust the threshold voltage which is set internally to be 2/3 Vs. Usually this function is not required are the control input is connected to 0V with a 0.01F capacitor to eliminate electrical noise. It can be left unconnected if noise is not a problem.

The Discharge Pin: Is not an input, but it is listed here for convenience. It is connected to 0V the time output is low and is used to discharge the timing capacitor in astable and monostable circuit

B. Output Pin Of 555 IC Timer:

The output of a standard 555 timer can sink and source up to 200mA . This is more tha most ICs and it is sufficient to supply. Many output transducers directly including LEDs(with a resistor in series), low current lamps, piezo transducers loudspeakers (with a capacitor in series), relay coils (with diode protection)and some motors(with diode protectio).The output voltage does not quite reach 0V and +Vs, especially if a large current is flowing.

From the above explanation of 555 timer inputs and output pin functions, it is deduced that the 555 timer provides stable time delays or free-running oscillation. The time-delays mode is RC-controlled by two external components. Timing from microseconds to hour is possible. The oscillator mode requires three or more external components, depending on the desired output

waveform. Frequencies from less than 1HZ to 500HZ with duty cycles from 1 to 99 percent can be attained.

C. 555 Timer Modes

1 Astable Mode: producing a square wave.

2 Monostable Mode: producing a single pulse when triggered.

3 Bistable Mode: a single memory which can be set and reset.

4 Buffer: an inverting buffer (Schmitt trigger).

CHAPTER THREE

3.1 BLOCK DIAGRAM

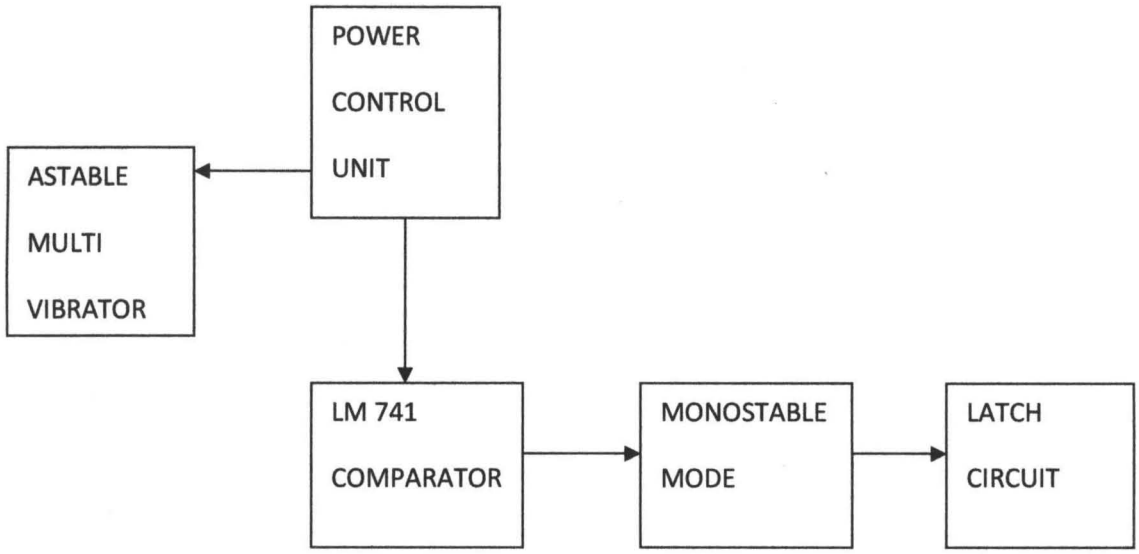


Figure 3.1 Block Diagram

The design of this whole project is powered with 12V DC. The astable multivibrator feeds from the point that goes to the radio system; the comparator then compares the voltage that is coming from the key starter which is being regulated to 5Volts, and the one that comes from the brake light, that is 12Volts. This voltage is termed the reference voltage. The output of this comparator is now the input of the monostable mode which in turn fires the SCR so that it would latch the circuit.

