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FABRICATION OF SOLAR BASED AUTOMATIC TIRE INFLATION SYSTEM FOR CARS

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Abstract
The goal of this research is to create a solar-powered automatic tire inflation system for automobiles, addressing the significant issue of underinflated tires, which can result in safety issues, tire wear, and poor fuel efficiency. The suggested system uses solar energy as a renewable energy source to power a tire inflation mechanism that automatically maintains the correct tire pressure. The fabrication procedure includes mounting a photovoltaic panel on the car's roof, which transforms solar radiation into electrical energy. This energy is then stored in a battery for continuous use. Each tire has a pressure sensor attached to continuously monitor the tire pressure. Additionally, it lengthens tire life and lowers the possibility of accidents brought on by tire blowouts or loss of control from underinflated tires. Extensive testing and assessment are carried out under numerous circumstances, including varied driving scenarios and weather conditions, to certify the system's effectiveness. The system's effectiveness is compared to more established manual tire inflation techniques, and the results show that the solar-powered automatic tire inflation system is superior in terms of sustainability, effectiveness, and practicality. Overall, the creation of an autonomous tire inflation system for cars that use solar energy is a big step towards improving vehicle safety, lessening the industry's impact on the environment, and encouraging energy sustainability. Future developments in green technology are made possible by the incorporation of renewable energy sources into vehicle systems.

Keywords: Automatic Tire Inflation System, Fabrication, tire.

I. INTRODUCTION

The primary goal of the project is to construct a solar-powered automatic tire inflate system. We are aware that a vehicle's performance, safety, and mileage will all suffer with a few pressure unit drops. The photo microcontroller, pressure sensor, LCD, POT, tire inflator, tire, DC motor, solar panel, charge circuit, and battery are the major components of the inflator.

We created this system to automatically deflate and inflate the tire using control units so that it can be installed in every vehicle under any operating scenario and boost tire life, mileage, and safety in addition to maintaining the proper tire pressure. As it continuously checks tire pressure using an integrated control unit, it is referred to as an automated system.

The research found that almost 80% of automobiles on the road have at least one under-inflated tire. Tires lose air as a result of normal driving (particularly after hitting curbs or potholes) and temperature variations throughout the year.

Normally, a dc motor operates by interacting magnetic fields with current-carrying conductors to transform electrical energy into mechanical energy. The opposite action is carried out by an dynamo, generator, or alternator, which converts mechanical energy into electrical energy.

II. LITERATURE SURVEY

The most important component of an automobile, the tire, is fundamental to ensuring safe driving. Even yet, the majority of cars on the road have one or more underinflated tires. A thorough study has revealed that even a small decrease in tire pressure affects vehicle performance, driving safety, tire life, and fuel economy. Tires operating with the wrong pressure can be caused by a variety of factors, including ignorance of specific pressure requirements and abrupt environmental changes. The self-inflating and automatic tire pressure control technology guarantees constant correct tire pressure. Tyre hissing signals a pressure drop and the system immediately begins automatically replenishing the tire to its specifications. Because it continuously monitors tire pressure using a pressure gauge and alerts the driver when necessary, this system is called automated. The project's objectives are to stabilize all automobile tires at the proper pressure, completely automate the system, achieve adequate fuel efficiency, build a cost-effective system, extend tire life, and decrease accident rates.[1]

To achieve our goal of demonstrating how even a small decrease in tire pressure may affect vehicle performance, safety, tire life, and fuel economy, we have built an autonomous, self-inflating tire system that keeps tires at the proper pressure at all times. In our design, a revolving connection between the wheel spindle and wheel hub at each wheel, as well as a portable compressor that effectively provides air to all four tires through hoses, are proposed and utilised. The rotating joints efficiently channel air to the tires without causing hoses to tangle. This system addresses possible improvements an increase in handling and tire performance, tire wear reduction, and gas mileage, in a variety of settings in light of recent increases in oil prices and increased environmental concerns. [2]

The goal of the project is to create an "automatic tire pressure inflation system". We are aware that a vehicle's performance, safety, and mileage are all negatively impacted by a little loss in pressure. We created this system to automatically deflate and inflate the tire using control units so that it can be installed in any automobile in any operating environment and boost tire life, mileage, and safety in addition to maintaining the proper tire pressure. This system is automatic since it continuously monitors the tire pressure using a built-in control device and alerts the driver about the tire condition as a result. [3]

