VISVESVARAYA TECHNOLOGICAL UNIVERSITY

MINI PROJECT REPORT ON

"LPG GAS DETECTOR"

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CERTIFICATE

Certified that the mini project work entitled "**Gas leakage detector**" carried out by **Pudi Yashwanth (1NH18EE043),Pramod Aithal (1NH18EC087),Naveen Krishna (1NH18EC082),Vaishak. Lakshmanan (1NH18EC117)** bonafide students of Electronics and Communication Department, New Horizon College of Engineering, Bangalore.

The mini-project report has been approved as it satisfies the academic requirements in respect of mini-project work prescribed for the said degree.

Project Guide HOD ECE

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External Viva

Name of Examiner Signature with Date

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ACKNOWLEDGEMENT

The satisfaction that accompany the successful completion of any task would be, but impossible without the mention of the people who made it possible, whose constant guidance and encouragement helped us succeed.

We thank **Dr. Mohan Manghnani**, Chairman of New Horizon Educational Institution, for providing necessary infrastructure and creating good environment.

We also record here the constant encouragement and facilities extended to us by **Dr.Manjunatha**, Principal, NHCE and **Dr. Sanjeev Sharma**, head of the Department of Electronics and Communication Engineering. We extend sincere gratitude to them.

We sincerely acknowledge the encouragement, timely help and guidance to us by our beloved guide **Dr. Reema Sharma** to complete the project within stipulated time successfully.

Finally, a note of thanks to the teaching and non-teaching staff of electronics and communication department for their cooperation extended to us, who helped us directly or indirectly in this successful completion of mini project.

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ABSTRACT

In this project we are employing the use of a MQ6 gas sensor which detects the leakage of combustible or LPG gas in the surrounding areas. It also sends an audio visual signal to the operators using a LED and buzzer.

MQ 6 gas sensor uses a semiconductor sensor inside. This semiconductor is protected by an aluminium mesh which protects it from the outside elements. It detects combustible gases by a chemical reaction that takes place when the gas comes in direct contact with the sensor. Tin dioxide (SnO2) is the most common material used in semiconductor sensors and the electrical resistance in the sensor is decreased when it comes in contact with the detected gas.

The signal output from the sensing module is sent to the 4th pin of the IC555. We are employing the use of IC 555 timer to produce pulse. The output from pin 3 is branched and sent to the LED through a 560 ohm resistor and SL100 transistor through a 1k resistor. The current then passes through the collector and gives a signal to the buzzer which produces noise and alerts the people in the surrounding area.

In this project we rigged the circuit on a bread board and gave a suitable power supply of 9V.

Introduction

> Fire accidents kill 54 people daily in India, yet deaths have declined
>
> Accidental fires caused 6% of all unnatural deaths in India, third-highest after car accidents at 53%, and drowning at 9%

A gas detector is a device that detects the presence of combustible gases in the immediate area, often as part of a safety system. This type of equipment is used to detect a gas leak or other emissions and can interface with a control system so a process can be automatically shut down or the leakage of gas can be controlled.

A gas detector can sound or send an audio visual signal to operators in the area where the leak is occurring, giving them the opportunity to leave or fix the gas leakage. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals**.**

Gas leak detection is the process of identifying potentially hazardous or combustible gas leaks by sensors. Additionally a visual and audio identification can be done using an LED and a buzzer. These sensors usually employ an audible alarm to alert people when a dangerous gas has been detected.

Exposure to toxic gases can also occur in operations such as painting, fumigation, fuel filling, construction, excavation of contaminated soils or nuclear landfills, mining operations, coal mining in confined spaces, etc.

Common sensors include combustible gas sensors, photoionization detectors, infrared point sensors, ultrasonic

sensors, electrochemical gas sensors, and semiconductor sensors.

In this project we are employing the use of a semiconductor sensor called a MQ6 sensor which detects leakage of LPG and other combustible gas in houses or working conditions.

Semiconductor sensors detect gases by a chemical reaction that takes place when the gas comes in direct contact with the sensor. Tin dioxide (SnO_2) is the most common material used in semiconductor sensors and the electrical resistance in the sensor is decreased when it comes in contact with the monitored gas. The resistance of the tin dioxide is typically around 50 kΩ in air. This change in resistance is used to calculate the gas concentration in the air.

Semiconductor sensors are commonly used to detect leakage of LPG and other combustible gases. One of the most common uses for semiconductor sensors is in MQ 6. They are used in

LPG gas detection alarm system because the tin dioxide element in the sensor must come in contact with the gas to detect it. The semiconductor sensors work over a smaller distance than infrared point or ultrasonic detectors.

Features of MQ6 gas sensor module:-

- High sensitivity to CH4, Natural gas and LPG.
- Small sensitivity to alcohol, smoke
- Fast response
- Stable and long life
- Simple drive circuit

In this project we are employing the use of an IC 555 timer to provide precise time delays.

