DESIGN AND CONSTRUCTION OF AUTOMATIC FIRE ALARM SYSTEM

BY
HALIDU ZAKARI USMAN
99/8402EE

DEPARTMENT OF ELECTRICAL/COMPUTER ENGINEERING
SCHOOL OF ENGINEERING AND ENGINEERING TECHNOLOGY

FEDERAL UNIVERSITY OF TECHNOLOGY MINNA
NIGER STATE NIGERIA

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 OF

FEDERAL UNIVERSITY MINNA
NIGER STATE.
NIGERA

DECLARATION

I HALIDU ZAKARI USMAN, hereby declare that this project was written by me and that the contents are result of my own design and calculation.

Information obtained from the published work has well been acknowledged by means of reference.

Signed ---

Date 06/12/2005 ---

CERTIFICATION

This is to certify that this project AUTOMATIC FIRE ALARM SYSTEM was design and Constructed by Halidu Zakari Usman under the supervision of Mr. M.A Sadiq for the partial fulfillment of the award of bachelor degree in Electrical/Computer Engineering

------------------------------------	2/12/05
MR M.A SADDIQ	**DATE**
PROJECT SUPERVISOR	
----------------------------	27/02/06
ENGR M.D. ABDULLAHI	**DATE**
(H.O.D) ELECTRICAL/COMP.ENGR	
----------------------------	--------------
EXTERNAL EXAMINER	**DATE**
----------------------------	6th/10/2005
HALIDU ZAKARI USMAN	**DATE**
STUDENT	

DEDICATION

This project is dedicated to my late uncle, Alhaji Ibrahim Halidu, my father, Mallam Usman Halidu, and my mother Mrs. Abeni Halidu, for all they have done for me and for enabling me to come this far in my endeavour.

My friends, brothers and sisters, whose prayer, support and encouragement has been of tremendous help to me.

Above all, I will like to dedicate this project to almighty Allah for his grace favor and faithfulness.

ACKNOWLEDGEMENT

I will like to thank almighty Allah for the strength, wisdom, knowledge and understanding he has given me to complete my program.

My sincere gratitude goes to my supervisor Mr. M A Saddiq for his intelligent and valuable suggestion provided throughout the period of this project. I am highly grateful to all members of staff in the department of Electrical/Computer Engineering for the numerous ways in which they have been of help to me towards the course of my study.

I humbly salute the courageous and loving support of my parent Mallam Usman Halidu and Mrs. Abeni Halidu, may almighty Allah bless you.

I want to appreciate my humble and intelligent uncle Mr.Isiaka Newton Yakubu and Mr. Abubakar Yakub, I appreciate your sacrifice you poured out for me during the period of this project. I want to acknowledge my friends, Etito Andrew, George Njoku, Abubakar Sadiku, Keneath Abimiku, and Akeem Olaitan

Ezumezu Stanley, Usman Musa, Sanusi Abubakar, Mamman Jimoh, Murtala Natiti, Ogbeni Isah, Ramatu Natiti, Mohammed Salihu and Ibrahim Musa.

I want to appreciate my brothers Haruna Suleiman, Mohammed Halidu and my sisters Fatima Halidu, Aishatu Tijjani, Hassana, Maryam, Sadiya,Rahina.thank you all and God bless you all for your encouragement.

ABSTRACT

The primary objective of this project was to produce a prototype detector circuit that would detect the presence of fire due to increase in temperature of the environment beyond required temperature through the thermistor and subsequently give an output to indicate the condition of the input, as the temperature of the thermistor increases, its resistance decreases thereby causing it to approach the set trip value of the variable resistor. When the thermistor resistance become less than the set value of the variable resistor, which give an audio sound through a 4 ohm speaker.

The components that made up of the fire alarm system include the following, the input transducer (thermistor) , the 555 timer (oscillator), Schmitt trigger were used as the control devices, while the 4 ohm 3 watt speaker is the output transducer used

CHAPTER ONE

1.1 INTRODUCTION

A fire and smoke alarm system is basically a circuit designed to alert human beings of impending dangers in our vicinity.

Fire is indiscriminate as it guts shops, houses and factories through accidental and malicious acts.

Over the centuries and decade fire accident had been so constant that it is considered as one or the most destructive accident today. It has great potential in destroying the industrial plant and community causing loss of lives, material and equipments and building. Some of the losses may be temporary, as they can be replaced, though at higher cost. For these reasons as part of industrial and domestic safety regulation, it is necessary to install a fire alarm system in building for the purpose of this project, the safety of human beings on the fire alarm system.

Generally, alarm system has been acknowledge globally as an effective way of sensitizing the public of the commencement of an fire event, alert people of unseen dangers and for many other purpose both at home and industries.

The most important security is the fire safety system. Apart from petroleum explosion, most fire is easy to control at early stages. For the reason stated above fighting equipments are better used in fire detection before professional fire fighters arrive, so the extent of damage due by fire on life and properties is greatly reduced due to the presence of fire alarm system. It is also important to know that detectors do not prevent fire but announces its occurrence; it can only warm of a situation which is dangerous.

Firemen are hampered or helpless in their rescue attempts by smoke which makes it difficult to locate and effectively fight fire. The deadly tonic gases are released during fire migration to the upper floors in tall buildings thereby endangering others lives and aiding the spread of the fire outbreak, but continuous surveillance is the best safe guard.

