DESIGN, CONSTRUCTION AND TESTING OF AN AUTOMATIC - ALARM - SIREN

BY

ADEREMI, ADEWALE OLUTUNDE
(93/3929)

A THESIS SUBMITTED TO THE DEPARTMENT OF ELECTRICAL / ELECTRONICS AND COMPUTER ENGINEERING SCHOOL OF ENGINEERING AND ENGINEERING TECHNOLOGY IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR OF ENGINEERING (B. ENG)DEGREE OF THE FEDE RAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGER STATE.

DECEMBER 1998

CERTIFICATION / APPROVAL PAGE

Adewale Olutunde ADEREMI

I certify that this work was carried out entirely by / and has been read and approved as tisfying in part the requirements of the Department of Electrical / Electronic and Computer ngineering, Federal University of Technology, Minna, for the award of Barchelor of Engineering egree (B. Eng).

....

STUDENT'S SIGNATURE
ADEREMI, A.O

....

DATE

....

NGR Y.A ADEDIRAN
SUPERVISOR

....

DATE

....

NGR S.N RUMALA
HEAD OF DEPT.

....

DATE

....

EXTERNAL EXAMINER

....

DATE

DECLARATION

This is to declare that this work being submitted by ADEREMI, A.O has not been submitted before and is not being currently submitted by anybody for any purpose. It was conducted under the supervision of Eng. Y. A. Adediran, Department of Electrical / Electronics and Computer Engineering, Federal University of Technology, Minna, Niger State.

STUDENT

18/12/98

DATE

ACKNOWLEDGMENT

ly deep appreciation goes to my supervisor - Engr. Y. A. Adediran - for his advice, constructive riticism and guidance throughout the project.

wish to express my profound gratitude to the numerous individuals who helps me in one way r the other in making this project a success.

pecial thanks go to my parents - the Aderemis - for their moral and financial support. To my love Bummi) for her much patience and understanding.

nd finally, I thank my heavenly Father and Jesus Christ for all the graces, blessings and sound ealth given me during the course of my academic programme.

ADEREMI , A. O

DECEMBER, 1998.

DEDICATION

This work is humbly dedicated to

the Almighty God

my better Half - Helen Olubummi Sekola

my loving parents,

caring guardian,

affectionate sisters and brothers

and the entire members of my family.

ABSTRACT

For a very long year, the use of intruder alarms to protect an area has become widespread in industrial, commercial and private uses.

Its design and construction has also increased in sophistication and style. This project - work is based on the widespread use of alarm / siren to detect an intruder. This was achieved by using astable current.

The signal processing which forms part of the detecting circuit is made up of the pulse amplifier, the inverter, the comparator, flip-flop and the astable multivibrator; all of this made it possible for the system to detect an intruder instantly and accurately.

TABLE OF CONTENT

ITLE PAGE i

ERTIFICATE ii

ECLARATION iii

EDICATION iv

CKNOWLEDGEMENT v

BSTRACT vi

ABLE OF CONTENT vii

HAPTER ONE

1.0 INTRODUCTION 1

1.1 BLOCK DIAGRAM 3

1.2 CONTROL UNIT 3

1.3 ALARM SIGNAL 4

1.4 TROUBLE SIGNAL 4

1.5 LITERATURE REVIEW 4

HAPTER TWO

2.0 THEORY OF OPERATION 7

2.1 MAIN CIRCUIT LAYOUT 8

2.2 PROJECT OPERATION 9

2.3 BASIC INTERNAL PRINCIPLE OF NE555 TIMER: DERIVATION OF FORMULA 11

CHAPTER THREE

3.0 DESIGN 15

3.1 STAGE 1 : ASTABLE MULTIVIBRATOR (ICI) UNIT 17

3.2 STAGE 2 : FREQUENCY MODULATION UNIT 18

3.3 STAGE 3 : ASTABLE MULTIVIBRATOR (IC2) UNIT 19

3.4 STAGE 4: AUDIO AMPLIFIED UNIT 20

3.5 POWER SUPPLY UNIT 21

CHAPTER FOUR

4.0 CONSTRUCTION AND TESTING 22

4.1 CONSTRUCTION 23

4.2 TESTING 25

RESULTS AND ITS DISCUSSION 26

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATION 28

REFERENCES 30

CHAPTER

ONE

"INTRODUCTION"

CHAPTER ONE

1.0 INTRODUCTION

Although there exists various forms of alarm system, this design - Auto - Alarm - Siren - has the unique advantage of being able to perceive an intrusion by triggering an alarm system on its own. The siren aspect of it incorporates a multi- functional circuit to enhance the easy defection of an intruden.

The circuit was therefore designed as a multi - purpose movement defector capable of forming the basis of all types of intruder alarm and automatic controllers.

The output of the device is a set of Integrated Circuits (ICS) which operate as soon as an object is detected. These ICS can be used to control a wide variety of system such as automatic ambulance siren, police siren, room lighting, alarm bells et cetera.

For the purpose of this project, the output is used to drive an alarm circiut. And the overall circuit generates force field of high - intensity sound inside car, painful enough to discourage thief from entering such can after tripping alarm switch by opening door.

The circuit below produces square - wave output that sweeps up and down in frequency. Modulation is provided by triangular wave form generated by potentiometer P1, Diode D1, and Capacitor C3.

However, in situation or environment whereby sweep - frequency siren is not allowed or is prohibited, C_3 can be removed to produce legal two - tone sound.

