

Fabrication of Multi Spanner Fastener Mechanism

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Abstract – In our daily life everyone should think about saving time in every work and maintenance is one of the major requirements in automobiles for achieving their specified life span. It includes replacing punctured tyres, which always had been a difficult task. This mechanism of removing nuts in one stock saves so much time. The main objective of this project is to develop a time-saving tool for automobile industry workers and for those people who have four wheeler cars. Multi spanner fastener mechanism is a kit involved to reduce the effort and time in replacing the wheel of the vehicle. This tool is so easy to use, handle, and for maintenance. This tool can be used as a standard tool in the automobile industry. Also, it can be used in garages, workshops and service stations.

Key Words: Ball Bearing, Gears, Spanner Socket, Base Plate, Shaft.

1. INTRODUCTION

Transformation is one of the important needs in day-to-day life, among which car usage plays an important role. However, most of the time an individual faces problem with tyre punctures that requires its removal from the vehicle for replacement. This is done with the help of a simple or standard cross wrench that is supplied by the car manufacturer. They are provided with heads having slots of different sizes to suit the type of nut to be handled. It is also required to lift the body of the car slightly above the ground using a jack to enable free removal of the tire from the wheel. All the four nuts at the periphery of the wheel are to be removed one by one and re-fixed. This makes the entire process laborious and time-consuming.

An automobile is known to be one of the most basic and fascinating things that a person could own. The car has now become essential and it is not only a symbol of luxury anymore. Car maintenance, for example, is one of the key factors in determining its life span. This includes basic knowledge of changing the cars tyre. But replacing punctured tyres has always been a difficult task for everyone who uses the car and other four-wheelers. Every car manufacturer provides a tool to remove the tyre such as an L wrench and Jack nut this tool is very difficult

to use for removing a tyre and requires a skilled person. This tool is so time-consuming. In case of emergency puncture in the tires of the ambulance, it will be a time-consuming process to remove nuts. In those cases, this project tool will be most useful.

2. MATERIALS

2.1 Shaft

The hollow shaft constitutes an essential component of the hollow shaft motor, which is used in electrically powered vehicles, such as trains. Hollow shafts are also suitable for the construction of jigs and fixtures as well as automatic machines.

A shaft for transferring torque is used to transfer the torque from the spur gear manually to the box spanner to remove the nuts. There are five shafts are used. One is connected to the pinion gear and the other four are connected to the spur gear.



2.2 Gears

A gear is a rotating machine part having cut teeth which is meshed with another toothed part in order to transmit torque, in most cases with teeth on the one gear being of identical shape, and often also with that shape on the other gear. Two or more gears working in tandem are called a transmission and can produce a mechanical advantage through a gear ratio and thus may be considered a simple machine. Gear devices can change the speed, torque, and direction of a power source. The most common situation is for a gear to mesh with another gear however, a gear can also mesh with a non-rotating toothed part, called a rack, thereby producing translation instead of rotation.

There are two types of gears are used:

- PRIMARY GEARS (Pinion Gear)
- SECONDARY GEARS (Spur Gear)



2.3 Ball Bearings

A ball bearing 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 the rotation friction and support radial and axial loads. As one bearing is connected to the pinion gear for transmitting force to the other gears. The remaining four gears are connected to the four spur gears. As one bearing rotates it causes the balls to rotate as well. Because the balls are rolling they have a much lower coefficient of friction than if two flat surfaces were sliding against each other. Ball bearings tend to have lower load capacity for their size than other kinds of rolling element bearings due to the smaller contact area between the balls and races.

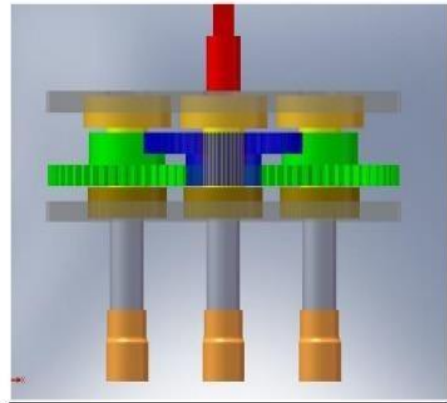


2.4 Base Plate

It is a plate that serves the base or support. This plate is used to keep the force and means of the gear base plate is used to withstand the gears and the shaft extensions. This plate is mainly used to remove weight and increase the stability of the device. This plate is made of cast iron, and mild steel.