CHAPTER TWO

2.1 LITERATURE REVIEW

The primary function of a fire alarm system is to alert the occupants of a building to the presence of fire. It may also perform other functions, for instance, the system can be designed to simultaneously alert the fire department by means of a direct or relayed signal where rapid response by the fire department is certain industrial occupancies large quantity of highly combustible or explosive materials where a fire can develop rapidly, and in high buildings, hospitals and nursing homes, where evacuation assistance may be required.

In other cases, because of the nature of the building occupancy, the alarm system may be designed to alert initially only the building staff before the general alarm is activated.

Fire alarm system can be designed to control the operation of the building service equipment to minimize the spread of fire. Signal from the system can automatically engage equipment to pressurize stair walls or shutdown recalculating air system. This helps confine smoke to the fire floor and minimizes dangers to life and property damage. The fire alarm system can also be designed to activate smoke exhaust systems to ventilate a fire and reduce heat build up. Fire alarm system may also be designed to activate fire suppression systems release hold open devices on fire doors and indicate the location of the fire within the building.

The building occupancy plays a major role as to the type of detection system to be used.

The two basic types of fire detectors are smoke detector and heat detectors. A smoke detector transmit a signal when the concentration of air borne combustion reaches a predetermine level. A heat detector transmit a similar signal when the temperature reaches a predetermine level or when there is abnormal rate of temperature rise.

There are two principal types of smoke detectors which include photoelectric detectors responds quickly to smoldering fires. A light source which sends out a light beam is interrupted by smoke entering the detectors react to visible particles of smoke, ionization smoke detectors on the other hand, are sensitive to presence ions, which are electrically charged particles produced by the chemical reaction that take place during combustion.

Manual pull boxes may be used in reporting fire, but they are useless when the building is unoccupied. People have a built in fear of pulling a fire alarm box and many times will wait until the fire is fully developed before turning on the alarm.

Heat-sensing element such as fusible links, react very slowly to fire and require high temperature before they can melt. These devices should not be used where quick response, such as smoke control is more desirable.

Until recent years, the method of preventing personnel injury and death in building was by shielding the occupants from the smoke and heat. However, the late sixties and early seventies saw several major building fire in which people who died were first removed from the immediate fire area. The smoke and tonic gases from fire causing more death than the direct effect of smoke and heat.

Authorities attributed the problem to the increasing use of plastic. The tonic gases given off during the thermal decomposition of these new plastic materials was far more deadly than those given off by traditional materials.

Today 80% of deaths in building fires are caused by smoke inhalation. A few breaths of some tonic gases will completely immobilize a person, with death following in a matter of minutes. The victims are often dead before the fire ever reaches them.

From the analysis of the damages that fire can cause, it is clear that fire affects not only property but more importantly life, hence early warning of out break of fire must be provided in dousing the fire and preventing is from advancing into other areas.

In this project work, emphasis is placed on early detection of the outbreak of fire incidents and the early preventive measures.

2.2 FIRE DETECTION SYSTEMS

A properly designed and installed fire alarm system can do much to limit both the life and properly loss in the event of fire outbreak.

Since approximately 80% of fatalities caused by fire occur in buildings, the use of early warning fire alarm system in buildings can have profound effect on the reduction of this figure. The system themselves can take many forms, ranging from one single-station, smokes is small single-family detected dwelling to a complex. Computerized high rise building system handling incoming number of independent actions on a function of input data.

A general overview of fire alarm equipments normally used in building would be a necessary prerequisite in order to provide a better understanding of the function of this equipment.

2.3 DETECTORS

These are devices in a fire alarm system which informs the control unit, of the presence of fire in a building. Automatic fire alarm initiating devices are actualized by heat, smoke or other aspect of devices.

2.4 SMOKE DETECTION

Smoke detectors are costlier than heat detectors but provide considerably faster detection time and subsequently higher false-alarm rates due to their increased sensitivity. Smoke detectors are very effective for life safety application but also more difficult to locate, in that air current which might affect the direction of smoke flow must be taken into consideration.

2.5 HEAT DETECTION

Heat detectors are the oldest type of automatic fire detection device. They began with the development of automatic sprinkler heads and have been continued to the present with a proliferation of different type of devices.

Heat detectors are the least expensive fire detectors. Heat detectors are best suited for fire detection in small confined spaces where rapid fires with high heat output are expected and in other areas where ambient conditions would not allow the use if other fire detection devices.

A sprinkler can also be considered as heat actuated fire detector when the sprinkler system is provided with water flow indicator when the sprinkler system is provided with water flow indicators lied to the fire alarm control unit system. This system automatically sounds the alarm as the water is being put on the fire.

2.6 FLAME DETECTORS

These optically sense either the ultra violet or infra-red radiation given off by flames or glowing members. They have the highest false alarm rate and the fastest detection times of any type of fire detector. Detection times for flame detectors are generally measured in milliseconds from fire ignition.

They are generally used only in high – natural situations such as fuel loading platforms and other areas with hazardous atmosphere in which explosions or very rapid fire may occur.

In general these detectors are restricted to nor-smoking areas or places where highly flammable materials are stored or used.

CHAPTER THREE

SYSTEM DESIGN AND OPERATION

Transducer is any devices which convert energy from one form (some qualities e.g. Energy, Temperature, or Light level etc.) to another form, such as heat energy into electrical signals. There are to types of transducer grouped as: -

INPUT TRANSDUCERS

Examples are Thermistor

Photocells

Thermocouples

Strainguage

- OUTPUT TRANSDUCERS

Examples are loud speaker

Motors

Solenoids

Electronics values

Transducers may be a small part of a system but they are very important device in electronics, most especially in control system owing to the success of any control system in terms of its operation and performance which often depend on the quality, sensitivity and stability on the input sensor. This sensor has to pick up the small tiny changes into useful electrical signals.

