IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE)
e-ISSN: 2278-1676,p-ISSN: 2320-3331, Volume 12, Issue 4 Ver. III (Jul. – Aug. 2017), PP 01-06
www.iosrjournals.org

Kitchen stove safety system using load cell

*Jaydeep Jitendra Gajjar[1], Deep Manojbhai Bhavsar[2], Rahul Rajesh Pahilajani[3]
B.E. Student Mechanical engineering SOCET Ahmedabad, India
B.E. Student Mechanical engineering SOCET Ahmedabad, India
B.E. Student Mechanical engineering SOCET Ahmedabad, India
*Corresponding Author: *Jaydeep Jitendra Gajjar*

Abstract: *The purpose of this research paper is to create a safety system for the people using the kitchen stove. In today's era the gas stoves are mainly working on LPG and electric system. The first gas stoves were developed in the 1820s, and a gas stove factory was established in England in the year 1836. This new cooking technology had an advantage that it was easily adjustable and could be turned off when not in use. However the gas stove did not became a commercial success until the 1880s, by which time a supply of piped gas was available in large towns in Britain. The stoves became widespread in the European Continent as well as in the United States of America in early 20th century. In day to day life, people who are using the gas stove forget to turn off the gas stove which causes very hazardous situation. The people who are using the gas stove sometimes put the utensil on the gas stove and leave the gas knob open which will cause gas leakage. Many times it happens that the kids in the house turns on the gas stove just for fun but it may create very dangerous situation for the family as the gas that leaks out can catch a spark and even a blast may occur.*

Keywords: *Kitchen stove; Utensils; Load cell; Gas leakage.*

Date of Submission: 27-07-2017 Date of acceptance: 10-08-2017

I. Introduction

The early humans discovered fire as a means of cooking, they started the fire with the help of stones. After that they invented the method of starting a fire with the help of wood sticks. After that they discovered the use of kerosene as a fuel. Nowadays the people use LPG (Liquefied Petroleum Gas) , PNG (Purified Natural Gas) , Propane and Butane gases as a main source of fuel for cooking. The latest stoves are electrically operated. Based on the number of burners the older versions had two burners and the latest have four to six burners. The kitchen stoves which are used in today's era are having no safety precaution to turn off the stove automatically so we have invented this system for safety called as kitchen stove safety system by using weight sensor. As we talk about Kitchen stove, let us go quickly into the journey of inventions which took place from the olden days to this modern era in energy development and explore the same.

From figure 1 the history of kitchen stove, village people used chula for cooking but main disadvantage when we were using the chula was that to start it, we would blow the air by mouth so it may cause harmful diseases. When people used primus for cooking, it is better than the chula as we took less cooking time than the chula. Main disadvantage is we need to do priming when we started the fire in the primus. For removal of the priming, people started using gas stove. People used LPG (liquefied petroleum gas) to start the 2 burner stove. When we used fossil fuel gas it is hazardous to human life and chance to occur accident is its main disadvantages. Afterwards People used 1 burner electrical stove. The use of this type of stove prevents the disadvantages of the gas type stove. The 4 burner stove does multiple operations in less time. People used 2 burner electrical stoves so they cooked the food faster than 1 burner electrical stove. Main disadvantages, we didn't do work very quickly. People used 4 burner electrical stoves; it gave the ability to do multiple operations in less time. When we used it we had safety issues while working and it is a main disadvantage.

For safety many sensors and load cells are invented. We are using this load cell to prevent the accidents occurring while working on kitchen stove.

