

Design and Fabrication of Manual Multi Spindle Nut Runner

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Abstract

A manual multi-spindle nut runner is a tool to remove and tighten the nuts in the wheels in a single operation with less amount of human efforts. There are various methods of removing and tightening nuts in the wheels that are used, they need more efforts to remove a single nut and requires more time to remove and tightening of a single nut. It is mostly used in automobile sectors, garages, service stations.

Keywords: Ball bearing, Helical gear, Pinion, Box spanner socket, Spanner

I. INTRODUCTION

Manual multi-spindle nut runner 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 the lever by using multiple operated spanners. In this type of tire nuts car, the nut, Type of tool required, basic gears theory, gear calculation, spur gear terminology removal steps, spur gear tooth calculation, overall calculation, material required to be analyzed.

II. OBJECTIVE

The fundamental goal of the undertaking is to decrease the time and the issue of setting the device over and over on each nut to free or tight it utilized by utilizing an L wrench and jack. By replacing it with the manual multi-spindle nut runner. The wheel has to be individually removed and tightened for the flat belt wheel for replacement by using the tool by maximum manpower. But, by using a Manual multi-spindle nut runner three nuts can be removed and tightened at one operation with less time consumption and less effort. Thus, the multi-spindle nut runner reduces the time

consumed in the normal process and also the manpower used

III. LITERATURE SURVEY

Tomchick. et al., discussed an automatic Production Fastening System the metal Volunteer State kooky ar fed and loaded into a socket with a retentive spring, and put in on Hi-Loks Hi-Lok with a Bosch right angle nut runner. Bolt installation and collar swage heights and hundreds, moreover as nut force values are captured and logged for reference.

Mir, and DeVlieg, discussed that. edge assemblies that needed the automation to figure its manner around from the higher to lower surface. Multifunction finish effectors change processes to be completed in one pass from initial hole preparation to put in the fastener. Advanced safety systems are used that embody programmable optical maser scanners on the robots and tooling that are mechanically organized supported this tooling.

Ascheri, Andrea Egidiodiscussed the KBE application is developed and tested on a particular powertrain assembly case study. Finally, a primary validation among style engineers is given, examination of the ancient and new approach and estimating an analysis helpful for future potential KBE implementations.

Naveenet al reported that main aim of the project is to style and fabricate a hackney nut

removing tool for constriction and removing of 4 kooky in a single time. With the increment of range of automotive on the road, the quantity of cars drawback thanks to tyre failure have exaggerated.

Li, Ruiya et al reported the mechanism was programmed to perform a spiral search motion to have interaction the tool onto the screw. An impression strategy combining force and position observance with active compliance was enforced. An existing mechanism cell was changed and used to demonstrate the conception and to assess the practicableness of the answer employing a turbocharger as a dismantling case study

Vikas Lonkar et al reported Motor operated multi-spindle hand tool could be a kit to scale back the trouble and time in substituting the wheels of the vehicle. The plurality of lug kooky will be removed at only once with the usage of an electrical motor. The planetary shafts are organized specifically within the pitch circle position of the lug kooky. This kit will be accustomed to take away four numbers of lug kooky and pitch circle diameter is a hundred millimetre. however, the look of substances varies consistent with the sure parameters like the range of lugkooky and pitch circle diameter is a hundred millimetre. however the look of substances varies consistent with the sure

parameters like the range of lug kooky, pitch circle diameter and also the drive used.

Oluwole Timothy et al., reported that the device was with success made-up, and performance analysis was distributed. The modification and loosening of kooky were finished with ease as evident from the results obtained. From the performance analysis of the developed machine, it took sixty-five seconds to loosen four kooky and seventy-five seconds to tighten the kooky and also the loosening and modification method were reduced by forty-first and thirty-eighth severally compared to victimization L formed wrench. applied science thought was placed in situ in coming up with this device because it will be used with ease by each man and girl. The device is additionally simple to take care of, simple to handle and ready to take away and tighten machine kooky of an automotive tyre directly.