The pin out diagram is given below:-

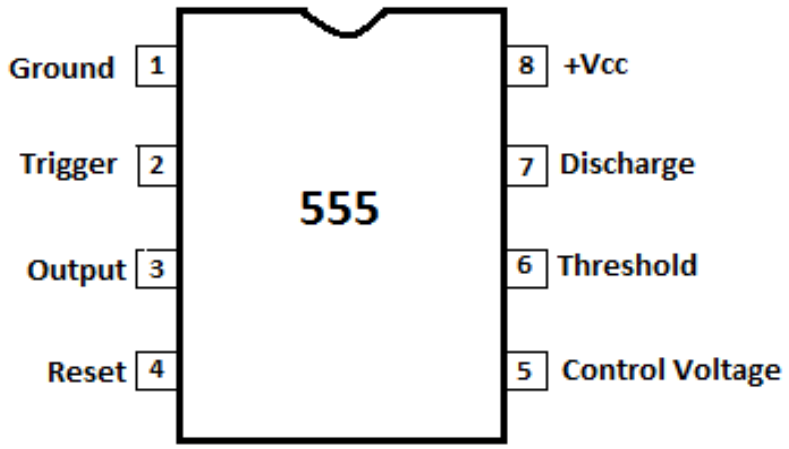


FIG 1.1

MQ6 LPG gas sensor module:-

FIG 1.2

Circuit diagram of gas sensor:-

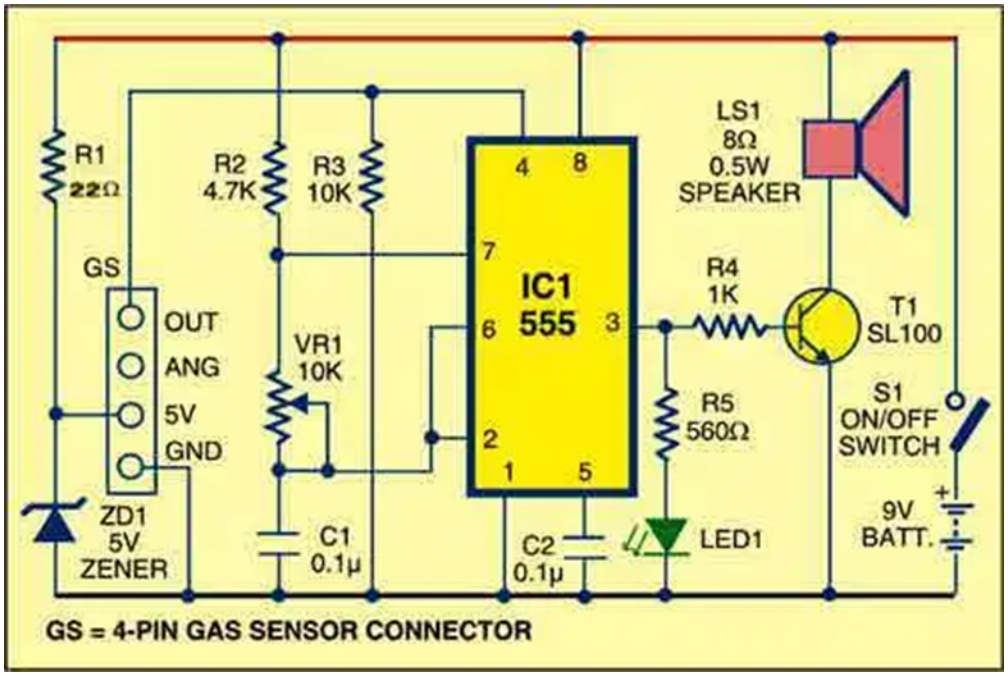


FIG 1.3

LITERATURE SURVEY

PAPER NO	TITLE	AUTHOR AND YEAR OF PUBLICATION	OUTCOME
1.	A Survey on LPG Level Monitoring & Gas Leakage Detector	Madura Ghule, Komal Hole, Sayali Pathak , Nishigandha Patil , Prof. Santosh A. Darade Year of Publication : March 2018 in IJRC.	Information on various circuits for detecting gas leakage and circuit for gas sensor using IC555 was obtained.
2.	LPG leakage detection and controlling system	Prof.M.Amsaveni, A.Anurupa, R.S.Anu Preetha, C.Malarvizhi, M.Gunasekaran Year of Publication: March 2015 in IJES.	The sensor could be used to detect different combustible gas, especially Methane; it is with low cost and suitable for different applications. The MQ-6 can detect gas concentrations anywhere from 200 to 10000 ppm. The sensor's output is an analog resistance.
3.	Study of IC555 (Timer IC)	Jay Metha Year of Publication: 2016	It gives information on the time delay produced at the output is independent of voltage fluctuations. It depends on external resistance and capacitance. It studies the compatibility of IC 555 with both Analog and Digital circuits.