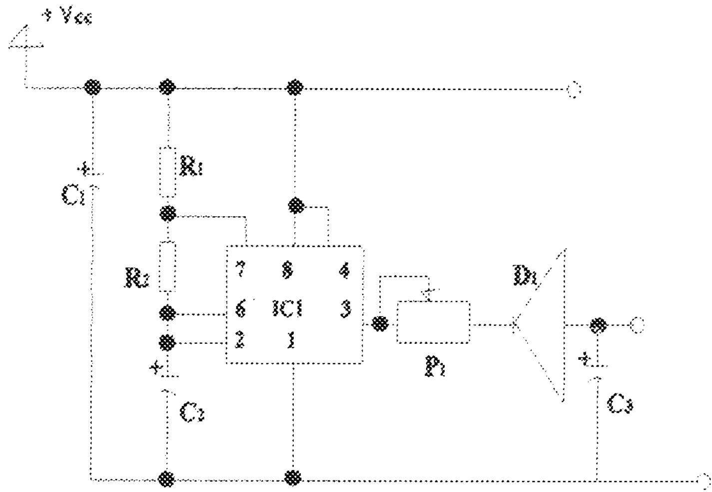


FIG 1.1 : SWEEP - FREQUENCY GENERATOR

.1 THE BLOCK DIAGRAM

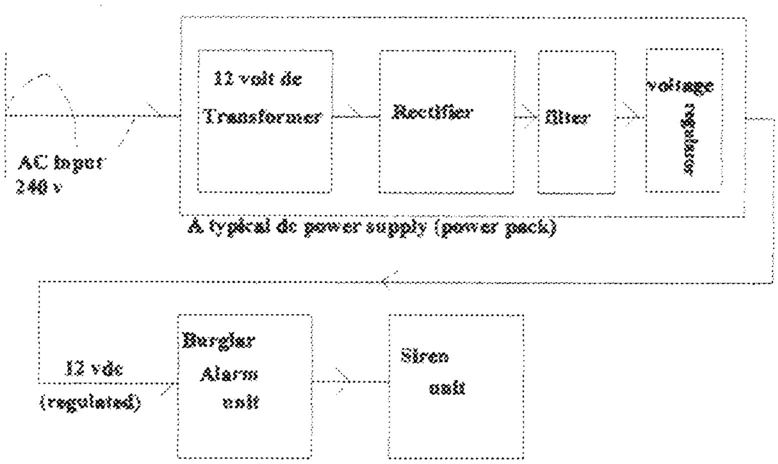


FIG 1.2: BLOCK ARRANGEMENT OF THE CIRCUIT

.2 CONTROL UNIT

The 'brain' behind any burglar alarm is the control unit. This is the type of central equipment cabinet to which all other sub - systems of the burglar alarm systems are connected.

The control unit provides power to all active devices and contains all the switching functions controlled by the initiating device which perform all the intended operations of the system. The control unit contains switches for silencing andible signals, set- reset alarm conditions et cetera.

There are some basic common feature of all control unit regardless of type. Each has a primary power supply and most have some sort of emergency power supply as engine - driven generators or battery supplies. They have one or more initiating device circuit to which the detectors and manual boxes are connected, and also one or more initiating device circuits, to which the evacuation signals such as bells, horn, sirens and so on are connected.

Control units can employ two distinct types of audible signals. These are:

1.3 **ALARM SIGNALS**:- Given when a burglan is detected (bells or siren throughout building, car in areas of jeopardy).

1.4 **TROUBLE SIGNALS**:- Given when a mal - function occurs in any critical circuit of the control unit.

1.5 LITERATURE REVIEW

The basic function of security system is to detect, as fast as possible, an un-authorized entry into a defined area.

Further more, the ideal security system should also be difficult to by-pass or over-ride, must be highly reliable and operates under adverse conditions such as, should not be subject to false alarming.

In security alarm system, there are two basic categories: space (volumetric)detection and perimeter detection.

SPACE DETECTION:- This a device which can detect an intrusion in volumetric (three-dimensional) space. In operation, a space intrusion detector generates an energy field in all direction. When this energy is distributed such as by the entry of human being, a signal is initiated which triggers the alarm Obviously, space intrusion detector is very difficult to JAM because one must pass through its energy field to get at the device.

One of the best way of generating this energy field is through the emission of invisible infra-red rays.

PERIMETER DETECTION:- Perimeter intrusion detector essentially consists of different types of switches which are strategically located around the perimeter of the protected premises. A classical example of the perimeter intrusion detector is the popular magnetic switch which can be mounted in any door or window.

Such a device consists of two pieces- a magnet and a reed or slide switch usually supplied in the electrically closed position. When the magnet is moved away from the switch as a result of the window or door being opened, the switch opens up, triggering an alarm.

Most perimeter detectors work on this basic switch principle and are employed in wide variety of applications.

Another type of perimeter switch is a mat or ribbon which is laid around or at the entrance point of the area to be protected. The mat is constructed in such a way that before any body can enter the protected premises, he must step on the mat; and anyone stepping on it will close an electrical contact; thereby triggering an alarm.

Another common form of perimeter detection is metallic window foil in which a conductive thin foil is glued to glass. When the glass is broken, the foil opens up the circuit, thereby triggering the alarm.

A more sophisticated type of perimeter detection consist of a light beam employing a light source and photoelectric cell. Whenever the beam is broken by someone passing through it, an alarm circuit is fired.

Another type of perimeter detector is a vibration switch. This device has adjustable contact which closes when vibration is exceeded on a wall or panel. Vibration perimeter switches are very useful in protecting roofs, walls, car doors or panels where the intruder might employ a saw, a hammer or any other vibrating equipment to gain entrance.

It can be noted that this perimeter detectors, though taking various forms, have one thing in common in that they protect the circumference of an area.

Moreover, as most intruders know, a perimeter type of detector (though mostly used and very common) can be easily "jumped". Such jumping is accomplished merely by paralleling the electrical connection prior to breaking it. This, by putting a jumper wire across a normally closed magnetic switch prior to entry (this might be done by sawing a hole through the door); the effectiveness of the magnetic switch can completely be defeated by electrically shunting it out.

Normally, electrically opened perimeter detectors (i.e. circuits are closed upon intrusion) are even more easily defeated by simply cutting the wires connecting them. Consequently, such devices offer less and less protection with regard to the prevention of robbery and un-authorized entry, if and only if the detector's switches are within the reach of the intruders, otherwise it becomes difficult to jump.

