SMART FIRE AND ALARM SYSTEM

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ABSTRACT

Design and Implementation of Fire Alarm Circuit combinational digital circuit which can perform an alarm by the voice signal. This project detects smoke using Light Dependent Resistor & Light Emitting Diode. Normally speakers have no alarm but when smoke detects then alarming. The project is based upon a major approach to control and secure homes, office, shop, markets, and University, etc. For the fire alarm, the main circuit design used (ISIS) software, and the circuit was finally implemented on a breadboard.

Keywords: *Combinational digital circuit, Resistor, Light Emitting Diode, ISIS.*

I. INTRODUCTION

A fire alarm system has several 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 pulsations. Alarms can be either motorized bells or wall mountable sounders or horns. They can also be speaker strobes that 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 using 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 applications inappropriate for or hostile to other detection methods.

II. PROBLEM STATEMENT

Safety is a crucial consideration in the design of residential and commercial buildings to safeguard against the loss of life and damage to property. The existing fire alarm system on market nowadays is too complex in terms of its design and structure. Since the system is too complex, it needs regular maintenance to be carried out to make sure the system operates well. Meanwhile, when the maintenance is being done to the existing system, it could raise the cost of the system

III. CIRCUIT ELEMENTS

1. **Light Dependent Resistor:** LDRs or Light Dependent Resistors are very useful, especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1000 000 ohms, but when they are illuminated with light resistance drops dramatically.

2. Light Emitting Diode:

Light-emitting diodes, commonly called LEDs, are real unsung heroes in the electronics world. They do dozens of different jobs and are found on all kinds of devices. Among other things, they form numbers on digital clocks, transmit information from remote controls, light up watches and tell you when your appliances are turned on. Collected together, they can form images on a jumbo television screen or illuminate a traffic light.

3. LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

3. 3-Terminal 1A Positive Voltage Regulator: The LM78XX series of three-terminal positive regulators are available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut-down, and safe area protection, making it essentially indestructible. If adequate heat sinking is provided, they can Deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

4. Transistor BC547: BC547 is an NPN bipolar junction transistor. A transistor stands for transfer of resistance and is commonly used to amplify current. A small current at its base controls a larger current at collector & emitter terminals. BC547 is mainly used for amplification and switching purposes. It has a maximum current gain of 800. Its equivalent transistors are BC548 and BC549.

The transistor terminals require a fixed DC voltage to operate in the desired region of its characteristic curves. This is known as bias. For amplification applications, the transistor is biased such that it is partly on for all input conditions.

The input signal at the base is amplified and taken at the emitter. BC547 is used in a common emitter configuration for amplifiers. The voltage divider is the commonly used biasing mode. For switching applications, the transistor is biased so that it remains fully on if there is a signal at its base. In the absence of a base signal, it gets completely off.

5. Transistor C1815Y: Enhanced performance, new generation, high-voltage, high-speed switching NPN transistor with an integrated damper diode in a plastic full-pack envelope intended for use in horizontal deflection circuits of color television receivers. Features exceptional tolerance to base drive and collector current load variations resulting in a very low worst-case dissipation.

IV. WORKING

The answer to that question is two answers because there are two quite different kinds of smoke detectors. One is a kind of electronic eye; the other's a sort of electronic nose. The eye type of detector is more properly called an optical smoke detector (or photocell smoke detector) and it works a bit like Tom Cruise in Mission Impossible. Remember the scene when Tom dangles from the ceiling trying to avoid all those light-detecting burglar beams? An optical smoke detector is just like that inside. Let's take a look.

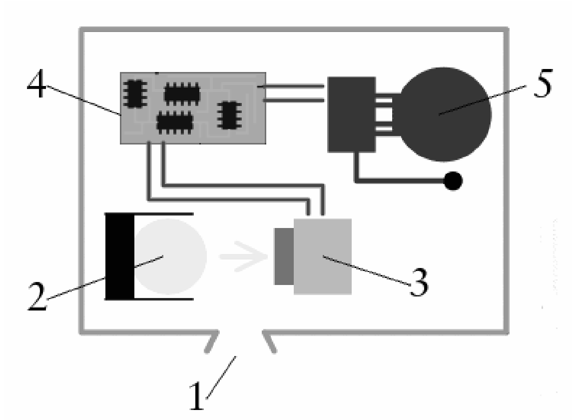

Fig 4.1: Working of optical smoke detector

The detector must be screwed to your ceiling because that's where smoke heads for when something starts to burn. Fire generates hot gases and because these are less dense (thinner—or weigh less per unit of volume) than ordinary air they rise upward, swirling tiny smoke particles up too.

The detector is designed with a large opening in the bottom (1), shown upper right in our top photo, that leads to the detection chamber up above.
An invisible, infrared light beam, similar to the ones that Tom Cruise dodged, shoots across the chamber from a light-emitting diode or LED (2) to a photocell (3). The photocell is an electronic light detector that generates electricity for as long as light falls on it. Normally, when there is no smoke about, the light beam shoots constantly between the LED and the detector. An electronic circuit (4) detects that all is well and nothing happens. The alarm (5) remains silent.