SYSTEM DESIGN

3.1 DESIGN

The details and breakdown of the design of the fire alarm system can be divided into four units each represented by a building block diagram namely: input ,output power supply and control devices.

Fig 3.1 shows clearly the block diagram, the detail and mode of operation.

OPERATION

The summary of the mode of operation is that for every system, there must be an input, for this project, Thermistor is used as the temperature sensor.

The output of the heat detector is controlled by the followings: 555 timer, transistor. For a complete system, an output is expected, for this project a speaker is used as output device.

3.2 THERMISTOR

Thermistor is an acronym for thermal resistor. As the name implies, it is a temperature sensitive resistor. It is made from sintered mixtures of the oxides of Nickel, zinc, copper and manganese. It has a resistance which can either decrease or increase by a factor of many hundreds from room temperature to 10^{o}c. two type of thermistors that are available i.e. NTC – Negative temperature coefficient whose resistance decrease with increase in temperature and PTC – Positive temperature coefficient whose resistance increase in temperature.

Thermistor generally is a semi-conductor device that exhibits a negative coefficient of resistance with temperature (i.e. NTC) typically in the neighborhood of – 4% per degree centigrade. Thermistor intended of accurate temperature measurement (i.e. used as temperature compensation elements in circuits) typically have a resistance of a few thousands of ohms at room temperature (mostly between 1000 ohms and 1 mega ohms) and they are available with tight conformity (0.1 – 0.2°c) to standard curves. Thermistor is a good choice for temperature measurement and control because of its large coefficient of resistance changes that makes them earlier to use and stable in the range of – 50°c to + 300°c A laboratory measurement of resistance variation versus temperature was also effected to enable proper design of the quiescent operating point of the bridge circuit. Data collected is given in general temperature resistance relation is of the form.

$$R = R_o e^{B(V_T - V_{To})}$$

Where R and Ro are resistance at temperature T and T_o respectively and β have unit K. the reference temperature to is usually taken as 1298K (25°c) while the constant β is of the order of by computing (∂R/∂T)/R the temperature coefficient was found to be given by $-\beta / T^2$ ($^{\Omega}/_{\Omega}$°c).

Table fig 3.2 Resistance Vs Temperature Curve for the Thermistor

Temperature (°c)	Resistance (KΩ)
30°	1.96
40°	1.76
50°	1.56
60°	1.44
70°	1.30
80°	1.20
90°	1.10

3.3 CIRCUIT DESCRIPTION

The circuit features a hysterisis control to provide regenerative snap on-off switching of the audio tone generator once the temperature rises above the desired.

Hysterisis prevent "jitter" and oscillation around a menu point in control circuit below which is a Schmitt trigger switch, if switches on at a particular voltage and off a slightly quite read voltage, the switching acts on relying on positive feed back

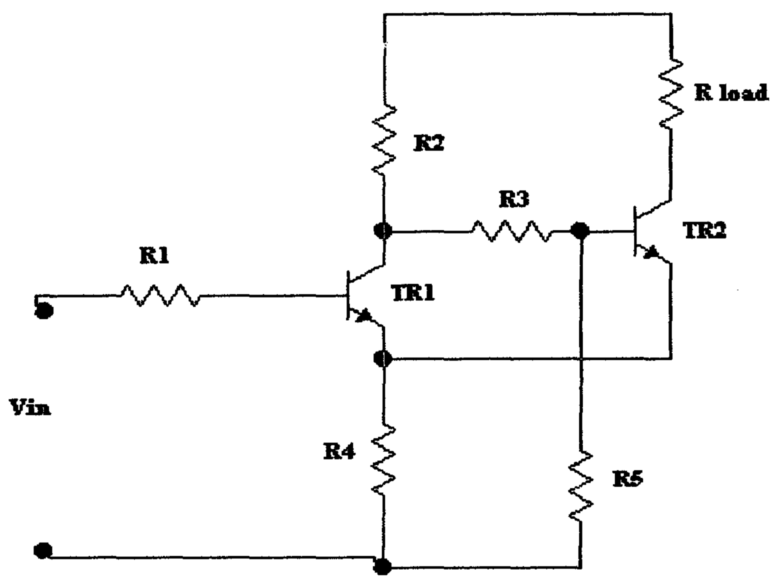


DIAGRAM OF SCHMITT TRIGGER

Two voltages are important in the Schmitt trigger: one the Von applied to the base of TRI which causes it to which ON: the second is the cover voltage V off which causes the transistor to switch OFF the difference between the voltages is hysterisis and in these can be V off lag V: on emitter voltages, being connected together. Thus the emitter and base voltages V_{off} then, $I_1 = V_{off} / R_4$ and $I_2 = V_{off} / R_5$ and the voltage drop across R_2 and R2 is then given by

$V_{cc} - V_{off} = (I_1 + I_2) R_2 + I_2 R_3$ if we substitute the value of I_1 and I_2 given above we obtain an equation for V_{off}.