Furthermore, since perimeter detectors must be interconnected into wired system, their installation cost, especially if many such devices are used, tends to become very high. For these reasons and many more, steps, mats, window foil and trip wires have diminished and their usage has, to a degree, been superceeded by the employment of space instruction detectors.

However, in car protection, perimeter detector (especially that of vibration whenever the car is touched prior to intrusion) is most widely used and very efficient.
For this obvious advantage, I have chosen to design an alarm siren to prevent all forms of car intrusion.

CHAPTER

TWO

"THEORY OFOPERATION"

2.2 OPERATION:

The first NE555 timer (ICI) in the figure2.1 generates a bipolar rectangular waveform, consequently forming the ON and OFF durations which are determined by the triangular waveform generated by the frequency determining network.

This network comprises resistors R_1 and R_2 and a capacitor C_2

C_2 is charged up through R_1 and R_2 to the applied voltage Vcc and then discharged via R_2 into IC1 through it's pin7. The discharge triggers IC1 into action.

The negative going end of the bipolar rectangular wave generated by IC1 is output through it's pin 3 and fed into the potentiometer (P1). This P1 serves as sweep control or voltage level control.

The diode D1 is a silicon rectifier rated 1A at 50volts PIV (Peak inverse voltage).This is positioned thus (in the reversed form) to prevent the positive going end of the bipolar rectangular waveform from entering IC2.

Capacitors C1 and C3 serve as low-pass filters to remove any high frequency signal which may be developed in the system due to instability, since this can cause distortion to the overall system function. However, if C3 is removed from the circuit, sweeping of the frequency is cancelled, thereby producing lagal two- tone sound.

In a similar way P1, DI and C3 are used to generates triangular wave which is used to modulate the frequency of IC1. The modulated wave is fed into IC2 via it's pin5 (voltage control pin)

The operation of the IC2 is similar to that of ICl in the circuit above (fig2.1). Resistors R3 and R4 and capacitor C4 form the frequency determining network.

When C4 is charged up via R3, R4 and D3 to the applied voltage Vcc, it discharges via pin 7 through diode D4 and resistor R4 into IC2, and consequently, triggers it.

The output wave is also a bipolar rectangular wave with ON and OFF durations as modulated by the triangular waveform that was fed into it.

The output of IC2 is fed into a medium power low frequency silicon PNP transistor (that is, an audio amplifier and switching transistor up to 1A). The transistor amplifies the signals entering into it via a potentiometer, P2, which acts as the biasing resistor as well as to control the sound level of the system's audio output.

A diode D2 is connected with the loudspeaker so as to clip- off the end of the bipolar waveforms which are fed into the transistor, thus making the output waveform a unipolar rectangular wave.

R3 and R4 are chosen in the ratio of one -to- one (1:1). This was arranged so as to achieve a perfect rectangular wave; since the ON- state of one IC commutates the other, and the OFF- state of one trigers the other automatically.

Consequently, it produces a clear , distinctive and audible two- tone siren signals which are free from overlapping or interference of each other.

* D2 -D4 are general purose silicon diodes.

2.3 BASIC INTERNAL PRINCIPLE OF NE555 TIMER

A very usefull 8-pin IC provides monostable or astable operation with minimum of external components e.g the astable configuration requires only one capacitor and two resistors. The full circuit of the NE555 timer is rather complex but is worth considering in the block diagram form of figure 2.2. It consist essentially of a resistive bias chain, two comparators, a set - reset bistable, a switching transistor and an inverting output buffer. A bias chain consisting of three equal valued resistors (R), makes use of a very important property of IC components. The three equal resistors in the timer ciuciut generate refrence voltages 2v/3 and v/3 from the supply voltage (v) irrepective of the supply voltage, temperature and absolute value of the resistors.

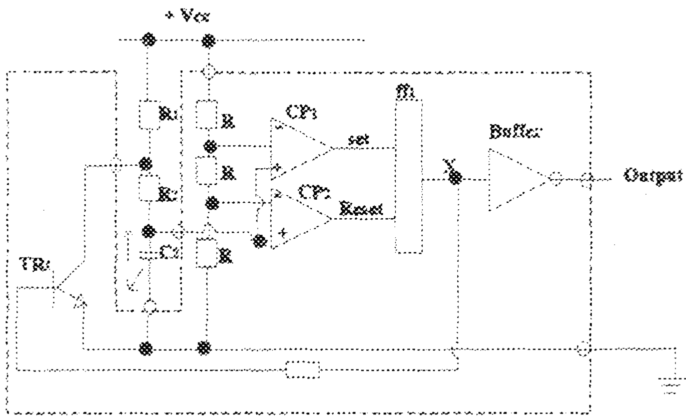


FIG 2.2: 555 TIMER CONFIGURED FOR AS TABLE

In astable opration, external resistors R1 and R2 charge and discharge the external capacitor C2 conditional upon the state of the internal switching transistor TR1. Two comparators (CP1 and CP2) compare the capacitor voltage with the bias chain refrence and provide SET and RESET inputs to a bistable or flip -flop (FF1) whose output (X) in turn determines wheather TR1 is ON or OFF. The output of the bistable ies buffer to give a low inpedance circuit output.

The operation of the circuit best described from the switch- ON state with C2 discharged (Vc=O)

a) When the supply voltage (+V) is first applied since Vc=0, the inverting comparator (CP1) applies a logic 1 RESET level to the bistable while the SET output of the non - inverting comparator (CP2) is at logic 0. The output X is of the bistable in its RESET state is at logic 0, holding TR1 OFF and, inverted by the buffer, gives an output voltage of the approximatelly +V.