The automatic car immobilizer system consists of components such as resistors, capacitors, thyristor, Voltage regulator, comparator, LED, relay switch and IC timer which produce the signal generated.

The arrangement of the components is in accordance with the principle of operation. The design of the whole circuit and its functions can be divided into different modules which are enumerated below:

i. Power Control Unit

ii. Signal Generation

iii. Time Delay.

3.2 MODE OF OPERATION

The system depends on the use of electromechanical switch to power the ignition of the car. This is installed in automobiles, Cars etc, which would not be moveable except correct procedures are carried out. This involves the turning of the key starter and then stepping on the brake for a period of time, say 4 to 5 seconds, before one applies pressure on the accelerator. This whole process puts the ignition coil in an enable state, initially it was disabled. Figure 3.2 shows the connection from the car battery to the security system

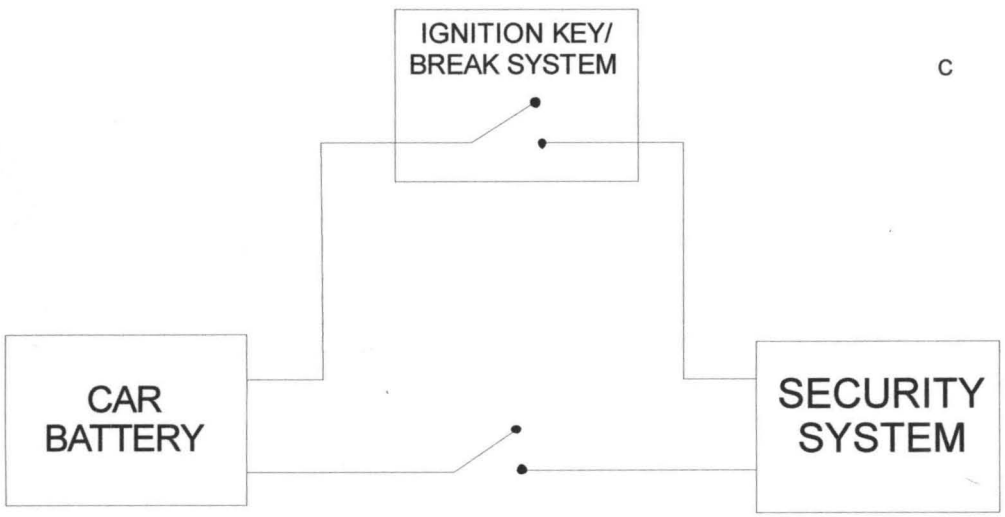


Figure 3.2 ELECTROMECHANICAL SWITCH

This device makes use of an astable-multivibrator which flashes, indicating that the key starter has been turned to the start position. Note that whenever this is turned without stepping on the accelerator, one can make use of the radio system. The voltage that feeds the radio is the one that feeds the Vcc of the astable.

Afterwards, pressing the brake for 5 seconds creates a room for voltage comparison between the voltage going to the brake light and the regulated voltage from the radio point. The voltage obtained after regulation is 5Volts. When this is compared with the 12 volts of the brake light, the output of the comparator goes low, triggering the 555 timer IC which is set on a monostable mode which inturn fires the SCR (Silicon Control Rectifier) so that it would latch the electromagnetic device which continues the line of the ignition coil to power supply. At this instance one can accelerate and the car would start.

3.3 POWER CONTROL UNIT

The system is supplied with the 12 V dc from the car battery. The power is controlled by an electromechanical switch that is placed in the car.

A switch is ordinarily a device or components use to break or make a contact as used in this project. It breaks off the continuous passage of electric voltage [DC] from the supply (12V).In order to ensure the security of the car when stationary, the electromechanical switch is designed to be used as the main switch that controls the supply of the system. The earthing is obtained from the circuitry in the car system which maybe connected to the ignition key or brake light. The design is made in such a way that if the main switch is closed and the key starter is turned to the start position without stepping on the accelerator, one can make use of the radio system. If the brake pedal of the car is not pressed for the provided time (5 secs) the car would

not start, but if it is pressed for the provided time (5 secs) the car will start, that is the main switch will open.

