

FIRE AND GAS DETECTING ALARM SYSTEM WITH EXHAUSTER

Submitted in partial fulfillment of the requirements for the award of

Bachelor of Engineering degree in

Electrical and Electronics Engineering

by

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INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with Grade "A" by NAAC

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **B.TARUN**
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carried
out the project entitled "**FIRE AND GAS DETECTING ALARM SYSTEM**
WITH EXHAUSTER" under our supervision from to

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We **B.TARUN** (Reg No. 40140006), **S.RAKESH** (Register No. 40140030), hereby declare that the Project Report entitled “**FIRE AND GAS DETECTING ALARM SYSTEM WITH EXHAUSTER**” done by us under the guidance of **Dr.BHUVANESWARI** mam is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electrical and Electronics Engineering.

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ABSTRACT

This project focuses on developing an electronic system that detects gas leakage and smoke giving visual level indication using LEDs. In case of high concentration gas or smoke detected, the system wirelessly activates a relay to switch off the mains thus preventing a major possibility of fire accident and also gives audio alarm for the same. The analog voltage values equivalent of smoke and gas concentration detected are wirelessly transmitted to be displayed on a computer screen periodically. The system is advantageous compared to the existing systems in the way that it is a battery powered, smart standalone module that does not require human intervention.

However, the success of a fire and gas detecting alarm system with an exhauster can be determined by its ability to accurately detect and alert occupants to the presence of gas or fire, as well as its effectiveness in quickly and safely evacuating the premises through the use of the exhauster

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CHAPTER 1

INTRODUCTION

1.1GENERAL

Fire alarm systems also commonly called smoke alarm and it provide a means to detect and identify a fire or a potential fire outbreak in a building, warn the occupants of the building about the fire via audible alarm and potentially notify emergency response professionals. The main components of a fire alarm system are typically the smoke detectors and other detectors like heat, gas detectors, which enable a person who physically detects fire to raise the alarm, bell or alarm sounders, flashers, and control panel, which is the brain of the system. A fire and gas detecting alarm system with an exhauster is a vital safety system designed to protect people and property from the risks of fire and hazardous gases. It is commonly used in industrial settings where there is a high potential for combustible gases, such as oil refineries, chemical plants, and manufacturing facilities.

The system uses gas sensors placed throughout the facility to monitor the levels of flammable gases and smoke in the air. When hazardous levels of gases or smoke are detected, the system activates an alarm to alert personnel and initiate safety protocols, such as evacuation and isolation of the affected area. In addition to the alarm, the system can also activate an exhauster to remove the contaminated air from the space. The exhauster works by drawing the hazardous air out of the affected area and venting it safely outdoors. This helps to minimize the risk of fire and explosion and protect personnel and property from harm.

Fire and gas detecting alarm systems with exhausters are essential safety systems in industrial settings where the risks of fire and hazardous gases are high. They provide early warning of potential hazards, allowing personnel to take appropriate action to minimize the risk of injury, property damage, or loss of life. Some advantages of fire alarms include an early warning benefit and the potential to save life and property, low cost and the opportunity to place the device in chosen locations.

1.2 LITERATURE SURVEY

There is a significant body of literature on fire and gas detecting alarm systems with exhausters, reflecting their importance in industrial safety. Here are some examples of relevant studies:

"Design and implementation of a fire and gas detection system with automatic exhauster" by M. M. Osman et al. (2017). This study describes the design and implementation of a fire and gas detection system with an automatic exhauster in an oil refinery. The system used gas sensors and flame detectors to detect potential fire and gas hazards and activated an exhauster to remove hazardous gases from the affected area.

"Evaluation of a gas detection system with automatic exhauster in underground coal mines" by S. C. Chaulya et al. (2018). This study evaluated the effectiveness of a gas detection system with an automatic exhauster in an underground coal mine. The system was able to detect hazardous levels of methane and carbon monoxide and activate an exhauster to remove the contaminated air from the mine.

"Performance evaluation of fire and gas detection systems in industrial applications" by M. R. Yari et al. (2016). This study evaluated the performance of fire and gas detection systems in various industrial settings, including oil and gas, chemical, and petrochemical facilities. The study found that the use of gas sensors and exhausters significantly improved the effectiveness of the systems in detecting and controlling potential hazards.

