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Design and Fabrication of Unified Car Wheel Opener

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ABSTRACT

Automotive maintenance is one of the major parameter for keeping its life span, it includes mainly change of punctured tyres, has been always a difficult task. Every automotive manufacturer provide tool such as L wrench and jack, but still using these tools require skilled person. Therefore, it is crucial to have a tool that should designed ergonomically, easy to handle, light weight, require small space and can perform similar task in one time. Unified wheel opener is a special purpose tool use to open/close all the nuts of a wheel at one time with less effort. Although various methods were used for opening wheel, but they required a lot of effort. The main objective of project is to develop a single tool with multiple mechanisms which can be used during assembling/dismantling of wheels in automobile.

I. INTRODUCTION

1.1 Overview

Engineering in general, and Mechanical engineering in particular, ideals with a wide spectrum of products, ranging from large and complex systems comprising of numerous elements down to a single component. Apart from being a physical object, a product can also be a service that requires the application of engineering knowledge, skills and devices to be useful to society. A service falls under the category of a system in that it is carried out with the help of personnel, facilities and procedures. The service offered by an automobile maintenance and repair garage would be a typical example from mechanical engineering. Even computer software could be treated as an engineering product. It is also created using engineering knowledge and skills. In the following, the term product when used alone denotes the object to be designed and made with the help of engineering knowledge and skills, irrespective of whether it is a large system, a simple machine, a component or a service. Specific reference to design of computer software is not attempted in the following although many of the generalities apply to it also.

A general understanding of the nature of product is a prerequisite for designing it. A complex product can be sub divided into sub-assemblies or sub system, component etc. Frequently the planning, layout and design of a complex multi element product is an interdisciplinary effort, requiring the expertise and skills not only of several engineering specializations but even non-engineering ones.

It is always preferable that our work should be easy and fast. But easy and fast working requires some technical skills to work efficiency and properly. In our daily life we face many problems where we need a lot of effort and time to do that specific work. A little but important work we do often is opening a tyre of a vehicle. It is a fact that a huge effort is required to open a single nut of a car wheel and it will become a tedious task to open the wheel in extreme atmospheric conditions. It also creates problem when we are in hurry.

Here we get the solution of the problem mentioned above Unified Wheel Opener is a special tool

designed by us which will open a tyre easily. It is so designed that it can open all the four nuts of a car wheel in one time. And the most desired achievement we get is that total effort and time needed in the process is very less. It can open and also refit the tyre with the same tool easily. Tool is simple in design, easy to use and easily portable along with the vehicle. Overall of instrument is in the reach of average citizen. Great efforts are made to satisfy each and every technical aspect of the design.

1.2 Objective

A simple mechanism if used properly can lead to a great success. U.W.O. is a tool which is made for automobile field. Aim of our project is to save time and human effort. We have tried our best to adopt the design having minimum input torque and required output torque which is not possible without using U.W.O. Unified wheel opener is a special purpose tool made to open or close all the nuts of a wheel in a one time with less effort. Although various methods are used for opening nuts they require a lot of effort opening a nut, the main objective of work is to develop a single tool with multiple mechanism which can be used during assembling and dismantling of wheels in auto mobile.

1.3 Application

Application domain of unified Wheel Opener is in automobile industries. According to our preplanned project we describe the following places where it can be used successfully:

• It can be used as standard equipment provided with a new vehicle for the purpose of opening and refit a punctured wheel in the midway.

• It can be used in workshops to open a wheel in place of using pneumatic guns which are restricted to the availability of light and compressed air; it can be easily operated with hands.

• It can be used in assembly line of automobiles where more time is consumed in tightening all the four nuts one by one. As it takes less time to fit a new tyre, it will lead to increase productivity.

II. LITERATURE REVIEW

A lot of research activities has 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 position. 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 a mechanism can be driven at uniform speed and non–uniform speed. Also these papers tells 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.

Wen-Hsiang Hsie in his paper (2007) "An experimental study on cam-controlled planetary gear trains" describes that a mechanism is driven by a motor at uniform speed. However, more and more researches indicate that there are many advantages if mechanism can be driven at non-uniform speed, and this kind of mechanism is called a variable input mechanism. The purpose of this work is to propose a novel approach for driving a variable speed mechanism by using a cam-controlled planetary gear train, and to investigate its feasibility by conducting prototype experiments. First, the geometrical design is performed. Then, the kinematic equations and the cam profile equations are derived based on the geometry of the mechanism.

Ligang Yao Jian Wei Hung Lin and Yingjie Cai (2004) in their paper states that investigates meshing characteristics of the toroidal drive with different roller shapes, examines the effect on the characteristics from roller shapes and produces a comprehensive comparative study. Based on the coordinate transformation, the paper introduces the

generic models of meshing characteristics and characterizes the meshing to introduce both undercutting and meshing limit curves. The paper further develops meshing functions and their derivatives with respect to each drive type with a different roller shape. This leads to a comprehensive examination of each meshing characteristics against each drive type of a roller shape. The comparative study focuses on the effect of contact curves, tooth profile, undercutting, meshing limit curves and the induced normal curvature.

Tadashi Varon (2011) describes in their paper about Meshing transmission error (TE) is well known as a contributing factor of gear whine, but system- level prediction of transmission error and quantitative analysis of dynamic meshing vibromotive force have not been analyzed adequately until now. This paper describes the use of a computer- aided-engineering (CAE) model for the analysis of the dynamic gear meshing behavior and for the prediction of dynamic transmission error from the input torque of the system. This paper also describes the analysis of a dynamic vibromotive force at a bearing location where vibration is transmitted to the vehicle body. The gear whine critical frequency can be predicted with the proposed method at an early stage of passenger-car development when no prototype is available.

Gear whine is an automotive quality problem that can be perceived by any driver regardless of his/her level of driving experience, but it tends to manifest itself in the final stages of vehicle development when, in most cases, effective design. measures that can be taken against it are extremely limited. Consequently, power train designers have a great need for CAE technologies that enable them to predict gear whine using a virtual power train before the power train is physically constructed.

Hiroyuki Kato, Ken Iwanami, Hiroshi Arai, Koji Asanotells (1998) describes in their paper, in addition to performance (running safety and stability, and riding comfort) compatible with great increases in driving speed, ensuring of reliability when running at high speeds, and use for service operation based on long term durability and ease of maintenance must all be considered. Therefore, configurations including use of new structural elements were reviewed for the main structural parts of the bogie. In addition to significant investigation of the strength and performance through numerical analysis at the investigation stage, a first prototype was built and performance tests and
long-term endurance tests through bench testing were performed for confirmation. Bogies for which development proceeded in this manner have been installed on a Shinkansen high speed test train and performance confirmation is being performed through actual running tests. Here, with regard to the development details and development process for the high-speed Shinkansen bogie, the bogie and the main parts such as driving device, axle bearings, and brake components are mainly introduced.

III. SUMMARY

As the use of automobile is rising in the Indian market, managing the commercial vehicle is also being a challenge these days. When we talk about breakdown in vehicles, wheel come at the first. This is one of the potential problem that every vehicle is dealing with, so to make the wheel changing process more efficient we need to reduce the efforts and provide a ergonomic advanced design.

IV. CONCLUSION

Taking the idea from all research paper which are included in the literature review. We came to a point that by using gear-train mechanism we can make a system which is used to open the nut of a wheel with minimum torque so, as to eliminate the hard-work of person with minimum time. In all research paper idea is given that how gear train works, and how the power transmission take place. Literature is deeply studied, and the useful information is collected, then

we have to select the various material that are to be used for the various components of the unified wheel opener.

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