3.3 SIGNAL GENERATION

3.3.1 ASTABLE MODE

The 555 timer is connected in astable mode and oscillated at a very low frequency for signal generation. This time of blinking is determined by these factors R_1,R_2 and C_1. Figure 3.3 below shows the timer used in astable mode.

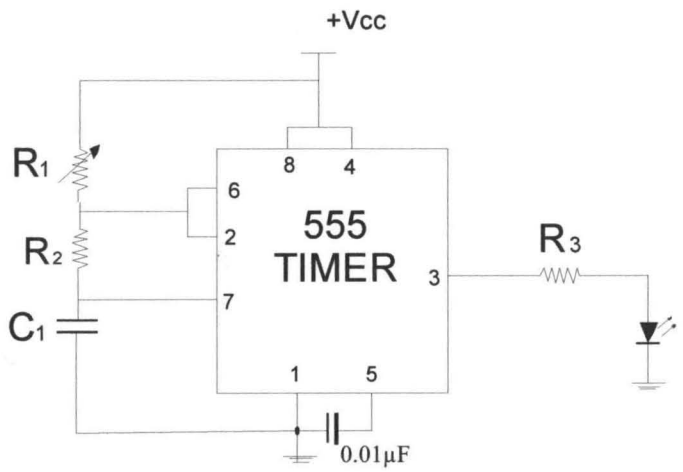


Figure 3.3 The timing used in astable mode

The variable resistor is chosen for R_1 to increase or reduce the rate of flashing. With the output high (+Vs), the capacitor C_1 is charged by current flowing through R_1 and R_2. The threshold (Pin 6) and trigger inputs (Pin 2) monitors the capacitor voltage and when it reaches 2/3 Vs (threshold Voltage) the output becomes low and the discharge Pin (Pin 7) is connected to OV. The capacitor now discharges with current flowing through R_2 into discharge Pin (Pin7).

When the voltage falls to 1/3 Vs (trigger Voltage) the output becomes high again and the discharge Pin is disconnected, allowing the capacitor to start charging again [5]. The whole process is controlled with these formulas;

$T1 = 0.7 \times (R1 \times R2) \times C1$

T1 is called the on time of the timer.

From the design,

$R1 = 4k\Omega$

$R2 = 1k\Omega$ and

$C1 = 100\mu F$.

R1 is adjustable. This varies the time it comes on. The on time T1 is given by the expression:

$T1 = 0.7 \times (4000 + 1000) \times 100 \times 10^{-6}$

$T1 = 0.35s$

Secondly, we have the off time given as

$T2 = 0.7 \times R2 \times C1$

$T2 = 0.7 \times 1000 \times 100 \times 10^{-6}$

$T2 = 0.07s$

Therefore,

The sum of on time and off time gives us the time for one complete cycle (T).

$T = T1 + T2$

Where, $T1 = 0.35s$

$T2 = 0.07s$

$T = 0.35 + 0.07$

$= 0.42s$

OR

$T = 0.7 \times (R1 + 2R2) \times C1$

Where, $R1 = 4k\Omega$

$R2 = 1k\Omega$ and

$C1 = 100\mu F$

$T = 0.7 \times [4000 + 2(1000)] \times 100 \times 10^{-6}$

$T = 0.42s$

The frequency flash,

$F=1/T$

Therefore, $F=1/0.42 = 2.38HZ$

The value of the astable frequency used to flash the LED ON and OFF when the operation occurs. This is illustrated in figure 3.3b

