Smart Stove

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Abstract- *The project aims to reduce the unwanted usage of LPG in kitchen thereby providing an efficient usage of fuel by modifying the gas stove. In most cases the flame will be kept low in order to avoid spilling of milk while the sight of the cook is out from gas stove. It consumes more fuel than it usually takes for a milk to get boiled. A smart pot which would enable to cut down the gas supply automatically when milk, tea, coffee are boiled keeping it in high flame that will save energy and time. Also, the project is incorporated with an idea of versatile cooking feature that would help the cook to set time on the stove thus gas is turned off automatically when desired cooking time is reached so that it is not necessary to linger in kitchen. The volume of cooking gas present in the cylinder and also leakage detection of gas is been found solution through this project. The amount of gas left in cylinder is displayed to the user so that the user will have knowledge about the volume contained in gas cylinder. And when there is a gas leakage, an alarm will alert about the leakage so that it could be fixed sooner.*

Keywords- Smart pot, versatile cooking, energy saving, volume of cooking gas, gas leakage detection

I. INTRODUCTION

Increased price of LPG have paved ways to adopt technology that could help in efficient usage of gas. In present days people find difficulty to have prolonged wait in the kitchen. Gas stove used in kitchen is modified into a smart stove that has following features

- Smart pot
- Versatile cooking
- Gas volume and leakage detection

Smart pot is a modified pot that could help in usage of fuel efficiently while boiling milk, preparing tea and coffee. The trend that people follow is that they keep the flame low while boiling milk so that it does not spill. By doing so, the gas consumed will be more. Smart pot is a system that will help to prepare the milk without spilling, keeping the flame high. The burner turns off automatically after achieving the desired result.

In this busy life there may be numerous tasks to be completed within a short span of time. People may not have time to linger in the kitchen until the cooking is completed. A feature called versatile cooking, that helps in setting time for cooking dishes. The burner turns off automatically after reaching the time that is set.

The prediction of gas left in the cylinder is another feature found solution through the project. Instant updation of the gas left in the cylinder is obtained through the seven segment display. So that the user will be aware about the volume of gas left in the cylinder. There are dangers happening due to the leakage of gas. In order to prevent that, gas leakage detection is given shape through this project. When there is a leakage, the alarm will alert about it and paves way to get it fixed soon.