Since the invention of tires, improvements are routinely made to a vehicle's tires for a longer lifespan and their contribution to increased vehicle safety. As is common knowledge, a car is the most significant aspect of our lives because it allows us to cover great distances quickly. For the vehicle to run more efficiently and safely, the tire pressure needs to be kept at the correct level. Therefore, this technology was introduced with consideration for fuel

consumption, vehicle comfort, and safety. It keeps the vehicle's tires at the proper pressure, improves fuel efficiency, and lessens tire wear, extending tire life and cutting down on the frequency and cost of tire replacement. Maintaining optimal tire pressure is a major goal of this system's introduction. When a tire's pressure dips below ideal levels, a pressure gauge monitors it and the tire is inflated once again. Researchers and novice learners will gain a better grasp of the operation, benefits, and drawbacks of the "Automatic tire inflation system" utilized in car tires after reading this paper. [4]

Nowadays, roads are the most significant means of transportation, and cars are a crucial component of it. Your tires deflate as you drive normally, especially when you strike potholes and other permeable surfaces. Temperature variations can contribute to tire air loss. Vehicles drive with underinflated tires as a result, increasing the risk of accidents. Studies show that even a few PSI of tire pressure loss can harm fuel efficiency, tire life, safety, and vehicle performance. Creating an autonomous, self-inflating tire system is the goal of this project. Such a mechanism guarantees that tires are always appropriately inflated. With the aid of a centralized compressor, our project design has been successfully tested and implemented. [5]

III. PROPOSED METHOD

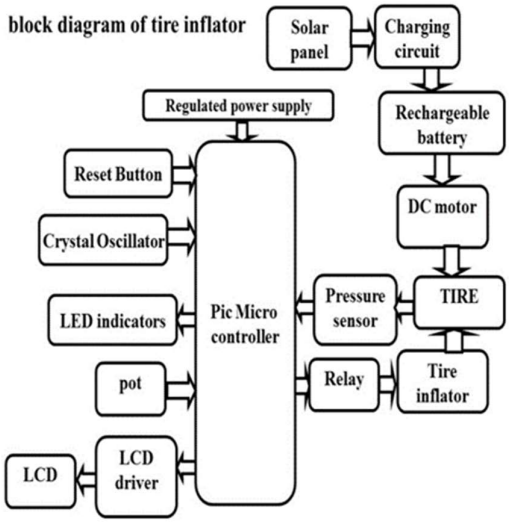


FIG 3.1: Block diagram of Solar based tire inflator System

The main blocks of this project are:

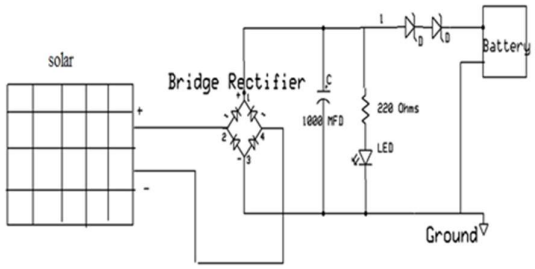
- **PIC microcontroller.**

A flexible and frequently used integrated circuit (IC), the PIC microcontroller is the central element in numerous electrical systems. The PIC microcontroller, created by Microchip Technology, has several features and abilities that make it useful for a variety of projects, including the creation of a solar-powered automatic tire inflation system for automobiles.

- **Solar panel.**

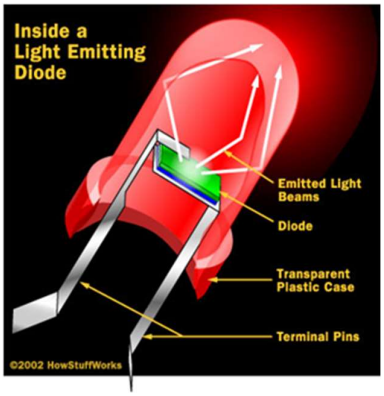
A solar cell, also known as a photovoltaic cell, is a device that uses the photovoltaic effect to convert solar energy into electricity. The word photovoltaic cell is frequently used when there is no obvious energy source, whereas the phrase solar cell is occasionally only used to refer to devices made expressly to harness solar energy.

- **Charging circuit.**



o A charging circuit that we can utilise to recharge the solar-powered battery.
o The rectifier will be connected to the solar output.
o With the use of a capacitor, these spikes are eradicated.
o At the output terminal, we can obtain 12V Steady DC, which can be seen if the LED illuminates.

- **LCD display.**



A light source made of semiconductors is a light-emitting diode (LED). Numerous gadgets employ LEDs as indicator lamps, and their use for lighting is growing.

- **Relay.**

An electrically controlled switch is a relay. Although other relays function using alternative principles, most use an electromagnet to power their switching mechanism. Relays are used in situations when a circuit has to be controlled by a low-power signal or when multiple circuits need to be controlled by a single signal.