The capacitor charges towards the aiming potential of +V with a time constant C (R_1+R_2) Fig 2.3(a)

b) When Vc reaches the V/3 reference for CPl, the RESET signal is removed and C continues charging while the SET signal and X remains at logic 0 and the output stay at +vV. Fig 2.3(b).

c) When Vc reaches the 2v/3 reference for CP2, the bistable is SET , X switches to logic 1 and turns TR1 ON.

C Now discharges (immediately removing the SET signal) towards earth with a time constant CR2. The circuit output is now at approximately 0V. Fig 2.3 (c).

d) When capacitor C2 has discharged to V/3 the RESET signal is applied and X switches to logic 0 turning TR1, OFF. The circuit output switches to +V. Fig 2.3(d).

The cycle of charging and discharging capacitor C2 repeats giving a rectangular output wave form whose part periods (t_1 and t_2) are now calculated thus.

To calculate t_1, consider the charging period (d) in fig 2.3

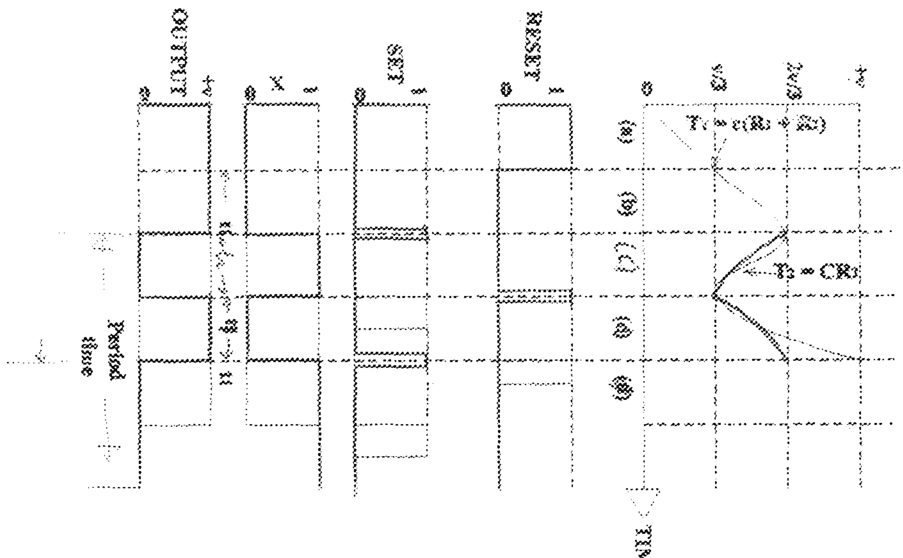


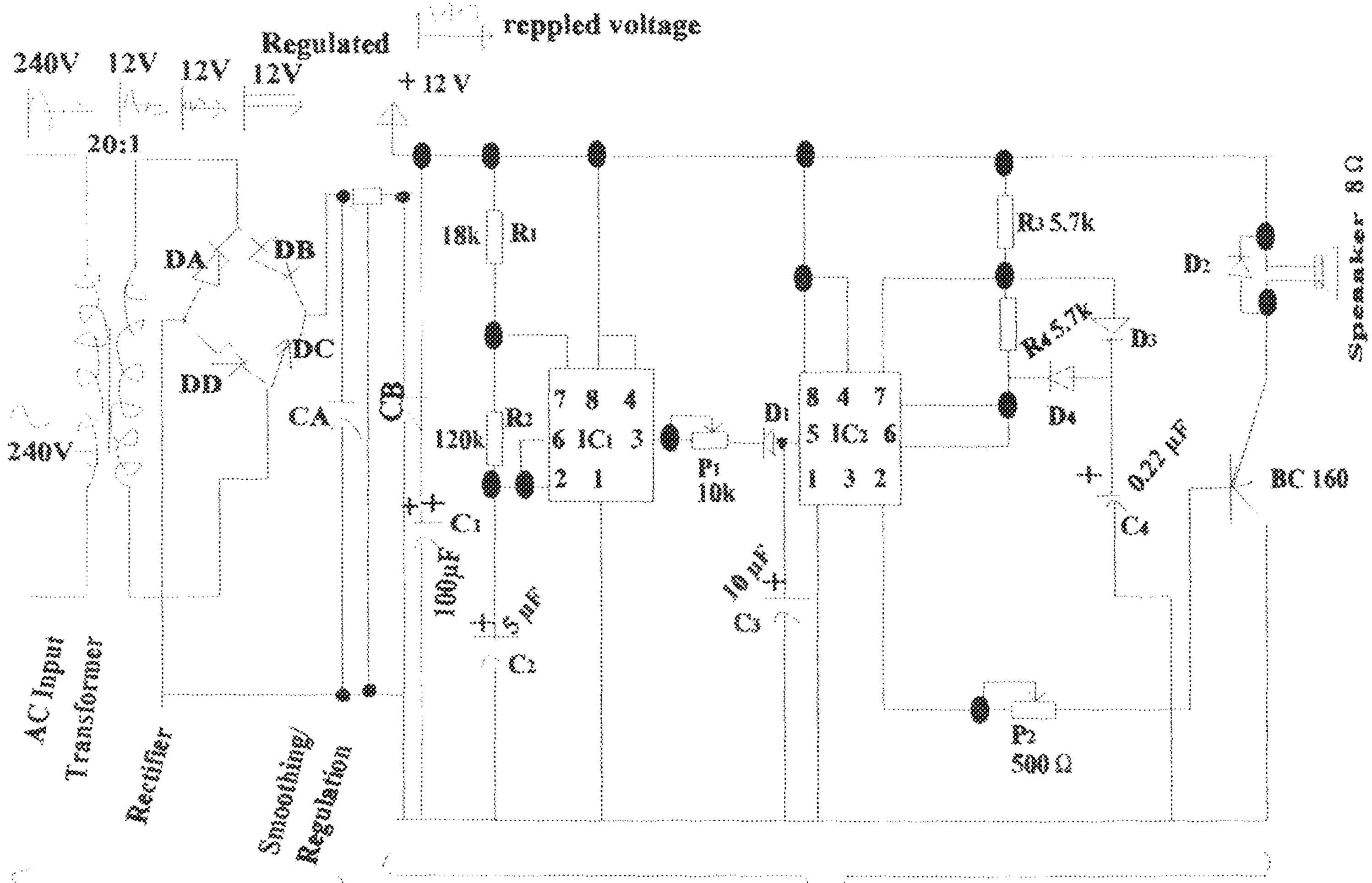
FIG 2.3: WAVEFORMS OF 555 TIMER

CHAPTER

THREE

"DESIGN"