But if a fire breaks out, smoke enters the chamber (6) and interrupts the beam (7). Because no light is falling on the photocell, it does not generate an electric current anymore. The circuit spots this straight away (8), realizes something's amiss and triggers the shrill and nasty alarm (9) that wakes you up and saves your life.

V. BLOCK DIAGRAM

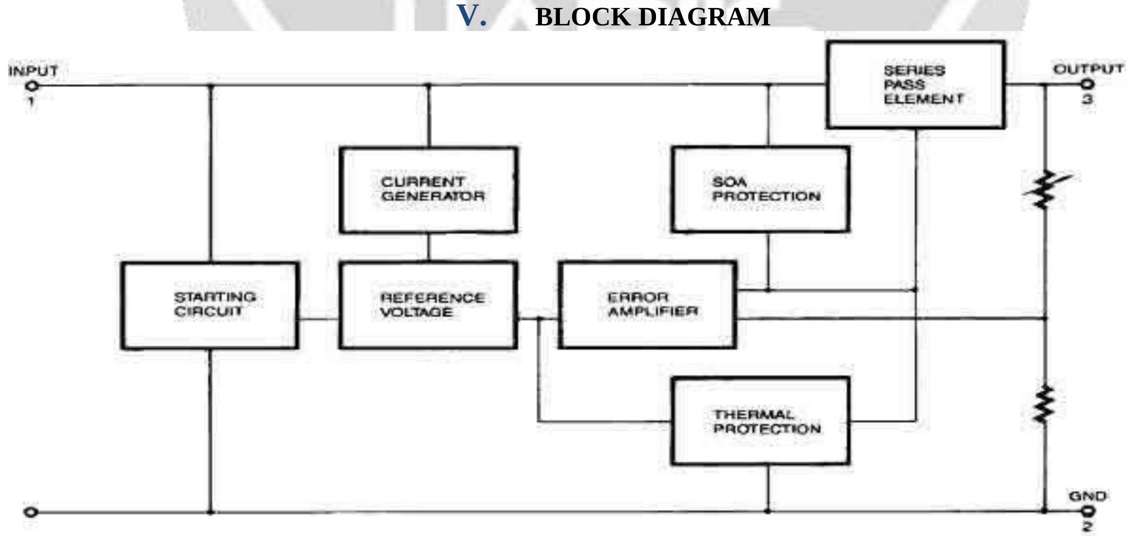

Figure 5.1:Block diagram

VI. CIRCUIT DIAGRAM

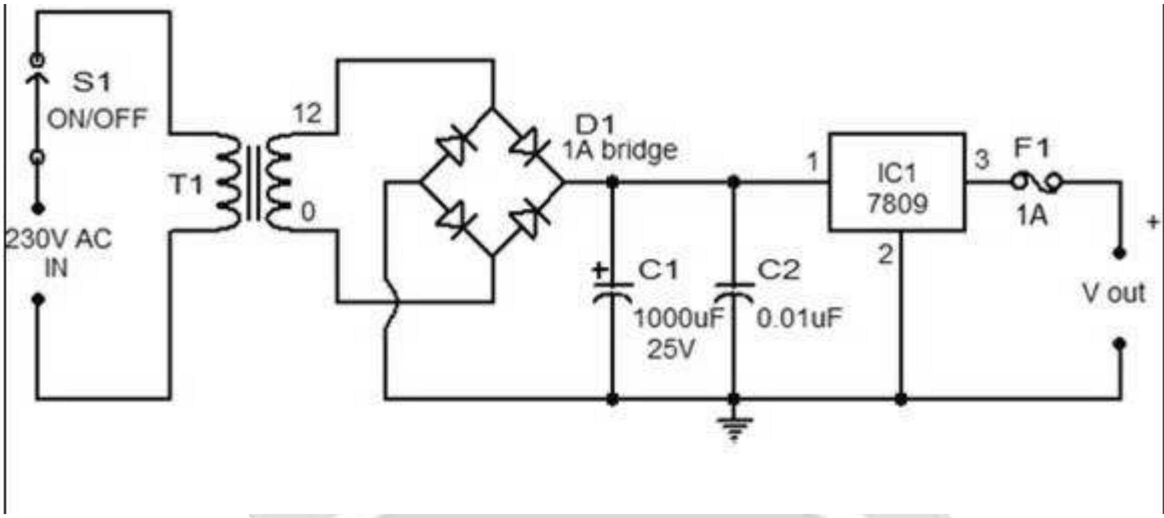

Figure 6.1: 9V Power supply for Circuit

A well-regulated power supply is essential for this circuit because even slight variations in the supply voltage could alter the biasing of the transistor used in the fire sensing section and this could seriously affect the circuit's performance.

