



DESIGN AND FABRICATION OF ANDROID APP CONTROLLED AUTOMOBILE SCREW JACK FOR LIGHT AND HEAVY TRANSPORT VEHICLE

Arun Kumar.R¹, Karthik.R², Gokul Raj.G³, Hariprasath.A⁴, Jeychandran.K⁵

¹Assistant Professor, Department of Mechanical Engineering, SNS College of Engineering, Coimbatore, Tamilnadu, India.

^{2,3,4,5}Students, Department of Mechanical Engineering, SNS College of Engineering, Coimbatore, Tamilnadu, India.

Abstract: Here we are introducing the motorized screw jack. The vehicle should be lifted for certain type of works. This cannot be done manually. To avoid such problem a jack was invented. To make the work easier than a screw jack we have introduced a new concept called motorized screw jack. We can easily lift the vehicle up and down by using the mobile application. The entire assembly is controlled by app which is made on IOT app maker and the brain of this project is the NODEMCU which controls all the motors by receiving signals from the app with help of a WIFI module, NODEMCU stores the code which is encoded into it by NODEMCU encoder.

Keywords: NodeMCU, Screw jack, Motorized screw jack, Android application

INTRODUCTION

A screw jack is a portable device consisting of a screw mechanism used to raise or lower the load. The principle on which the screw jack works is similar to that of an inclined plane. There are mainly two types of jacks-hydraulic and mechanical. A hydraulic jack consists of a cylinder and piston mechanism. The movement of the piston rod is used to raise or lower the load. Mechanical jacks can be either hand operated or power driven.

Jacks are used frequently in raising cars so that a tire can be changed. A screw jack is commonly used with cars but is also used in many other ways, including industrial machinery and even aeroplanes. They can be short, tall, fat, or thin depending on the amount of pressure they will be under and the space that they need to fit into. The jack is made out of various types of metal, but the screw itself is generally made out of lead. While screw jacks are designed purposely for raising and lowering loads, they are not ideal for side loads, although some can withstand side loads depending on the diameter and size of the lifting screw. Shock loads should also be avoided or minimized. Some screw jacks are built with anti-backlash. The anti-backlash device moderates the axial backlash in the lifting screw and nut assembly to a regulated minimum.

A large amount of heat is generated in the screw jack and long lifts can cause serious overheating. To retain the efficiency of the screw jack, it must be used under ambient temperatures, otherwise lubricants must be applied. There are oil lubricants intended to enhance the equipment's capabilities. Apart from proper maintenance, to optimize the capability and usefulness of a screw jack it is imperative to employ it according to its design and manufacturer's instruction. Ensure that you follow the speed, load capacity, temperature recommendation and other relevant factors for application.

LITERATURE SURVEY

Roy et al.[1],detailed information about the very first jack which was been introduced in the automobile industry. The jack used earlier need much effort to lift the vehicle for changing the tire. But now the changing of the tires has been easy, due to the introduction of the new pneumatic jack. The working of that pneumatic jack was simple, the person just needs to connect the jack to the electrical driven compressor or compressor driven by engine doing so the jack use to get working the vehicle use to get lifted. The jack was stable and easy to operate. Inflation pressure for most standard-sized cars is in the range of 20-25 psig. The pneumatic jack was compact and so it can be stored within the spare wheel. Today's automobile offers limited space and uncertain lifting methods and so this offers the chassis engineer considerable freedom of choice.

Nitinchandra et al.[2], the study related to the toggle jack design, testing and result obtained with different materials. It was found that the toggle is compact and easy to use as compared to the other jack that are available in the



market. In this toggle jack it was found that the distribution of load is symmetric and uniform. The Toggle jack reduce the force required for lifting the vehicle in order to change tire or minor repair. The toggle jack design is simple and consist of the eight main components I.e. the four parts are power screw driven and other four parts are for loading conditions. Here the unique design of the toggle jack been introduced to lift heavy loads at the stable state with the unique conditions. The main parts of the toggle jack are screw and nut, the screw is the moving part and the nut is the stationary part. The materials of the screw and nut were been checked for different materials and loading conditions from 1kN to 5kN, it was found that the alloy steel for screw and phosphorus bronze for nut was the most best suitable combination.

Sainath.etal.[3], the information about the basic jack along with the types of Jack's used in the automobile industry, the design procedure of mechanical hydraulic jack is also been studied. The classification of the jack is based on the forces employed, the mechanical jack includes car jack and house jack, the other is the hydraulic jack they are bottle jack and floor jack. After the proper study and research, it was found that the hydraulic jack is stronger and can lift the heavy loads at the height required. The hydraulic jack are the most efficient and reliable jack available in the market,they lift the vehicle with the less human effort and with the help of the pressure generated inside the cylinder and oil present inside the cylinder. The calculation are been done in order to get the proper dimension of the jack and make the jack more efficient than the earlier.