CHAPTER 03

PROPOSED METHODOLOGY

The method in which MQ 6 detects the leakage of LPG and other combustible or harmful gases is that it has a filament of Tin Oxide inside the sensor which is covered by an aluminum mesh. It is very sensitive to certain gases like liquid petroleum gas, methane, carbon dioxide etc. When the monitored gas comes in direct contact with the filament the electrical resistance in the sensor decreases and it sends a signal to the alarm system which consists of LED and a buzzer.

The important and the most useful part of the system is IC 555. All the output devices are controlled by IC 555. It also reads and manipulates the input from sensor. The MQ6 sensor has an electrochemical sensor, which changes its resistance for different concentrations of varied gasses. The sensor is connected in series with a variable resistor to form a voltage divider circuit, and the variable resistor is used to change sensitivity to which the sensor detects. When one of the above gas comes in contact with the sensor after heating, the sensor's electrical resistance changes. The change in the resistance changes the voltage across the sensor, and this voltage can be read by a microcontroller. The voltage value can be used to find the resistance of the sensor by knowing the reference voltage and the other resistor's resistance. The sensor has different sensitivity for a different type of gases.

The functionality of the system is divided into three main steps. In the initial step, the gas leakage is detected by the gas sensor. This detects the gas leakage and gives the signal to the microcontroller. After that in the second step the microcontroller receives the signal, which sends by gas sensor. It sends activation signal to other external devices attached such as LED and buzzer .The audio visual signal will show the gas is detected in excess quantity in the immediate surroundings.

CHAPTER 04

PROJECT DESCRIPTION

A gas detector is a device that detects the presence of combustible gases in the immediate area, often as part of a safety system**.**

It usually sends an audio visual signal to the operators to alert them of leakage of combustible or harmful gases in the environment.

It can be used in painting, fumigation, fuel filling, construction, excavation of contaminated soils or nuclear landfills, mining operations, coal mining in confined spaces, etc.

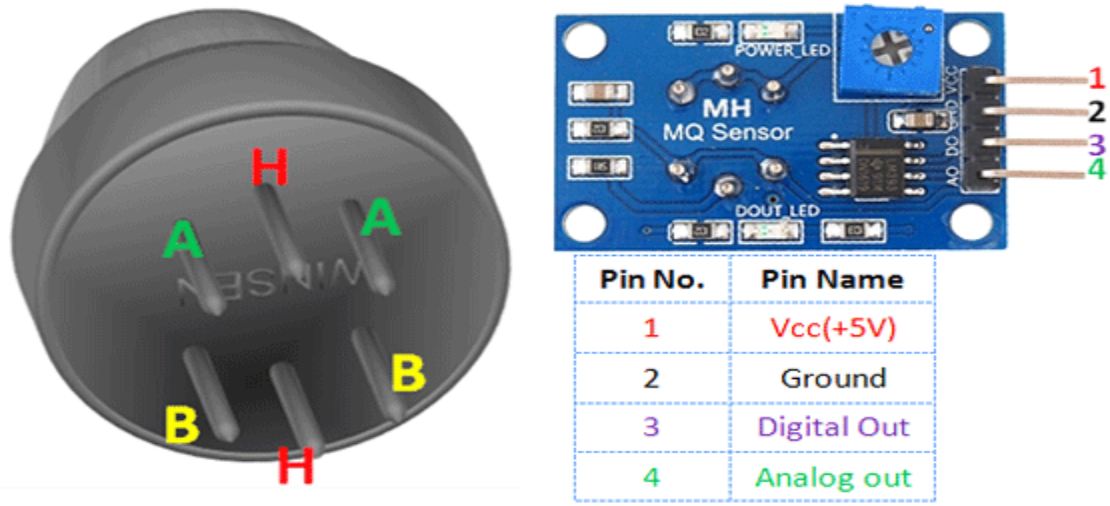
This mini project consists of the following components:-

1. MQ 6 LPG Gas Sensor Module.
2. 9V Power Supply.
3. IC 555 Timer.
4. Transistor (SL100)
5. 5V Zener Diode.
6. Buzzer.
7. LED.
8. Variable Resistance (10K)
9. Resistors.
10. Capacitors.
11. Bread Board.
12. Jumper Wires.

1. MQ 6 LPG Gas Sensor Module:-

The MQ-6 Gas sensor can detect or measure the ppm of gases in the atmosphere like LPG and other harmful or combustible gases. The MQ-6 sensor module comes with a Digital Pin and Analog Pin which makes this sensor to operate even without a microcontroller or Arduino board and this comes in use when you are only trying to detect one type of particular gas. When it comes to measuring the gas in ppm the analog pin has to be used, the analog pin also TTL driven and works on 5V and hence can be used with most common microcontrollers.

