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(71)**Name of Applicant :**
1)N.Rajeswaran
Address of Applicant :Department of EEE Malla Reddy Engineering College Maisammaguda Secunderabad Telangana State India ----------- -----------
2)K.Hanumaji
3)P.Sampath kumar
4)P.Shekar
5)G.Haritha
6)Kesava Vamsi Krishna V
7)D V Acharyulu
8)Hema Chandra Rao Bitra
9)K.Umadevi
10)P.Swapna
11)Narahari Dudiki
12)Mandava Swathi
13)M.Deenababu
14)T.Suman
Name of Applicant : NA
Address of Applicant : NA
(72)**Name of Inventor :**
1)N.Rajeswaran
Address of Applicant :Department of EEE Malla Reddy Engineering College Maisammaguda Secunderabad Telangana State India ----------- -----------
2)K.Hanumaji
Address of Applicant :Department of EEE, Malla Reddy Institute of Engineering and Technology (Autonomous), Hyderabad Hyderabad ----------- -----------
3)P.Sampath kumar
Address of Applicant :Department of ECE, Malla Reddy Institute of Engineering and Technology (Autonomous), Hyderabad Hyderabad ----------- -----------
4)P.Shekar
Address of Applicant :Department of ECE, Malla Reddy Institute of Engineering and Technology (Autonomous), Hyderabad Hyderabad ----------- -----------
5)G.Haritha
Address of Applicant :Department of ECE, Malla Reddy Institute of Engineering and Technology (Autonomous), Hyderabad Hyderabad ----------- -----------
6)Kesava Vamsi Krishna V
Address of Applicant :Department of Physics, Malla Reddy Engineering College, Maisammaguda, Secunderabad hyderabad ----------- -----------
7)D V Acharyulu
Address of Applicant :Department of Physics, Malla Reddy Engineering College, Maisammaguda, Secunderabad Hyderabad ----------- -----------
8)Hema Chandra Rao Bitra
Address of Applicant :Department of Physics, Malla Reddy Engineering College, Maisammaguda, Secunderabad Hyderabad ----------- -----------
9)K.Umadevi
Address of Applicant :Department of Physics, Gokraju Ranga Raju Institute of Engineering and Technology, Hyderabad Hyderabad ----------- -----------
10)P.Swapna
Address of Applicant :Department of IT, Malla Reddy Engineering College, Maisammaguda, Secunderabad Hyderabad ----------- -----------
11)Narahari Dudiki
Address of Applicant :Department of CSE, Malla Reddy Institute of Technology, Maisammaguda, Secunderabad Hyderabad ----------- -----------
12)Mandava Swathi
Address of Applicant :Department of IT, Vignan Institute of Technology and Science, Hyderabad Hyderabad ----------- -----------
13)M.Deenababu
Address of Applicant :Department of IT, Malla Reddy Engineering College, Maisammaguda, Secunderabad Hyderabad ----------- -----------
14)T.Suman
Address of Applicant :Department of EEE, Malla Reddy University, Hyderabad Hyderabad ----------- -----------

(57) Abstract :
Technology is typically supplied with power in the rapidly developing world of today because they can operate in harsh environments where humans cannot. However, as industries have grown rapidly and require more power for daily needs, non-renewable energy sources have been replaced by renewable energy sources like solar energy. The main goal of our project is to use solar energy to power a robot that will detect LPG gas leaks when they reach a predetermined threshold level. The robot will be powered by solar energy. The robot displays the alert that was given to the mobile device so that swifter action can be performed. It can therefore be used in industrial settings where gas leakage mishaps are frequent nowadays and have a significant impact on many lives. Our project's primary components are a PIC microcontroller, a gas sensor, permanent magnet DC motors, GSM for quick data transmission, and ultimately an Android application to control the robot. MPLAB software is used to implement the circuit after it has been designed using Proteus software. As a result, a solar-powered robot that has been created specifically to detect LPG gas in the real world has been implemented. If the gas produced surpasses a predetermined threshold level, a warning message is displayed.

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FORM - 2

THE PATENTS ACT, 1970

(39 OF 1970)

THE PATENTS RULES, 2003

COMPLETE SPECIFICATION

(Section 10; rule 13)

1. **Title of the invention: CLOUD BASED SMART SYSTEM FOR SMART CITY**
2. **Applicant (s) (Name, Nationality, Address)**

Sr. No.	Name	Nationality	Address	Country	State
1	N.Rajeswaran	Indian	Department of EEE, Malla Reddy Engineering College (Autonomous), Hyderabad	India	Telangana State
2	K.Hanumaji	Indian	Department of EEE, Malla Reddy Institute of Engineering and Technology (Autonomous), Hyderabad	India	Telangana State
3.	P.Sampath kumar	Indian	Department of ECE, Malla Reddy Institute of Engineering and Technology (Autonomous), Hyderabad	India	Telangana State
4.	P.Shekar	Indian	Department of ECE, Malla Reddy Institute of Engineering and Technology (Autonomous), Hyderabad	India	Telangana State