CHAPTER THREE
THE CIRCUIT DIAGRAM



REGULATED POWER SUPPLY UNIT

ALARM/SIREN CIRCUIT

FIG 3.1

THE DESIGN

3.1 STAGE 1

Let R_1 and R_2 be of ratio 3:20 having in mind a relatively shorter "discharge" time when compared to "charge" period.

Let $R_1 = 18k\Omega$

$\therefore R_2 = \frac{(20 \times 18)}{3} k\Omega$

$= 120k\Omega$

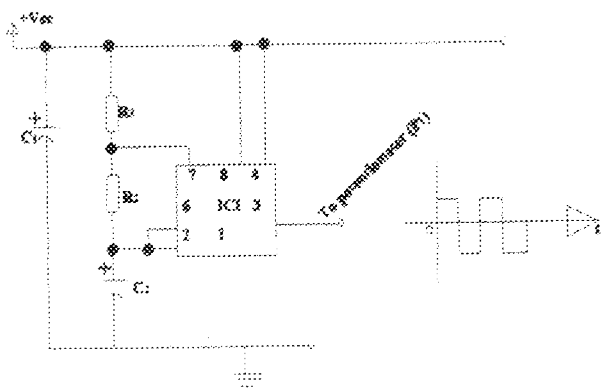


Fig 3.2: Astable Multivibrator (IC1) Unit

To obtain value for C_2, the free running frequency fr_1 for IC1 is assumed to be 1 Hertz. For an astable mode 555 timer, the frequency f is given by:

$f = 1/\{0.693C_2 (R_1 + 2 R_2)\}$, where f is in Hertz (Hz), C_2 is in farad (F), R_1 and R_2 are in Ohms (Ω).

$fr_1 = 1/\{\ln 2 C_2 (R_1 + 2 R_2)\}$ (1)

$fr_1 = 1.44/\{C_2 (R_1 + 2 R_2)\}$

$C_2 = 1.44/\{1x (18000 + 240000)\}$

$= 5.58\ \mu F$

$\therefore C_2 \approx 5\mu F$

Therefore frequency $f_1 = 1/\{\ln 2\ C_2 (R_1 + 2 R_2)\}$ (2)

$f_1 = 1/\{0.693x5x10^{-6} (18000 + 240\ 000)\}$

$= 1/0.89397$

$f_1 = 1.1186$ Hert, frequency at which IC1 operates.

Hence, the "charge" time (output HIGH) for IC1 can be obtained from

$Vc = V (1 - \exp^{-t/T_1})$ where

$T_1 = C_2 (R_1 + R_2)$

$V/3 = 2v/3 [1 - \exp^{-t/T_1}]$

$t_{11} = 0.693 [C_2 (R_1 + R_2)]$ (3)

or

$t_{11} = \ln 2 [C_2 (R_1 + R_2)]$

This shows the time it takes the two resistors R_1 and R_2 to charge up C_2 to the applied voltage (Vcc)

Again, for " discharge" period (output LOW) for ICl is:

$t_{12} = \ln 2 C_2 R_2$ (4)

This shows that resistor R_1 is redundant at " Discharge" period.

Hence, $t_{11} = 0.693 [5x10^{-6} (18000 + 120000)]$

$= 0.47817$ seconds

$t_{11} \approx 0.5$ seconds (output HIGH)

$t_{12} = 0.693 [5 \times 10^{-6} \times 120000]$

$t_{12} = 0.4158$ seconds

$t_{12} \approx 0.4$ seconds

hence $f1 = \frac{1}{t_{11} + t_{12}}$ (5)

$= \frac{1}{0.47817 + 0.4158}$

$= \frac{1}{0.89397}$

$f1 = 1.1186$ Hert₃

3.2 STAGE 2

In order to be able to set the frequency, the resistor R_2 is achieved by calculation and then combined with a variable resistor (i.e potentiometer of 10 kΩ)

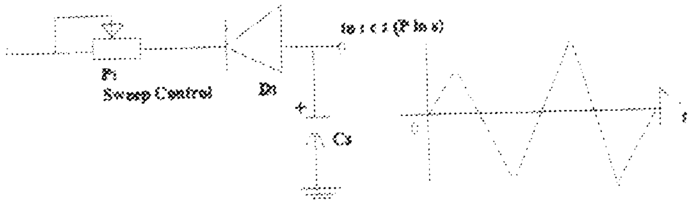


Fig 3.3: Frequency Modulation Unit

3.3 STAGES 3

Resistors R_3 and R_4 are selected on ration 1.1, having in mind an equal "output HIGH" and "output LOW" as the output waveform of 1C2.