MQ 6 has a Tin Oxide filament inside the sensor which is protected by an aluminum mesh which protects the filament
from external forces.
When combustible gases or harmful gases comes in contact with the Tin Oxide filament inside, the electrical resistance of the chemical filament decreases and the gas is detected and sends and audio-visual signal in the form of LED and a buzzer.
Therefore we are using this sensor to detect or measure gasses like LPG, or methane with or without a microcontroller or Arduino board.



Pin No.	Pin Name
1	Vcc(+5V)
2	Ground
3	Digital Out
4	Analog out

FIG 4.1

2. IC555 Timer:-

The 555 timer IC is an integrated circuit used in a various application like timer, pulse generation, and for oscillations.

It can be used to provide time delays, as an oscillator, and can be used as a flip-flop because it is a bi-stable element.

Depending on the chip, the standard 555 chip package includes 25 transistors, 2 diodes and 15 resistors on a silicon chip installed in an 8-pin dual in-line package.

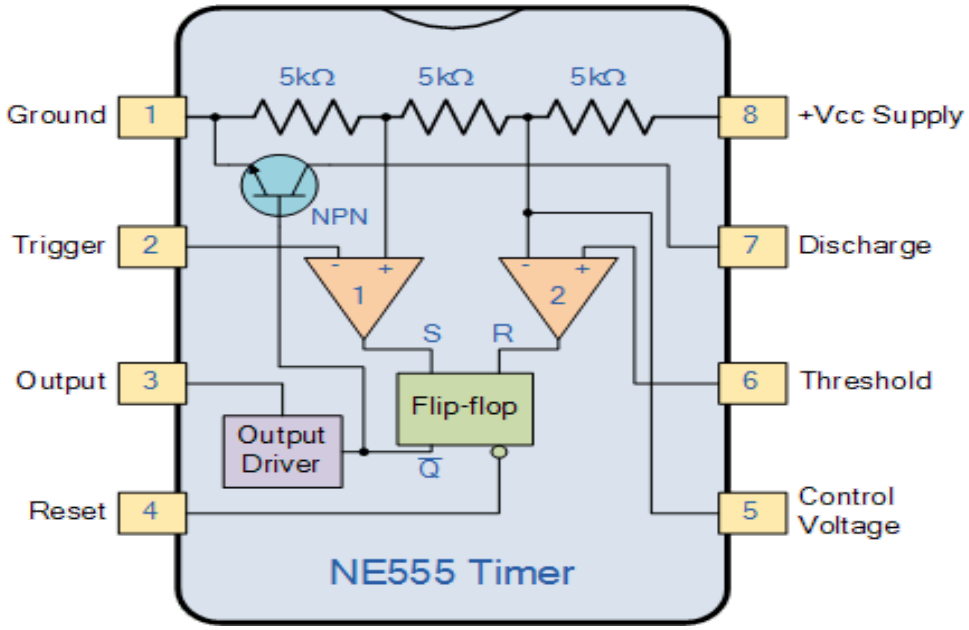


FIG 4.2

3. Transistor (SL100):-

Transistors are the basic building blocks of integrated circuits.
SL100 is a general purpose low power transistor. It can be used for the various application like switching circuits, amplifying circuits, and manufacturing of the logic gates.
It is a NPN Transistor. NPN Transistors consists of a P type material sandwiched between two N type materials.
It has emitter, base and collector.
In this circuit the transistor is in Common Emitter configuration.
The input is given base and the output is taken from collector and emitter is grounded.