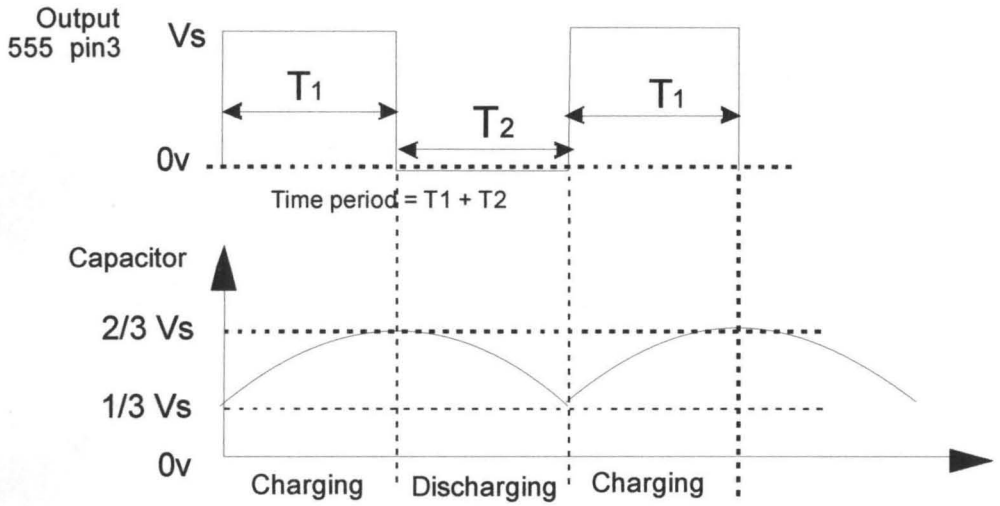


Figure 555 Timer Connected in Astable Mode.

$$\text{Duty Cycle} = \frac{T1}{T1 + T2} = \frac{R1 + R2}{R1 + 2R2}$$

$$\text{Duty cycle} = \frac{4000 + 1000}{4000 + 2\,(1000)} = 0.83$$

$$\text{Duty Cycle} = 0.83 \times 100$$

$$D = 83\ \%$$

3.3. 2 THE MONOSTABLE MODE

The monostable mode is used in this project as a logic switching device. It only brings a high for a particular period before going back to low. This is achieved using 555 timer as shown below.

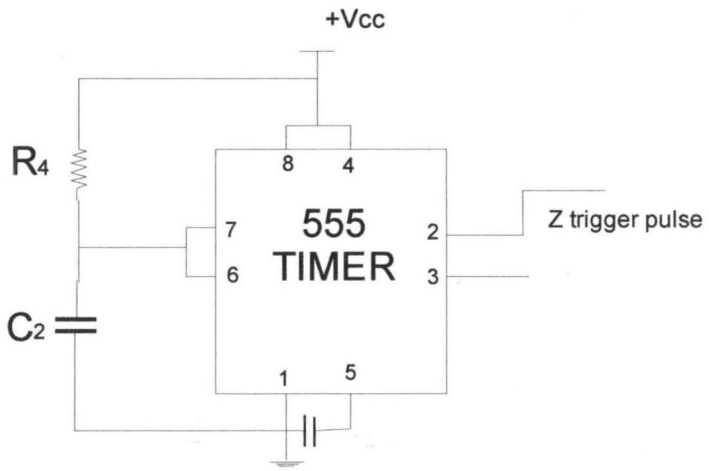


FIG 3.4a Shows the Monostable Circuit

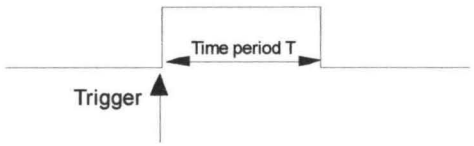


FIG 3.4b Output Pulse.

555 Monostable output, a single pulse.

The duration of the pulse is called the time period (T) and this is determined by resistor R4 and Capacitor C2.The trigger pulse goes from high to low [6].