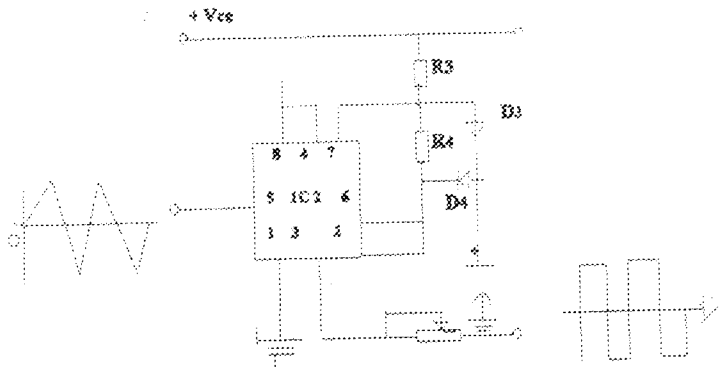


FIG 3.4: ASTABLE MUTLIVIBRATOR (ICI) UNIT

Let R_3 = 5.7kΩ

then R_4 = 5.7 kΩ

To obtain value for C_4, the free running frequency for 1C2, fr_2, is assumed to be 380Hertz.

$$fr_2 = 1/\ln_2 [C_4 (R_3 + R_4)] \qquad (6)$$

$$C_4 = 1.44/[380 (5700 + 11400)]$$

$$= 2.1 \times 10^{-7} F$$

$$C_4 \approx 0.22\mu F$$

$$\text{Hence, } f_2 = 1/\ln_2 [C_4 (R_3 + 2R_4)] \qquad (7)$$

$$= 1/0.693 [.22 \times 10^{-6} (5700 + 11400)]$$

$$= 1/2.60706 \times 10^{-3}$$

$$= 383.5H_3$$

$$f_2 \approx 384H_3 \text{ frequency at which 1C2 operates}$$

$$t_{21} = \ln 2\,[C_4(R_3 + R_4)] \qquad (8)$$

$$= 0.693[0.22 \times 10^{-6} (5700 + 5700)$$

$$= 1.738044 \times 10^{-3} \text{ secs}$$

$$= 1.738044 \text{ m secs (OUTPUT HIGH)}$$

$$t_{22} = \ln_2 C_4 R_4 \qquad (9)$$

$$= 0.693 \text{ X } 0.22 \text{ X } 10^{-6} \text{ X } 5700 = 0.869022 \text{ X } 10^{-3} \text{ sec}$$

$$= 0.869022 \text{ msecs (OUTPUT LOW)}$$

$$f_2 = \frac{1}{t_{21} + t_{22}}$$

$$= \frac{1}{1.738044 \text{ X } 10^{-3} + 0.869022 \text{ X } 10^{-3}}$$

$$= \frac{1}{2.607066 \text{ X } 10^{-3}}$$

$$= 383.5\ H_3$$

$$f_2 = 384H_3$$

STAGE 4

BC 160 is a medium power low frequency silicon transistor.

It is an audio amplifier and switching up to 1A.

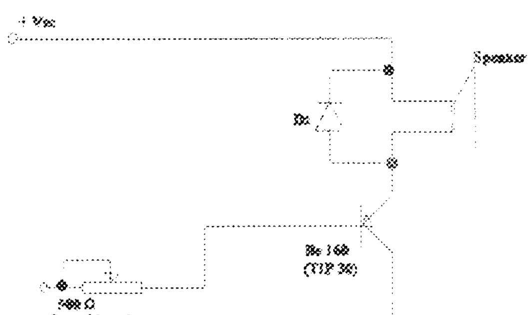


FIG 3.5: AUDIO AMPLIFER UNIT

CHAPTER

FOUR

CONSTRUCTION AND TESTING

CHAPTER FOUR

CONSTRUCTION AND TESTING

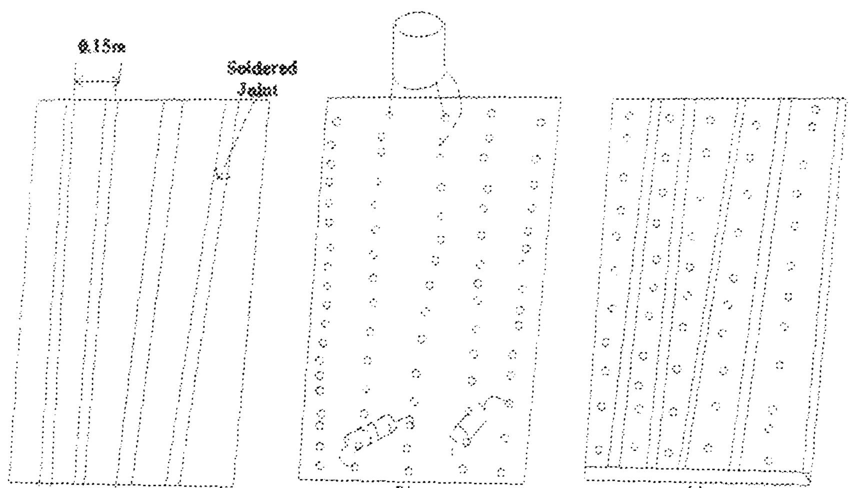
4.0 CONSTRUCTION:-

Since the circuit in figure3.1 is more useful in a compact form, the method for building it will be discussed first. The circuit was first set up on a bread - board (figure 4.1(c)) on a temporary basis. It was later transfered to Veroboard. The diagram of a sheet of Veroboard with a few components soldered on it is shown in figures 4.1(a) and (b) below. The legs of each component are pushed through the holes in the top of the Veroboard and are soldered into copper strips which are on the reversed side of the Veroboard. The copper strips run-in rows so that all the components' leg of a particular row are joined together.

Obviously, it was worked out very carefully where to put components or where their legs are inserted; since this is quite difficult.

In the Veroboard used the distance between the holes is 3.8mm (0.15m). The figures 4.1(b) below shows a side view of the components soldered on the Veroboard and how they are mounted. They are only a few millimeters above board, and may be standing upright or lying down. The components are pushed through from the top and carefully soldered underneath, and then excess wires are cut off. The wires are removed with wire - cutter, as close to the Veroboard as possible.

For transistor and diodes, which might be easily damaged by heat from the soldering iron, the components were mounted about 1cm above the Veroboard.