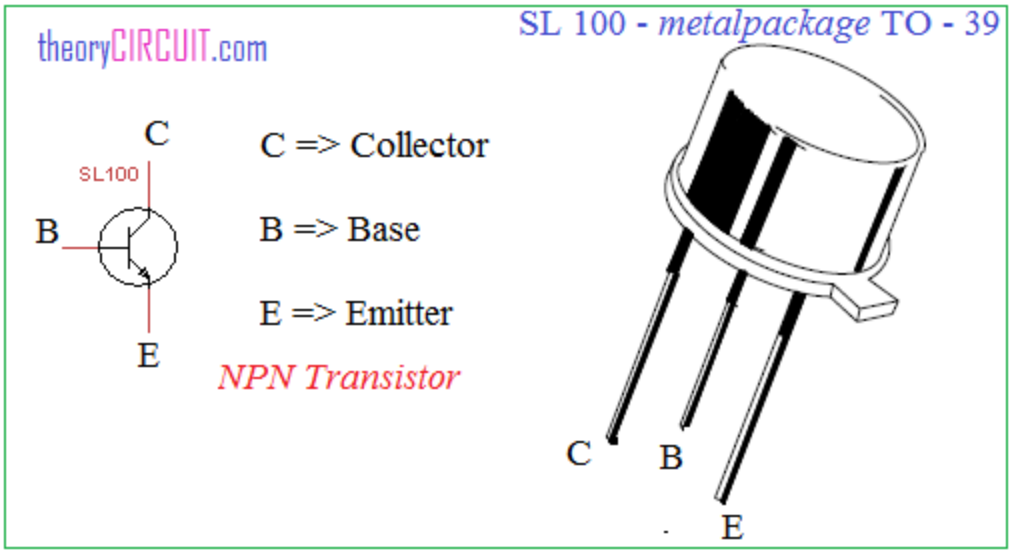


FIG 4.3

4. 9V Power Supply:-

The **nine-volt battery**, or **9-volt battery**, is a common size of battery that was introduced for the early transistor radios. It has a rectangular prism shape with rounded edges and a polarized snap connector at the top. This type is commonly used in walkie-talkies, clocks and smoke detectors.

The nine-volt battery format is commonly available in primary carbon-zinc and alkaline chemistry, in primary lithium iron disulfide, and in rechargeable form in nickel-cadmium, nickel-metal hydride and lithium-ion. Mercury-oxide batteries of this format, once common, have not been manufactured in many years due to their mercury content. Designations for this format include *NEDA 1604* and *IEC 6F22* (for zinc-carbon) or *MN1604 6LR61* (for alkaline). The size, regardless of chemistry, is commonly designated **PP3**—a designation originally reserved solely for carbon-zinc, or in some countries, *E* or *E-block*.

Most nine-volt alkaline batteries are constructed of six individual 1.5 V LR61 cells enclosed in a wrapper. These cells are slightly smaller than LR8D425 AAAA cells and can be used in their place for some devices, even though they are 3.5 mm shorter. Carbon-zinc types are made with six flat cells in a stack, enclosed in a moisture-resistant wrapper to prevent drying. Primary lithium types are made with three cells in series.

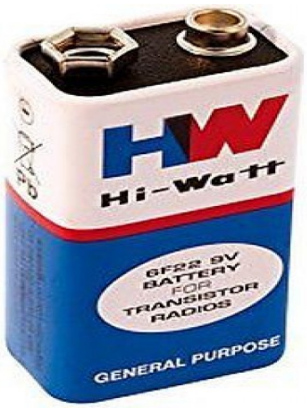


FIG 4.4

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5. Zener Diode:-

Zener Diode is a highly doped PN junction diode which works in reverse bias.
It is a type of diode that allows current to flow not only from its anode to its cathode, but also in reverse direction, when the voltage across its terminals exceeds the Zener voltage or breakdown voltage.

It is also used to protect the circuit and components from overvoltage or Electrostatic Discharge .

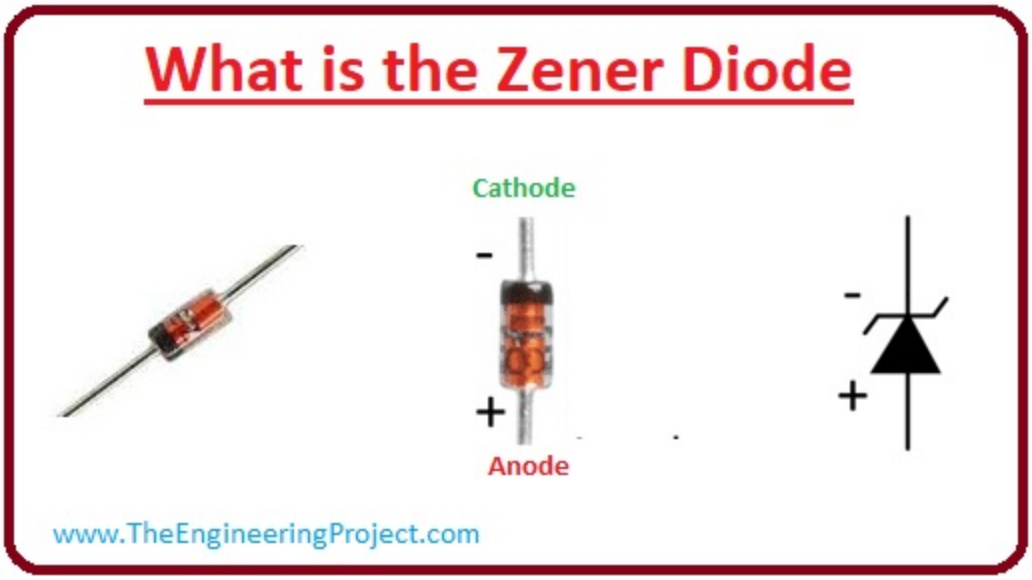


FIG 4.5

6. Buzzer :-

A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

It is used in our circuit to give audio visual signal to the operators in the surrounding areas to alert them of gas leakage.
The circuit will be switched on until the gas has been controlled or the gas supply is turned off.