"Optimization of fire and gas detection systems in oil and gas facilities" by S. A. Al-Sulaiman et al. (2019). This study proposed an optimization model for fire and gas detection systems in oil and gas facilities. The model considered factors such as the layout of the facility, the location of potential hazards, and the response time of the system to optimize the placement of gas sensors and exhausters.

Overall, the literature suggests that fire and gas detecting alarm systems with exhausters are an essential safety measure in industrial settings where the risks of fire and hazardous gases are high. They can detect potential hazards quickly and effectively and activate safety protocols to minimize the risk of injury, property damage, or loss of life.

1.3 SCOPE OF THE PROJECT

The future scope of a fire and gas detecting alarm system with an exhauster project may involve the incorporation of emerging technologies and features to enhance safety and efficiency. Here are some potential future developments:

The integration of the system with the Internet of Things (IoT) could allow for real-time monitoring of gas levels and other safety parameters. The integration of AI could help to improve the accuracy and speed of the system in detecting and responding to potential hazards. AI algorithms could be used to analyze data from gas sensors and other sources to predict potential hazards and trigger appropriate safety protocols. The use of wireless communication technology could allow for greater flexibility in the placement of gas sensors and exhausters, as well as easier installation and maintenance.

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1.4 ADVANTAGES OF PROPOSED TECHNIQUE

1: Improved safety: The use of gas sensors and exhausters can help to quickly detect potential fire and gas hazards and activate safety protocols, such as alarms and ventilation systems, to minimize the risk of injury, property damage, or loss of life. This can greatly improve safety in industrial settings where the risks of fire and hazardous gases are high.

2: Early detection and prevention of hazards: The system can detect potential hazards early, before they can cause significant damage or harm. This can allow for faster response times and more effective implementation of safety measures to prevent accidents and mitigate the impact of potential hazards.

3: Cost-effective: A fire and gas detecting alarm system with an exhauster can be a cost-effective safety solution in the long run. It can help to reduce the costs associated with accidents and property damage, as well as the costs of downtime and lost productivity.

4:Compliance with regulations: Many industrial facilities are required to comply with safety regulations and standards. A fire and gas detecting alarm system with an exhauster can help to ensure compliance with these regulations, as well as provide a record of safety measure.

