

FORM 2
THE PATENTS ACT 1970
(39 of 1970)
&
The Patents Rules, 2003
COMPLETE SPECIFICATION

(See section 10 and rule 13)

Smart LPG Leakage Detection System

2. APPLICANTS:

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3. TECHNICAL FIELD OF THE INVENTION:

This invention relates to gas safety systems, specifically an automated system for detecting and preventing LPG leakage in residential, commercial, and industrial applications. The growing dependency on LPG as a primary fuel source necessitates the development of robust safety mechanisms to prevent hazardous situations. This invention focuses on an intelligent, real-time monitoring system that integrates sensor technology, wireless communication, and automation to mitigate risks associated with LPG leakage.

4. PRIOR ART:

Existing LPG leakage detection system dominantly rely on localized alerts via alarms or SMS/calling which limits the safety. This project distinguishes itself by introducing a GPS module for real-time precise location tracking. This is a crucial difference from conventional systems that often lack the ability to provide emergency responders with accurate location data. This system not only detects LPG leaks using an MQ-6 sensor and sends a notification to the user, but it also captures the precise GPS coordinates of the leak. This location data, transmitted via GSM module to a dedicated LPG healthcare unit, enables immediate and targeted emergency response. This approach coupled with the accuracy of GPS data, significantly enhances the efficiency of emergency services and strengthens the overall safety measures compared to systems that only rely on basic alert mechanisms or limited information of the leakage happening.

5. OBJECTIVES:

- Provide an LPG leakage detection system with real-time monitoring.
- Integrate a GPS module for precise location tracking of leakage incidents.
- Alert users via SMS/notifications and facilitate emergency response.
- Enhance detection accuracy and reduce response time.
- Enable data logging for future analysis and predictive maintenance.
- Offer a cost-effective and scalable solution that can be implemented in various settings, from homes to industrial plants.
- Incorporate fail-safe mechanisms such as automatic gas shutoff and ventilation activation to prevent the buildup of combustible gases.

6. SYNOPSIS:

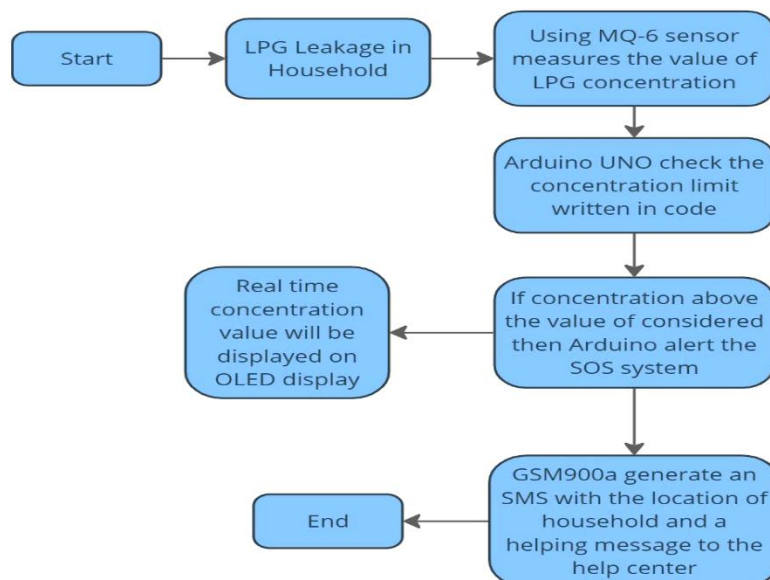
The proposed system comprises:

1. Arduino UNO – Acts as the microcontroller to process data from sensors and control outputs.

2. MQ-6 Sensor – Detects the presence of LPG in the surrounding air and sends data to the microcontroller.
3. GSM-900A Module – Sends SMS alerts to pre-set contacts in case of a gas leak.
4. GPS Module – Provides real-time location tracking to facilitate emergency response.
5. OLED display – Displays real-time sensor readings and system status.
6. Power Supply – Ensures a stable power source for the entire system.

The system consists of interconnected components designed for efficient LPG leakage detection and alert mechanisms. The MQ-6 sensor continuously monitors the air for the presence of LPG gas. Upon detection, the microcontroller (Arduino UNO) processes the sensor data and triggers necessary actions. The GSM module sends instant SMS notifications to pre-set contacts, ensuring timely awareness of the leak. The GPS module identifies the precise location of the leak and transmits this data along with the alert message for a quick emergency response. OLED display provides a real-time display of gas levels and system status, allowing users to monitor the environment effectively. The buzzer sounds an audible alarm, alerting nearby individuals immediately. The entire system is powered by a reliable power source, ensuring consistent operation. Additionally, future iterations may include cloud storage capabilities for data logging and remote monitoring.