7. LED:-

What is Light Emitting Diode

A light releasing diode is an electric component that emits light when the electric current flows through it. It is a light source based on semiconductors. When current passes through the LED, the electrons recombine with holes emitting light in the process. This is a specific type of diode with characteristics similar to a p-n junction diode. In other words, the LED allows forward current flow and blocks reverse flow.. Light-emitting diodes are built using a weak layer of heavily doped semiconductor material. Based on the semiconductor material used and the

amount of doping, an LED will emit a coloured light at a particular spectral wavelength when forward biased.

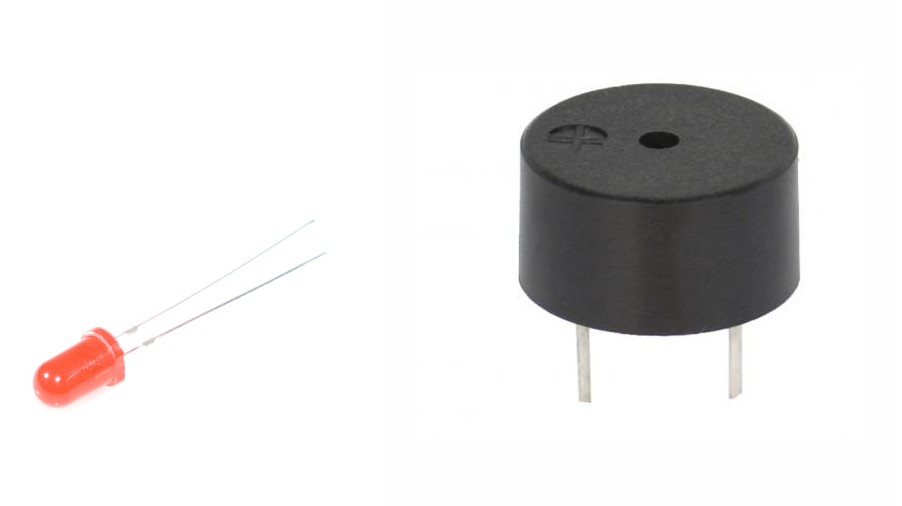


FIG 4.6

8. Variable Resistance:-

It is used in our circuit to detect the intensity of the leaked gas in the atmosphere.
We can tune it to our requirements using the knob on the resistance for the optimal detection of the specific gas and its intensity.

FIG 4.7

9. Bread Board:-

Bread Boards are used to build and test circuits without soldering or testing on printed circuit board.
It is the easiest way to rig up a circuit and troubleshoot problems if they are any.
Components are connected using jumper wires.
First 5 consecutive ports are connected to a common power and ground supply.
The middle section of the bread board are short circuited vertically.

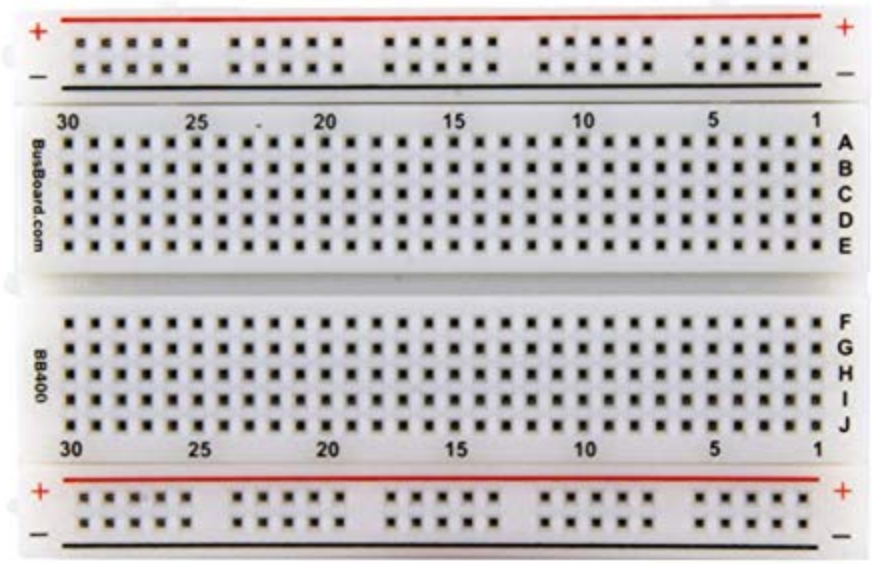


FIG 4.8

10. Jumper wires:-

A jumper cable is a simple cable with a connection pin on both ends and can be used to connect two points together without soldering. Jumpers are generally used on breadboards and other prototyping tools to facilitate circuit editing as needed.