5.	G.Haritha	Indian	Department of ECE, Malla Reddy Institute of Engineering and Technology (Autonomous), Hyderabad	India	Telangana State
6.	Kesava Vamsi Krishna V	Indian	Department of Physics, Malla Reddy Engineering College, Maisammaguda, Secunderabad	India	Telangana State
7.	D V Acharyulu	Indian	Department of Physics, Malla Reddy Engineering College, Maisammaguda, Secunderabad	India	Telangana State
8.	Hema Chandra Rao Bitra	Indian	Department of Physics, Malla Reddy Engineering College, Maisammaguda, Secunderabad	India	Telangana State
9.	K.Umadevi	Indian	Department of Physics, Gokraju Ranga Raju Institute of Engineering and Technology, Hyderabad	India	Telangana State
10.	P.Swapna	Indian	Department of IT, Malla Reddy Engineering College, Maisammaguda, Secunderabad	India	Telangana State

11.	Narahari Dudiki	Indian	Department of CSE, Malla Reddy Institute of Technology, Maisammaguda, Secunderabad	India	Telangana State
12.	Mandava Swathi	Indian	Department of IT, Vignan Institute of Technology and Science, Hyderabad	India	Telangana State
13.	M.Deenababu	Indian	Department of IT, Malla Reddy Engineering College, Maisammaguda, Secunderabad	India	Telangana State
14.	T.Suman	Indian	Department of EEE, Malla Reddy University, Hyderabad	India	Telangana State

3. Permeable to the Description (Complete)

The following specification particularly describes the invention and the way it is to be performed

1. Background

1.1 Description of problem

Robotics is a branch of applied science that combines computer and machine tool applications. It covers a wide range of topics, including production theory, artificial intelligence, microelectronics, computer programming, control theory, and machine design. A general-purpose, programmable machine with some anthropomorphic—or human-like—features that mimic human physical structure or enable the robot to react to sensory input similarly to humans—is referred to as an industrial robot. These anthropomorphic traits include mechanical limbs, which are employed for a variety of industrial jobs, or sensory perceptive tools, such sensors, which enable robots to interact with other machines, communicate with them, and make simple decisions.

A solar cell, also known as a photovoltaic cell, is an electrical device that uses the photovoltaic effect to convert light energy directly into electricity. It is a type of photoelectric cell that, when exposed to light, can generate and sustain an electric current without being connected to any external voltage sources (in that its electrical characteristics, such as current, voltage, or resistance vary when light is incident onto it). The words "light" and "volt," which stand for the electromotive force unit and the last name of Italian physicist and battery inventor Alessandro Volta, respectively, are the roots of the word "photovoltaic" (electrochemical cell). Since 1849, the word "photo-voltaic" has been used in English. Though term is frequently used to refer particularly to the production of energy from sunshine, photovoltaic is the branch of science and research concerned with the practical application of photovoltaic cells in creating power from light. Even when artificial light sources are used instead of sunlight, cells can still be considered photovoltaic (lamplight, artificial light, etc.). In these circumstances, the cell is occasionally utilized as a photo detector (for instance, infrared detectors), sensing light or other electromagnetic radiation close to the visual range, or calculating light intensity.

1.2 Review of work already done

French physicist A. E. Becquerel performed the first experimental demonstration of the photovoltaic effect. In 1839, while he was 19 years old and doing experiments in his father's lab, he created the first photovoltaic cell ever. The earliest account of the "Effect of Light on Selenium during the passage of an Electric Current" was written by Willoughby Smith and appeared in Nature on February 20, 1873. However, Charles Fritts did not create the first solid state photovoltaic cell until 1883. To create the connections, he covered the semiconductor selenium with an incredibly thin layer of gold. The system's efficiency was only about 1%. Based on Heinrich Hertz's earlier discovery of the outer photoelectric effect, Russian physicist Aleksandr Stoletov created the first photoelectric cell in 1888.

The photoelectric effect's fundamental process was first described by Albert Einstein in 1905. For this work, he was awarded the Nobel Prize in Physics in 1921. While working on the chain of innovations that would eventually lead to the transistor, Russell Ohl found the contemporary junction semiconductor solar cell and patented it in 1946. Gerald Pearson, Calvin Souther Fuller, and Daryl Chapin at Bell Laboratories created the first usable solar cell in 1954. In contrast to selenium cells, which struggled to achieve 0.5% efficiency, they used a diffused silicon p-n junction and achieved 6% efficiency. The Semiconductor Division of Hoffman Electronics Corporation, headed by Les Hoffman, the company's CEO, pioneered the development and mass manufacture of solar cells.