(a) A vero board showing soldered joint

(b) Soldering techniques on vero bpard

(c) Bread - board

Fig. 4.1: VERO BOARD/BREAD BOARD

4.1 LIST OF COMPONENTS FOR THE AUTO - ALARM /SIREN

Resistor:	5.7kΩ	two in number
	18kΩ	one in number
	120kΩ	one in number
Potantiometer:	500Ω	one in number
	10kΩ	one in number
Capacitors:	0.22 μf	one in number
(polarized)	5μf	one in number
	10μf	one in number
	100μf	one in number
Diodes	D_1--special silicon rectifier diode rated 1A of	
	50V (PIV) --	one in number
	D_2--D_4--	one in number each
NE555 Timer 1C		two in number
PNP type Transistor (BC160)		one in number
8Ω loudspeaker **~~800~~ Indspeaker**		one in number

The Veroboard upon which the components were soldered was suspended on an insulated holder in the box/housing container.

Box arrangement that was used for the project with its bottom plate opened to show the circuit layout is show in figure 4.2 below.

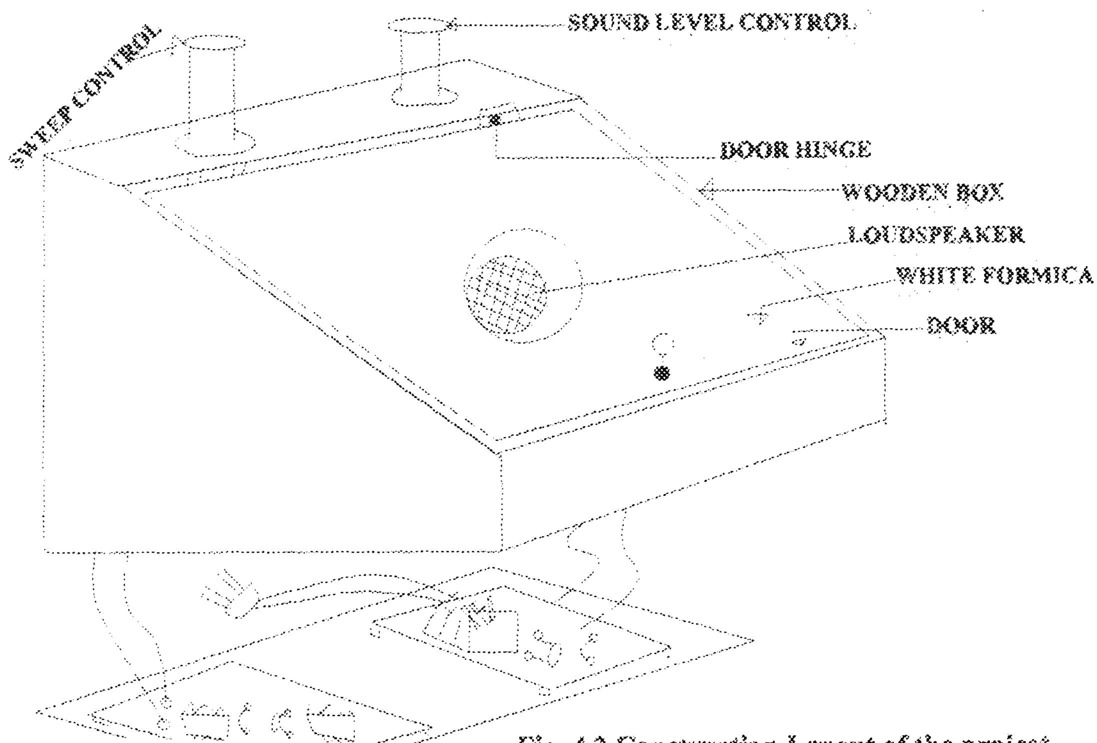


Fig. 4.2 Construction Layout of the project

4.2 CHOICE OF WOODEN HOUSING/BOX:- Phywood casing was used for this project

because of its cheapness compared to metal casing.

The wooden box was covered or wrapped with white formica. Evostic was applied both on the outer surface of the box and the rough side of the formica. After about two hours, the box was wrapped with the formica in a very careful way.

The white formica serves as rays- reflector and thereby keeping the inside of the box cool; this is one of the advantages of wooden casing over metal one. The joints of the phywood were firmly gummed to make the box very strong and solid, and to protect the components that the phywood is encasing.

4.3 PROBLEMS ENCOUNTERED AND SOLUTIONS

1) Multiplication of faults in stages were avoided by testing every stage. This was to confine a fault to the particular stage concerned.
2) All circuits were grounded with low capacitance.
3) Proper component values were used to avoid system's short life span.
4) Electrolytic capacitors' polarity was taken into consideration before connection was done to prevent the component from being damaged.
5) Noise due to soldered joints were observed and corrected by proper soldering of the leg on the Veroboard.
6) As much as practicable, all dry-joints were re-soldered.
7) Transistors, capacitors and other components were tested in isolation in the event of circuit malfunctioning.

4.4 TESTING

The project was tested when its two - pin outlet plug was inserted into a single-phase 13Amps socket outlets. The switch was pressed to ON position.

The siren was left in its operating mode as the switch was kept in the ON position for a few minutes to test the reliability of the project. This was calculated, using Fault-Tree Analysis, to be Ninety-nine percent (99%)