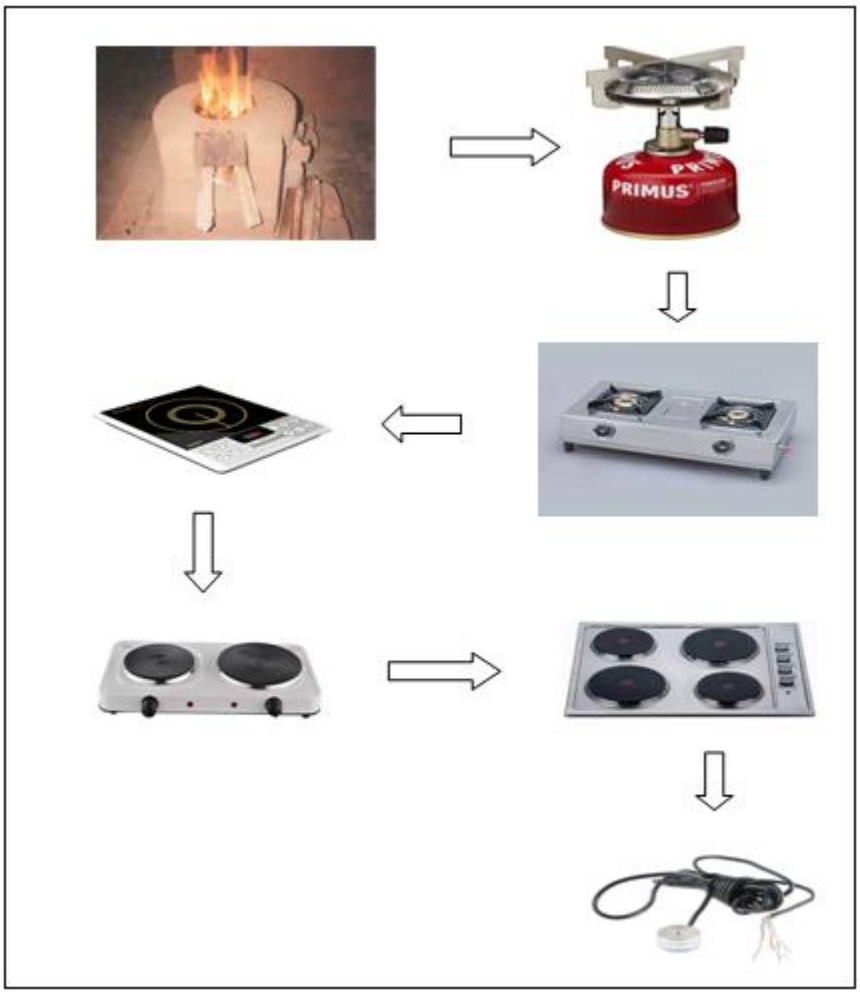


Figure 1 (modified kitchen stove)

II. Concept Of Kitchen Stove Safety System Using Load Cell

A. ***Why do we need to bring this system into existence?***

The basic needs of a human are food, shelter and clothes. From the Stone Age to 21st century we have used various appliances for cooking the food and latest appliances which we are using for cooking the food are gas stoves with LPG or Electric system. But in gas stoves, sometimes people forget to turn off the gas knob and this results to gas leakage and whole space in house gets covered by gas. So if someone starts any electric related thing which results into blast and loss of life. This happens because of kids who don't know how to turn off the gas knob or even adults sometimes who forget to turn it off. So this system automatically turns off the gas knob after sometime if there is no weight on the gas stove with the help of weight sensor. This system will be helpful to our society.

B. ***Which main components are being used in this system?***

The components being used in this system are kitchen stove, load cell, microcontroller.

C. ***Working Principle***

As soon as the cooking vessel is removed from top of the stove the weight sensor senses that the stove is unloaded and nothing is kept over the gas stove will get turned off. Now the gas flow is still ongoing as the knob is not turned off. The sensor gives signal to amplifier and microcontroller stops the flow of gas thus situation of gas leakage is prevented and no hazardous accident occurs.

III. Construction Of Kitchen Stove Safety System By Using Load Cell

The list of the components is shown below which are used in the modified kitchen stove using kitchen stove safety system:-

D. ***Stove***

We are going to use 2 or 4 burner kitchen stove. This is the main component for cooking food. The burner is mounted on the stove. The knob is fitted in the stove and by using it the flame intensity is controlled.

E. ***Burner***
The burner is the component of the stove on which the utensils are mounted for cooking the food.
F. ***Knob***
The knob is fitted in the stove to regulate the intensity of flame. We can adjust the flame from low to high intensity.
G. ***Microcontroller***
The microcontroller is most important component of this system. The microcontroller is the brain of the system as it controls the Flame by controlling the knob when the system is in working condition.
H. ***Amplifier***
The amplifier will receive the signal from the load cell and will transmit this signal to the microcontroller.
I. ***Load cell***
This load cell is of button type. The load cell will be fitted under the burner and whenever any load is kept on it, the load cell will sense the load and the button will be pressed due to the load. When the load is removed then the button will return to initial condition and this signal will be sent to the amplifier.