ASSEMBLY - 3D PICTURES

TOP VIEW



2.5 Spanner Socket

Spanner is made from metal in tube form and often has two profiles, one at each end of the tube. They cover the whole head of the nut or bolt and made full contact with them on all flat sides and corners. The profile of a spanner is very specific and cannot be used on other sizes or shapes. They are made in such a manner that they grip the entire head of the nut or the bolt instead of just gripping two faces. A spanner is a tool used to provide grip and mechanical advantage in applying torque to turn an object. Usually rotary fasteners, such as nuts and bolts or keep them from turning. In the UK, Ireland, Australia, and New Zealand spanner is the standard term

Types of Spanners:

- Open-end of Single-end Spanner
- Double-ended Spanner
- Ring Spanner
- Socket Spanner
- Box Spanner

- Hook Spanner
- Adjustable Spanner

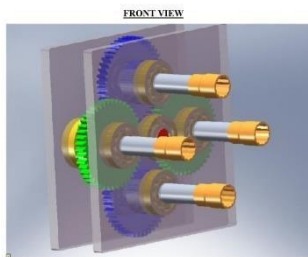


2.6 Lever

A handle is a part of the tool or attachment to, an object that can be moved or used by hand. The design of each type of handle involves substantial ergonomic issues, even where these are dealt with intuitively or by the following tradition. Handles for tools are an important part of their function, enabling the user to exploit the tools to maximum effect. Package handles allow for convenient carrying of packages.

3. CONSTRUCTION

This multi spanner mechanism consists of one pinion gear and four spur gears in a bigger size. The lever is rotated by the operator and is connected to the smaller pinion gear which is mounted on a bearing. The socket is connected to the spur gear by using shafts (extension rods). Slots are made on the plate in such a way that this machine can be adjustable for opening tires which are having a different centre to centre distances. The base plate and supporting plates are connected by bolts and nuts. The lever is connected to the main shaft which is connected to the main gear.



4. ADVANTAGES

This tool is simple for construction Less in weight
It saves more time as compared to other nut remover tools.
It can easily operate by any person No
need for any special skill to operate it.
Easy to fabricate.

Less running cost.
Easily adaptable technology.
No type of electricity is required.

5. APPLICATIONS

This tool can be used in the automobile industry.
It can be also used in the garage.
It can also be used in a junkyard.
This tool can be used as a standard tool with a new vehicle for the purpose of tightener.
It can use in the assembly line.

7. WORKING PRINCIPLE

The working of the multi spanner mechanism is simple and can be performed by anyone. It does not require any special skill to operate it just basic knowledge about the setup is required for the operation. This works under the principle of removing the wheel nuts in less time by applying force by the hand. It consists of shafts, lever, ball bearings, gears, base plate, and box spanner. The main objective of the work is to develop a single tool, which can be made use of during the assembling and disassembling of wheels of automobiles. The main objective of this work is to develop a complete mechanism in one assembly.

This machine is operated by both hands, due to which the central gear rotates in the same direction as the handle and by this motion, the four output gears which are in mesh with the main gears rotates in opposite direction to the first. Five bearings are attached at the centres of five gears to transmit free rotational motion and to give the exact position of the gears

By finally, the force is transmitted to the sockets at the end of the connecting rods, and thus the four nuts can be opened at once. Generally, spur gear and pinion gears are used for transmitting power between non-parallel intersecting shafts. The cad and cam follower mechanism is used for making the project adjustable. For this purpose, a radial cam is used because the follower moves in the direction perpendicular to the cam axis. And spherical face follower is used because the side thrust and wear are considerably low. The pinion gear is meshing with four auxiliary gears which are in turn connected to a gear whose axle contains the socket spanners at its end. The auxiliary gear is connected to a hollow shaft (main shaft) which is acting as a guide for the follower. The order end of

the follower is connected to a bevel gear. A lock nut arrangement is provided for connecting the main shaft to the follower at any desired position.

8. DISADVANTAGES

It is difficult to remove if rust is formed on the nut since it requires high torque to remove the nut.

9. CONCLUSION

Thus fabrication of multi spanner fastener mechanism is successfully done. This project is practically implemented in a four-wheeler and it found that the result is positive. The project is economical, and it sustains all the required feasibilities. A multi spanner fastener is a perfect tool for assembling and dismantling a wheel in a four-wheeler.

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