$T = 1.1 \times R4 \times C2$

Where, R4 = 470K

$C2 = 10\mu F$

$T = 1.1 \times 470 \times 10^3 \times 10 \times 10^{-6}$

$T = 5.17$

Therefore,

$T \approx 5secs$

3.3.3 THE VOLTAGE REGULATOR

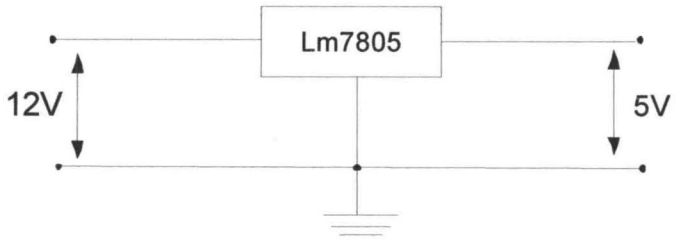


Figure3.5 Voltage Regulator.

This is used to regulate the voltage coming from the radio point which was earlier used to power the astable multivibrator. The output of this system is fed into the Comparator as reference Voltage.

3.3.4 THE COMPARATOR

The comparator is achieved via the use of a LM741 operational amplifier. This receives a 5volts input at Pin 3 (non inverting input). This voltage is termed the reference voltage. This makes the output of the comparator high.

However, as it receives a 12 Volts at pin 2 which is the inverting input, this output goes low. The 12 Volts it receives is from the brake light when ever the brake is stepped on.

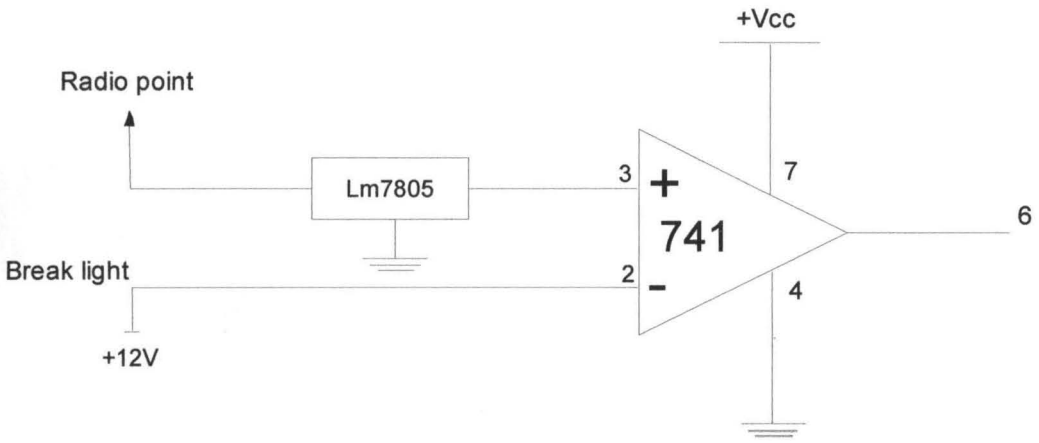


Figure3.6 The Comparator.

3.3.5 THE SCR TIGGER (THYRISTOR)

The SCR device is triggered using a electronic latch made out the pnp and one npn transistor serves as a very convenient means of controlling the triggering of the SCR in this project design. Once the latch is activated it remains in that position until one reset it manually. The figure 3.7 shows the schematic diagram of the electronic latch.

