

Tire Pressure Self Inflating and Controlling System

Shubham S. Fawade, Pragati P. Ghan

Abstract: *Tire is a very essential component in an automobile. If the tire pressure is not at the proper level, it may cause over inflation or under inflation which may further cause big accidents and affect the tire life. In this project a system is developed which can control the pressure of the tire automatically by using sensors and it will inflate the tires to its required pressure. A pressure sensor is used which will signalize if the pressure goes beyond or below the required level. Compressor is used for compressing the atmospheric air and filling it inside the tires. The signal will cause the compressor to supply the air as per the requirement to the tire.*

Keywords: automobile, compressor, over inflation, pressure sensor, rotary joint, tire pressure, under inflation

1. Introduction

As per the statistics and the observations approximately 70 percent of the vehicles running on the ground are having at least one or more tires underinflated or over inflated. Tires having under inflation as well as over inflation may cause a serious damage to the life of the tires. It can also cause severe accidents. In 2000-2001, the United States Transportation Recall Enhancement, Accountability, and Documentation Act (TREAD) requested the National Highway Transport Safety Authority for investigation of a system controlling the inflation pressure of the vehicle tires. From 2006, the trucks and passenger cars in the United States were restricted with an automated system called Tire Pressure Monitoring System. The system used to warn the driver as soon as the tire pressure is gone below or above the preset required value. The tires were also manufactured with a great care to have better life, but the proper usage of the tire is also important for a better tire life. Tire pressure also has a great concern in case of military vehicles. The Self Inflating Tire Systems are therefore applied in the Cargo vehicles of the military. Thus the tire pressure should be adjustable and self controlled according to the conditions and the load requirements in the vehicles.

2. Methodology

2.1 Components

Following components are used for designing Self Inflating Tyre System:

- 1) Air Compressor
- 2) Pressure Gauge
- 3) Rotary joint
- 4) Relay
- 5) Pedestal bearings
- 6) Belt
- 7) Pulley

1) Air compressor:

Electric compressor working on a 12 V battery is used for compressing the atmospheric air. Compressed air is then supplied to the air tank for storage purpose. Portable and compact air compressor having capacity 300psi is used for Auto tires, cars /bike tires and sports equipments.

2) Pressure Gauge:

Pressure gauges are used to measure air pressure in the storage tank. Bourdon tube pressure gauge principle is used in which pressure difference causes the semicircular metal tube to get straightened due to which reading is shown on a calibrated scale. Pressure difference between 0 to 200 psi can be measured.

3) Rotary Joint:

Rotary joint is an alternative method of routing the air. Rotary joint is equipped with an air chamber in it which allows air to pass from the half which is stationary with the spindle into the half which is rotating with drive axle hub. Ball bearings are used to reduce friction between two halves.

4) Relay:

It is a switch which is operated electrically. This switch can be operated mechanically using electromagnets. Relay comes in picture where a low power signal can be used to control a circuit. It also controls many circuits with only one signal.

5) Pedestal Bearings:

Axle housing is supported by two such pedestal bearings. Nuts and bolts are used to fix the bearings to the rigid support.

6) Belt:

Mechanical linkage of two or more parallel rotating shafts can be made by using a belt. Belt is made up of a loop of flexible material.

7) Pulley:

Pulley is a wheel which is mounted on axle or shaft. It is used to support movement and change of direction of belt on its circumference.

2.2 Working

This mechanism works on the principle that the compressor supplies air to the tire when the vehicle is running. The air from the compressor is supplied to the rotary joint, from where the air is supplied to the tire which is under-inflated. Because of the implementation of rotary joint the air is easily supplied to the tire without tangling the hoses. An automatic compact air compressor shut down automatically when the

required tire pressure is reached. In the process the compressor is used to compress the air. The air is taken from the atmosphere and compressed at required pressure. There is a ducting which is used connect to the compressor outlet port and one end of the rotary joint. The compressed air is supplied to the rotary joint through the ducting. Two Pedestal bearings are used to support the axle of the assembly. Bearings are fixed to the rigid supports via nuts and bolts. The axle is rotated on which wheel or rim is mounted on one end. One end of coupler is connected to axle and other end is connected to rotary joint.

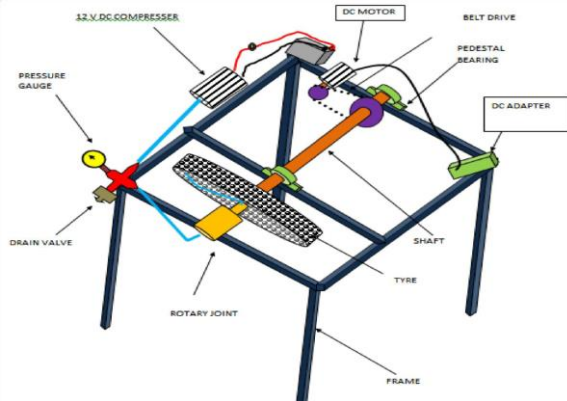


Figure 1: Setup of self inflating tire system

There are electronic sensors used to detect the tire pressure with the help of pressure gauge. When the pressure in the tire is reduced below the required level then the sensors sense the pressure level and send feedback signal to the compressor for maintaining pressure level of air in the tire. Compressor works on a 12V battery of the vehicle and it is reciprocating in nature. So, it is easy to obtain the desired pressure level. Rotary joint is used to supply compressed air simultaneously when required.

3. Conclusion

Self inflating tire system increases the efficiency of the tires as well as its life. It also increases the fuel economy by controlling the tire pressure to its required level. It provides a comfort ride and avoids the road accidents causing due to the over inflation and under inflation. Installing this system in the vehicle will not cost much if seen towards its advantages.

Acknowledgment

I wish to thank my brother Mr. Sumit Fawade for his tremendous support in the project work. This work was supported in part by a grant from my beloved mother and father.

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Author Profile

Shubham S. Fawade is currently pursuing graduate degree program in Automobile Engineering in Rajarambapu Institute of Technology (An Autonomous Institute), Shivaji University, Kolhapur, India

Pragati P. Ghan is currently pursuing graduate degree program in Mechanical Engineering in Dr. Babasaheb Ambedkar Technological University, Lonere, Raigad, India