Design of LPG gas level indicating mechanical Device

C.Manivelprabhu[1], Stenin Varghese[2], Roney Abey Thomas[3] and Shijo Baby[4]

[1]Assistant professor, Mechanical engineering,Christian college of engineering and technology,India
[1]manivel135@gmail.com
[2]UG Scholar, Mechanical engineering,Christian college of engineering and technology,India
[2]ninets007@gmail.com
[3] UG Scholar, Mechanical engineering,Christian college of engineering and technology,India
[3]roneyabeythomas17@gmail.com
[4] UG Scholar, Mechanical engineering,Christian college of engineering and technology,India
[4]shijobaby89mklm@gmail.com

ABSTRACT

Liquefied petroleum is one of the most important domestic fuels in this present world, like our country the developing countries are used liquefied petroleum gas cylinders. Because of invisible property of gas, people feel strait to know the gas level in the cylinder and also they feel strait to reserve the cylinders.

Now days, there are so many devices which are used to measure the gas level in the LPG cylinders. Like 'Torra gas' it is a pneumatic device and fuel gauge. But those devices may be electronic and partially mechanical devices.There have so many errors and energy losses in the measuring, and the cost of all devices is not suitable for normal people. In some devices there wants external energy supply. So it is difficult use for normal people.

In this paper there is possibility to reduce the evident problem which occurs in the existing devices. It is mainly aims to house hold purposes. In this design, mechanical components such as springs, steel plates etc. are used, due this reason the energy loss can be solved

Index Term— Compression spring, gravity, level indicator, LPG cylinder, trolley .

1. INTRODUCTION

LPG, first invented in 1910 by Dr. Walter Snelling . It is a mixture of propane and butane having saturated as well as unsaturated hydrocarbons. Because of the versatile nature of LPG it is used for many needs such as domestic fuels, industrial fuel, automobile fuel, heating, illumination etc., and the demand for LPG is on an exponential raise day by day. The LPG is finding wide usage in homes, automobiles and in industries as fuel because of its desirable properties which include high calorific value, produces less soot, produces very less smoke and does not cause much harm to the environment.

In modern world the living status were developed and equipped. Fuels have great role in the daily life. Now the world have no time to waste, all the people all around the world are very busy. Due to this reason the world is looking for devices and instruments which reduces their effort and save time. So instruments and devices have great role in this generation.

In most of fuels the liquefied petroleum is most important fuel in domestic level. There is no mechanical devices which uses to measure the gas level in the LPG cylinder. There have some electrical and pneumatic devices, but they need external power supply and their cost is high. In this project solve the above problems like external power supply and errors, we choose idea to make fully mechanical device. It is "LPG CYLINDER GAS LEVEL INDICATING MECHANICAL DEVICE". This device is fully mechanical device, so there is no need of any external power supply.

2. WORKING PRINCIPLE

In this project**, the device is worked by the help of mass property of gas and gravitational force of the earth**. In here two mild steel plates are fixed using four open coil compression spring. The plates are not fixed permanently. This device can be dismantle anyone; the springs placed between two cups to connect the mild steel plates.

The cylinder is placed on the upper movable disc, due to the weight of cylinder the spring shows maximum deflection in the scale reading. When cylinder is fully loaded the deflection is maximum, when gas is used to burn due to the consumption of gas the weight of cylinder is reduced. Correspondingly the pointer in the upper movable disc move upwards respect to the weight of cylinder. In this device the scale is made up based on the deflection which produced in the spring for each 2 kg.

By the help of wheels the gas cylinder is carried out from one place to another place.

3. DESCRIPTION OF PART

3.1 Open coil compression spring

Spring is the main mechanical element of this device, it is acted as mechanical energy reservoir. In here we have used open coil compression spring, because the nature of the load is compression load.

The spring give deflections corresponding to the weight applied on the spring. It will compress it's length when the load is higher, and also it will retain its length when the load is reduced

3.2 Upper movable disc

The upper disc is the movable disc. The cylinder is placed on this cylinder and also pointer is also fixed in this disc. The disc will move upwards and downwards corresponding to the weight of gas cylinder by the help of compression spring.

3.3 Lower disc

Lower disc is fixed in position. It is just use to support the upper disc and also the wheels are fixed in this part. The reading scale is fixed in the perimeter of the disc vertically.

3.4 Pointer

Pointer is fixed in the upper movable disc. It is use to indicate the deflection corresponding to the load applied.

3.5 Scale

Scale is to show the reading to the observer. The scale is calibrated for specific readings, in the scale the scale is against time remaining and weight of gas. It is fixed on lower disc vertically. Wood is used as the scale material

3.6 Wheels

Wheels are used to provide smooth and easy transportation of gas cylinder from one place to another place.

3.7 Grill

Due to the use of spring there have chance to make shocks, so there is also chance to fall dothe gas cylinder. To avoid this grill is used as support or protection layer.

3.8 Handle bar

Handle bar is used to control the direction of movement of cylinder. It is made up of C15 mild steel.