7. BRIEF DESCRIPTION OF PROJECT:



8. DETAILED DESCRIPTION OF THE INVENTION:

System utilizes an MQ-6 gas sensor to detect LPG levels. The microcontroller processes the sensor output and triggers alerts if the concentration exceeds a safety threshold. The system consists of interconnected components designed for efficient LPG leakage detection and alert mechanisms. The MQ-6 sensor continuously monitors the air for the presence of LPG gas. Upon detection, the microcontroller (Arduino UNO) processes the sensor data and triggers necessary actions. The GSM module sends instant SMS notifications to pre-set contacts, ensuring timely awareness of the leak. The GPS module identifies the precise location of the leak and transmits this data along with the alert message for a quick emergency response. OLED panel provides a real-time display of gas levels and system status, allowing users to monitor the environment effectively. The buzzer sounds an audible alarm, alerting nearby individuals immediately. This project successfully demonstrates the feasibility of a smart LPG leakage detection system. The integration of MQ-6 sensor, Arduino microcontroller, GSM Module, GPS Module and OLED panel and forms a system which is able to detect LPG in real time with not only alert notifications but also precise location tracking. The MQ-6 sensor effectively sensed the leakage of LPG and sent alerts timely. The GSM module made it possible to send leak alerts to the pre-set contacts and the GPS module ensured the fast emergency response by providing the precise location. The interface that is developed is user-friendly which consists of an OLED panel that allowed for real-time data display. The system has the potential to remarkably raise safety by decreasing the risks related with the leakage of LPG. However, improvements are still needed for efficient performance of the system developed

9. BEST METHOD OF PERFORMANCE OF THE INVENTION:

The system is best implemented using IoT connectivity, allowing alerts to be sent not only through SMS but also via cloud-based platforms or mobile applications. Integrating machine learning algorithms could further enhance its ability to detect anomalies and predict potential failures before they occur. The system's reliability is further improved by incorporating a redundant power source such as a backup battery, ensuring functionality even during power outages. Additional calibration of gas sensors enhances accuracy and minimizes false alarms, making the system more effective and user-friendly.

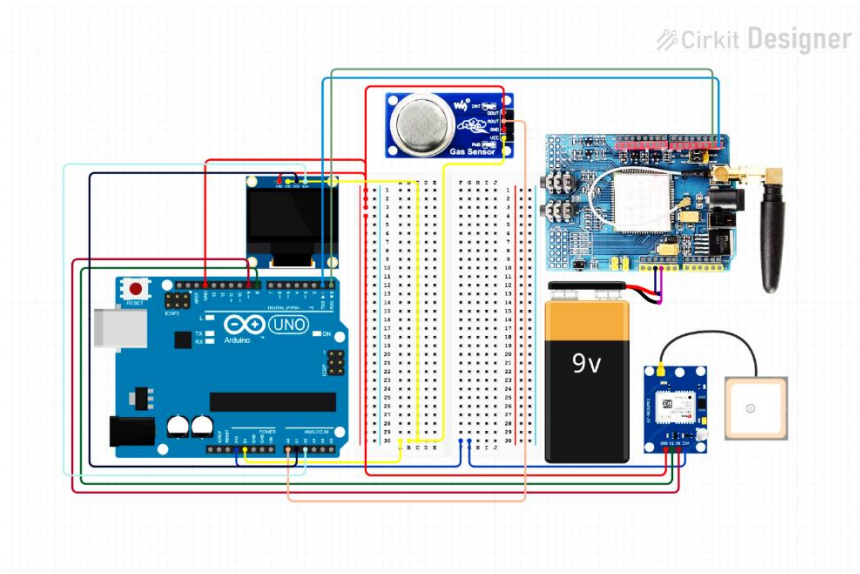
10. INVENTION STEP OF YOUR INVENTION:

The key inventive step in this project is the integration of a GPS module within the LPG leakage detection system. Unlike traditional gas leak detectors that only trigger local alarms or send alerts via SMS, this system enhances emergency response by transmitting real-time location data of the leakage incident. By incorporating GPS technology, users and emergency responders can pinpoint the exact location of the leakage, significantly reducing the time required to take corrective actions. This integration is particularly crucial for large industrial setups, commercial kitchens, or multi-unit residential buildings where identifying the leakage source can be challenging. The GPS-enabled feature ensures that even if the user is not present at the site, they can take immediate action based on precise location data.

11. INDUSTRIAL APPLICATION:

This invention is applicable in homes, restaurants, industrial facilities, and gas-powered appliances, ensuring safety against LPG leaks. It is particularly useful in environments where unattended gas leaks can lead to catastrophic failures. Industries dealing with large-scale gas storage and transportation can benefit greatly from the system's real-time monitoring and alerting mechanisms. The ability to integrate with smart infrastructure makes it a viable solution for modern urban developments and industrial safety protocols.

12. DRAWING:



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- (b) Signature(s)
- (c) Name: Deepa Abin

- (a) Date
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- (c) Name: Arahath Paikrao

- (a) Date
- (b) Signature(s)
- (c) Name: Prathmesh Nirmal

13. CLAIMS:

We claim:

1. A cost-effective, modular design that allows easy implementation in residential, commercial, and industrial environments.
2. A smart LPG leakage detection system integrating an MQ-6 gas sensor, GSM module, and GPS module for real-time precise location tracking and emergency alerting.

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14. ABSTRACT:

Liquefied Petroleum Gas (LPG) is widely used in households, industries, and commercial establishments due to its efficiency and convenience. However, LPG leakage poses severe risks, including fire hazards, explosions, and potential fatalities. This paper presents a smart and advanced LPG gas leakage detection system designed to enhance safety through real-time monitoring and immediate alerts. The system integrates an MQ-6 gas sensor for detecting LPG concentration, a GSM module for sending SMS alerts, a GPS module for precise location tracking, and an LCD panel for real-time status display. Upon detecting a leakage, the system triggers an alarm, displays warning messages on the LCD, and sends an SMS alert with the exact location to predefined emergency contacts. This proactive approach minimizes response time, reducing potential damage and casualties. The proposed system is cost-effective, efficient, and suitable for residential and industrial applications, aiming to mitigate accidents caused by LPG leaks through automated detection and rapid notification mechanisms