II. DESIGN

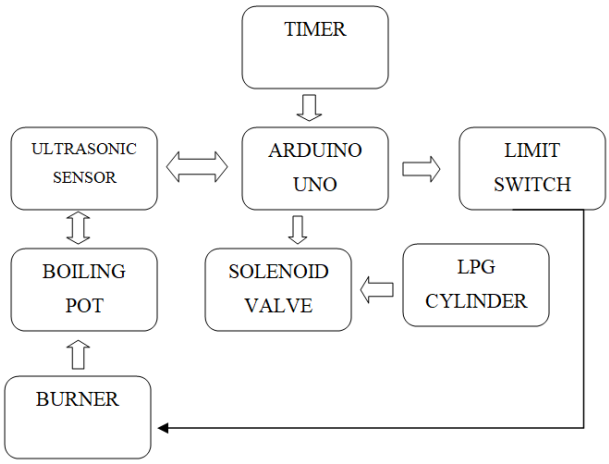

Figure 1: block diagram of smart pot and versatile cooking

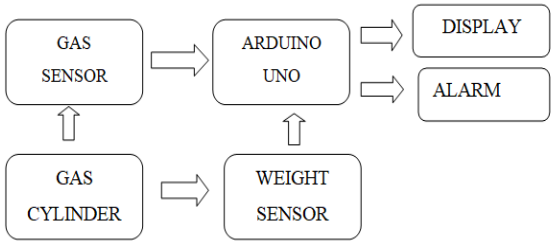

Figure 2: block diagram of gas volume and leakage detection

III. CIRCUITS

1. SMART POT

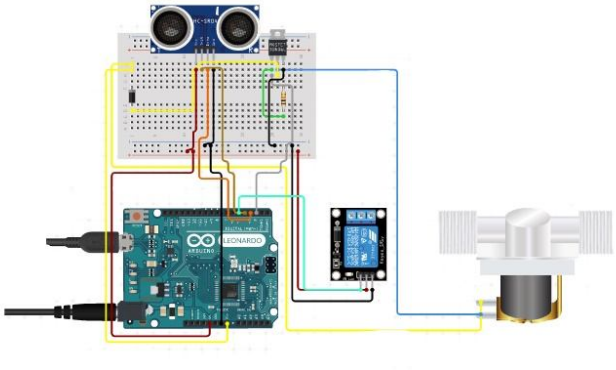

Figure 3: circuit of smart pot using arduino leonardo

- The digital pin 2 of the arduino is connected to the gate pin of MOSFET.
- Digital pin 3 of the arduino is connected to ECHO pin (output) of the ultrasonic sensor.
- Digital pin 4 of the arduino is connected to TRIGG pin (input) of the ultrasonic sensor.
- Digital pin 5 of the arduino is connected to the SIGNAL pin of 5V relay.
- Vin pin (power) of the arduino is connected to N-terminal of P-N junction diode.
- GND pin of relay and ultrasonic sensor are both grounded.
- 5V pin of the arduino is connected to Vcc (+5V) pin of the ultrasonic sensor.
- SOURCE pin of MOSFET is grounded.
- GATE pin of MOSFET is connected to 10k ohm resistor.
- DRAIN pin of MOSFET is connected to P junction of P-N junction diode.
- DRAIN pin of MOSFET is also connected to one way solenoid valve.
- The other pin of solenoid valve is connected to N junction of P-N junction diode.
- 5V Vcc pin of relay is connected to 5V pin of an arduino.

2. VERSATILE COOKING

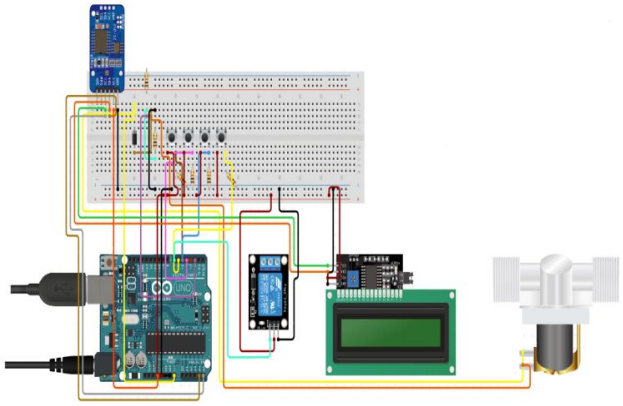

figure 4: circuit of versatile cooking using arduino uno

- The digital pin 3, digital pin 4, digital pin 5, digital pin 6, of the arduino is connected to 4 push buttons. One of the other leg of these push buttons are connected to 5V pin of the arduino uno. A 10k ohm resistor is connected between each push button and GND pin of the arduino
- The digital pin 7 is connected to the SIGNAL pin of the relay.
- The analog pin 5 of the arduino uno is connected to the SDA pin of the RTC module.
- The Vin pin of the arduino is connected to the cathode of the diode. The cathode of the diode is connected to the negative of solenoid valve. The anode of the diode is connected to the positive of the solenoid valve.
- The 3.3V pin of the arduino uno is connected to the Vcc pin of the RTC module.
- The GND pin of the RTC module is connected to the GND pin of the arduino uno.
- The SDA pin of the RTC module is connected to the SDA pin of the 16*2 I2C display.
- The SCL pin of the RTC module is connected to the SCL pin of the 16*2 I2C display.
- The Vcc pin of the 16*2 I2C display is connected to the 5V pin of the arduino uno.
- The GND pin of the 16*2 I2C is connected to the GND pin of the arduino uno.
- The 5V Vcc pin of the relay is connected to the 5V pin of the arduino uno.
- The GND pin of the relay is connected to the GND pin of the arduino uno.