IV. Working Of Load Cell

In figure 2 the TAS606 200KG load cell is shown. We put it under the burner so we will get the exact weight reading. This load cell is button type load cell, when load on the burner is present due to utensils the button will be automatically pressed due to weight, so we will get the reading. If the load is not on the burner then the button will remain as it is so we will not get the reading. After we will get reading, if load is removed from the top of the stove after sometime the load cell will translate signal to amplifier. The amplifier is connected with microcontroller. The Microcontroller controls the whole system when the signal will be sent to it. The person who have recently worked on the kitchen stove has left and have forgot to turn off the knob of the kitchen stove then the microcontroller will turn off the kitchen stove. Accidents will be prevented while the system is working.

This disc load cell (sometimes called a strain gauge) can translate up to a whopping 200kg of pressure (force) into an electrical signal. Each load cell is able to measure the electrical resistance that changes in response to, and proportional of, the strain (e.g. pressure or force) applied to the disc. With this gauge you will be able to tell just how heavy an object is, if an object's weight changes over time, or if you simply need to sense the presence of an object by measuring strain or load applied to a surface.

Figure 2 (load cell)

Disc load cells are a bit easier to mount than bar-style load cells, making them more straightforward to implement into a design. Each load cell is made from a steel-alloy and is capable of reading a capacity of 200kg. These load cells have four strain gauges that are hooked up in a Wheatstone bridge formation. The colour code on the wiring is as follows: red = E+, green = O+, black = E- and white = O-. Additionally, these load cells offer an IP66 protection rating.
Dimensions: 20mm x 11mm, 2000mm Wire

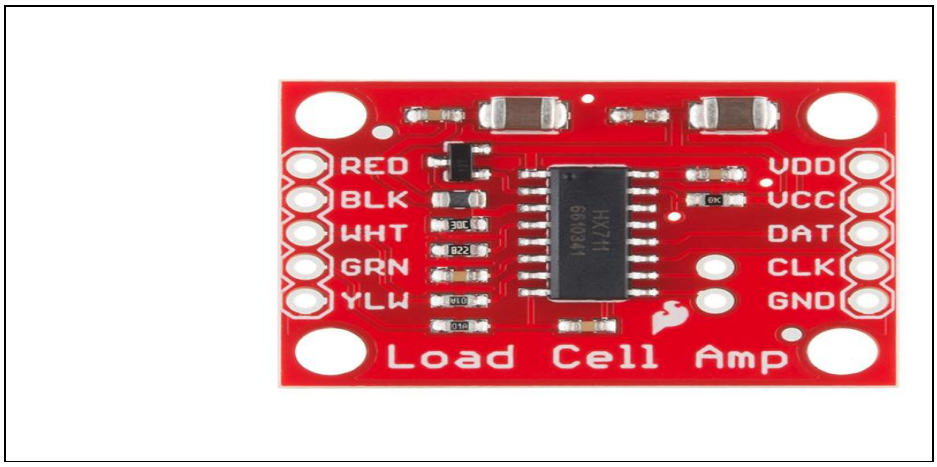


Figure 3 (amplifier circuit)

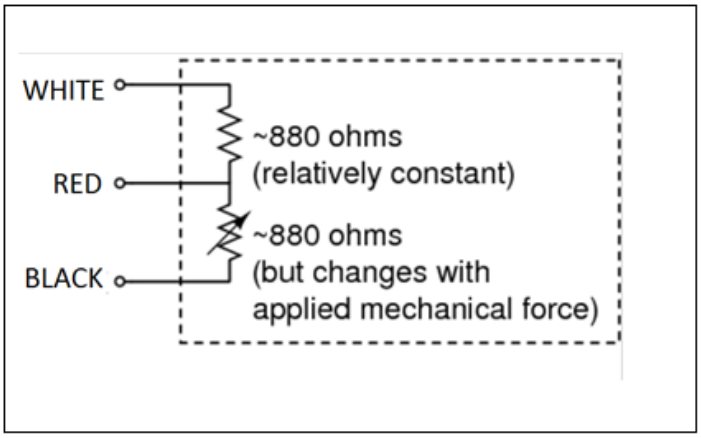
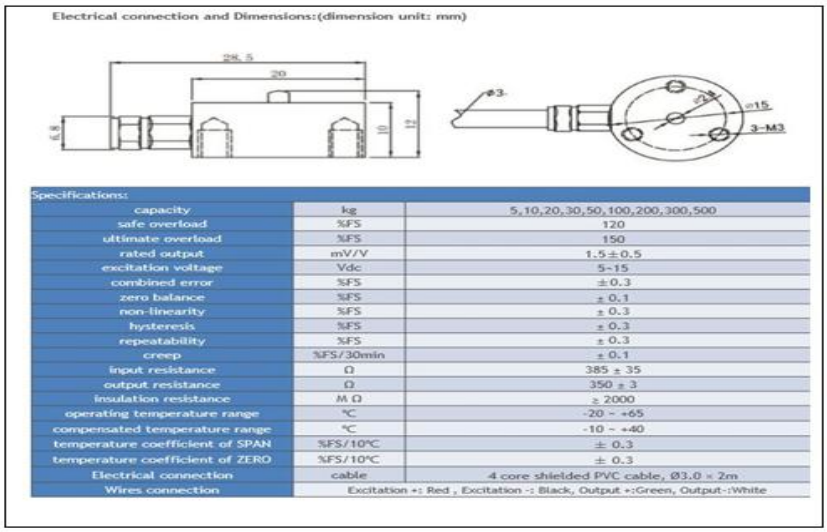