RESULTS

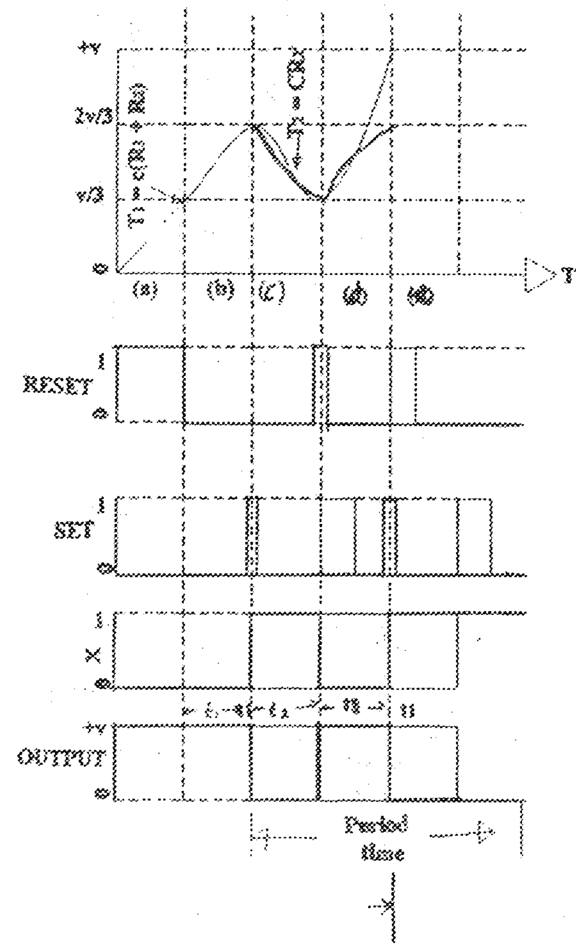


FIG4.3 : WAVEFORMS OF 555 TIMER

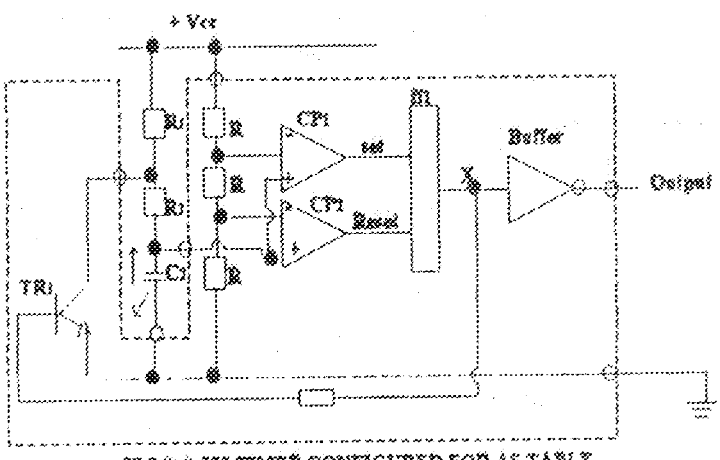


FIG4.4 555 TIMER CONFIGURED FOR AS TABLE

DISCUSSION OF RESULTS

The operation of the circuit best described from the switch- ON state with C2 discharged (Vc=O)

a) When the supply voltage (+V) is first applied since Vc=0, the inverting comparator (CP1) applies a logic 1 RESET level to the bistable while the SET output of the non - inverting comparator (CP2) is at logic 0. The output X is of the bistable in its RESET state is at logic 0, holding TR1 OFF and, inverted by the buffer, gives an output voltage of the approximatelly +V.

The capacitor charges towards the aiming potential of +V with a time constant C (R_1+R_2) Fig 4.3(a)

b) When Vc reaches the V/3 reference for CPl, the RESET signal is removed and C continues charging while the SET signal and X remains at logic 0 and the output stay at +vV. Fig 4.3(b).

c) When Vc reaches the 2v/3 reference for CP2, the bistable is SET , X switches to logic 1 and turns TR1 ON.

C Now discharges (immediately removing the SET signal) towards earth with a time constant CR2. The circuit output is now at approximately 0V. Fig 4.3 (c).

d) When capacitor C2 has discharged to V/3 the RESET signal is applied and X switches to logic 0 turning TR1, OFF. The circuit output switches to +V. Fig 4.3(d).

The cycle of charging and discharging capacitor C2 repeats giving a rectangular output wave form

Similarly, the cycle of charging and discharging capacitor C4 also repeats giving bipolar a rectangular output wave form.

The diode D2 which is connected with the loud speaker serves to clip-off the end of the bipolar wave forms which are fed into the transistor, thus making the output wave form a unipolar rectangolar wave.

CHAPTER

FIVE

CONCLUSION AND RECOMMANDATION

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATION

It can be seen in the foregoing report, that the design of an Auto-Alarm siren system, like any other electronic system, needs careful planning and implementantion.

In this project, the use of astable circuit was employed to generate the alarm. And the circuit froms the basis for all sorts of automatic controllers. It can be used to control a wide variety of objects such as automatic garage door opening mechanism, room lighting, alarm bells, tape-recorders, televisions and video cameras.

With regards to the detector, a detailed block, schematic, circuit and typical installation diagrams are provided in addition to the information about waveforms and signals at some strategic points in the circuit to facilitate easy repair and maintenance. Figures 1.2, 2.1, 2.2, 2.3, and 3.1. The detector uses very few components namely: switching transistor, a loudspeaker and the astable circuit.

There is a need only for very few spare parts and thus a very moderate cost is required to implemtent the detector unit.

And since this design can still be improved upon, it will serve as a stepping stone for whoever is interested in building a latest automatic alarm siren system with more tones and higher output power.

This, it is hoped, will step-wisely lead us to the solutions of high rate of property such as motor-car which is in our days.

REFERENCE

1. Ralph J. Smith, 1980, Electronic Circuit and Devices, John Wiley and Sons Inc., USA
2. E.C. Bell and R.W. Whiteheal, 1981, Basic Electrical Engineering and Instrumentaion for Engineers, 2nd Edition, Granada Publishing Ltd, Technical books division USA
3. Steven Hahn, 1984, Modern Electronic Security Systems, Hayden Book Company Inc. Rochelle Park, New Jersey.
4. Douglas R. Malcolm, Jr, Fundamentals of Electronics, 2nd Edition, Breton Publishers, Boston, Massachusetts, 6M Fanuc Inc. USA.
5. Harry Kybeft, 1979, Electronics, John Wiley and Sons Inc. USA
6. G. J Ritche, The Transistor circuit Techniques (Discrete and Integrated), 3rd Edition, Chapman and Hall, USA