As the cost of the electricity, they produced was relatively costly at initially, cells were designed for toys and other insignificant uses. For example, a cell that produced 1 watt of electrical power in direct sunlight cost around $250, against $2 to $3 per watt for a coal plant. The notion to use solar cells was likely motivated by Hoffman Electronics' successes with the Vanguard I satellite, which was launched in 1958. The satellite was originally intended to run solely on battery power and endure only a short period of time before it ran out.

The mission period might be increased by adding cells to the exterior of the body without significantly altering the spacecraft or its power systems. American spacecraft Explorer 6 was launched in 1959. It had enormous solar arrays that resembled wings, which later appeared on many spacecrafts. There were 9600 Hoffman solar cells in these arrays. Although there was some initial scepticism, the cells proved to be a great success in practice. Solar cells were soon included into several new satellites, including Bell's own Telstar. Over the following two decades, advancements were modest, and their only significant application—where their power-to-weight ratio was higher than that of any rival technology—was in space applications.

However, this success also contributed to the slow pace of development because space consumers were prepared to pay any price for the best cells, so there was little incentive to invest in more affordable options if doing so would diminish efficiency. Instead, the semiconductor industry played a significant role in determining the cost of cells; their shift to integrated circuits in the 1960s made larger cells more readily available at lower relative costs. The cost of the resulting cells also decreased as their price decreased. However, these effects were only temporary, and by 1971, it was projected that a cell cost $100 per watt.

2. Existing System

Lead-acid, nickel-cadmium (NiCd), nickel-metal hydride (NiMH), lithium ion (Li-ion), and lithium-ion polymer (Li-ion polymer) are examples of rechargeable batteries. Non-rechargeable batteries include lithium, carbon-zinc batteries, alkaline manganese (non-button cell), mercury-zinc button batteries, and carbon-zinc batteries. In comparison to rechargeable batteries, non-rechargeable batteries have a shorter lifespan. Because of their capacity and duty cycle, rechargeable batteries are preferred more often. Due to the growing demand for power, the main drawback in this situation is the scarcity of power sources. When a battery is charged using solar energy, it goes through a continual charging and discharging cycle, which offers a consistent power source at a particular voltage and is one of the ways to consume electricity.

3. Description of Proposal

The proposed design goal is to use solar energy to power the robot. The 5W solar module supplies power to the 12V SMF battery. The robot's PIC16F877A microcontroller receives the signal if the gas sensor (GS-106) is insensitive to 1000 ppm of LPG gas in clean air (Temperature: 20°C, Humidity: 60%), and the input is then provided to the microcontroller's ADC. From there, gas leaks in that specific area can be found. Then, for communication, the microcontroller transfers the digital data to a GSM modem. The microcontroller uses a mobile keypad to control the robot's movement based on the sensor threshold level.

According to Fig.1, the solar panel receives input from the surroundings. Light energy is converted to electrical energy by solar panels, and the electricity is stored in batteries for later use. The PIC 16F877A is interfaced with the GS-106 sensor and ADC. The driver circuit drives the output to the robot. The motor provides the Robot with direction. Through an LCD display, the output is seen. GSM and RS-232 are interfaced to transmit data. An Android smartphone is used to control the robot.