Pawar etal. [4], the design of a screw jack and its automation are been introduced. The jack operation was easy and less effort was required to lift the jack it was also much more reliable than the usual basic jack that are manually operated and were used earlier. Now the modification are been done in the screw jack made the operation automatic I.e the motorised screw jack was introduce in the automobile industry, the jack was compact and much more reliable. After several studies and researches the screw jack it was been found that the jack was easy to operate, reliable, easy to move and store due to desirable size.

Asonye etal. [5], the study is about the design and fabrication of hydraulic jack using remote controlled system and the jack is tested for its effectiveness by varying loads up to 5tons. The hydraulic jack available in the market are manually operated and required more efforts to lift the load. Taking into consideration the effort required for lifting the load which was not easy to operate the remote-controlled system for hydraulic jack was been introduced. This jack was remotely controlled so its was easy to operate as compared to the usual jack available in the market. The main components used were a 12V battery, DC Motor, Crank lever mechanism. The aim of making this jack was to reduce the effort required to lift the load and make its easy and simple for operation at any loads. The results obtained were very effective and it was found that the time required to lift was minimum depending upon the weight, this remotedcontrolled system jack was found reliable than the manual jack available in the market

Sudarsan etal. [6], they have designed a automatic hydraulic Jack. The motive of design this project is to provide a button to lift heavy load, because there are mechanical Jack's which is difficult to operate and requires more effort and also the Jack are to huge to carry, during the tire puncher in the ruler area, hilly regions, forest area etc. It is difficult to charge the tire with the mechanical Jack, so they have designed a automatic hydraulic Jack which is easy to operate and carry. The automatic Jack is operated by pressing a button which is mounted on a dashboard.

Masiwal etal. [7], they have designed a hydraulic Jack for four wheelers, the purpose of designing this project is to reduce the mechanical effort and it helps to save lots of time while repairing the puncher tire as compared to earlier method. It consists of main components like piston cylinders which is welded on the chassis of vehicle. When the driver presses the brake pedal the pressurized brake oil passes through non-retune valve and move to the piston, the piston cylinder which result in lifting, the puncher side of the vehicle.

Jayapradha etal. [8],they have designed the hydraulic jack of self-jacking the main purpose of design is that the driver can operate inside the car itself and it also consumes less effect and time compared of mechanical Jack's. The hydraulic Jack are mounted on the frame and the motors are used to control the jack and it connected with the crankshaft and also the suspension springs are attached on the side, the 12v battery is provided to run the motor, the hydraulic Jack is operated by the help of button which is mounted on the dashboard. This project is easy to mount on chassis or frame and it's easy to servicing of vehicles. When the vehicle gets punctured this system is very helpful to replace the tires and no need to carry external Jack.

Sharvanan[9], lifting of Automobiles vehicle has used by built-in hydraulic jack it's consists of main parts like hydraulic cylinders, lead screw and solenoid valves. It's operated by pressing a button that has been provided on dashboard. The hydraulic jack is self-lubricated and fixed asset with a pump, which helps to a fluid to force into a cylinder. A vehicle is lifted by the help of lead screw and the DC motor. The main motive to design this project is to reduce the human efforts while lifting of a vehicle.

Kamalakkannan etal. [10], they have fabricated the manually operated screw Jack to a motorized screw jack to lift the heavy loads. The manually operated screw jack required more effort to lift the load compare to motorized screw Jack. The motorized screw Jack is easy to operate by pressing a given button to lift the loads, it is very useful in Automobile service centre to service a car. The main reason to design the motorized screw jack is to keep away from the tiredness of a human during lifting of the load. The cost of this project is less and its efficient to operate.



OPERATIONAL CONSIDERATIONS OF A SCREW JACK

1. Maintain low surface contact pressure:

Increasing the screw size and nut size will reduce thread contact pressure for the same working load. The higher the unit pressure and the higher the surface speed, the more rapid the wear will be.

2. Maintain low surface speed:

Increasing the screw head will reduce the surface speed for the same linear speed. Keep the mating surfaces well lubricated: The better the lubrication, the longer is the service life. Grease fittings or other lubrication means must be provided for the power screw and nut.