3. GAS LEAKAGE DETECTION

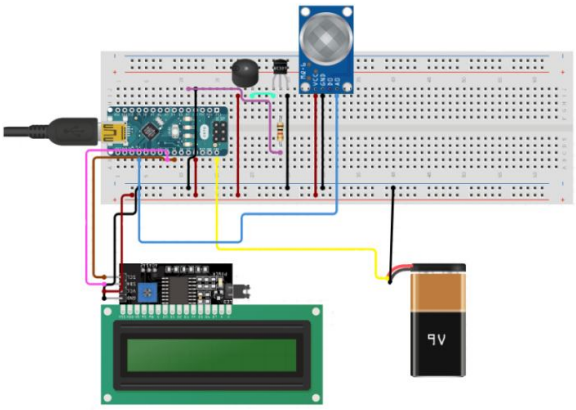

Figure 5: circuit of gas leakage detection using arduino nano

- The positive terminal of the 9V battery is connected to the Vin pin of the arduino nano.
- The GND pin of the arduino is connected to the negative terminal of the 9V battery.
- The base pin of the BC 337 transistor is connected to the digital pin 2 of the arduino nano through a 1k ohm resistor.
- The analog pin 5 is connected to the SCL pin of the 16*2 I2C display.
- The analog pin 4 is connected to the SDA pin of the 16*2 I2C display.
- The analog pin 0 of the arduino nano is connected to the analog pin 0 of the LPG, butane and propane gas sensor MQ-6.
- The 5V pin of the buzzer is connected to the 5V pin of the arduino nano.
- The GND pin of the buzzer is connected to the collector pin of the BC 337 transistor.
- The emitter pin of BC 337 transistor is connected to negative terminal of the 9V battery.
- The Vcc pin of the MQ-6 sensor is connected to the 5V pin of arduino nano.
- The GND pin of MQ-6 sensor is connected to negative terminal of the 9V battery.
- The GND pin of 16*2 I2C display is connected to negative terminal of the battery.
- The Vcc pin of 16*2 I2C display is connected to 5V pin of the arduino nano.

4. GAS VOLUME DETECTION

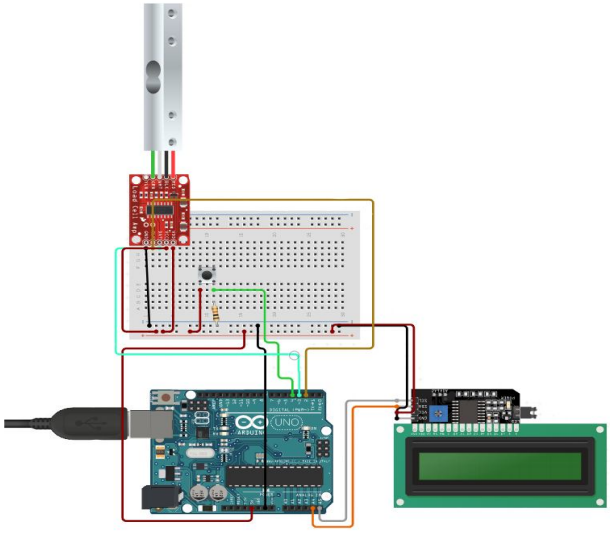

Figure 6: circuit of gas volume detection using arduino uno

- The digital pin 2 of the arduino uno is connected to the CLK pin of the load cell amplifier HX711.
- The digital pin 3 of the arduino uno is connected to the DAT pin of the HX711 load cell amplifier.
- The analog pin 5 of the arduino uno is connected to the SCL pin of the HX711 load cell amplifier.
- The analog pin 4 of the arduino uno is connected to the SDA of the 16*2 I2C display.
- The Vdd and Vcc pins of the load cell amplifier HX711 is connected to the 5V pin of the arduino uno.
- The Vcc pin of the 16*2 I2C display is connected to the 5V pin of the arduino uno.
- There are four wires coming out from wheatstone bridge inside the load cell and it is connected to four pins of HX711 module. The red wire from the load cell is connected to the RED pin of the HX711 load cell amplifier. The black wire to the BLACK, the white wire to the WHITE, and the green wire to the GREEN of the HX711 load cell amplifier.

