DESIGN AND FABRICATION OF MULTI-WAY MULTI-NUT TIGHTENER

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Abstract: *The fabrication o f two way multi-nut tightener and remover is a new innovation concept . The main aim of our project is to fabricating the two way tool which is the combination of two tools four nut remover and five nut remover. Now a days most of the car s have five nut and four nut wheel its is difficult to carry two tools and costly to buy both the tool. From our project we can reduce the carrying loa d of two tools into one tool and also the cost of buying two tool by buying the sing e tool. It reduces the man power and equal torque is applied on the entire nut in car wheel. It can be successfully used as a standard tool provided with a new vehicle. also it can be used in assembly line of automobiles, workshops and service stations.*

Key Words: *Torque, Man Power, Gears,. Methodology, Sun Gear, Internal Gear ,Gear mesh, Wheel Wobbling, Gear System.*

1. INTRODUCTION:

Cars have become a basic requirement for every family. They can be used for travelling, shipping, and several other reasons. There are lots of problems faced in car tires. A Multi-Nut Tightener can solve lots of tire related problems in cars. For example, if a tire suddenly gets punctured, a multi-nut remover can be used to remove the punctured wheel immediately and replace it with a spare wheel. Both the removing and tightening part are done fast and with very less effort. Also due to uneven tightening of the nuts, wheel wobbling occurs, which is one of the main reason for car accidents and also some fatal car accidents. A Multi-Nut Tightener can eradicate a lot of these problems by applying equal torque on each nut. Most of the cars have 5-nuts and some smaller vehicles have 4nuts. So, our tool is optimized in such a way to help to remove both 4-nuts and 5-nuts in car wheels.

2. LITERATURE REVIEW:

Breaking loose all four over tightened lug nuts required totally discharging two full batteries in the cordless impact wrench obviously, the last person to install that wheel had over tightened the nuts with a powerful pneumatic impact wrench.The installed lug nuts on the spare with a torque wrench, carefully adjusted to the correct 100 ftlb, which we looked up in the owner's manual. That process got us the stink eye from thecar's otherwise grateful owner who was convinced that the proper way to tighten the lugs required that pneumatic wrench again, or at least jumping up and down on the end of the lug wrench. Car manufacturers specify a proper tightening level, atorquevalue expressed in foot pounds, for every fastener on your car. Torque is a rotational force applied around a point or, in this case, a nut. Put a 1foot long wrench on a nut and apply 10 pounds of force to the opposite end. You're now twisting that nut with 10 ft lb (distance times force, or 1 foot times 10 pounds). Use a 2footlong wrench and apply 50 pounds of force, and you'll have 100 ftlb, which, happily, is just about as long as most lug wrenches, and as much force as most elbows are happy cranking on.While most mechanics rely on a well-calibrated elbow to tighten things, it's vitally important that the tightness of a fastener fall within a fairly narrow range. Too loose and there's the danger of the nut or bolt spontaneously unscrewing down the road. Or maybe the gasket or ring fitting clamped by that bolt will leak. Too tight and there are other risks: The bolted together part may be compressed, bent or otherwise damaged. The bolt shank could break, or the threads may strip, providing no clamping force at all. The best way to tighten fasteners is with a device called a torque wrench. Let's discuss what happens when you turn a nut or bolt head. The threads are a form of inclined plane or wedge, the simplest type of tool. As the inclined plane is wedged (turned) into the threads, it applies a force along the bolt's length, effectively making the bolt a tension spring. This tension in the bolt shank clamps two parts together. If the clamping force is greater than the load exerted between, say, the head and the block, those two pieces will never spontaneously get loose. And the more twisting force you apply to the bolt head or nut, the more clamping force in the joint. So just tightenit until it won't come loose, right?Wrong. Differences in overall bolt length, the material of the clamped parts,the presence of a gasket between the two parts, and even the alloy of the bolt itself affect the proper torque. Also, the proper torque value takes into account the friction between the threads, which is the single biggest variable that affects the relationship between the torque applied to the bolt head and the clamping force. Friction arises from the threads as well as the rotating bolt face scrubbing along the stationary workpiece. Overcoming friction can account for as little as a few percent or as much as 50 percent of the force needed while tightening a nut or bolt. And that means that the clamping force can vary widelynot well when you're installing a cylinder head or an intake manifold.

3. MATERIALS:

NAME OF THE MATERIAL	TYPE OF MATERIAL	QUANTITY	COST OF MATERIAL
1.Box Spanners	CAST IRON	5	500/-
2.Sun Gear	M.S	1	350/-
3.Shaft	M.S	7	200/-
4.Bush	STEEL	12	60/-
5.Steel Plate	M.S	2	350/-
6.Planet Gear	M.S	5	500/-
7.Internal Gear	M.S	1	800/-

4. METHODOLOGY:

The basic definition of gear mechanism is "Gears are mechanisms that mesh together via teeth and are used to transmit rotary motion from one shaft to another". In our project we use three types of gears, namely, Sun gear, Planet gear, Ring gear. These three gears are meshed together as shown in the Figure.1. The design software used here is Pro-E.

