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NOVEL FIRE ALARM CIRCUIT FOR SECURITY PURPOSES

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Abstract: Novel Fire Alarm Circuit is really easily implemented circuit that can completely detect the fire and it activates the Siren Sound or Buzzer. These Circuits are crucially important to detect fire in the proper time and prevent any damage to people or property. Smoke Sensors and conventional fire alarm are a part of the security systems now days which help in identifying or stopping damage. Proper installation of Fire Alarm Systems and Smoke Sensors in public or private buildings like offices, movie theatres, shopping malls and other public places are the need of current scenario. There are so many expensive and sensitive alarms Circuit in the form of stand-alone devices, but we have designed very simple Fire Alarm Circuits using some common components like Thermistor, LM358, Germanium Diode, LM341 and NE555. The used Fire alarm circuit using Thermistor, LM358 Operational – Amplifier and a Buzzer. The basic purpose of fire alarm system is to deliver an early warning of fire so that people can be evacuated & immediate action can be taken to stop or nullify of the fire effect as soon as possible. Alarm canFire Alarm Circuits and be triggered by using detectors or by manual call point (Remotely).

Index Terms **- Fire alarm system, thermistor, operational amplifier**

I. INTRODUCTION

A fire alarm system has a number of devices working together to detect and warn people through visual and audio appliances when smoke, fire, carbon monoxide or other emergencies are present. These alarms may be activated automatically from smoke detectors, and heat detectors or may also be activated via manual fire alarm activation devices such as manual call points or pull stations. Alarms can be either motorized bells or wall mountable sounders or horns. They can also be speaker strobes which sound an alarm, followed by a voice evacuation message which warns people inside the building not to use the elevators. Fire alarm sounders can be set to certain frequencies and different tones including low, medium and high, depending on the country and manufacturer of the device. Most fire alarm systems in Europe sound like a siren with alternating frequencies. Fire alarm electronic devices are known as horns in the United States and Canada, and can be either continuous or set to different codes. Fire alarm warning devices can also be set to different volume levels. Manually actuated devices; also known as fire alarm boxes, manual pull stations, or simply pull stations, break glass stations, and (in Europe) call points. Devices for manual fire alarm activation are installed to be readily located (near the exits), identified, and operated. They are usually actuated by means of physical interaction, such as pulling a lever or breaking glass. Automatically actuated devices can take many forms intended to respond to any number of detectable physical changes associated with fire: convicted thermal energy; heat detector, products of combustion; smoke detector, radiant energy; flame detector, combustion gases; fire gas detector, and release of extinguishing agents; water-flow detector. The newest innovations can use cameras and computer algorithms to analyze the visible effects of fire and movement in different applications.

II. MATERIALS AND METHODS

1. Resistance temperature detectors (RTDs)

A Resistance Thermometer or Resistance Temperature Detector is a device which used to determine the temperature by measuring the resistance of pure electrical wire. This wire is referred to as a temperature sensor. If we want to measure temperature with high accuracy, RTD is the only one solution in industries[4].

2.Thermocouples

A Thermocouple is a sensor used to measure temperature. Thermocouples consist of two wire legs made from different metals. The wires legs are welded together at one end, creating a junction. This junction is where the temperature is measured. When the junction experiences a change in temperature, a voltage is created [3].

3.Thermistors

Thermistor is a type of resistor whose resistance is dependent on temperature, more so than in standard resistors. The word is a combination of thermal and resistor. A thermistor is a resistance thermometer, or a resistor whose resistance is dependent on temperature.

4. Semiconductor sensors

Semiconductor-based temperature sensors, or integrated circuit (IC) temperature sensors, operate with reverse bias, have a small capacitance and a low leakage current. They are formed on thin wafers of silicon. They are compact, produce linear outputs, and have a small range of temperature.