$$V_{off} = \frac{V_{cc}}{(1 + (R_2/R_5)} + (R_2/R_3) + (R_3/R_5)$$

Substituting the resistor values in figure shown given:

$$Von = \frac{(5 \times 2200)}{(2200 + 2200 + 100)}$$

$$Von = \frac{11000}{5400} = 2.037v$$

and $$V_{off} = \frac{5}{1 + (1000/2200) + (1000/500) + (2200/2200)}$$

$$V_{off} = 1.122v$$

Therefore, the hysterisis of the circuit is Von – Voff = 2.037v – 1.122v = 0.915v

Different values of R_2 to R_5 provide different values for the hysterisis

3.4 CIRCUIT OPERATION

Schematic of the prospect, a 50kohm adjustable potentiometer in series with negative temperature coefficient thermistor forms a potential divider, the output voltage of which is (2.79) V_1 thus Q_1 is on, and since the base potential of Q_2 is now very close to its emitter potential, therefore Q_3 is off and the reset terminal pin4, or NE555 oscillator is at low potential, approximately zero.

Since the reset pin is at very low level i.e. the Thermistor heats up and the resistance fall, the voltage at the midpoint of the potential divider fall low enough to bring it out of conduction into an off. When this happens, its collector potential and invariably, the base potential, of Q_2 rises rapidly, bringing Q_2 into conduction, with Q_2 in conduction, the base of Q_3 is brought very low to ground through 1.5kohm resistance formed by the collector and emitter resistance of Q_2. At this point, Q_3 in conduction, it's collector potential rises and pin4 or the multi-vibrator is brought high, the high on pin 4 now enables normal circuit functionality, the oscillator therefore oscillates, generating, an audio tone

The frequency of oscillation is given by

$$1 = \frac{1.44}{0.693(R_1 + 2R_2) \times C_1}$$

$$= \frac{1.44}{0.693(99000) \times 2.2 \times 10^{-8}}$$

With the given values, the audio frequency tone generated is approximately 1.4KHZ. This high frequency pulse given a loudspeaker through two parallel connected 25C1815GR NPN transistors connected as switches to ground.

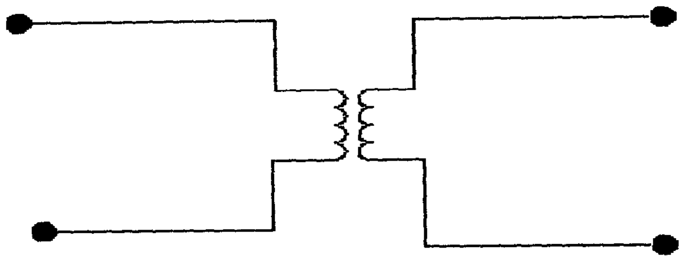
The oscillator keeps oscillating until the temperature drops low enough to cause the base potential of Q_1 to rise, after which it goes into conduction and Q_2 is cut off, switching off Q_3 and resetting the alarm generator, so at this point the system stops sounding.

A very stable voltage reference was chosen for the value of Vcc used for the calculation of Von and Voff, this voltage derived from a 7805 5 – V regulator.

3.5 POWER SUPPLY UNIT

Modem electronic devices and circuits require a direct voltage supply. A battery could be used this direct voltage but it has disadvantages due to its limited life and the manner in which the battery's internal resistances decreases with age and the deteriorating battery condition. The effect of increased resistance is to lower the battery terminal for a given load current. Also, the effect of varying load current will cause a change in the terminal voltage of the battery. An ideal power supply will not change its terminal voltage despite changes in input voltage or output current conditions and thus, a battery is far from an ideal power supply.

Furthermore, in achieving the desired ideal power supply for the circuit it has become a matter of necessity to design power supply unit. Since, the source of electricity available is an alternating current (a.c.) main of 240V, 50Hz; a step down transformer was used to convert these mains to a 12V, direct voltage (D.C.) amplitude level supply. This was achieved by making use of the turn's ratio the primary windings to the secondary windings to get the desired voltage and current value i.e. the voltage applied to the primary appears across the secondary, with a voltage multiplication proportional to the turns ratio of the transformer and a current multiplication inversely proportional to the turns ratio. In a transformer operation, power is conserved and it also serves to "isolate" the circuit from the actual connection to the power line due to the windings of the transformer being insulated from each other.



240V

12V

The detector unit operates on two different voltage supplies. There is 5V terminal tapped via voltage regulator (LM7805) which is meant to supply to the circuit. The 12v terminal meant to supply for the audio visual alarm system.

Now, $\frac{V_p}{V_s} = \frac{N_p}{N_s} = \frac{I_s}{I_p}$

$V_p = 240V$; $V_s = 12V$; $I_s = 500mA$ (transformer values)

$\frac{N_p}{N_s} = \frac{240}{12} = 20 = \frac{I_s}{I_p}$

$I_p = \frac{I_s}{16} = \frac{500x10^{-3}}{16} = 31.25mA$

Also, $P_D = V_pI_p = V_sI_s = 500x10^{-3} \times 12 = 6.0W$

where V_p = Primary voltage (from a.c. source)

V_s = Secondary voltage (output voltage from transformer)

N_p = Number of turns of the primary coil

N_s = Number of turns of the secondary coil

I_p = Primary current (from source)

I_s = Secondary current (transformer output)

P_D = Power dissipated by the transformer.

Rectification is then required to provide a uni-polar voltage i.e. a voltage made up of sinusoidal half-cycles but each of the same polarity, positive in this case. This was achieved using four diodes in full-wave bridge rectifier mode

3.6 5/12 D.C POWER SUPPLY

The alternating current from the mains is converted to suitable form use by the system components. The alternating current passes through the following processes.