3. Keep the mating surfaces clean:

Dirt can easily embed itself in the soft nut material. It will act as a file and abrade the mating screw surface. The soft nut material backs away during contact leaving the hard dirt particles to scrap away the mating screw material.

4. Keep heat away:

When the mating surfaces heat up, they become much softer and are more easily worn away. Means to remove the heat such as limited duty cycles or heat sinks must be provided so that rapid wear of over-heated materials can be avoided.

NEED FOR AUTOMATION

1. To increase the efficiency of the device.
2. To reduce the work load.
3. To reduce the overall operation (lifting & lowering) time.
4. To reduce the handling and fatigue of workers.

PRINCIPLE OF OPERATION

The jack is raised and lowered with a metal bar that is inserted into the jack. The operator turns the bar with his hands in clockwise direction. This turns the screw inside the jack and makes it go upwards. The screw lifts the small metal cylinder with platform that are above it. The bar is turned until the jack is raised to the required level. To lower the jack the bar is turned in opposite direction.

FUTURE SCOPE

1. There is a scope of improvement that is by replacing the Bluetooth control with car automatic switch technology.
2. The device can also be designed to operate using android application (BT)

EXISTING METHOD

The vehicle should be lifted for certain type of works. This cannot be done manually. To avoid such problem a jack was invented. To make the work easier than a screw jack we have introduced a new concept called motorized screw jack. We can easily lift the vehicle up and down by using the ON/OFF switch. This helps to reduce the burden of the worker. This project is designed by following blocks, Jack model, DC motor and On/Off switch.

PROPOSED SYSTEM

Here we are introducing the motorized screw jack. The vehicle should be lifted for certain type of works. This cannot be done manually. To avoid such problem a jack was invented. To make the work easier than a screw jack we have introduced a new concept called motorized screw jack. We can easily lift the vehicle up and down by using the mobile application. The entire assembly is controlled by app which is made on IOT app maker and the brain of this project is the NODEMCU which controls all the motors by receiving signals from the app with help of a WIFI module, NODEMCU stores the code which is encoded into it by NODE MCU encoder.



BLOCK DIAGRAM

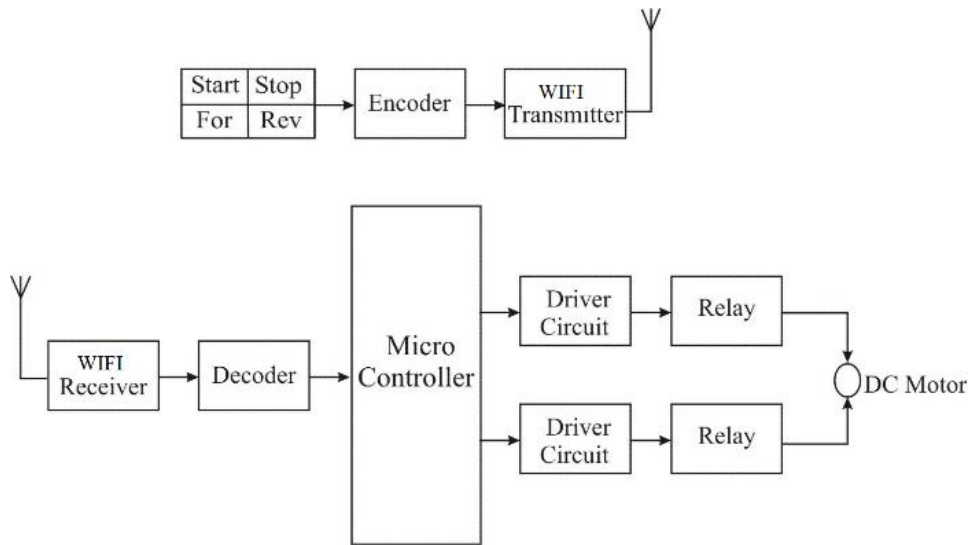


FIGURE 1: BLOCK DIAGRAM OF THE SYSTEM

METHOD OF FABRICATION:

Here the motorized power jack is worked with the help of motor. The name of jack is “scissor jack” To carry the vehicle load for working in the automobile workshop and in the service station.