4. CONSTRUCTION

4.1 Helical spring

It is also called coil spring, generally there are two types of coil springs are available there are open coil and closed coil spring.in here we have used open coil compression spring. The compression force is stored on the spring and shows deflection and regain its original length when the load is reduced.The spring material is oil tempered low carbon low alloy steel

Material Properties:

Grade	1074/1075
Carbon©	0.70-0.80%
Manganese (Mn)	0.50-0.80 %
Phosphurous (P)	Max. 0.030 %
Sulphur(S)	Max. 0.035 %
Yield strength	430 – 530 Mpa

Table-1:material properties

4.2 Calculation of coil spring

4.2.1 Parameters and calculations of spring

- Number of coils (n) - 7
- Wire diameter (d) - 3mm
- Mean diameter (D) - 49mm
- Free length (Lf) - 143mm
- Solid length (Ls) - 21mm
- Pitch length (P) - 22mm
- Type of spring used - Open coil compression spring
- Time for consumption - 6.04 hrs for 1Kg of LPG

4.2.2 Equations

1. Deflection , $y = \frac{8PD^3n}{Gd^4}$ ……..(1)

2. Stiffness , $q = \frac{Gd^4}{8D^3n}$ ……..(2)

Where,

P-Axial load (kg)
D-Mean diameter of spring (mm)
n- Number of coils
G-Rigidity modulus (N/mm^2)
d- Wire diameter (mm)

4.3 Design of mild steel disc

In this project, two metallic discs is used. One of the disc is movable and the other is fixed. The pointer is fixed on upper movable disc. The lower disc is used to support the upper disc using coil springs. In here, the discs are not fixed permanently, that can be easly dismantable. The rolling wheels are fixed on the lower disc. By this arrangement, transportation of this device is quite easy.

4.3.1 Material:

In this project, C15 mild steel is used. When it is marketelised, the mild steel is replaced by stainless steel inorder to avoid corrosion.

4.4 Design of handle bar

The handle bar is used to apply the load on the device to move the device from one location to another location, and it is also use to control the direction of motions. In here the handle is made up of C15 mild steel. The handle is free to rotate in the X axis. The length and diameter of shaft is given below.

4.4.1 Specifications of handle bar

Length of handle bar - 900 mm
Diameter of handle shaft - 10 mm

5. SPRING GEOMETRY

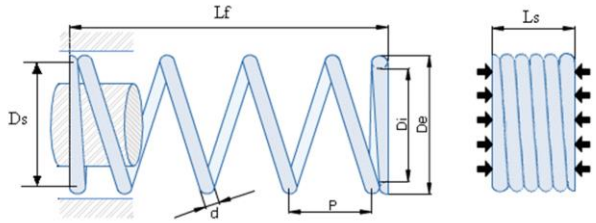

Fig-1:spring geometry

5.1 Ls (Solid length): Maximal length of a spring after total blocking. This parameter is shown in the picture on right.
5.2 Lf (free length): Free length of compression springs is measured in its uncompressed state.
5.3 P (pitch): Average distance between two subsequent active coils of a spring.
5.4 Ds (Spring diameter): Spring diameter is mean diameter of spring. That is calculated by subtracting wire diameter d from external diameter De.
5.5 De (external diameter): External diameter of a spring can be find out by adding the doubled wire diameter to the inner diameter of a spring.

6. COST ANALYSIS

Sl. No.	Name of the Parts	Rate Of The Price	Quantity
1.	Compression spring	30	4
2.	Mild steel disc	200	2
3.	Handle bar	120	1
4.	Wheels	10	4
5.	Protection covering	40	1
6.	Total	720	

Table -2: cost analysis

7. MODEL DIAGRAM

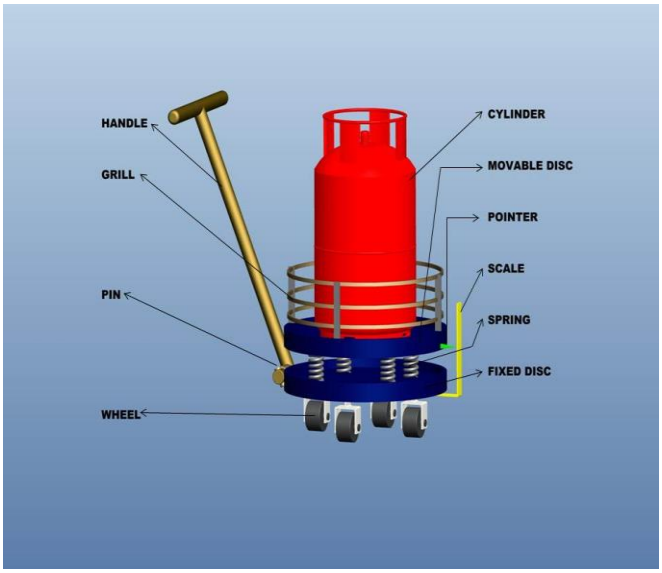

Fig-2: Model diagram

8. RESULT AND DISCUSSIONS

Thus this paper is effectively fabricated and get the result of 2mm deflection on reading scale for 0.5 kgf of LPG gas. The device is fully mechanical with cost effectively manufactured, with the help of wheels and handlebar gas cylinder conveying become easy. The device worked by only with the gravitational force of earth. So the output of this paper is success. Fabricated system of this device is given below

8.1 Merits

- It is very Low cost when compare to existing methods.
- We can save the energy.
- There is no wear and tear in the mechanical elements.
- Easy transportation of gas cylinder can be done.
- Assembling and dismantling is quite easy.
- Less number of components.

8.2 Future scope of this device

- This device useful for home makers. They can be easy transport the cylinder from one place to another place, which means it act as trolley or carrier.
- It does not need any external supply or energy, so in future the energy can be save.

9. CONCLUSION

This device is fully mechanically operated by the help of gravitational force of earth. Due to change in the gravitational force different altitudes the device shows small error in the scale reading, it may be positive error or negative error. Due to less working components overall cost of the device is very low. And also the maintenance and repair is very low for this device is the another advantage of this device.

Fig -3: fabricated device

12.REFERENCE

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