Kunal Sharma et al reported the Development of a Clamping Device for 6 Face Machining Experiments to grip the semi-machined job piece that is currently an irregular form, a versatile screw fixture is developed. versatile screw fixture uses movable manual screws which will be tightened and hold the semi machined job

Abdul Junaid et al. reported that this work aims to style and fabricate a hand-operated tool used for a roll in the hay and

unscrewing of auto tire kooky that is understood as Multi Nut Remover. Mostly, the tire nut remover and a jack are given automotive for tire replacement. But, thanks to the issue in applying needed force and to avoid wasting consumption of your time, we've with success developed a multi nut remover that has a gear

Akshay et al discussed that the project aim is to style and fabricate4 wheel nut removing tool for modification and removing of 4 kooky in one stroke. With the increment of range of automotive on the road, the quantity of cars drawback thanks to tyre failure have exaggerated. Often, the automotive is given tyre wheel kooky remover and jack for example spare tyre replacement. notwithstanding, thanks to the issue in applying force to get rid of nut and to avoid wasting a time.**IV. COMPONENTS USED**

4.1 Gear

In this setup we are using a five spur gears, Out of which one is driving gear with pcd of 34mm drives the other four gear of pcd 45mm. 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 16 and on driven is 32.

4.2 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 box spanners are attached to it.

4.3 Socket

A socket is a cylindrical type female hexagonal fit. It is fitted over the common male hexagonal head of the nut. In this case, the size of the socket of M19 is taken for making the product.

4.4 Bearing

A bearing rolling-element bearing a type races. The purpose of balls to maintain the separation between the rotational friction and support radial loads and to reduce the axial. In most applications, a race is stationary and the other rotating assembly (eg.hub or shaft) is attached. Causes the rotate the bearing races as well as a change it is much less than the coefficient of sliding friction against each other if the two flat surface.

4.5 Baseplate

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.

4.6 Design Calculation

1. Firstly we find out some data from our machine design book and analytical calculation done with the help of the design data book.
2. Find out the size of gear dimensions like PCD, width, module and teeth. As same, we calculated dimension of pinion, As well– as of design of gear.
3. Select the standard data and size of pinion such as the number of teeth, pressure angle, addendum etc., and the same procedure follows – for the gear.

Detail of von mises stress analysis: Model = Maruti Alto

Engine = Maruti 800 cc

Torque (T) = 85 NM

Speed (N) = 2500 rpm

Power (P) = = 35405.74

W = 35.40 kW

Torque (T) = $F \times (d/2)$

Where, F-load,

d- Pitch circle diameter ($z \times m = 56 * 2$ mm)

$F = T / (d/2)$

$F = 135240 / 90$ Load (F) = 1502.66 N

Using Lewis equation

Tangential load $F = b \times y \times p_c \times \sigma_b$

$p_c = \pi \times m = 3.14 * 2.0$ mm

$y =$ Lewis form factor = 0.134 mm

$b =$ face width = 40 mm

V. WORKING PRINCIPLE

The working of the vehicles multi-wheel nuts remover and tightener is simple and can be performed easily. It consists of five spur gears, a pinion gear, four shafts that have been connected to the four spur gears, and box sockets at each end of the four shafts. First, the machine setup is placed with the correct fitting of the box socket to the nuts of the vehicle.

- Power is supplied to the main gear with the help of a handle either manually or by a motor that rotates all the gears.
- Each spur gear is connected with the shafts with the box socket at the end of 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 the handle.

VI. CONCLUSION

This project is much enforced in a four-wheeler and it found that the results area unit positive. The project is economical, and it

sustains all the desired feasibilities. The automobile vehicle all wheel's nut remover and tightener could be an excellent tool for collecting and disassembling a wheel in a four-wheeler. From the results of experiments, the tool is feasible to be improved and prototyped for production. 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 everyone for the tyre removal and tightening process. For future development and improvement of the tool, light-weight weight and high strength material is anticipated to be offered and applied.

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