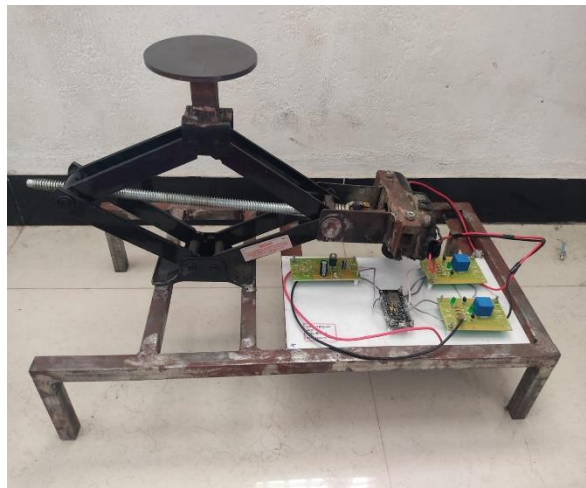


FIGURE 2: HARDWARE MODEL

WORKING PRINCIPLE

This project is designed with Driver circuit with relay, IOT APP (remote), Dc motor and jack model. Either the battery power or direct power supply is used to control the jack motor. The IOT application is used to control the direction of the motor which is coupled with the spur gear. Relay is directly connected with the DC motor. When the start key is pressed the motor is operated in forward direction and the when the stop key is pressed the motor is stops automatically. The forward and reverse button in the remote is used to operate the motor is required directions. wifi app Using To Control All Operation Using Wireless Communication.

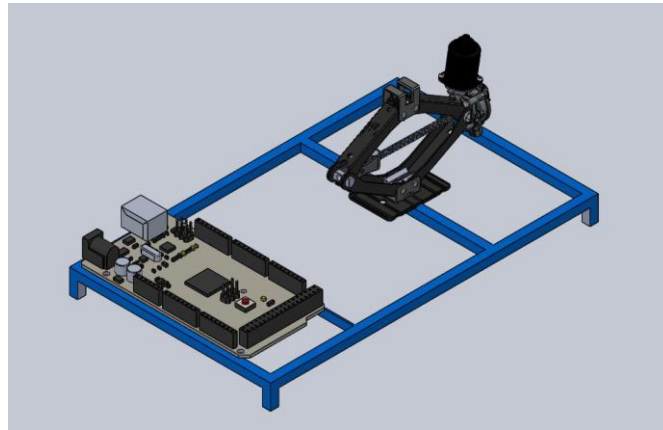


FIGURE 3: DRAWING FOR DESIGN AND FABRICATION OF ANDROID APP CONTROLLED AUTOMOBILE SCREW JACK

MERITS

- Low cost
- Easy to operate
- Reduce the manpower
- Portable device
- Low power consumption

DEMERITS

- ✓ Jack cannot be operated without electric power.

APPLICATIONS

- It is using for In all automobile industries
- Material transportation application
- Used in weight lifting.

CONCLUSION

The project carried out by us made an impressive task in the field of automobile and automobile workshops. It is very usefully for the workers to work in the automobile workshop are in the service station.

This project has also reduced the cost involved in the concern. Project has been designed to perform the entire requirement task which has also been provided.

REFERENCES

1. Roy L. Orndoff and James Sidles, "A New Automotive jack," SAE Technical paper 700179, 1970, ISSN:0148- 7191, <http://doi.org/10.4271/7001179>
2. Prof. Nitinchandra R. Patel, Sanketkumar Dalwadi, Vijay Thakor and Manish Bamaniya, "Design of Toggle jack considering material selection of screw-nut combination," International Journal of Innovative Research in Science, Engineering and Technology, Vol. 2, Issue 5, May 2013 www.ijirset.com
3. K.Sainath,MohdSalahuddinMohdJibranBaig, MdAzam Ali Farooky, Mohammed Siddique Ahmed, MohdRiyazUdin, Faraz Ur Rehman Azhar and Md Shaffi, "Design of Mechanical Hydraulic Jack" IOSR Journal of Engineering (IOSRJEN), ISSN (e): 2250-3021, ISSN (p): 2278-8719, Vol. 04, Issue 07 (July. 2014), ||V1|| PP 15- 28, www.iosrjen.org.
4. Pawar R. R, Shinde M.S., Shinde A.B., Garde M.B and Prof. Bhane A.B.Recent "Technologies in Automobile: Need of Motorised Screw Jack: A Review" International Journal of Recent Development in Engineering and Technology, (ISSN 2347-6435(Online) Volume 4, Issue 4, April 2015), www.ijrdet.com
5. ASONYE G. U., Nnamani C.E. and Alaka and C.A, "Design and fabrication of Remote Controlled System for Hydraulic Jack", International Research Journal of Engineering and Technology (IRJET), Volume: 02 Issue: 07, Oct-2015, www.irjet.net