CHAPTER 2

PROJECT DESCRIPTION

2.1 FIRE AND GAS DETECTING ALARM SYSTEM WITH EXHAUSTER

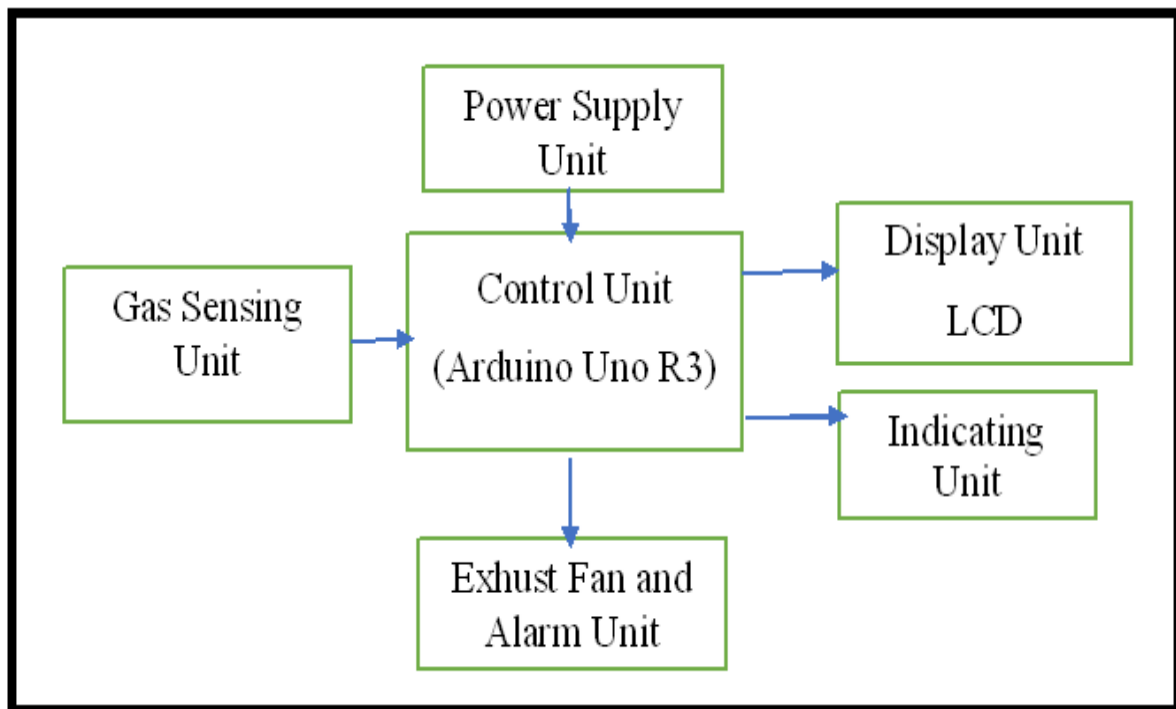


Fig 2.1 FIRE AND GAS DETECTING ALARM SYSTEM WITH EXHAUSTER

2.2 CONCEPT EXPLANATION

The concept behind a fire and gas detecting alarm system with an exhauster project is to provide a comprehensive safety solution for industrial facilities where the risk of fire and hazardous gases is high. The system uses gas sensors to detect the presence of hazardous gases, such as methane or propane, and activates an alarm system if gas levels exceed a predetermined threshold. The alarm system alerts personnel of the potential hazard with audible and visual signals..

The detailed description of the individual blocks is given in HARDWARE DESCRIPTION section.

2.3 HARDWARE DESCRIPTION

COMPONENTS:-

1. Arduino uno
2. GSM Module
3. LCD
4. MQ3 Sensor
5. Buzzer
6. Exhauster
7. I2C LCD Module
8. Relay module
9. Adapter
10. Volt battery
11. Battery cap
12. Soldering wire
13. Soldering iron
14. Connecting wire

1. ARDUINO UNO :

The Arduino Uno is a popular microcontroller board that is widely used in the field of electronics and programming for various projects. The Arduino programming language is based on C/C++, It is part of the Arduino family of open-source hardware and software platforms, designed for hobbyists, students, and professionals who are interested in creating interactive electronic projects. The Arduino Uno has a total of 14 digital I/O pins, which can be configured as inputs or outputs to interface with various external devices such as sensors, LEDs, motors, and more. These pins operate at a voltage of 5V. The Arduino Uno has 6 analog input pins, labeled as A0 to A5, It has a built-in voltage regulator that can regulate the input voltage to 5V, which is used to power the microcontroller and other components on the board.