1 Transformation
2 Rectification
3 Regulation

3.6.1 TRANSFORMATION

The transformation of an AC voltage of a known magnitude (240v) to a lower magnitude

(12v) was achieved by using transformer rated 240/ 12v

3.6.2 RECTIFICATION

This process is achieved by use of a bridge rectifier. The final voltage needed for the operation of this device is a D.C voltage, therefore the 12v alternating voltage from the output of the step-down transformer will have to be converted to D.C voltage through the bridge diode device. The bridge rectifier consists of two pairs of diode with a pair having its common anode terminals joined together while the other pair has its common cathode terminal joined in a similar way. Actually, two diodes which are always in series with the input voltage conduct simultaneously. For instance, during the positive half cycle of the transformer, D_1 and D_3 conducts while D_2 and D_4 are reverse biased. This results in an average D.C. voltage output with considerable ripple component of twice the input frequency of 100Hz.

Now, $V_{max} = V_{peak} = (2)^{1/2} x V_{rms}$

$V_{peak} = 12 x (2)^{1/2} = 16.9V$

Where V_{peak} = peak output voltage from transformer

V_{rms} = root mean square output voltage of the transformer

The peak inverse voltage (PIV) rating of each of the diode is normally equal to V_{peak}. By standard, the acceptable PIV for a full-wave bridge rectifier is 2PIV = 4 x 16.9 = 67.88V.

Thus, the diode IN5392 with PIV rating of 100V was chosen as the rectifier diodes.

Also, $V_{rect} = V_{peak} - 2V_D$

Where V_{rect} = output voltage from the rectifier

V_D = the two conducting diodes instantaneous voltage drop

V_{peak} = 16.9V; V_D = 0.7V (for silicon diodes)

$V_{rect} = 16.9 - 2(0.7) = 15.5V$

The rectified D.C. output voltage is normally pulsating and contains a high percentage of ripple content which needs to be filtered out to minimize the ripples and give a better approximation to the required D.C. voltage. A 12V, 3300uF capacitor was used to provide the required smoothing action by connecting it in parallel with the rectifier diodes as shown below

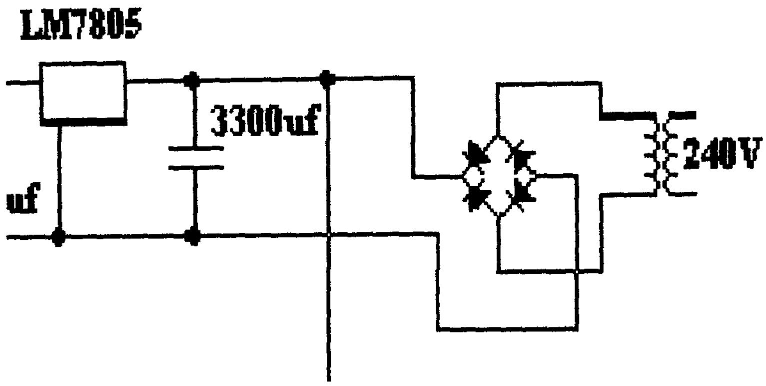
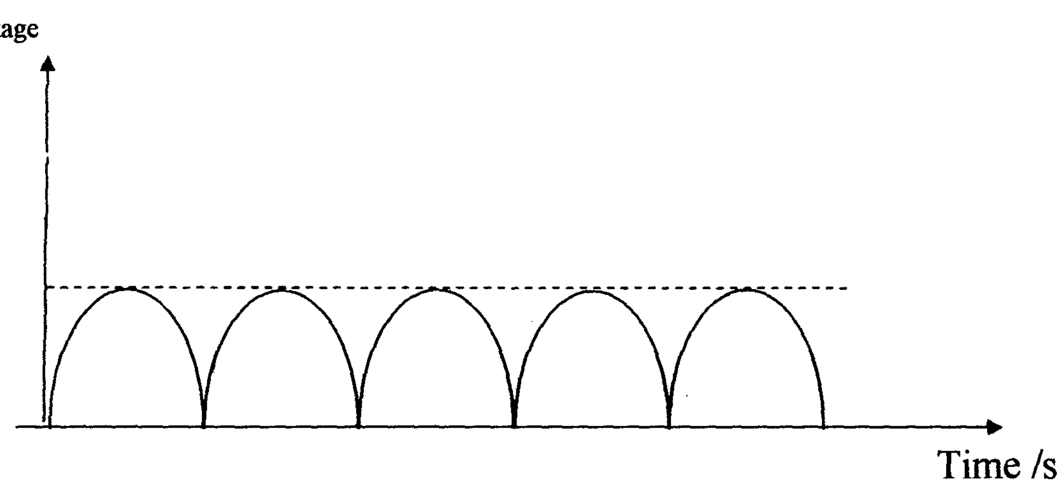
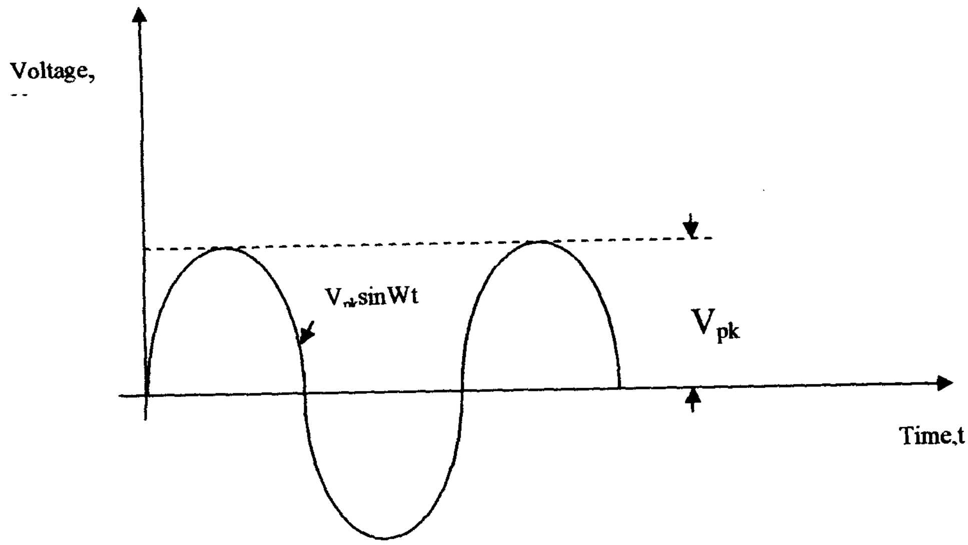


