

Hybrid Car

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ABSTRACT - In this paper the work, design and fabrication of motorized screw jack height adjusting, chassis adjusting, motorized screw jack and automatic air filling is fabricated to reduce the work load and to decrease the human effort. The motorized power jack can be widely used in low cost automation in manufacturing. There is two motorized power jack. One is for the wheel repair or replacement and another for the height adjusting while moving on road where the speed breaker is present. The weight lifting is quick and effortless, which reduces the physical fatigue (tiredness). In this the motorized screw jack is also in the chassis to increase or decrease the length of the car to move in minimum place or for the fewer parking spaces. This is to increase the human comfort. In this the automatic seat folding as bed is arranged for human comfort while travelling very long distance. In this automatic car washing system is also arranged which also carried out during travel for the human comfort. Tire pressure monitoring and automatic filling system is a system being developed for use by commercial vehicles. It is an electronic system designed to monitor air pressure and temperature inside the tires and inform to driver via display. If pressure is below the desired, the compressor will re-fill the tire. If it is above desired, excess pressure will release through a valve.

KEYWORDS: Motorized power jack, Electric car jack, high safety features, automation, compatible gases, automatic washing system, easy to operate.

INTRODUCTION

Our research survey in this regard revealed that in several workshops, revealed the facts that mostly some difficult methods were adopted in lifting the vehicles for reconditioning, repair and maintenance. This fabricated model has mainly concentrated on this difficulty, and hence a suitable device has been designed, such that the vehicle can be lifted chassis from wheel and also lifted from floor land without the application of impact force. The fabrication part of it has been considered with almost case for its simplicity and economy, such that this can be accommodated as one of its essential tools on automobile workshop. The object lifting jack has been developed to cater to the needs of small and medium automobile workshop, which are normally man powered with minimum skilled labour. In most of the garages/workshop the vehicles are lifted by using screw jack. This needs high man power and skilled labour.



In order to avoid all such disadvantages, the automated motorized electric lifting jack has been designed and adjusted in such a way that it can be used to lift the vehicle very smoothly without any impact force. The operation is made simple so that even unskilled labour can use it with ease. The D.C. motor is coupled with the lead screw by gear arrangement; the lead screw rotation depends upon the rotation of D.C. motor. In the D.C. motor is also implemented in the chassis for the length adjustment according to need and space. This is an era of automation where it is broadly defined as replacement of manual effort by mechanical power in all degrees of automation. The operation remains to be an essential part of the system although with changing demands on physical input, the degree of mechanization is increased.



Fig.: Motorized jack and chassis adjusting.

Tire pressure monitoring and automatic filling system is a system being developed for use by commercial vehicles. It is an electronic system designed to monitor air pressure and temperature inside the tires and inform to driver via display. If pressure is below the desired, the compressor will re-fill the tire. If it is above desired, excess pressure will release through a valve. In this paper, the basic structure and the implement method, automatic filling of air are introduced. This is an electronic system designed to monitor air pressure inside the tires on various types of vehicles. This system report real time tire pressure information to the driver via a display. Proper tire inflation pressure improves fuel efficiency, reduces breaking distance, improves handling, and increases tire life, while under inflation creates overheating and can lead to accidents. The main causes of under inflation are natural leakage, temperature changes and road hazards. The accurately measured temperature and pressure values were obtained by using smart transmitter pressure sensor. The excellent agreement between the pressure and temperature results measured by the sensor and the direct measurement data is presented. The practical results in the certain ranges of pressure and temperature demonstrated that the micro sensor is able to measure temperature (20°C-100°C) and pressure (0kPsi- 150Psi) at the same time.

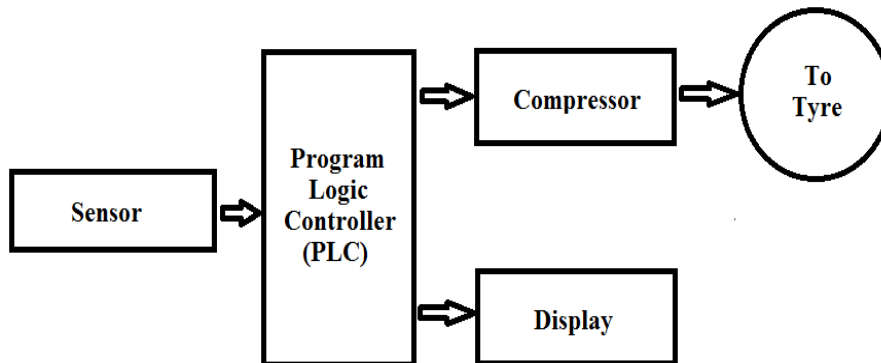


Fig.: Circuit Diagram of tire pressure monitoring and automatic filling system.

