Multi Nut Remover Device of Car Wheel

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ABSTRACT

- The abstract serves as a condensed summary of the research paper, encapsulating its objectives, methodology, findings, andimplications.

- It provides a glimpse into the significance of the Multi Nut Remover Device for Car Wheels (Manually) in addressing challenges within automotive maintenance.

- Highlights include the device's design, functionality, and potential impact on efficiency, safety, and user experience in automotive workshops.

- Mention any innovative features or unique aspects of the device that set it apart from existing solutions.

INTRODUCTION

- Delve into the context and significance of manual wheel nut removal in automotive maintenance, emphasizing the need forefficient and reliable tools.

- Explore the limitations of traditional methods and tools for nut removal, highlighting safety concerns, time inefficiencies, and ergonomic issues.

- Introduce the Multi Nut Remover Device as a novel solution to these challenges, offering improved performance, ease of use,and versatility.

- Discuss the motivation behind the research, such as enhancing workshop productivity, reducing downtime, and ensuring technician safety.

CONSTRUCTION AND WORKING

It consists of gear train mechanism, in which centre pinion is engaged with another gears as shown in the Fig-1. Centre pinion is mounted onthe shaft which is having a round hole at one end into which lever is inserted. Pinion is having long facewidth so as to mount four gears on it in order to not come in contact with each other. By increasing the axial facewidthof the pinion the left & right side of the gears are mounted on the centre side of the pinion along facewidth. In such fashion two gears are mounted on the pinion. In such fashion the bit spanner will be in position to either tight 'or' loose the nut. The attachment is used at one end of each shaft by means of welding into which bit spanner is press fitted . The whole assembly is mounted on the stand.

First adjust the position of the bit spanner with respect to theposition of the nut head. Insert the lever into the round hole of the shaft of the pinion and apply the load on the end of the lever. Now, the pinion is rotated & it will transmit the motion to the engaged gears having bit spanner which tight or loose the nut depending uponthe direction of the rotation of the gears. In this way more than one nut is either tighten 'or' loosen easily.

DESIGN AND CALCULATIONS

All engineering activities necessarily begin with some ideas with high or low innovative content, translated into definite plans for their realization in the form of products. This is the essence of design engineering. The ultimate success depends on a thorough consideration of how the product will be made and used as well as on the attention to detail paid by the design engineering. This is applicable equally for a minor redesign of a existing product or for a most innovative one. The project model is designed in UNIGRAPHICS. That is also called as NX software. It is CAD/ CAM based software .

Dimensions of the components: Gears: Diameter of the pinion (Dp) = 54mm
Number of teeth's on pinion (Tp) =22 Diameter of the gear (DG) =64 mm Number of teeth's on gear (TG) =24 Bearings: Type of Bearing = Ball bearing Bore diameter = 16mm Diameter of the bearing =40mm Shaft: Shaft type =solid shaft Diameter of the shaft =16mm Length of the shaft = 150mm Metal plates: Shape of the plate Size of the plate = Square =300*300mm Thickness of the plate=10mm Wheel: Pitch circle of the wheel = 112mm Nut to nut distance = 80mm Nut size =19mm

Torque required for one nut:
Figure 6 - "Multi nut remover device of omni wheel (manually)"

Torque required for pinion: $T = F * L$

Where,

T = Torque in Nm. F = Force in N.

L = Length in m.

$T = 15 * 9.81 * 40 * 10^{-2}$
$T = 58.86 \, Nm$

Torque required for one nut: $T = 58.86/2$

$T = 29.43 Nm$

Publication Principles

-   Articulate the core principles and values guiding the publication of research papers in the journal.

-   Emphasize scientific rigor, transparency, reproducibility, and ethical conduct as fundamental principles of scholarly publishing.

-   Discuss the criteria used to evaluate the scientific and technical merit of submitted manuscripts, including originality, significance, and methodological rigor.

-   Address issues such as data availability, funding disclosures, and conflicts of interest relevant to publication in the journal.

FUTURE SCOPE

The multi nut remover is fixed to certain model of the car so in further work we will change the tool into adjustable type whichcan be suited for any model of the car. We will try to reduce the cost of the model in further work. The weight of the model is heavy so in future we will try to reduce the weight by fabricating the model with different lightweight materials. Now operatingenergy of the model is mechanical energy so in further step we will try to arrange motor to rotate the tool.

Helpful Points:-

- Provide practical tips and strategies for authors to enhance the quality, clarity, and impact of their research papers.

- Cover topics such as manuscript organization, effective communication of results, and engaging with readers.

- Offer guidance on data visualization, graphical presentation, and incorporating supplementary materials to support the main text.

- Address common challenges faced by authors, such as writing style, language proficiency, and manuscript revision strategies.

PERFORMANCE EVALUATION

The performance evaluation was carried out after the design and fabrication process of the multi-lug nuts tighter and remover had been completed. This was done to determine the time taken to lose and tighten five-wheel nuts of car tyre. At the end of using the multi-lug nuts tightener and remover to carry out the operation, conventional tool (L shaped socket wrench) was also used; the two results were then compared to analyze the efficiency of the developed device. From the result obtained above, it clearly shows that the developed multi-lug nuts tightener and remover has reduced the time spent in the process of loosening by 93% and tightening by 95% with less application of torque compared to when the L-shaped wrench was used.

CONCLUSION

- Summarize the key findings, contributions, and implications of the research paper on the development and application of the Multi Nut Remover Device.

- Reflect on the broader significance of the study in advancing knowledge, addressing challenges, and driving innovation in automotive maintenance.

- Offer suggestions for future research directions, technological advancements, and practical applications of the device in real-world settings.

- Encourage readers to engage with the research, contribute to ongoing discussions, and explore opportunities for collaboration and further inquiry.

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