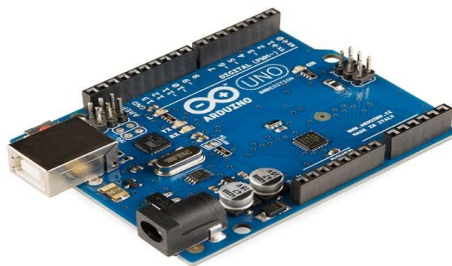


Fig : Arduino uno

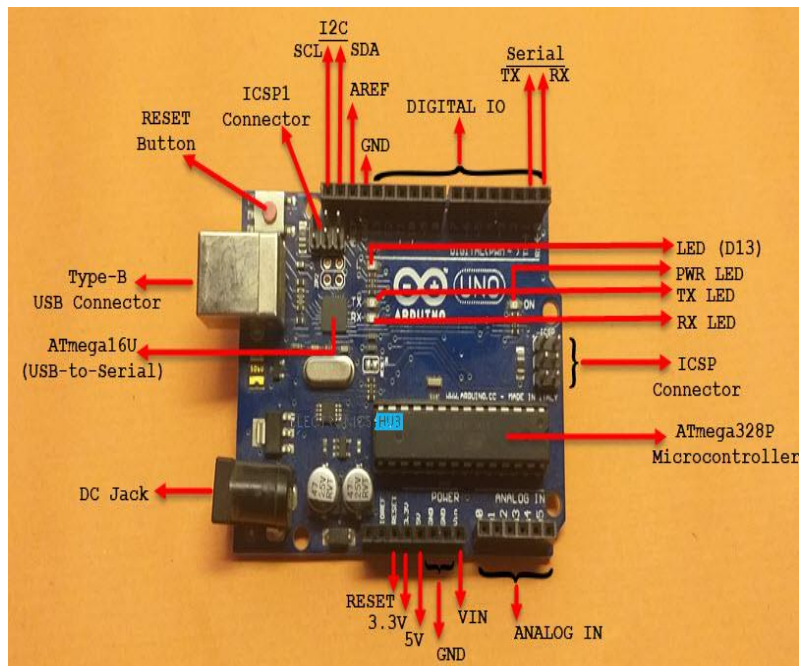


Fig : parts of arduino uno

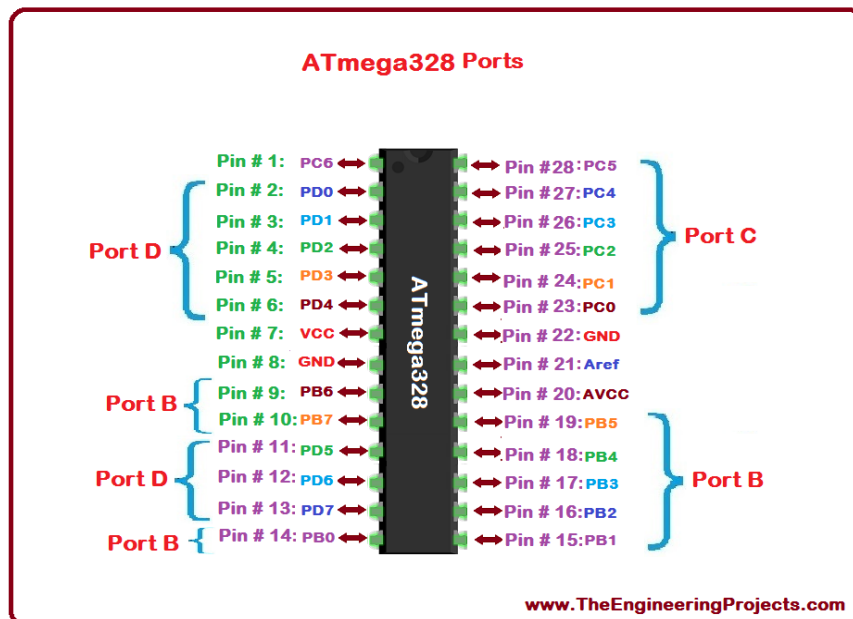


Fig: pin diagram

2.GSM MODULE

A GSM module, also known as a GSM modem or GSM shield, is a device that allows communication over the Global System for Mobile Communications network. The GSM network is a standard for digital cellular communication, commonly used for mobile phones and other wireless communication devices. A GSM module typically contains a SIM card slot to insert a Subscriber Identity Module (SIM) card, which is a smart card that identifies the user and provides authentication and encryption for communication. GSM modules are widely used in various applications such as Internet of Things devices, remote monitoring and control systems, vehicle tracking systems, security systems, and industrial automation. They provide wireless connectivity to these devices, allowing them to communicate with other devices or systems over the cellular network.

They may support different GSM bands, such as 2G, 3G, or 4G, and may have additional features like voice calling, SMS, GPRS and GPS capabilities, depending on the module's specifications and intended use.



Fig ; GSM module

3.LCD

LCD stands for Liquid Crystal Display, which is a commonly used output display for various electronic devices. The 20x4 LCD is a specific type of LCD display that has 20 columns and 4 rows of characters that can be displayed. To use an LCD 20x4 display, you typically need to interface it with a microcontroller, such as an Arduino or Raspberry Pi. The display is usually connected to the microcontroller via a parallel interface, which allows the microcontroller to control the display. To display information on the LCD 20x4 display, you typically use a library or code that sends commands and data to the display. The code typically involves initializing the display, setting the cursor position, and sending the data to be displayed on the screen.



Fig : LCD

4; MQ3 SENSOR

The MQ3 sensor is a type of gas sensor that is commonly used to detect and measure the concentration of alcohol vapor in the air. It is also known as an alcohol gas sensor or an ethanol sensor. The MQ3 sensor is a part of the MQ series of gas sensors manufactured by a company called Hanwei Electronics. The MQ3 sensor works based on the principle of metal oxide semiconductor (MOS) gas sensing. The MQ3 sensor is commonly used in applications such as breathalyzers, alcohol detectors for automotive ignition interlock systems, and industrial safety systems where the detection of alcohol vapor is important for safety reasons. However, it's worth noting that the MQ3 sensor is designed to detect alcohol vapor and not liquid alcohol, so it may not be as accurate in measuring the concentration of alcohol in liquid form.