Need for Automation

- To achieve mass production.
- To reduce human effort.
- To increase the efficiency of the jack.
- To reduce the work load.
- To reduce the material handling.
- To reduce the fatigue of workers.

EXPERIMENTAL SETUP

The main parts of the automated motorized lifting jack, chassis adjusting and air filling are as follows:

- **D.C. Motor**

An electric motor is a machine which converts electrical energy into mechanical energy. Its action is based on the principle that when a current carrying conductor is placed on a magnetic field, it experiences a magnetic force whose direction is given by Fleming's left hand rule. When a motor is in operation, it develops torque. This torque can produce mechanical rotation. D.C motors are also like generators classified into shunt wound or series wound or compound wound motors.

D.C. Motor Specification	
Torque	10 Kg cm
Speed	150 rpm
Voltage Supply	12 V
Type	DC

- **Lead Screw**

A lead screw is a portable device consisting of a screw mechanism used to raise or lower the load. The lead screw can be short, tall, fat or thin depending on the amount of pressure they will be under and space that they need to fit into. It is made of various types of metals but the screw itself is made of lead. A large amount of heat is generated in it and long lifts can cause serious overheating. To retain the efficiency, it must be used under ambient temperatures, otherwise lubricants must be applied. These are oil lubricants intended to enhance the equipment's capabilities. Apart from proper maintenance, to optimize the capability and usefulness of lead screw it is imperative to employ it according to its design and construction.

- **Limit Switch**

It is a switch operated by the motion of a machine part or presence of an object. It is used for control of a machine, as safety interlocks, or to count objects passing a point. It is an electromechanical device that consists of an actuator mechanically linked to a set of contacts. When an object comes into contact with the actuator, the device operates the contacts to make or break an electrical connection. It is used in a variety of applications and environments because of their ruggedness ease of installation, and reliability of operation. It can determine the presence or absence, passing, positioning and end of travel of an object. It was first used to define the limit of travel of an object, hence the name 'limit switch.'

Limit Switch Specification	
Type	Roller type
Two way voltage supply	12 V

- **Ball Bearing**

This is a type of rolling element bearing that uses balls to maintain the separation between the bearing races. The purpose of a ball bearing is to reduce rotational friction and support and radial and axial loads. It achieves this by using at least two races to contain the balls and transmit the loads through the balls.

- **Control Switch**

It is used in order to start or stop the entire operation of the object lifting jack. The type of switch that is used is known as a toggle switch. The toggle switch is a class of electrical switches that are manually actuated by a mechanical lever, handle, or rocking mechanism. This is designed to provide the simultaneous actuation of multiple sets of electrical contacts, or the control of large amounts of electric current or mains voltages.

Control Switch Specification	
Type	DPCO (Double Pole Control Off)

- **Control cables**

These are used in order to connect the battery to the motor and the switch.

- **Base and Frame**

A base for the entire set-up has also been made. The motor is mounted on chassis and motorized screw jack to support frame and wheel jack. Ball rollers are attached to chassis and four ends of the base for movement and are electrically controlled by switch.

- **Pressure gauge**

Pressure gauges and switches are among the most often used instruments in a plant. But because of their great numbers, attention to maintenance and reliability can be compromised. As a consequence, it is not uncommon in older plants to see many gauges and switches out of service. This is unfortunate because, if a plant is operated with a failed pressure switch, the safety of the plant may be compromised. Conversely, if a plant can operate safely while a gauge is defective, it shows that the gauge was not needed in the first place. Therefore, one goal of good process instrumentation design is to install fewer but more useful and more reliable pressure gauges and switches.

- **Program Logic Controller**

A Programmable Logic Controller, PLC or Programmable Controller is a digital computer used for automation of electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or light fixtures. PLCs are used in many industries and machines. Unlike general-purpose computers, the PLC is designed for multiple inputs and output arrangements, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. Programs to control machine operation are typically stored in battery-backed-up or non-volatile memory.

- **Compressor**

A gas compressor is a mechanical device that increases the pressure of a gas by reducing its volume. An air compressor is a specific type of gas compressor. Compressors are similar to pumps: both increase the pressure on a fluid and both can transport the fluid through a pipe. As gases are compressible, the compressor also reduces the volume of gas. Liquids are relatively incompressible; while some can be compressed, the main action of a pump is to pressurize and transport liquids.



Fig.: Tire pressure monitoring and automatic air filling system.