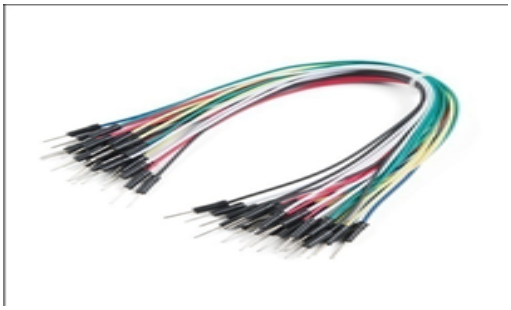


FIG 4.9

11. Resistors:-

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses. High-power resistors that can dissipate many watts of electrical power as heat may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented in the integrated circuit.

The electrical function of the resistor is specified by the resistor. Typical commercial resistors are manufactured with more than 9 digits. The nominal value of the resistance is within the manufacturing tolerances indicated on the component.

OHM'S LAW

The behavior of an ideal resistor is dictated by the relationship specified by Ohm's law:

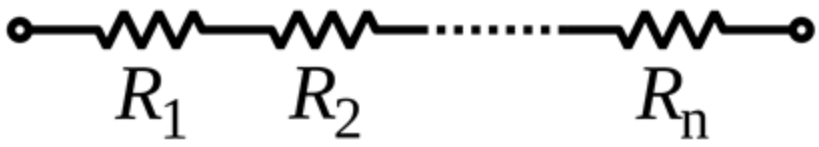
{\displaystyle V=I\cdot R.}

Ohm's law states that the voltage (V) across a resistor is proportional to the current (I), where the constant of proportionality is the resistance (R). For example, if a 300 ohm resistor is attached across the terminals of a 12 volt battery, then a current of 12 / 300 = 0.04 amperes flows through that resistor.

Practical resistors also have some inductance and capacitance which affect the relation between voltage and current in alternating current circuits.

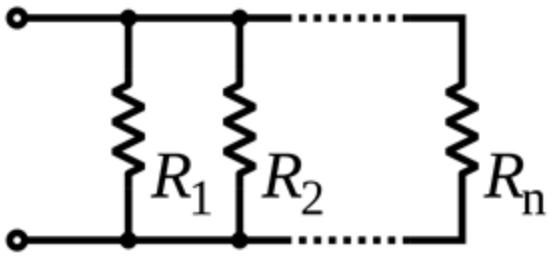
The ohm (symbol: Ω) is the SI unit of electrical resistance, named after Georg Simon Ohm. An ohm is equivalent to a volt per ampere. Since resistors are specified and manufactured over a very large range of values, the derived units of milliohm ($1m\Omega = 10^{-3}\ \Omega$), kilohm ($1k\Omega = 10^{3}\ \Omega$), and megohm ($1\ M\Omega = 10^{6}\ \Omega$) are also in common usage.

SERIES RESISTANCE

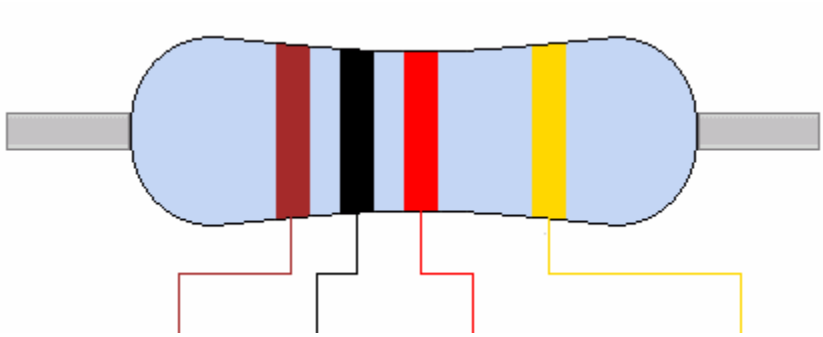


The total resistance of resistors connected in series is the sum of their individual resistance values.

PARALLEL RESISTANCE



The total resistance of resistors connected in parallel is the reciprocal of the sum of the reciprocals of the individual resistors.



Black	0	0	0	1	-
Brown	1	1	1	10	±1%
Red	2	2	2	100	±2%
Orange	3	3	3	1000	-
Yellow	4	4	4	10 000	-
Green	5	5	5	100 000	±0.5%
Blue	6	6	6	1 000 000	±0.25%
Violet	7	7	7	10 000 000	±0.1%
Gray	8	8	8	100 000 000	±0.05%
White	9	9	9	1000 000 000	-
Gold				0.1	±5%
Silver				0.01	±10%
None					±20%

WORKING:-

The circuits shown in journals and online sites are quite complicated and hard to understand because they used timers and other IC's in that. Here we simplified it and got an easy to understand and simple circuit.