DIAGRAM BRIDGE RECTIFIER



The wave form of supply voltage after passing through bridge rectifier and filtration



The wave form of supply voltage before passing through bridge rectifier and filtration

3.6.3 REGULATION

The 7805 voltage regulator regulates between 12v and 5v this is made is easily adjust and self protection against short circuits, over heating etc. with excellent properties as a voltage source (e.g. internal resistance measured in millions). The use of 7805 regulator reduces the ripple voltage to a desired level.

The regulation to the 555 timer and the speaker is kept between 5v and 12v respectively, so that the switching of the output devices does not affect the circuit operation and also to prevent damage to the ICs if any fault condition arises.

3.7 555 TIMER

When power is finally applied, the capacitor start charging through the resistor. The two components are connected to junction F of pin 6 and 7 of the timer, which are the threshold and discharging pins.

When the voltage applied to pin 6 rises to a value that is greater than two-third (⅔) of the value of the voltage applied to pin 8, a flip-flop inside the 555 timer J.C is RESET, and the output of the timer goes low.

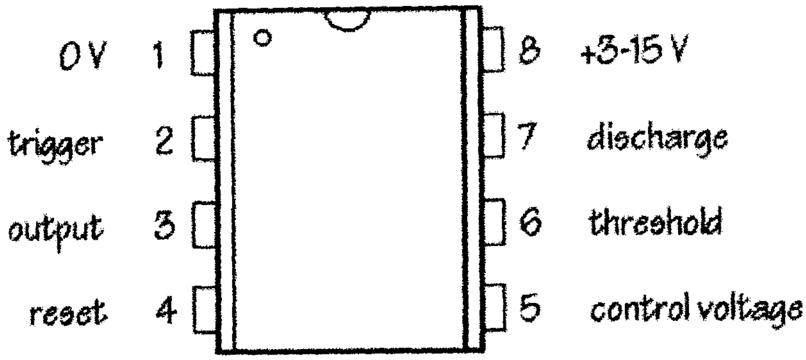
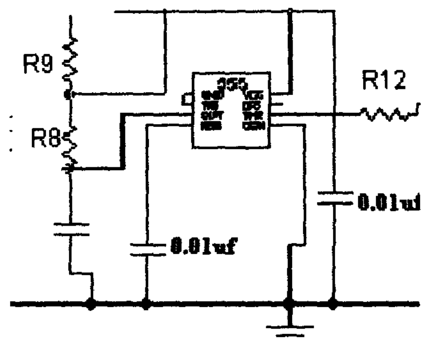


DIAGRAM OF A 555 TIMER



3.7.1THE OUTPUT DEVICE (SPEAKER)

A 4 ohms speaker was used to obtain an audible output the signal from the emitter of the transistor is connected to the speaker which produces the required audible output whenever there is either heat or smoke detection.

The speaker which produces an audible sound is meant to sensitize the people in the close range of fire outbreak, for the sake of this project, if is one of the most significant devices incorporated, as it's signal have reduced the rate of fire outbreak by providing high response rescue initiation.

CHAPTER FOUR

CONSRUCTION, TESTING AND RESULT

4.1 ASSEMBLY OF SUB - UNIT

As earlier stated in the previous chapters, the system is made up of three building blocks namely:

i INPUT DEVICE: these include the transducer like the thermistor (for heat detection)

ii CONTROL DEVICE: These include the 555 timer IC switch and the Schmitt trigger

ii OUTPUT DEVICE: These includes the speaker (4 ohms, 3 watt),light emitting diode(LED)

The system was powered with two different D.C voltages (12V and 5V) power supply, the 12V D.C terminal is meant to supply the output devices like the speaker and light emitting diode and the 5V supply terminal is meant to feed the circuit.

The construction was first done on a bread board and tested in other to have a satisfactory output i.e. preliminary test was carried out under induced alarm conditions, and some major and minor adjustment were made on some part and components, for instance , some values of 9V zener diode with 5V LM7805 regulator until the system operate as expected. With the result gotten as required, then the components were finally transferred to the Vero board and tested in stages.

4.2 SYSTEM TESTING

The basic principle of operation of each stages and the expected output were treated in earlier chapters.