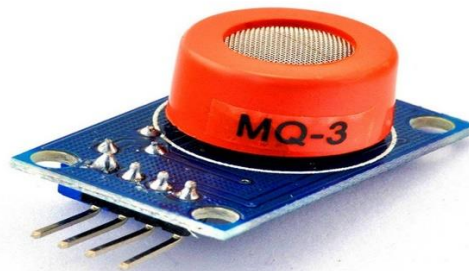


Fig ; MQ3 sensor

5; BUZZER

A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke. 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. By changing the frequency of the buzzer, the speed of the vibrations changes, which changes the pitch of the resulting sound. Piezo buzzers are simple devices that can generate basic beeps and tones. They work by using a piezo crystal, a special material that changes shape when voltage is applied to it.



Fig:- buzzer

6 EXHAUSTER :

An exhauster is a mechanical device used to remove gas, air or other substances from a system. It works by creating a vacuum or negative pressure that pulls the gas or substance out of the system,.Exhausters are used in a wide range of industries, including manufacturing, food processing, and wastewater treatment. They can be found in applications such as ventilation systems, vacuum packaging machines, and fume hoods. The choice of exhauster depends on the specific requirements of the application, such as the volume of gas or substance to be moved, the pressure requirements, and the environment in which Exhauster used.



FIG; EXHAUSTER

7. I2C LCD MODULE:-

I2C (Inter-Integrated Circuit) LCD modules are a type of LCD display that uses the I2C protocol for communication with a microcontroller, such as an Arduino or Raspberry Pi. I2C is a serial communication protocol that uses two wires for communication between devices - a data line (SDA) and a clock line (SCL). Compared to parallel LCD displays, I2C LCD modules require fewer pins to connect to a microcontroller, making them more convenient to use in projects with limited available pins. I2C LCD modules also have the advantage of being able to support multiple devices on the same I2C bus, allowing multiple modules to be connected to the same microcontroller.

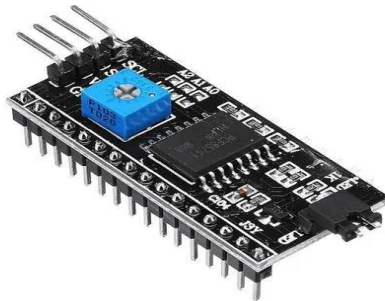


FIG ; I2C module

8.RELAY MODULE;

A 5V 1 channel relay module is an electronic device that allow you to control high-voltage and high-current devices with a low-voltage signal. The relay module consists of a small PCB board that houses a single relay switch and other circuitry needed to control the relay. The 5V rating refers to the voltage required to trigger the relay and the module is designed to be compatible with microcontrollers, such as Arduino, Raspberry Pi, or other similar devices, that use a 5V signal to control the relay. The 1 channel relay module is capable of controlling a single circuit, typically a single high-voltage or high-current device such as a motor, light, or pump. The module can be connected to the device to be controlled using screw terminals or other connectors.



Fig: RELAY module

9: ADAPTER

The most common type of adapter or charger is a wall adapter, which is a small, portable device that plugs into a wall outlet and provides a low-voltage DC output. Wall adapters typically have a built-in transformer, rectifier, and voltage regulator to convert the AC power from the wall outlet into a stable DC voltage that can be used to charge a battery or power an electronic device.



Fig ; Adapter

9. BATTERY

A battery is a device consisting of one or more electrochemical cells with external connections for powering electrical devices such as flash lights ,mobilephones and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load, a redox reaction converts high-energy reactants to lower-energy products, and the free energy difference is delivered to the external circuit as electrical energy to lower-energy products, and the free energy difference is delivered to the external circuit as electrical energy.



Fig:- Battery

11.BATTERY CAP:-

A battery assembled cap, a cylindrical battery with the cap and a method for making the same. ... The vent cap is attached to the battery cover by a hinge connection which allows for play between the vent cap and the battery cover and which allows for rotation of the vent cap. A battery holder is one or more compartments or chambers for holding a battery. For dry cells, the holder must also make electrical contact with the battery terminals. For wet cells, cables are often connected to the battery terminals, as is found in automobiles or emergency lighting equipment. The purpose of the vent caps is to allow for the escape of gases formed when the battery is charging.