In our project, we have used a 9V power supply to power the breadboard where we have rigged the circuit. The current passes through a zener diode and powers the gas sensing module.The sensor module has four ports, the second is for power input. Once the sensor is powered on it starts sensing the combustible gases in its surroundings. Once the gases are detected the output is is used high and the signal is sent to the IC555 timer. the timer is used to produce pulses these pulses are used trigger the buzzer and the LED. The current output is taken from pin 3 of the timer IC. this is branched into two branches. One of them is given to the LED through 1k resistance. The other branch is given to a transistor, whose output is given to the buzzer.

The buzzer produces sounds and the LED lights up to alert the operators in the surroundings to take the needed measures and control the leakage or turn off the source of the gas. This can prevent major accidents and leakage of harmful gases into the atmosphere that are life risk.

CHAPTER 05

RESULT AND DISCUSSION

The result that we expect from out mini project **" GAS LEAKAGE DETECTOR"** is that it will detect the leakage of combustible or LPG gases in the surrounding areas and sends an audio visual signal through LED and a buzzer which alerts the operators working in the area.

To leak LPG gas we have used two zippo lighters. The zippo lighters use naptha or liquified petroleum gas. Once the flame is high, higher amount of the gas is leaked which makes it easy for the sensor to sense the gas.

We have used a 9V power supply to power the breadboard where we have rigged the circuit. The current passes through a zener diode and powers the gas sensing module.The sensor module has four ports, the second is for power input. Once the sensor is powered on it starts sensing the combustible gases in its surroundings. Once the gases are detected the output is is used high and the signal is sent to the IC555 timer. the timer is used to produce pulses these pulses are used trigger the buzzer and the LED. The current output is taken from pin 3 of the timer IC. this is branched into two branches. One of them is given to the LED through 1k resistance. The other branch is given to a transistor, whose output is given to the buzzer.

The buzzer produces sounds and the LED lights are up to alert the operators in the surroundings to take the needed measures and control the leakage or turn off the source of the gas. This can prevent major accidents and leakage of harmful gases into the atmosphere that are life risk.

Conclusion

As we know there has been many incidents of gas explosion due to the carelessness of the people and sometimes due the faulty pipes or any other instrument which cause devastating explosion where many lives are lost and many injured beyond cure, and also a lot of property damage for the govt as well. This can be avoided easily by using this gas leakage detector. It is said the 6% of the unnatural death is due to fire accidents and with a population of 1,36,81,38,206 as per 29 oct 2019 you can just imagine how many die every year due to this.

About 54 die everyday due to fire accidents .

This gas sensor can is cheap coming up to less than 200 rupees for a set and can be made easily available in every household for free. To prevent any sort of accident due to gas leakage at home. And this also prevents wastage of gas thus saving it. As we know LPG is an exhaustible source and saving it should be a main priority.

This can be used in many places to detect harmful gases and many more which will slowly kill us if not looked into on time this detector will be very helpful in that as well. As we all know the Bhopal gas tragedy on dec 1984 which affected 500,000 people . a total of 3787 dead and it did not end there their future generation was also affected upto maybe 3-4 generations.

> Fire accidents kill 54 people daily in India, yet deaths have declined
>
> Accidental fires caused 6% of all unnatural deaths in India, third-highest after car accidents at 53%, and drowning at 9%

Future scope

There can still be many modifications that can be done to the gas detector, just by adding additional features.

The model we made is only for a small household purpose and in the future since seeing the technology growing at such a speed we can expect much more advanced , efficient and easier way to stop any accidents caused due to gas leakage. The future holds everything. They could make the response feedback from the sensor faster.

In the future if the leak is detected a message could be sent and the cause could be found by AI and also stopped. That is if there is a leak the owner will first be informed and then the machine will check from there is the gas leaked and what is the reason and stop it as soon as possible and allowing ventilation.

REFERENCES:

1. Aravinda Beliraya" GSM Based Gas Leakage Detection System Using Arduino"

2. .J.M.Huges, Aurdino A Technical Reference ,O'Reilly Media,Inc

3. Mr. Akshay D. Prabhu,Mr. Ashwin D. Pathak" Gas Leak Detector using Arduino UNO Microcontroller"

4. Ahuja,R.B.Bhattacharya, S. "An analysis of 11,196 burn admissions and evaluation of conservative management techniques"

5. C. Selvapriya, S. Prabha Sathya, M. Abdulrahim, C. K. Aarthi, " LPG Leakage Monitoring and Multilevel Alerting System", International Journal of Engineering Sciences & Research Technology

6. Prof. Pankaj C. Warule, Shivam Upadhyay, Snehal S. Shelke, Sumitra K. Khandade, "LPG Detection, Metering and Control System Using Microcontroller",