A regulated 9V/500mA power supply that can be used for powering the basic fire alarm circuit and its modified versions is shown above. Transformer T1 is a 230V primary, 12V secondary, and 500mA step-down transformer. D1 is a 1A bridge that performs the job of rectification.
Capacitor C1 filters the rectifier output and C2 is the AC by-pass capacitor. IC1 (7809) is a 9V fixed positive voltage regulator. The output of the rectifier+filter section is connected to the input of 7805 and a regulated steady 9V is obtained at its output. S1 is the ON/OFF switch. F1 is a 500mA safety fuse.

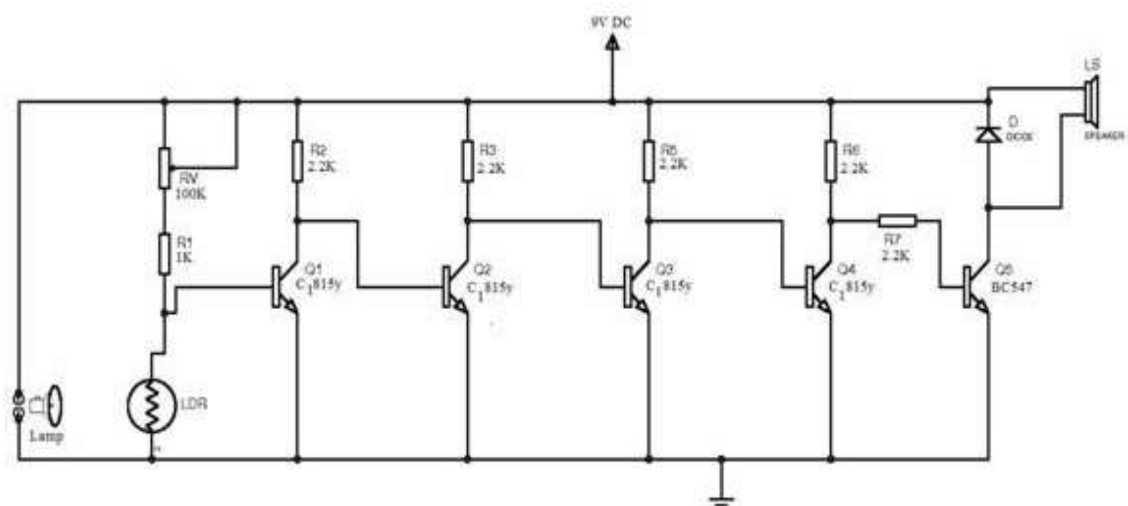

Figure 6.2: Fire Alarm Main Circuit

Normally, led are high lighting & then LDR resistance is meager. Then the transistor Q1 is off & the collector current of Q1 flows to the base of transistor Q2 &is it on. Then collector current of Q1 flows to the emitter. Then transistor Q3 off. The collector current of Q3 passes to the base of the Q4 transistor & it is on. The current is passing from collector to emitter. Then transistor Q5 off & Speaker no alarm.

But when fire breakout LDR resistance increased & transistor Q1 on, current are flowing collector to emitter. Then transistor Q2 off. The collector current of Q2 flows to the base of the Q3 transistor. This current on transistor Q3 & current flowing collector to emitter. Then transistor Q4 off. The collector current of Q4 flows to the base of transistor Q5 & it on. Then current flowing collector to emitter & speaker alarming.

VII. APPLICATION

- 96 Outputs Plasma Display Driver 90V Absolute Maximum Rating Reduced EMI (Electro-Magnetic Interference) 3.3V / 5V Compatible Logic -40 / 30 mA
- Source / Sink Output Mos 6 Bit Data Bus (40 MHz) BCD Process Packaging Adapted to Customer Request (DICE, COB, COF, TAB).

VIII. RESULT

The present paper offers a response for maintaining a strategic distance from such disasters by checking the structure yet likewise talking about the proportional with IoT framework to kill the fire delivering operators and the chief control if there ought to emerge from an event of a spillage. Additionally, it establishes a caution similarly as establishes a connection with the authorities. Further progress can be by abstaining from concealing sensors which will have the choice to identify the territory reliant on concealing coding. At the point when the temperature and gas are distinguished, the IoT-based alarm produces the alarm sound and it tends to be checked by utilizing an IoT server and a few sensor esteems are recognized it will be introduced on the web through the web of things.

IX. CONCLUSION

The developed prototype in this work is made for a user to control the fire alarm system remotely. This helps the user if he/she is not in the building or even unaware of an emergency condition. The use of this prototype will avoid unpredictable situations or any critical situations from occurring in the residential areas without the awareness of the resident. The home alert system is observed to be functional by triggering the fire extinguisher. The use of a coupled sensor of temperature sensor and the smoke detector was found to be more appropriate than the use of only one of them. Though the prototype was able to extinguish the fire the portability can be significantly improved by efficient assimilation of the different modules. This system should also take care that each module of it can be easily replaced by a better sensor and equipment with updated technology.

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