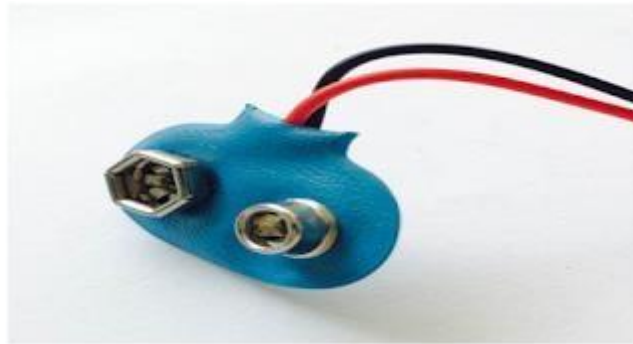


FIG: BATTERY CAP

12. SOLDER WIRE:-

Solder is a fusible alloy used to join less fusible metals or wires, etc. ... Solder wire is comprised of different alloys, or of pure tin. Each metal requires a certain type of soldering wire to create strong bonds, because the combinations of metals that comprise soldering wire melt at different temperatures.



13 Fig:- solder wire

13. SOLDERING IRON:-

A soldering iron is a hand tool used in soldering. It supplies heat to melt solder so that it can flow into the joint between two workpieces. A soldering iron is composed of a heated metal tip and an insulated handle. The basic purpose of a soldering iron is to create a bond between two workpieces using electronically heated soft metal (ie, the solder). The soldering iron supplies heat to the soldering tip, which is used to melt the solder. The melted solder forms a bond in the joint between two workpieces.



13 Fig:- soldering iron

14 ;CONNECTING WIRE:-

Connecting wires allows an electrical current to travel from one point on a circuit to another because electricity needs a medium through which it can move. Most of the connecting wires are made up of copper or aluminum. Copper is cheap and good conductivity. The Function of Connecting Wires. Connecting wires provide a medium to an electrical current so that they can travel from one point on a circuit to another. In the case of computers, wires are embedded into circuit boards to carry pulses of electricity.