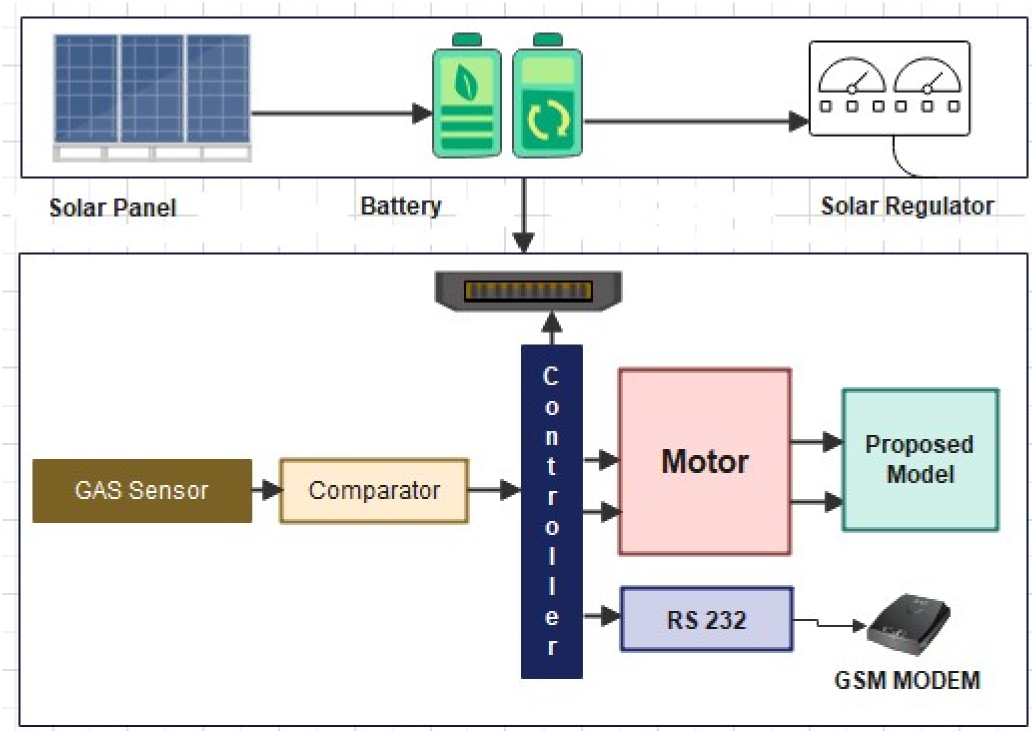

Figure 1 : Block diagram of Proposed Module

The best sensors are used to find a dangerous LPG leak in a small space or near a gas station or storage tank. This unit is simple to integrate with an alarm system, either for a visual display of the LPG concentration or for an alarm to ring. The sensor offers a quick response time and great sensitivity. Additionally, the sensor can detect cigarette smoke, propane, isobutane, and LNG. The non-inverting input terminal of the comparator is connected to the gas sensor output terminals. Here, the operational amplifier LM 358 is used to build the comparator. The inverting input terminal receives the reference voltage. The required gas intensity determines the reference voltage. The output of the comparator is a positive voltage that is applied to the base of the switching transistor BC 547 when there is no leakage between the non-inverting and inverting inputs. The transistor is therefore conducting. The collector and emitter will be closed in this case because the transistor is acting as a switch. From the collector terminal, the output is obtained. Hex inverter 40106 is now given the output of zero.

The inverting input voltage is higher than the non-inverting input when there is a gas leak. The transistor is in the cutoff area as the comparator output is currently -12V. Hex inverter 40106 IC receives 5v. The microcontroller will use the final output data to identify any gas leaks.

Features

- High Sensitivity
- Detection Range: 100 - 10,000 ppm Iso-butane propane
- Fast Response Time: <10s
- Heater Voltage: 5.0V
- Dimensions: 18mm Diameter, 17mm High excluding pins, Pins - 6mm High.

The majority of recent research focuses on lowering solar cell costs or improving efficiency. The military and the green technology sector are its two main sectors. Solar panels, wind turbines, and automobile batteries for electric vehicles all utilize cutting-edge robotics technology. A solar photovoltaic lantern is a type of lighting that combines an external solar photovoltaic module with bulb, battery, and electronics that are light-efficient. It is built of plastic and is appropriate for small spaces. The PV Module produces electricity that is used to charge the battery. For tiny remote lighting needs, the Solar Portable Lantern provides a silent, rechargeable battery power source.

Thus, the interfaced with the controllers for the design and construction of the solar-powered gas detecting module, and the output is shown on the LCD when it exceeds the threshold level. The message is sent to the mobile device via a GSM modem. We can lessen the gas leak incidents that happen frequently in enterprises nowadays by implementing this idea.

I/We Claim

1. To develop a gas leakage detection system.
2. The design technique was used to improve the power of module with solar cell.
3. The controllers are used to interconnect the sensor through \interfacing unit.
4. To monitor and protect the gas leakage in home and industries.
5. The suggested approach makes use of all places and the suggested model may provide more dependable accuracy.

Abstract

Technology is typically supplied with power in the rapidly developing world of today because they can operate in harsh environments where humans cannot. However, as industries have grown rapidly and require more power for daily needs, non-renewable energy sources have been replaced by renewable energy sources like solar energy. The main goal of our project is to use solar energy to power a robot that will detect LPG gas leaks when they reach a predetermined threshold level. The robot will be powered by solar energy. The robot displays the alert that was given to the mobile device so that swifter action can be performed. It can therefore be used in industrial settings where gas leakage mishaps are frequent nowadays and have a significant impact on many lives. Our project's primary components are a PIC microcontroller, a gas sensor, permanent magnet DC motors, GSM for quick data transmission, and ultimately an Android application to control the robot. MPLAB software is used to implement the circuit after it has been designed using Proteus software. As a result, a solar-powered robot that has been created specifically to detect LPG gas in the real world has been implemented. If the gas produced surpasses a predetermined threshold level, a warning message is displayed.