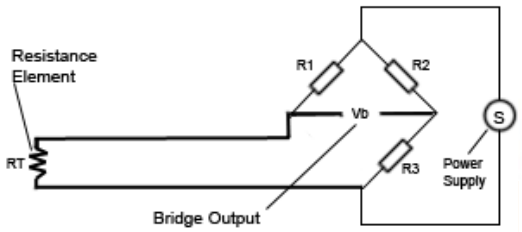

Fig.1

Fig.2

Fig.3

Fig.4

III. METHODOLOGY

The fire alarm working principle is based on thermistor used in the fire alarm circuit. This fire alarm circuit is used to identify and indicate an increase in temperature beyond certain value (temperature of an enclosed area). All Fire Alarm Systems essentially operate on the same principle. If a detector detects smoke or heat, or someone operates a break glass unit, then alarm sounders operate to warn others in the building that there may be a fire and to evacuate[2].
A thermistor is an inexpensive and easily obtainable temperature sensitive resistor, thermistor working principle is it's resistance depends upon the temperature. When temperature changes, the resistance of the thermistor changes in a predictable way. The benefits of using a thermistor is accuracy and stability.

IV. COMPONENTS REQUIRED

Table 4.1: Components List

1	Thermistor	10K	1
2	Operational Amplifier (Op – Amp)	LM358	1
3	Resistor (1/4 Watt)	4.7 KΩ	1
4	Potentiometer	10 KΩ	1
5	Small Buzzer (5V Buzzer)	-	1
6	Connecting Wires		
7	Mini Breadboard		
8	5V Power Supply		

10K Thermistor: Thermistors are Temperature Dependent Resistors i.e. the resistance of a Thermistor varies according to the ambient temperature. There are two types of Thermistors: PTC Thermistor and NTC Thermistor. PTC stands for Positive Temperature Coefficient and NTC stands for Negative Temperature Coefficient. In PTC Thermistor, the resistance is directly proportional to the temperature and in NTC Thermistor, the resistance is inversely proportional to the temperature. In this project we have used a 10 KΩ Thermistor with NTC. At 250C, the resistance of the 10 KΩ Thermistor is 10 KΩ.

LM358 Operational Amplifier: LM358 is a Dual Operational Amplifier (Op – Amp) IC. All the functional modes of the typical operational amplifier can be implemented using LM358 IC. In this project though, we will be using the LM358 Operational Amplifier in the Comparator Mode where the input signals on inverting and non – inverting terminals are compared and corresponding output is produced.
Gain of an inverted op amp = -Rf/Ri Gain of a non-inverted op amp = 1+(Rf/Ri) .

10k ohm Potentiometer: A potentiometer is a manually adjustable variable resistor with 3 terminals. Two terminals are connected to both ends of a resistive element, and the third terminal connects to a sliding contact, called a wiper, moving over the resistive element. A potentiometer is a manually adjustable variable resistor with 3 terminals.

Buzzer: The buzzer consists of an outside case with two pins to attach it to power and ground. ... When current is applied to the buzzer it causes the ceramic disk to contract or expand. Changing the This then causes the surrounding disc to vibrate. That's the sound that you hear. PUI has the AI-3035, a piezoelectric buzzer rated for 2-5 Volt operation, nominal 3 Volts, and with a maximum current requirement of 9 mA.

V. CIRCUIT DESIGN AND WORKING

The design of the Fire Alarm Circuit with Siren Sound is very simple. First, connect the 10 KΩ Potentiometer to the inverting terminal of the LM358 Op – Amp. One end of the POT is connected to +5V, other end is connected to GND and the wiper terminal is connected to Pin 2 of Op – Amp. We will now make a potential divider using 10 K Thermistor and 10 KΩ Resistor. The output of this potential divider i.e. the junction point is connected to the non – inverting input of the LM358 Operational Amplifier. We have chosen a small, 5V buzzer in this project to make the alarm or siren sound. So, connect the output of the LM358 Op – amp to the 5V Buzzer directly. Pins 8 and 4 of the LM358 IC i.e. V+ and GND are connected to +5V and GND respectively.

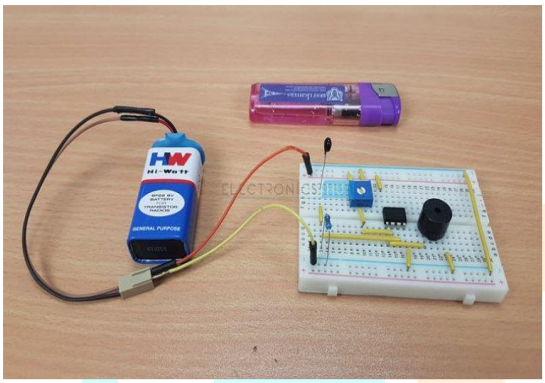

Fig. 5

We will now see the working of the simple Fire Alarm Circuit. First thing to know is that the main component in detecting the fire is the 10 K Thermistor. As we mentioned in the component description, the 10 K Thermistor used here is a NTC type Thermistor. If the temperature increases, the resistance of the Thermistor decreases. In case of fire, the temperature increases. This increase in temperature will reduce the resistance of the 10 K Thermistor. As the resistance decreases, the output of the voltage divider will increase. Since the output of the voltage divider is given to the non – inverting input of the LM358 Op – Amp, its value will become more than that of the inverting input. As a result, the output of the Op – Amp becomes high and it activates the buzzer.