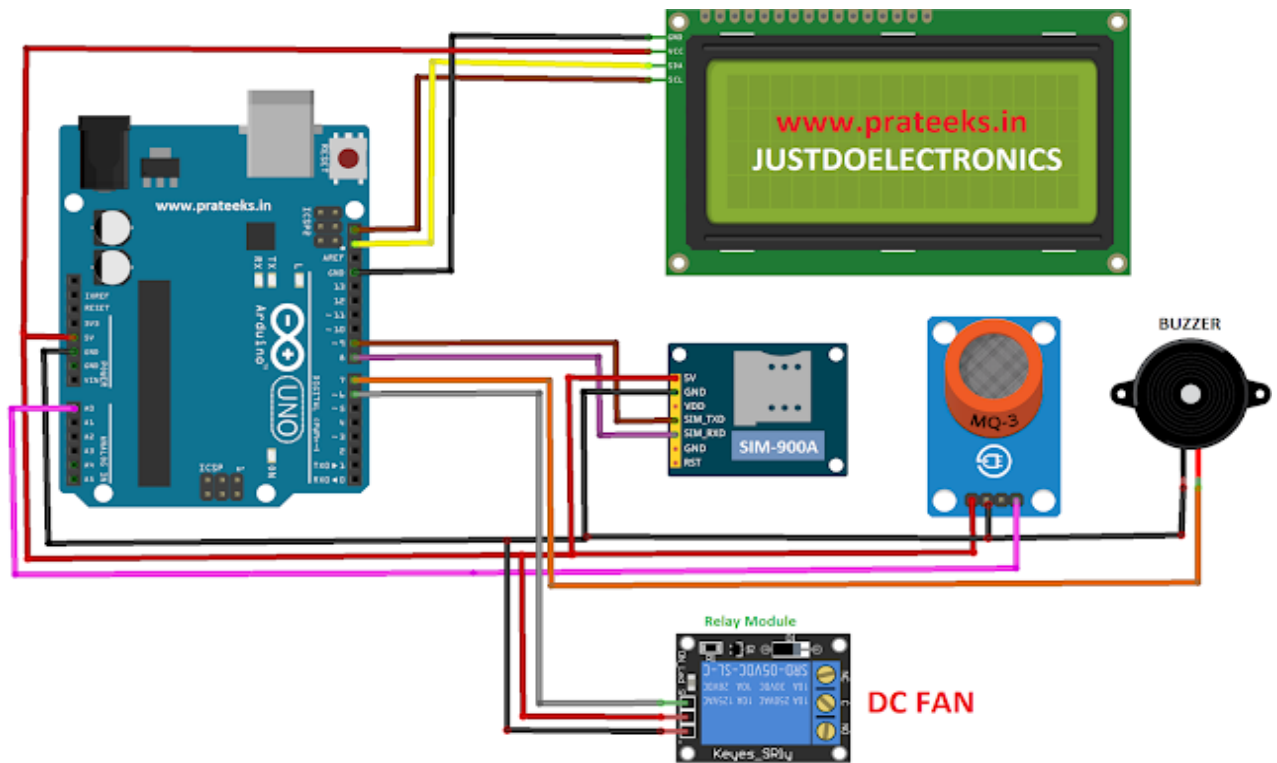
14 Fig:- connecting wire

This takes a look at establishing a fuel line leak detector. With the aid of this technology, the presence of gases, inclusive of liquefied petroleum fuel line (LPG) and methane, in our environment, industry, faculties, and hospitals is detected. If there's any type of ACORS fuel line leak that threatens or harms society or human beings residing in this environment, the circuit layout MQ5 sensor will routinely stumble on this and the layout GSM modem will ship a caution sign. It is delivered to the consumer whose quantity is registered inside the gadget, or to the tracking device that displays units or manages the construction or organization. This gadget includes a buzzer that triggers an alarm if a fuel line leaks into the environment.

The gadget may be utilized in plenty of different locations, along with oil and fuel pipelines, kitchens, and fuel line garage facilities. This study's ambition is to expand a fuel line caution gadget that routinely detects and warns of fuel line leaks. This tool is predicted for use in domestic protection regions in which heating gadgets and gadgets powered with the aid of herbal fuel lines and liquefied petroleum fuel lines can pose a hazard. This fuel line caution gadget can also be used for different features of industries and vegetation that depend upon LPG and herbal fuel line operations. The fuel line leak detection gadget sends a notification message to the registered cellular phone. The Arduino microcontroller operates as a result of the collective mind of all studies. This fuel line alert gadget is managed and monitored through the ADAFRUIT net software. pumps are switched on. This clever online caution gadget has been proposed to be used in diverse hospitals.

In the case of an unexpected fuel line leak, the fuel line sensor used inside the layout sends a signal to the Arduino. The Arduino then sends a notification to different gadgets concerned within the layout, inclusive of hospitals. Alarms are despatched again until the necessary response is received. The machine was designed and applied for ceiling and wall mounting. If the gadget is simply positioned or wall set up and powered, the detection gadget will send a brief message (SMS) to advise the owner of the house on the occasion of a fuel line leak.

2.4 CIRCUIT DIAGRAM



2.4 Fig; Circuit Diagram

2.5 - ARDUINO PROGRAMMING:-

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 20, 4);
#include <SoftwareSerial.h>
```

```
SoftwareSerial mySerial(9,8);
```

```
int gasValue = A0;
int data = 0;
int relay = 6;
int pir_Status;
int buzzerPin = 7;
```

```
void setup()
{
```

```

randomSeed(analogRead(0));
mySerial.begin(9600);
Serial.begin(9600);
lcd.init();
lcd.backlight();
pinMode(gasValue, INPUT);
pinMode(relay, OUTPUT);
pinMode(buzzerPin, OUTPUT);
lcd.setCursor(2,0);
lcd.print ("WELCOME TO ");
lcd.setCursor(2,1);
lcd.print ("sathyabama");
lcd.setCursor(6,2);
lcd.print ("institute of :-");
lcd.setCursor(6,3);
lcd.print (" science and technology");
delay(3000);
lcd.clear();
}

```

```

void loop(){
data = analogRead(gasValue);