IV. WORKING

1. SMART POT

Smart pot is a system that automatically cut off the gas supply to the burner without boiling over of the milk, tea or coffee.

The pot with milk is kept in the burner and when the milk starts rising up the ultrasonic sensor placed in the perimeter of the gas stove senses this and the solenoid valve cuts the gas supply to the respective burner. The user can recover the knob position later. There is a limit switch near the knob. When the user change the position of the knob which is

presently in on position to off, the limit switch will make arrangements for the reflow of gas to the burner. And then the gas supply to the burner is restored.

2. VERSATILE COOKING

The cooking time can be controlled with this mechanism thereby preventing over consumption of the LPG.

All the connections are made according to the circuit diagram. The arduino code is uploaded. A timer is set in the gas stove. The user can set the desired time that will be required for cooking. When the set time is reached, the solenoid valve blocks the gas supply from the cylinder to the respective burner. A limit switch is placed near the knob of the burner. The user after turning the knob to off position the gas supply which was blocked will start to flow to the burner. The user can cook the food without lowering the flame because he will not be able to keep an eye on the dish.

3. GAS LEAKAGE DETECTION

Connections are made according to the circuit diagram. The code is uploaded to arduino nano. The MQ-6 gas sensor senses the leakage of gas if any, and the buzzer connected to the arduino nano will start to make noise indicating the leak. The display system shows the rate of leakage that occurred.

4. GAS VOLUME DETECTION

The connections are made according to the circuit diagram. The arduino code for the circuit is uploaded. A load cell is mounted on the holder of the cylinder. The load cell module reads the weight of the cylinder, and is calibrated with the actual weight of the cylinder and the volume of gas inside the cylinder is found out. It is displayed in percentage measure in the LCD display near the cylinder.

V. FUTURE WORK

A modification to the versatile cooking is what can be expected in future work. The cook have to rush to the kitchen to turn off the burner when the pressure cooker whistles. The modification which is likely to be made is to reduce this effort by providing user a platform to set the number of whistles required in the stove so that when the desired result is achieved, the burner is turned off automatically.

After detecting the gas leakage, the exhaust fan is turned on automatically. The intensity of leakage and the information about the occurrence of leakage is passed to the users mobile. An app is preinstalled in the mobile and by the request from the user the windows of the kitchen are opened automatically by sending signal from the app. Also the cylinder can be turned off through the app.

VI. CONCLUSION

Through this paper, the efficient usage of LPG, which is extracted from non-renewable source of energy, can be achieved. The necessity of lingering in the kitchen can be avoided and the constant requirement of keeping an eye on the kitchen while boiling milk, preparing tea and cooking other dishes can be avoided. The dangers that would happen from leaking of gas can be identified easily and necessary steps can be taken immediately to stop the leak. The gas volume left in the cylinder can be analyzed, and the booking of next cylinder could be done based on the volume left in the existing cylinder. The user will not run out of gas through this understanding of his own gas volume.

VII. ACKNOWLEDGMENT

It is a pleasure to acknowledge the help and encouragement of Mrs. Neethu M, Assistant Professor of department of Mechatronics engineering, Nehru College of Engineering and Research Centre Thrissur, Kerala for her endless support with reviewing and for her valuable advice and guidance. Also we are indebted to our colleagues from Nehru College of Engineering and Research Centre for their inspiration and assistance in completion of this research.

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