Figure 4 (Symbolic diagram of Amplifier)

In figure 3 we see the HX711 load cell amplifier is used to get measurable data out from a load cell and strain gauge. The HX711 Load Cell Amplifier accepts five wires from the load cell. These pins are labelled with colours; **RED, BLK, WHT, GRN, and YLW**. These colours correspond to the conventional colour coding of load cells, where red, black, green and white wires come from the strain gauge on the load cell and yellow is an optional ground wire that is not hooked up to the strain gauge but is there to ground any small outside EMI (electromagnetic interference). Sometimes instead of a yellow wire there is a larger black wire, foil, or loose wires to shield the signal wires to lessen EMI.

V. Datasheet Of Load Cell



Specifications:		
capacity	kg	5,10,20,30,50,100,200,300,500
safe overload	%FS	120
ultimate overload	%FS	150
rated output	mV/V	1.5±0.5
excitation voltage	Vdc	5~15
combined error	%FS	±0.3
zero balance	%FS	± 0.1
non-linearity	%FS	± 0.3
hysteresis	%FS	± 0.3
repeatability	%FS	± 0.3
creep	%FS/30min	± 0.1
input resistance	Ω	385 ± 35
output resistance	Ω	350 ± 3
insulation resistance	MΩ	≥ 2000
operating temperature range	℃	-20 ~ +65
compensated temperature range	℃	-10 ~ +40
temperature coefficient of SPAN	%FS/10℃	± 0.3
temperature coefficient of ZERO	%FS/10℃	± 0.3
Electrical connection	cable	4 core shielded PVC cable, Ø3.0 × 2m
Wires connection	Excitation +: Red , Excitation -: Black, Output +:Green, Output-:White	

[1] Product Numbers:TAS606
[2] Capacity : 5,10,20,30,40,50,100,200,300,500 kg
[3] Material: stainless steel
[4] Defend grade: IP66.
[5] Application: suitable for force control in production control, vibratory feeding equipment and other electronic weighing or force measuring fields.

VI. Conclusion

Earlier, we were using chula then we started using primus. Less work was required for primus. After that we started using gas stove, we can operate this stove easily compared to previous inventions. The latest invention is the electrical stove, in this type of stove there is no need of gas to run the stove.

Now we used the kitchen stove safety system in the kitchen stoves of gas type and electric type. By using this system we have prevented the accidents from occurring in the gas stoves and electric stoves. The safety of the user is ensured while this system is working.

References

[1]. Alka D "Design and development of ARM7TDMI-S based GSM Mobile for home automation and security ". E- Journal of science and Technology. (4), 7, PP. 67-74(2012).
[2]. Ashish S., Ratnesh P., Rajeev K. and Rahul V. "GSM Based Gas Leakage Detection System". International Journal of Technical Research and Applications e-ISSN: 2320-8163, Volume 1, Issue 2, PP. 42-45(2013).
[3]. Massachusetts Department of Fire Services "Liquefied Petroleum Gas (LPG) Awareness.pdf", Massachusetts Department of Fire Services, Massachusetts Firefighting Academy, PP. 1-35
[4]. PadmaPriya K, Surekha M,. Preethi R. "Automatic Refill Booking Using Embedded System". International Journal of Key Scientific Research for Industrial Engineering and Technology. Vol.1, Issue 1. PP. 01-05(2014)
[5]. Theraja B.L. and Theraja A.K. "A textbook of Electrical Technology". S.Chand & Co. ltd, 23rd Edition, pp 1029-1118(2002).

IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE) is UGC approved Journal with Sl. No. 4198, Journal no. 45125.

Jaydeep Jitendra Gajjar. "Kitchen stove safety system using load cell." IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE), vol. 12, no. 4, 2017, pp. 01–06.