Serial.print("Gas Level: ");
Serial.println(data);
lcd.clear();
lcd.setCursor(1,0);
lcd.print ("Exhaust fan :- OFF");
lcd.setCursor(2,1);
lcd.print("Gas Level: ");
lcd.print(data);
delay(1000);

if ( data > 700)

```

```

{
SendMessage();
Serial.print("Gas detect alarm");
lcd.clear();
lcd.setCursor(1,0);
lcd.print ("Exhaust fan :- ON");
lcd.setCursor(2,2);
lcd.print("Gas Level Exceed");
lcd.setCursor(2,3);
lcd.print("SMS Sent");
delay(1000);
digitalWrite(buzzerPin, HIGH);
digitalWrite(relay, HIGH);

}
else
{

Serial.print("Gas Level Low");
lcd.clear();
lcd.setCursor(2,3);
lcd.print("Gas Level Normal");
delay(1000);
digitalWrite(buzzerPin, LOW);
digitalWrite(relay, LOW);

}

//lcd.clear();
}

void SendMessage()
{

```

```
delay(1000);  
}
```

2.6 - CHALLENGES FACED ON GAS ALARM DETECTION SYSTEM;

1. The gas detection warning device or indicator can only applied as a Gas leak system.
2. The 5 Volt power supply is used to work the gas leak detection system.
3. Temperature and humidity may affect the sensitivity of detection system.
4. Smoke has an effect on sensitivity to gas detection systems.
5. The fire resistance that may occur with the equipment is not affected by the gas alarm system

2.7 - IMPACT OF THE GAS ALARM DETECTION SYSTEM;

1. With a gas detection system, you can get instant results is not affected by the gas alarm system.
2. With the designed gas detection system, the is not affected by the gas alarm system
3. The gas warning system is excellent in safety, is not affected by the gas alarm system
4. The sensors used in the gas warning system have excellent sensitivity combined with fast response time.
5. The gas detection system also helps detect alcohol so that it can be used as a drinking detector.
6. The gas warning system can be used as an LPG leak detection system in offices, schools, homes, organizations and industries

2.8 – BENEFITS :

- Improved safety: The system can detect gas and fire hazards early, allowing occupants to evacuate the premises quickly and safely. This can help prevent injuries and save lives.
- Reduced property damage: Early detection of gas or fire hazards can help prevent extensive property damage by alerting occupants and authorities to the situation before it gets out of control.
- Peace of mind: Knowing that a reliable safety system is in place can provide peace of mind to building owners, occupants, and employees.
- Compliance with safety regulations: Having a fire and gas detecting alarm system with an exhauster installed can help building owners and operators comply with safety regulations and building codes.
- Lower insurance premiums: Insurance companies often offer lower premiums for buildings with safety systems in place, such as fire and gas detecting alarm systems with exhausters.

2.6 - RESULT:

However, the success of a fire and gas detecting alarm system with an exhauster can be determined by its ability to accurately detect and alert occupants to the presence of gas or fire, as well as its effectiveness in quickly and safely evacuating the premises through the use of the exhauster. Regular testing and maintenance of the system can ensure that it is functioning correctly and can provide early detection and warning of any potential hazards.

CHAPTER 3

3.1 - CONCLUSION:

In conclusion, a fire and gas detecting alarm system with exhauster is an essential safety system that can protect lives and property by detecting and alerting occupants to the presence of gas or fire. The proposed system integrates various components, including gas and fire sensors, alarm devices, an exhauster, and a control panel, to provide a comprehensive safety solution. The advantages of the proposed system include early detection of gas and fire, timely alerting of occupants, and rapid evacuation of the premises through the use of the exhauster. The system also includes an LCD display to provide real-time information about the status of the system and any detected hazards. Wiring instructions must be followed carefully to ensure that the system is installed and wired properly. Regular maintenance and testing of the system are also important to ensure that it is functioning correctly.

3.2 - FUTURE SCOPE :

The future scope of a fire and gas detecting alarm system with an exhauster project may involve the incorporation of emerging technologies and features to enhance safety and efficiency. Here are some potential future development. The integration of the system with the Internet of Things (IoT) could allow for real-time monitoring of gas levels and other safety parameters. The integration of AI could help to improve the accuracy and speed of the system in detecting and responding to potential hazards. AI algorithms could be used to analyze data from gas sensors and other sources to predict potential hazards and trigger appropriate safety protocols. The use of wireless communication technology could allow for greater flexibility in the placement of gas sensors and exhausters, as well as easier installation and maintenance.

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