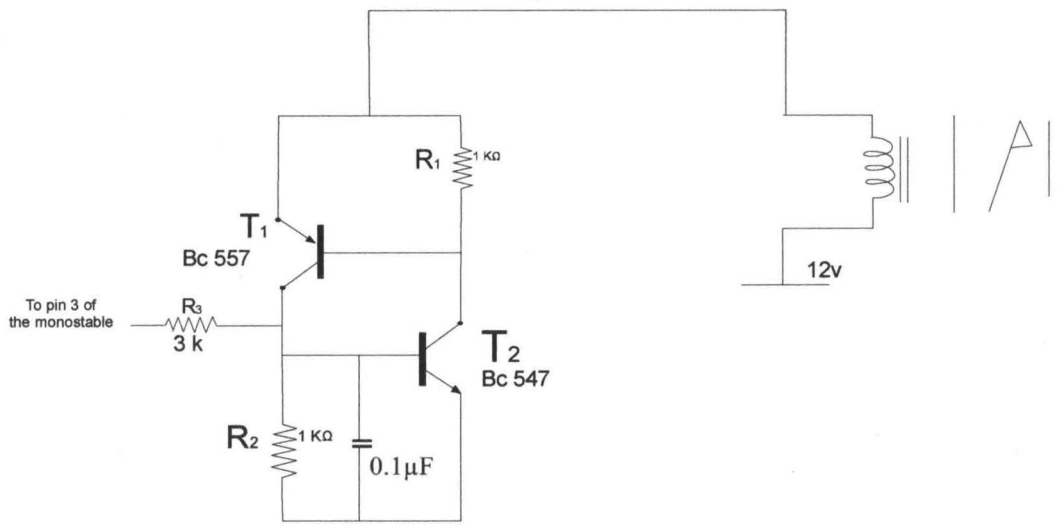


Figure3.7 Electronic Latch

In figure the complementary transistors T1 and T2 are connected in a regenerative manner.

The resistors R1 and R2 reduce the effect of leakage currents. The pair is non-conducting initially and if a battery is connected through a relay the relay goes off.

The pair can be triggered into conduction by momentarily connecting R3 to make T1 conducting. Once triggered, the regenerative pair quickly goes into full conduction and the relay operates. The drop across the complementary pair is about1 Volt. The circuit can be reset only by interrupting the power supply. Sometimes because of high gain of the transistors, the latch may be triggered by the surge produced when the battery is connected. Small capacitors of 0.1μF in parallel with R1 and R2 will reduce this tendency. The latch is then used to trigger the SCR device[7].

3.3.6 RELAY SWITCH (ELECTROMAGNETIC SWITCH)

This switch is used to activate and deactivate the flashing unit. It is also used to activate the ignition coil. Before the brake pedal is pressed, it is wired, in such a way that it continues the LED to the ground so that flashing continues. Once the brake is pressed, it takes the neutral or ground away from the flashing LED to the ignition coil.