The chapter shows the practical output of all the waveforms and the expected voltage . The waveform were monitored through the use of cathode ray oscilloscope (C.R.O), while the voltage level were measured using a digital voltmeter.

Resistances and other components specification were gotten from the data book. Those values used can be found in the last chapter.

4.3 SYSTEM PACKAGING

The power pack, the speaker and the LED bulb were mounted in front of the tile casing for AC and D.C supply, for the input transducers.

The Vero- board was mounted firmly on the base of the tile case.

CHAPTER FIVE

CONCLUSION

The design and construction of automatic fire alarm system had been carried out successfully. The primary objective of this project was to produce a prototype detector circuit that would detect the presence of heat due to increase in temperature of the environment beyond required temperature through the thermistor and subsequently give an output to indicate the condition of the input which had been fulfilled.

RECOMMENDATION

Despite the high reliability of the design, some area of the circuit can still be improved upon so as to enhance its performance.

Such improvement could include an increase in the sensitivity of the heat detector, and the use of high watt speaker.

The fire alarm system should be completely separated from other wiring circuit.

Other sources of power supply should be provided so as to provide an emergency supply to alarm system incase of power failure from power holding company of Nigeria.

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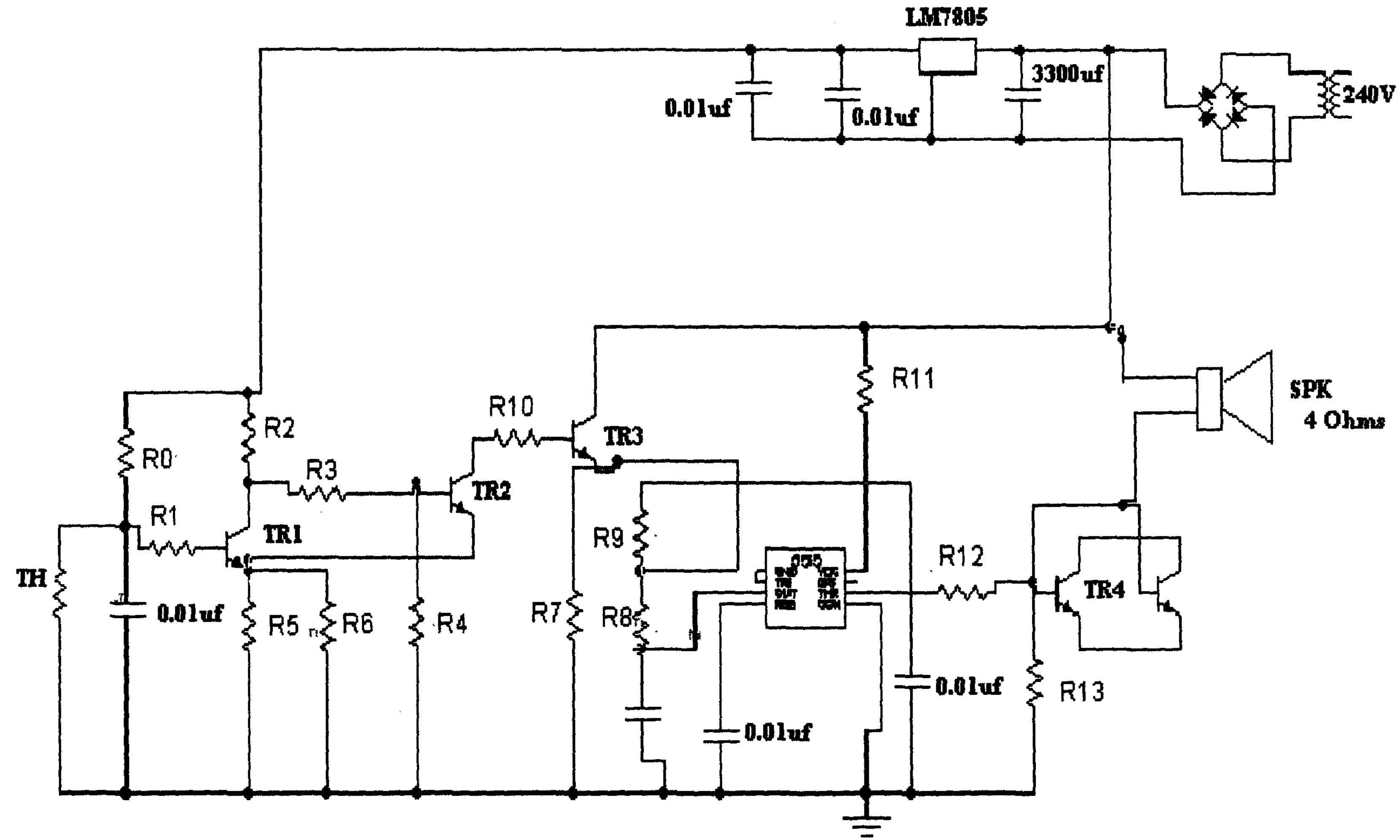
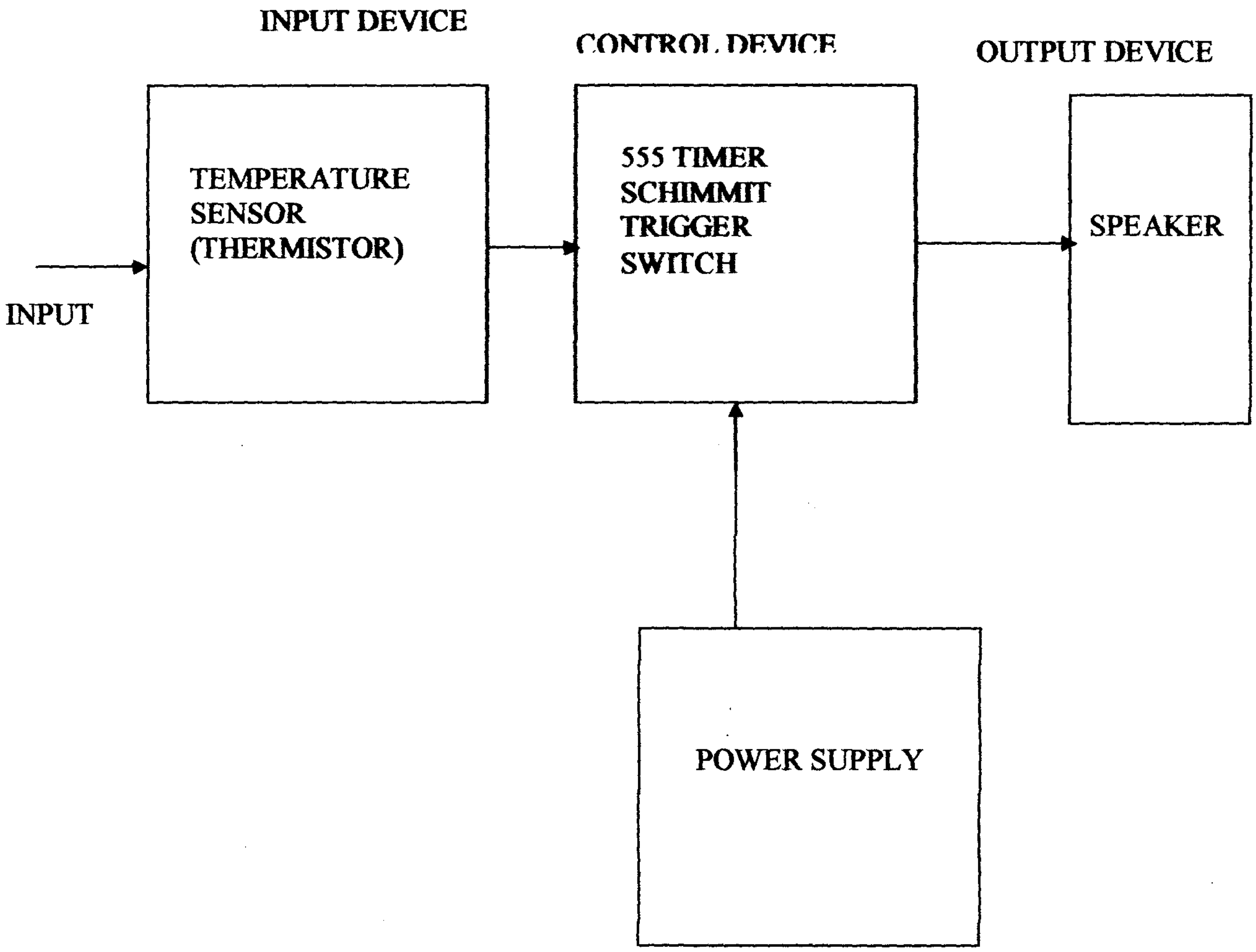
5.5 APPENDIX