Service: Compatible gases, steam, liquids or vapours.

Accuracy: $\pm 0.075\%$

Range ability: 100:1

Stability: $\pm 0.125\%$

Temperature Limits:

Process: -40 to 248°F (-40 to 120°C);

Ambient: Without LCD: -40 to 185°F (-40 to 85°C); With

LCD: -22 to 176°F (-30 to 80°C).

Pressure Limits: Max. Pressure: Range:

-14.5 to 2000psi ; Burst pressure: 10000psi .

Thermal Effect: $\pm 0.125\%$ span/ 32°C

Power Requirements: 11.9 to 45VDC .

WORKING

Working of motorized jack and chassis adjusting:

With the above stated attachment to the jack the jack becomes automatic in operation. When the motor is connected to battery of car, current flows through motor. A switch is provided for changing the polarity of motor. Hence as the motor rotates the pinion connected to it rotates. The pinion is in mesh with the gear on the lead screw. Because of the gear ratio provided the torque gets multiplied and required torque is applied at the screw. As the screw of jack rotates the jack moves up. The whole assembly is required to be moved in horizontal as well as vertical direction simultaneously. This is achieved by bracket attachment provided between motor and jack. Now when the jack is lifted sufficiently to remove the tire the switch is made off. The tire then can be easily removed. After repairing the tire it is fixed to car. Now with the help of switch the current supply can be reversed so that the jack can be lowered and the same mechanism is applied in chassis adjusting. In this way the motorized jack and chassis adjusting can be operated easily without much fatigue. The figure shows the actual working model that we have manufactured.

Working of automatic air filling system:

In the tire pressure is monitoring and automatic air filling system report real time tire pressure information to the driver via a display. Tire Pressure Monitor (TPM) portion of design which is comprised of sensors. The sensors on each tire physically measure the tire pressure and temperature. Proper tire inflation pressure improves fuel economy, reduces braking distance, improves handling, and increases tire life, while under inflation creates overheating and can lead to accidents. The main causes of under inflation are natural leakage, temperature changes, and road hazards. The accurately measured temperature and pressure values were obtained by using SMART transmitter pressure sensor.

Working of automatic washing system:

In this automatic washing system the nozzles are arranged around the chassis for washing. The nozzles move inward and outward through the 12V DC motor. The nozzles are connected with the water tank which is arranged in the front area of the chassis which is operated through 12V DC motor and pump. The pressure of the water through the nozzles is upto 1000 PSI. By this method of washing system the car can be washed at the time of driving also. According to this method car can be washed easily, human comfort and time can be saved.

RESULT AND DISCUSSION

The motorized power jack can be widely used in low cost automation in manufacturing industries. The weight lifting is quick and effortless, which reduces the physical fatigue (tiredness) felt by the worker. The project carried out by us made an impressive task in the field of automobile and automobile workshops. It is very useful in the service stations. And also reduced the cost involved in the concern.

Tire pressure monitoring and automatic air filling system is a key in reduction of accidents due under inflated tires. Tire is filled by turning on compressor only if the pressure inside the tire becomes less than the desired value. If the tire is filled with air above a particular value the compressor turned off and excess pressure release through a valve. All these processes were controlled by PLC. Also the temperature on each tire is measured using thermistors. Abnormal temperatures and pressure values were informed to the driver via display.

CONCLUSION

The need has long existed for an improved portable jack for automotive vehicles. It is highly desirable that a jack become available that can be operated alternatively from inside the vehicle or from a location of safety off the road on which the vehicle is located. Such a jack should be light enough and be compact enough so that it can be stored in an automobile trunk, can be lifted up and carried by most adults to its position of use, and yet be capable of lifting a wheel of a 4000-5000 pound vehicle off the ground. Further, it should be stable and easily controllable by a switch so that jacking can be done from a position of safety. It should be easily movable either to a position underneath the axle of the vehicle or some other reinforced support surface designed to be engaged by a jack. Thus, the product has been developed considering all the above requirements. This particular design of motorized automated object lifting jack will prove to be beneficial in lifting and lowering of heavy loads.

In this car can be automatic washed through the automatic washing system for the human comfort and for the time saving.

By applying tire pressure monitoring and automatic air filling system properly it is easy for the driver to monitor the pressure and temperature on each tire. Tire's inflation pressure is always under check and is maintained at a standard level, as stated by the manufacturer by using tire pressure monitoring and automatic air filling system. Using this system gives safety of drivers and passengers become a forefront benefit, fuel efficiency is improved by having standard tire pressure and helps to avoid accidents caused with low inflated tires.

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