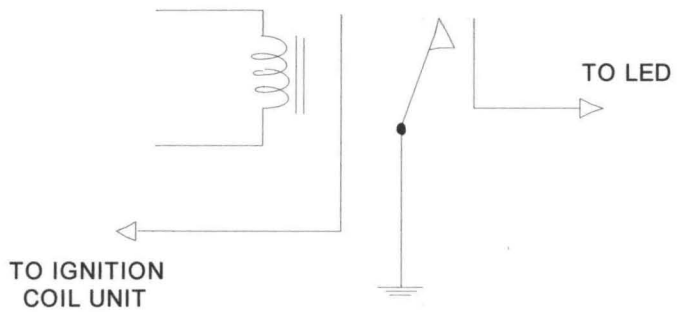
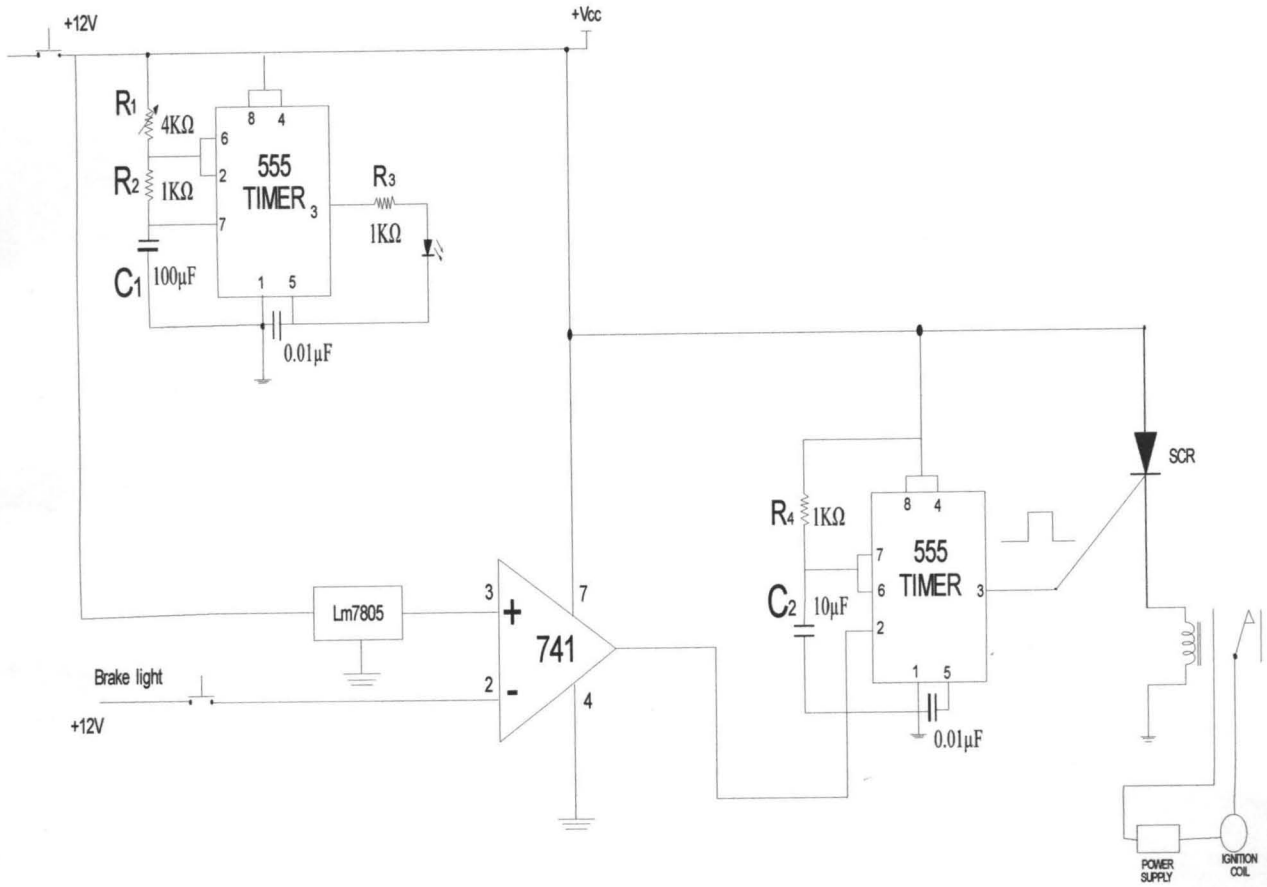


Figure3.8 Relay Switch.

3.4 LIMITATION

The limitation of this project occurs due to the choice of transistor used. The holding current is small. Therefore, any large resistance has load will inhibit the normal continuous operation of this large circuit. The solution for any large load transistor with high or collector current gain should be used.

The astable being used also reduce the current, thereby stopping the electronic latching from working as presumed.



The circuit Diagram of the Project Car Immobilize

CHAPTER FOUR

4.1 CONSTRUCTION, TESTING, RESULT AND PRECAUTIONS.

4.1.1 CONSTRUCTION:

Construction is basically the mounting or assembling connection, casing and the arrangement of components. The construction of the entire project was carried out in stages. First, the circuit was implemented on a breadboard and tested to ascertain the workability of the circuit design, giving out the required output. This also involved the right placement of all-components following the right convention of placements on breadboard.

Secondly, the circuit implementation which gave out a satisfactory output during breadboarding was transferred from the breadboard to the veroboard with all the components held to it by soldering. The stage-by-stage coupling was done with appropriate device designed to fit into the situation.

4.1.2 COMPONENTS ASSEMBLY

The complete circuit served as a guide to assembly of the components. This was done in accordance to the stage-by-stage working operations which allows for easy identification of faults during the putting together.