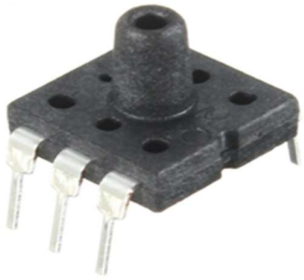
- **DC motor.**

Normally, a dc motor operates by interacting magnetic fields with current-carrying conductors to transform electrical energy into mechanical energy. The opposite action is carried out by an dynamo or generator, alternator, which converts mechanical energy into electrical energy.

- **POT.**

o A three-terminal resistor with a sliding contact that creates an adjustable voltage divider is called a potentiometer. It functions as a variable resistor or rheostat when only one terminal (one side) and the wiper are connected.
o Potentiometers are frequently employed to regulate electrical equipment, such as the volume controls on audio equipment.
o Potentiometers that are controlled by a mechanism can serve as position transducers in various devices, such as joysticks.

- **Pressure sensor.**



A sensor that measures pressure typically detects the pressure of gases or liquids. The force needed to stop a gas or liquid from expanding is known as pressure, and it is typically expressed in terms of force per unit area. A pressure sensor produces a signal about the applied pressure.

- **Tire.**

Drivers who have flat tires can quickly and temporarily fix the problem with the use of tire inflates, which is a one-time-use gadget. A punctured tire is sealed before being driven at a low speed for a brief period to restore pressure.

IV. RESULT

An automatic tire inflator system was created for the Fabrication of Solar-based Automatic Tyre Inflation System for Cars project. The efficiency, safety, and performance of a vehicle are all negatively impacted by a small loss in pressure. The battery, charge circuit, solar panel, DC motor, tire, tire inflator, POT, LCD, pressure sensor, and Picture microcontroller are the major components of the inflator.

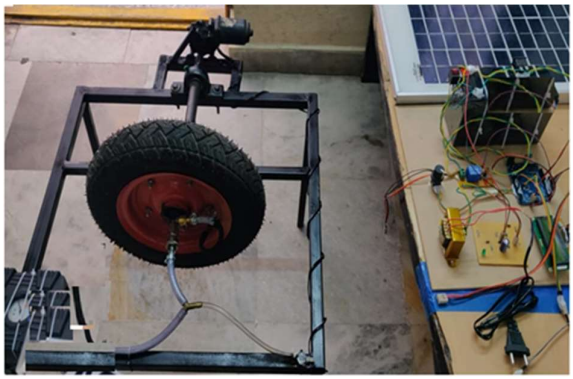


Fig: Solar Power Automatic Tire Inflator

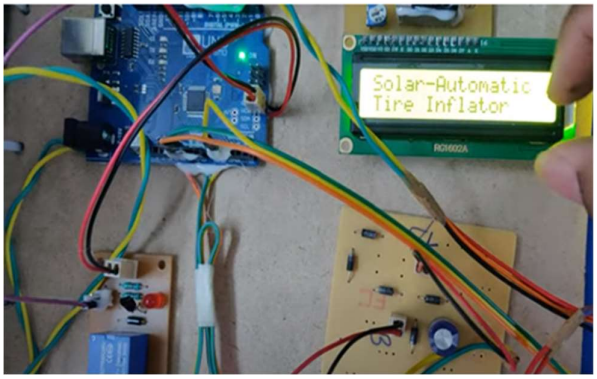


Fig: Display the project name on LCD module.

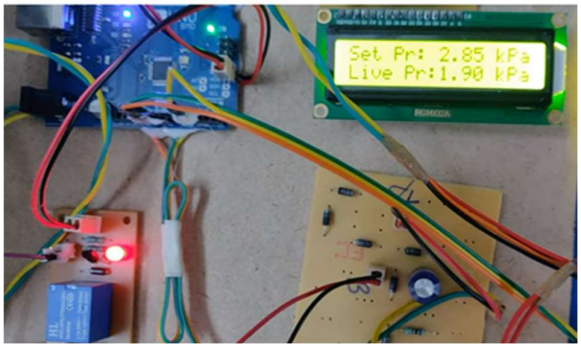


Fig: display the set pressure and live pressure values on LCD

V. CONCLUSION AND FUTURE SCOPE

We could conclude to the conclusion that this technology promotes increases overall vehicle safety, extends tire life, and fuel efficiency while ensuring that every tire is correctly inflated to the recommended tire pressure throughout the voyage. Additionally, it offers us accurate inflation and deflation of the tire, continuously monitors tire pressure, and helps to deliver a comfortable ride with greater mileage.

By integrating this technology with tires and a real-time car, this project can be further developed.

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