

Motorized Operated Multi Spindle Spanner

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ABSTRACT

Motor operated multi spindle spanner is a kit to reduce the effort and time in replacing the wheels of the vehicle. The plurality of lug nuts can be removed at one time with the usage of an electric motor. The planetary shafts are arranged exactly in the pitch circle position of the lug nuts. This kit can be used to remove four numbers of lug nuts and pitch circle diameter is 100 mm. But the design of gear varies according to the certain parameters like number of lug nuts, pitch circle diameter and the drive used. The torque wrench or manual operated spanners are the instruments, which are widely used to remove the nuts from the bolts. Torque wrench helps in setting required torque. The multi nut remover is most widely used in formula one racing and automobile area for quickly removing and tighten nut. Removing a wheel and replacing with other one requires wrench or spanner. The spanner can be used to remove or tighten the nuts from bolts of the wheel. But this spanner can remove only one nut at a time. In case, to reduce time requires removing the wheel, like puncture center, it will be time consuming to remove nuts one by one. In those cases, Multi Nut Remover will be more useful. The torque, which is needed to apply to remove one nut, can be used to remove all nuts using planetary gear arrangement. This will reduce time consumed in replacing the wheel. If we consider a four wheeler removing and replacing the car wheel is a very frequent job performed by the worker. Normally each of the four nuts is removed or tightened individually one by one applying the spanner. But with the help of the equipment developed we can loosen or tight all four nut at a time and at the motor operated Spanner.

Keywords: Spindle Spanner, Planetary Shafts, Motor, Gear

I. INTRODUCTION

A lot of research activities have been carried out on gears mechanisms since very first gear was manufactured. A gear transmits the power from one shaft to another in various relative positions. Many engineers and designers put their efforts in this field and succeeded also. They put all of their knowledge and the studies about gears on papers, with the use of these papers anyone can know about advancement of the research carried out by them.

With these research papers, we come to know various aspects about gear. These papers explore how equipment

can be driven at uniform speed and non-uniform speed. Also these papers conclude about selection of material for a gear depending upon requirement. There are a number of different gears which have different application areas. The research papers helps in choosing the appropriate type of gear. mechanism but we are Mr. R. Sivabalan &, Mr. M. Vignesh both publish paper on this topic but it operates on cam introducing it atomized operated with motor and geared mechanism.

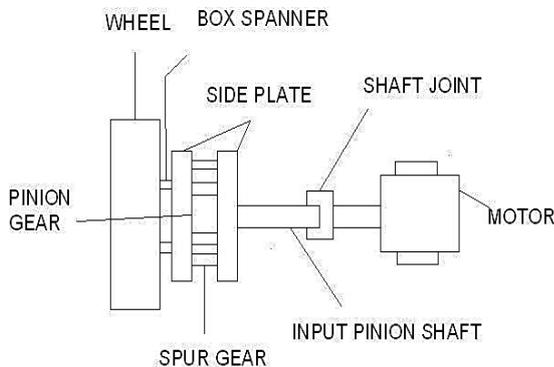
II. METHODS AND MATERIAL

Components:

- 1) Sun Gear ($\text{\O}46$ mm)
- 2) Planate Gear ($\text{\O}54$ mm)
- 3) Motor (12V DC)
- 4) Main Shaft ($\text{\O}12$ mm)
- 5) Sub Shaft ($\text{\O}15$ mm)
- 6) Base Plate ($\text{\O}170$ mm)
- 7) Bush ($\text{\O}15$ mm)
- 8) Stand

Working Principle

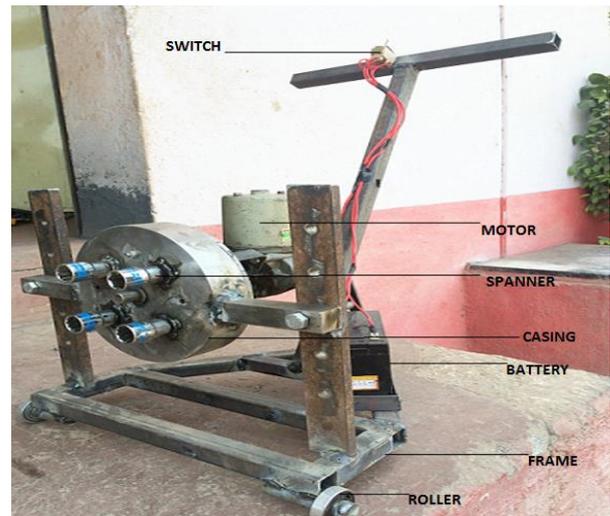
It works on the principle wheel is a very frequent job performed by the operator. Normally each of the four nuts is losing/tighten individually by simultaneously applying Rotary motion with gear arrangement either with the help of mechanism developed that one can loosen or tight all four nuts at a time with motor operated multi nut spanner. This is done by adjusting the five gears between two side plates operated only motor or input pinion shaft.



III. RESULTS AND DISCUSSION

The calculated torque is 40.00 N-m for removing / tightening of lug nuts. This torque is adequate and replacing the nuts at much faster rate is possible compared to the conventional spanner. The human effort required for operating the equipment is relatively less.

Therefore it is recommended that the multiple operated spanner if fabricated will prove very much beneficial for installation of wheels while assembling the cars.



IV. CONCLUSION

This kit reduces the time consumed in removing the lug nuts. In conventional method, certain torque has to be applied to remove a single lug nut. In this case, the torque applied for removing/tightening of one lug nut is adequate for removing/tightening of all the lug nuts in the wheel. So the process of replacement of the wheels can be done so faster and it reduces the time.

It doesn't cost more as compared to hydraulic and pneumatic devices. In this kit, a sun and planet gear system is used. Sun gear is smallest gear and planetary gears are placed exactly in the position of the lug nuts in the pitch circle diameter according to the number of lug nuts. Pitch circle diameter is the diameter of the circle in which lug nuts are positioned.

V. FUTURE SCOPE

1. Equipment can be made more flexible with varying PCD dimensions.
2. Sensors can be used for limiting the torque and safety.

VI. REFERENCES

- [1] Abd Aziz “Improvement and Optimization of Tire Nut Removal with 100 PCD”. University Malaysia Pahang, Thesis Degree, 2008.
- [2] M. F. AbdRahim “Design, Development and Fabrication of Tyre Lug Wrench”. University Technical Malaysia Melaka (UTeM), Thesis Degree, 2007.
- [3] R. Abdul Rahman, C. A. Che Ismail and M. Y. Abdullah “Mechanical Machines”. University Technology Malaysia Publisher, 2003.