Box Spanners are used to tighten/remove the nuts on the wheels. The box spanners and gears are connected with a shaft. One end of the shaft is welded to the center of the gear and the other end of the gear is fixed with a box spanner. When the multi-nut tightener is used to tighten 4-nut wheels, only four of the planet gears mesh with the sun gear and the other planet gear is fixed and always meshed with the ring gear. The sun gear is fixed with an electric motor, which produces the rotary motion to the sun gear, which in turn rotates the planet gears. The design is represented in Figure.2.

When the multi-nut tightener is used to tighten 5-nut wheels, the four planet gears which is meshed with the sun gear are moved via a slot and meshes with the ring gear. Therefore, all the planet gears are now meshed with the ring gear. The fixed gear is connected to an electric motor. This planet gear produces rotary motion, which is transmitted to the ring gear, which in turn rotates the other four planet gears. The design is represented in Figure.3.

Fig.1.1

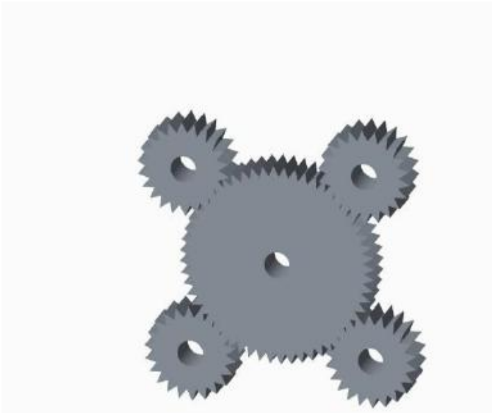

Fig.1.2

Fig.1.3

FINDINGS:

- This tool's advantage is less timing.
- It is Low cost when compare to previous used tools.
- No need to carry two tools everywhere.
- Easy to use.
- Life of the tool is very high
- Easy to portable everywhere

ANALYSIS:

Forces Involved:

Breaking loose all four over tightened lug nuts required totally discharging two full batteries in the cordless impact wrench—obviously, the last person to install that wheel had over tightened the nuts with a powerful pneumatic impact wrench. The installed lug nuts on the spare with a torque wrench, carefully adjusted to the correct 100 ft-lb, which we looked up in the owner's manual. That process got us the stink eye from the car's otherwise grateful owner—who was convinced that the proper way to tighten the lugs required that pneumatic wrench again, or at least jumping up and down on the end of the lug wrench.

Torque Basics:

At some time, we have all had difficulty in removing the lid from a jar. The reason we have this trouble is simply that we are unable to supply adequate torque to the lid to break it loose. The solution to our dilemma may be to: 1) grit our teeth and try harder, 2) use a rubber pad, or cloth, to increase the ability to transmit torque without slippage, or 3) use a mechanical device to help multiply our torque producing capability. Failing on all of the above, we may pass the jar to someone stronger who can produce more torque.If we were to wrap a cord around the lid and supply a force to the end of the cord through a scale, we could get the exact measurement of the torque it takes to loosen the lid. The torque required would be the force as indicated on the scale, multiplied by the radius of the lid.

RECOMMENDATIONS:

The recommended materials can be used for making the gears and shafts:

• 400 and 450HB is through hardened, quenched and tempered abrasion resistant steel and is the most widely used of the wear resistant grades for all weld on wear components

• Used in high impact and abrasion applications such as bucket, blade and truck deck liners, weld-in cutting edges, wear strips, ripper shanks and crusher plates

• This plate is 3-4 times the abrasion resistance and strength of mild steel with an excellent combination of workability, weld ability and formability

• Thickness range available is from 6mm to 90mm. Sheet size: 6000mm x 2500mm

500HB Abrasion Resistant Steel

• 500HB is through hardened, quenched and tempered abrasion resistant steel, providing the ultimate wear resistance for severe abrasion

• Applications for this steel include bolt-on cutting edges, crusher plates, wear strips and any other sliding wear surfaces

• This steel will last up to 10 times the wear life of mild steel and will outperform the 400-450HB steel due to its mechanical properties

CONCLUSION:

The multi-nut tightener is used to tighten multiple nuts in a single use. They are mostly used to tighten and remove the wheel nuts and hence, the effort required for removing/tightening the wheel is very less. The Multi-nut tightener can be used in automobile units and manufacturing units. The weight of the model can be reduced by using a light weight material base plate.

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