# PRECISION FABRICATION AND DEVELOPMENT OF AN INNOVATIVE MULTI NUT OPENER AND TIGHTENER SYSTEM

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## ABSTRACT:

This project aim is to fabrication of Multi Nut Opener and tightener for tightening and removing of four nuts altogether. With the increment of number of cars on the road, the number of cars problem due to tyre failure has increased. Often, the car is provided with tyre wheel nuts remover and jack for instance spare tyre replacement. Nevertheless, due to difficulty in applying torque to remove nut and to save a time. We develop tool having a gear mechanism. In our project we are tried to focus on the minimization of human effort for fixing all for nuts of 100mm PCD wheel. The main objective of work is to develop a single tool, which can be made use during assembling and disassembling of wheels in automobiles. It can be successfully used as standard tool irrespective of the model of the vehicle. Also, it can be used garages, workshops and service stations. The remover is designed to be ergonomic to be used, easy maintenance, easy storage, easy to handled and able to remove all nuts at once.

## INTRODUCTION

This project is to atomize the labor work in tightening or loading the nuts one by one. This project focuses on the minimization of human effort and time consumed for fixing all four nuts of the four wheeler tire with a single stroke of lever by using multiple operated spanners. This is achieved by developing a planetary gear mechanism as such occurs which reduced the time and effort for the above mentioned task that is losing or tighten the nut of the car wheel. To avoid time wasting and a lot of energy used to change the tire, a special tool is designed and fabricated to allow driver or machine to remove four nuts of wheel at once with less energy consumption. The design is based on standard PCD of 100mm for most of cars available. In this type of tire nuts car, the nut removal steps, type tools needed, basic gear theory, spur gear terminology, standard gear calculation, standard spur gear tooth, the project calculation, and material specification will be analyzed and shown.



## LITREATURE SURVEY

Nut remover is the most widely used in the field of vehicle. Normal when we have to fix our four wheelers tyre issue we use torque wrench or spanner to deal with its nuts. But with this system one can open or tighten a nut, but only one at a time. Every car manufacturer provide tool for doing so. Emergency puncture the wheel of the ambulance, it will be a time-consuming. To handle such issue we propose a tool " MULTI NUT OPENERAND TIGHTENER'' a tool who can open all four nuts of wheel of a four wheeler simultaneously and in a time saving manner. To do so we used gear mechanism, with one main gear and four pinion gear and spanner depending on BCD ( bolt circle diameter ) are mounted over pinion in such a manner that when main gear rotate it transmit motion and power to pinion and with pinion spanner to rotate. Now arrangement and size of gears used is depending on PCD (Pitch circle diameter) of wheel and nut location. Which make it user friendly, convenient and time efficient tool. Some of the references taken are M. Mukhtar, M.H.P Hilmie Hussaine, 2014, Design Improvement and Computer Assisted Fabrication on the Impact Wrench for a Car Wheel Nuts Puller in Automotive Industry, Australian Journal of Basic and Applied Science, Vol.1, Issue 3, ISSN: 2320-401X, pp. 381-384.Azizul Rahman B Abd Aziz, 2008, Improvement and Optimization of Wheel Nut Remover with 114

PCD". University of Malaysia, Pahang. These references helped us to develop our model for 100 PCD. IJSRD - International Journal for Scientific Research & Development| Vol. 3, Issue 02, 2015 | ISSN (online): 2321-0613 Design & Fabrication of Four Wheeler Opening Spanner had a published a paper for adjustable one.

**OBJECTIVE**

The main objective of the project is to reduce the time consuming and the problem of setting tool again and again on each nut to loose or tight it used by using L wrench and jack. By replacing it with the vehicles multi wheel nuts and remover. In case of a flat wheel for wheel replacement, each wheel nut has to be individually removed and tightened using the tools by man power. But by the vehicles multi wheel nuts tightener and remover, instead of removing the nuts individually all the four nuts of the wheel can be removed at the same time. Thus the vehicles multi wheel nuts remover and tightener reduces the time consumed in the normal process and also the man power used. Considering all the advantages we recommend for the usage of this tool in every vehicle. This tool can be operated by anyone of different ages from young people to old people as it is easy to use and light in weight.

**COMPONENTS USED**

Gear and pinion

In this setup we are using a five spur gears .Out of which one is driving gear with pcd of 40mm drives the other four gear of pcd 60mm. The gear and pinion in this set up is made according to the pitch circle diameter of the wheel which is 100 mm. No of teeth on driving gear is 18 and on driven is 28.

Shaft

A shaft for transferring torque is used to transfer the torque from the spur gear manually to the box spanner to remove the nuts. Four shafts are connected to the four spur gears individually and at the end of the each shaft the each shaft box spanners are attached to it.

Socket

A socket is a cylindrical type female hexagonal fit which is fitted over the common male hexagonal head of the nut. In this case the size of the socket of M19 are take



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Base plate

In order to keep the forces and means of the gear base plate is used to withstand the gears and the shaft extension. To remove the weight and increases the stability of the device. This is a plate made of cast iron.

Base plate

**WORKING**

The working of the vehicles multi wheel nuts remover and tightener is simple and can be performed by anyone. It does not require any skills or anything, just basic knowledge about the setup is required for operation. It consist of an five spur gears, an pinion gear, four shafts which has been connected to the four spur gears, and box sockets at each end of the four shafts. First the machine setup is placed with correct fitting of the box socket to the nuts of the vehicle.

Power is supplied to main gear with the help of handle either manually or by motor which rotates all the gears.

Each spur gear is connected with the shafts with the box socket at the end of the each shaft.

As the shaft rotates the socket also turns and the nuts in the wheels are thus removed or tightened by the rotation of the socket.

The tightening and removing process can be changed by changing the rotation of the motor or fluctuating the amount of force through handle.

Thus all the wheel nuts can be tightened and removed by this process. it is found to be a simple process and very much convenient for every one for the tyre removal and tightening process.

Assembled set up

## CONCLUSION

Thus the design and fabrication of vehicle all wheels nut remover and tightener is successfully done. This project is practically implemented in a four wheeler and it found that the results are positive. The project is economical, and it sustains all the required feasibilities.

Vehicles all wheels nut remover and tightener is a perfect tool for assembling and dismantling a wheel in a four wheeler.

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