After the implementation of the circuit on the breadboard and on the veroboard, the battery was put in place with the relay next to it to control the occurrence in the circuit. This arrangement is such that if there is a fault or problem, it is detected and rectified before the next stage to reduce time wastage, more damages or condemnation of other components during trouble shooting. This also aid neat presentation of work.

4.1.3 CASING

This whole panel of construction off-course cannot be left naked. This was enclosed in a wooden case which was constructed to adequately accommodate the whole panel and give a little allowance for easy removal in case there is any need for adjustment or repair arises. The hardware was firmly fitted to the base and sides of the box to avoid wombling. The sketch of the cased job is as shown below:

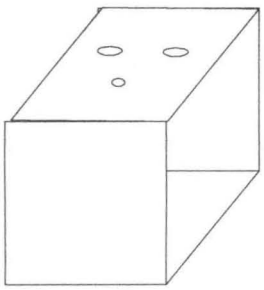


Fig 4.1 Showing the Casing of the Design Car Immobilize

4.2 TESTING

Testing involves the checking of the workability of the different modules of the entire work since the circuit was realized in modules.

The first module was tested so that its output which is the input for the next module gives the expected values. The output of all the stages was duly monitored and measured, giving the right value of both the modules or stages and components like resistors.

The bread boarding stages was tested, the soldered component on the veroboard was also tested and after the whole coupling involving the casing was also tested. This is however, to avoid discovering of fault coupling stage which could lead to starting all over again. Even the battery (DC) and every other component were tested before usage.

4.4 RESULT

The automatic car immobilizer system works on the principle of set executed and reset mode as observed from the hardware test carried out. A common voltage with magnitude of about 12V is required throughout the circuit. When the ignition key is turned and the acceleration is stepped on for about 4 to 5 seconds the switch is ON, triggering the relay circuit, and this result to the immobilization of the system.

4.4 PRECAUTIONS

The precautions taken were:

i. It was ensured that all the components were in order before they were used.

ii. The actualization of the entire circuit on the breadboarding was achieved first before soldering on the veroboard, to avoid starting all over again and again.

iii. The configurations of components like the ICs, where known before being put into use to avoid unnecessary damage.

CHAPTER FIVE

5.1 CONCLUSION AND RECOMMENDATION

5.1.1 CONCLUSION

The design and actualization of the project, car immobilizer is a way of securing vehicles (car) since immobility hinders or causes difficulty in operation by intruders. This is due to the fact that the time delay the conductivity and other mechanism involved in the operation of the immobilizer are known only to the car owner. The security system thereby causes immobility (i.e.) unease of starting of the car when ever it is brought to a stop. This could be used for other automobiles provided there is a true understanding of the operating principle, a deeper sense of reasoning by the designer, and inculcation of other means of achieving the same security goal. Except the exact principle, the right part to be operated and the right timing is known by any operator, the vehicle remains in a stand-still position and doesn't agree to start.

5.1.2 RECOMMENDATION

This project has been logically designed to be able to rescue all possible approaches to car theft and to give maximum protection to the owner. It is therefore recommended for all car owners.

The scope of the work leaves much room for greater improvement mostly to time constraint and limited resources. The circuit could be further enhanced to cater for a lot of other needs in car security. It is therefore suggested as a further improvement on this project to incorporate a sequential logic lock to further turn off and on the ignition switch.

REFERENCES

[1.] Tom Harris, how car alarm works, how stuff work, Inc. http:/electrics, Howstuffworks.com/alarm.

[2]. History of Integrated circuit, e-museum, http://www.geogle.com

[3]. Charles A. Schuler, 'Electronics principle and applications' (1990) Fifth Edition, Glencoe/McGraw-Hill publisher

[4]. B.L Theraja and AK Theraja 'A textbook on Electrical Technology'

[5]. The Electronic Club '555 and 556Timer Circuits' Page 5 of 10, http://www.geogle.com

[6]. The Electronics Club '555 and 556 Timer Circuits' Page 7 of 10, http://www.geogle.com

[7].M.C. Sharma 'Practical SCR/TRIAC PROJECT' BPB PUBLICATION