VI. RESULTS AND DISCUSSIONS

The circuit is simple and can be easily implemented. The sensors give an analog output signal representing the value of the sense phenomenon. The output of an analogue addressable detector is variable and it is proportional representation of the sense effect of fire, smoke and flame. Transition of this output from a detector is usually in a form of analog current to the control panel that tells the panel what condition of the room being sense monitored. In order for an analog addressable system to raise alarm, the analog value output by the detector must be in the alarm condition (above the alarm threshold) for a period equal to time taken to complete three successive address sequences.

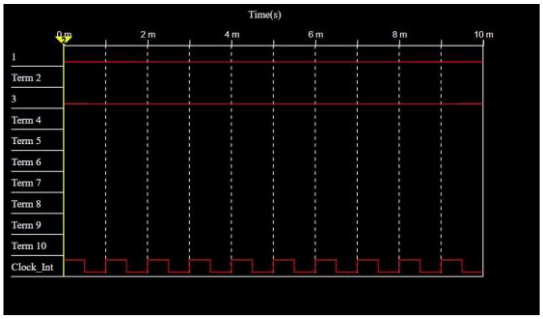

Fig. 6

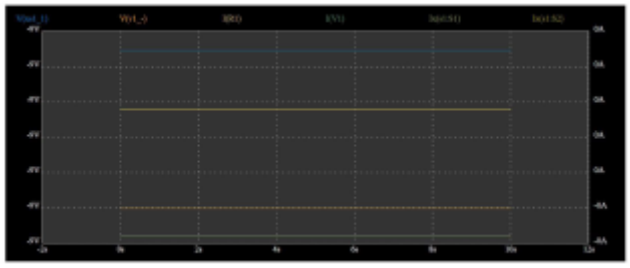

Fig.7

REFERENCES

[1] Ali, A. 2001.Macroeconomic variables as common pervasive risk factors and the empirical content of the Arbitrage Pricing Theory. Journal of Empirical finance, 5(3): 221–240.

[2] Basu, S. 1997. The Investment Performance of Common Stocks in Relation to their Price to Earnings Ratio: A Test of the Efficient Markets Hypothesis. Journal of Finance, 33(3): 663-682.

[3] Bhatti, U. and Hanif. M. 2010. Validity of Capital Assets Pricing Model.Evidence from KSE-Pakistan.European Journal of Economics, Finance and Administrative Science, 3 (20).

[4] Arthur E. Cote, "Fire Protection Handbook," Nineteenth Edition, Volumes I & II, Copyright© 2003, National Fire Protection Association, Inc., Quincy, Massachusetts, USA.

[5] Robert Burke, "Fire Protection Systems and Response," CRC Press, Taylor & Francis Group LLC© 2008, New York, USA.

[6] .Terry Kennedy and John E. Traister, "Low Voltage Wiring: Security/Fire Alarm Systems," Copyright© 2002 by the McGraw-Hill Companies, Inc., USA.

[7] Jeffrey S. Tubbs, "Intelligent Fire Alarm Systems," Fire Protection Engineering Journal by the Society of Fire Protection Engineer (SFPE), ISSN 1524 – 500X, Issue No. 11, September 2011, OH, USA.

[8] John Ypsilantis, "The Trial of a Self-Learning Alarm Processor and Generator," Heuristics Australia Pty Ltd, Copyright© 2001 J., Sydney, Australia http://www.heuristics.com.au .

[9] .Raúl Costa, Nuno Cachulo, and Paulo Cortez, "An Intelligent Alarm Management System for Large-Scale Telecommunication companies," Proceeding EPIA '09 Proceedings of the 14th Portuguese Conference on Artificial Intelligence: Progress in Artificial Intelligence Springer-Verlag Berlin, Heidelberg©2009.