6. R. Sudarsan, Salin Sasankan and P.Nicholas Niranjan, Automatic Hydrulic jack, International Journal of Innovative Research In Technology (IJIRT) 144625, June 2017, Volume :4 Issue: 1, ISSN: 2349-6002, www.ijirt.net
7. Aditya Masiwal, Aman Kanungo, Ishan Rawlley, Devendra Jha, Ashutosh Singh, Dhruv Kumar and Ram Jatan Yadav, Design and fabrication of Hydraulic Jack system for four wheelers, International Research Journal of Engineering and Technology (IRJET), Volume: 05 Issue: 04, Apr-2018, www.irjet.net
8. Jayapradha P, Krishna Kumar and Priyadharshini, Design and Fabrication of Hydraulic Jack (Self Jacking), International journal of Engineering Development and Research (IJEDR), 2019, Volume 7 Issue 3, ISSN: 2321- 9939, www.ijedr.org
9. R. Sharvanan, Design of Built-In Hydraulic Jack for Light Motor Vehicles, Volume:8 Issue:8, August 2017, ISSN Print: 0976-6340 and ISSN Online: 0976-6359, pp1649–1655, Article ID: IJMET_08_08_179, <http://www.iaeme.com/IJMET/issues.asp?JType=IJMET &VType=8&IType=8>
10. Kamalakkannan.A, Kalaiselvan.P, Isaac.R and Vijay. V, Automatic motorized screw jack to reduced man power, International Journal of Scientific & Engineering Research, Volume:7, Issue:5, May-2016, ISSN 2229-5518 <http://www.ijser.org>
11. Abhishek Madhukar Barewar, Abhishek Ashok Padole, Yugal Dhanpal Nagpure, Pranav Shivraj Gaupale, Sagar Bhimraoji Nagmote, Chandankumar Ram and Rupali Suresh Raut, Fabrication of automatic screw jack, International Journal of Advance Research and Development Volume3, Issue4, www.ijarnd.com
12. Batriwal Taha, Kathiria Kutbuddin, Koonath Shreyas, Labana Khushwant and Mr. Saksena Nirav, A Review on Failures of Scissor Jack International Conference on Current Research Trends in Engineering and Technology 2018 IJSRSET, Volume 4 Issue 5 Print ISSN: 2395-1990, Online ISSN:2394-4099, 10-April2018, March-April-2017 (4) 5: 554-560 www.ijrsrset.com
13. Eric Brigham, Chris Destefano and Zachary Killoy, "Slider crank Mechanism for demonstration And Experimentation", April 25, 2013, <http://web.wpi.edu>
14. Bhupesh Chandrakarv and Manmohan Soni, "Design and Optimization of Slider and Crank Mechanism with Multibody Systems" International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064 Index Copernicus Value (2013): 6.14, Impact Factor (2013): 4.438.
15. Dr. Ch. Chengaiah and Venkateshwarlu, Comparitive Study on DC motor speed control using various controllers, Volume: 3 Issue:1, jan 2014 <http://www.ijareeie.com>
16. Tae-Yang Lee, Ki-Hoon Kim and Gu-Min Jeong, "Design of an Easy-to-Use Bluetooth Library for Wireless Sensor Network on Android" , Contemporary Engineering Sciences, Vol.7, 2014, no. 16, 801 – 805 HIKARI Ltd, <http://dx.doi.org/10.12988/ces.2014.4694>
17. Yang-Hang Lee, Kuo-Wei Ho, Hsien-Wei Tseng, ChihYuan Lo, Tzu-Cheng Huang, Ji-Yu Shih and Tsai-Hua Kang., "Accurate Bluetooth Positioning Using Large Number of Devices Measurements", Proceedings of the International Multiconference of Engineers and Computer Scientists 2014 Vol II, IMECS 2014, March 12 - 14, 2014, Hong Kong
18. Kshirasagar Naik, Velupillai Mahinthan, "Impacts of Bluetooth Device Addresses and Native Clocks on Packet Interference in Piconets", Journal of Wireless Networking and Communications 2014, 4(2): 42-48 DOI: 10.5923/j.jwnc.20140402.02
19. Poonam V. Gaikwad, and Yoginath R. kalshetty Bluetooth based smart automation system using android, international journal of science and research(IJSR), ISSN(Online): 2319-7064, volume: 6 Issue:05, May 2017, www.ijsr.net
20. Mrs. Anisha Cotta, Miss. Naik Trupti Devidas and Miss. Varda Kalidas Naik Ekoskar, "Wireless Communication using HC-05 Bluetooth module interfaced with Arduino, ISSN: 2278 – 7798 International Journal of Science, Engineering and Technology Research (IJSETR) Volume 5, Issue 4, April 2016.