PART LIST

Item	Description	Types
R_1	4.7kΩ	fixed resistor
R_2	1.5kΩ	fixed resistor
R_3	2kΩ	fixed resistor
R_4	1kΩ	fixed resistor
R_5	2.2kΩ	fixed resistor
R_6	1kΩ	fixed resistor
R_7	10kΩ	fixed resistor
R_8	33kΩ	fixed resistor
R_9	33kΩ	fixed resistor
R_{10}	1kΩ	fixed resistor
R_{11}	22Ω	fixed resistor
R_{12}	2.2kΩ	fixed resistor
R0	50kΩ	Variable resistor
C_1	0.01µf	Electrolytic type
C_2	0.01µf	Ceramic type
C_3	0.01µf	Ceramic type
C_4	3300µf	Electrolytic type
LED	Light emitting diode	
TR_1	25C 1815 GR	
TR_2	25C 1815 GR	
TR_3	25A 1015 GR	
TR_4	25C 1815 GR	
D_1	IN 5392 diode	
D_2	IN 5392 diode	
D_3	IN 5392 diode	
D_4	IN 5392 diode	
D_5	L. M 7805	
IC	555 timer	
TRANS	Transformer	
SPK	3watt, 4 ohms speaker	



CIRCUIT DIAGRAM OF AUTOMATIC FIRE ALARM SYSTEM


INPUT DEVICE
CONTROL DEVICE
OUTPUT DEVICE
TEMPERATURE SENSOR (THERMISTOR)
555 TIMER SCHIMMIT TRIGGER SWITCH
SPEAKER
INPUT
POWER SUPPLY

DESIGN AND CONSTRUCTION OF AUTOMATIC FIRE ALARM SYSTEM

BY
HALIDU ZAKARI USMAN
REGISTRATION NO: 99/8402EE

DEPARTEMENT OF ELECTRICAL/COMPUTER ENGINEERING

FEDERAL UNIVERSITY OF TECHNOLOGY MINNA
NIGER STATE
NIGERIA

NOVEMBER 2005