Dec. 20, 1966 W. H. GRIMES ET AL 3,292,464

GEAR DRIVEN WHEEL RETAINER NUT WRENCH

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Fig. 1

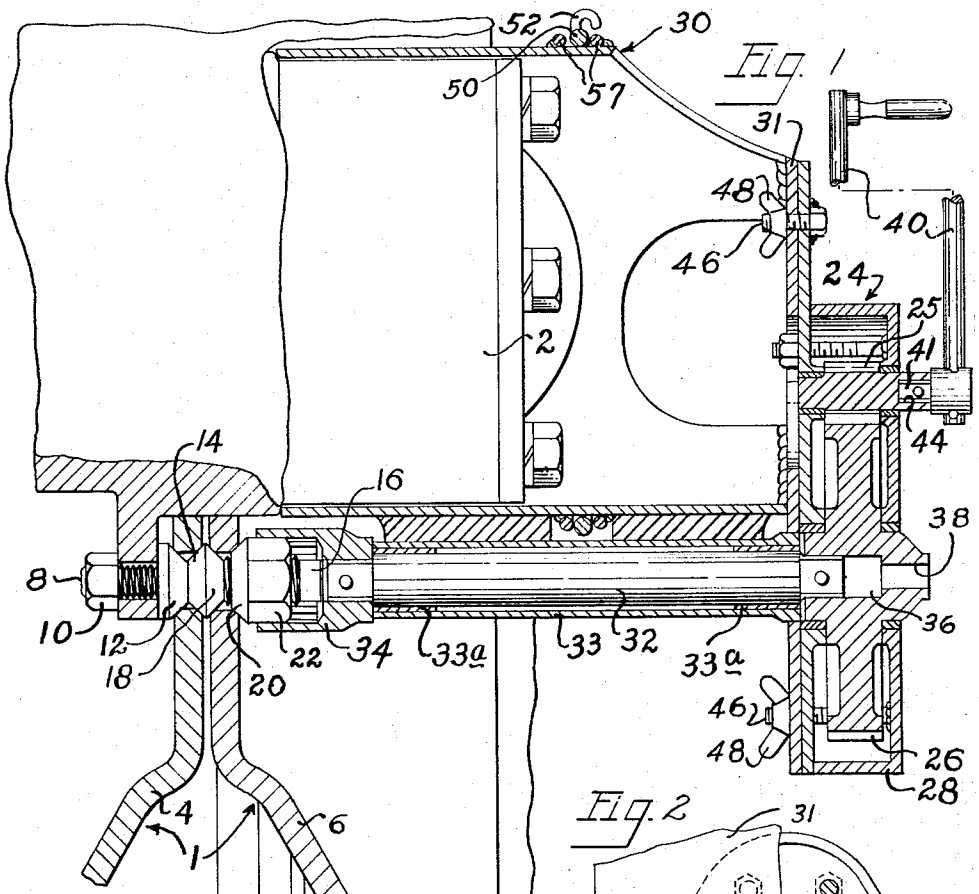


Fig. 2

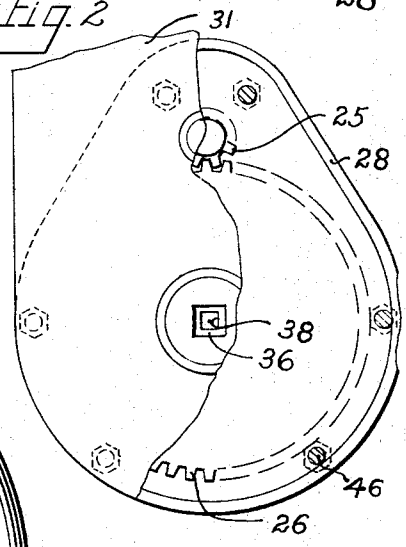
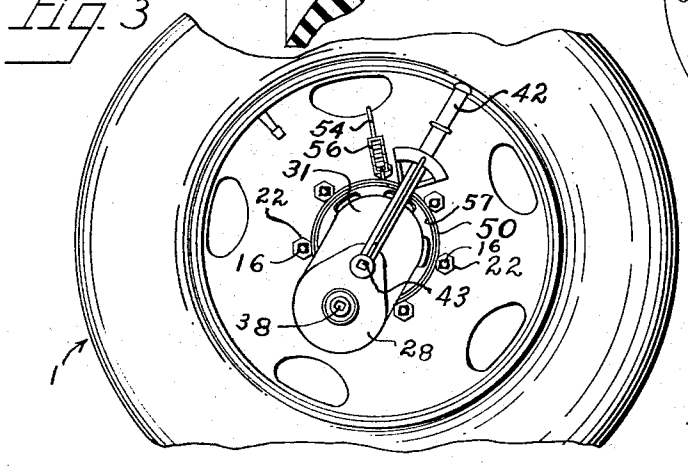


Fig. 3



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GEAR DRIVEN WHEEL RETAINER NUT WRENCH

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This invention relates to improvements in gear operated wrenches and more particularly to a gear operated wrench for removing wheel retainer nuts from vehicle wheels, such as dual truck wheels and the like.

Various removal means for wheel retainer nuts have been proposed heretofore, but these for the most part lacked sufficient power to remove stubborn wheel retainer nuts, lug bolts, and the like.

The present wrench is so constructed that stubborn wheel retainer nuts may be readily removed from dual wheels, either the exterior nuts or the intermediate nuts, by a pull on the handle, through the reduction gearing which is preferably geared to a ratio of ten to one, or the ratio may be even greater.

Furthermore, the present wrench is so geared that nuts can be tightened to the required torque without the aid of pneumatic wrenches or excessive leverage, as a one foot handle on a ten to one gearing arrangement enables approximately one thousand foot pounds of torque to be applied to the nut, with only one hundred pounds torque pull on the wrench handle. The wrench is held in supported relation with respect to the hub of the vehicle, thereby enabling a single person to remove and replace large tires on dual wheels of a truck, either the interior wheel or the exterior wheel, by the use of the wrench.

It is preferable to have the body of the wrench and the gear housings made of light weight material such as aluminum, magnesium or the like.

An object of this invention is to provide a gear actuated wrench on which a predetermined amount of torque may be exerted either to loosen retainer nuts on vehicle wheels or to tighten the retainer nuts thereof to a required tightness.

Another object of the invention is to provide a gear wrench whereby wheel retainer nuts, both exterior and intermediate nuts, may be readily removed or tightened with a minimum of effort.

Still another object of the invention is to provide a gear wrench which may be driven either directly or in geared relation, to remove retainer nuts from vehicle wheels.

Still another object of the invention is to provide a gear set arrangement which may be readily removed from one hub adapter and readily replaced on another hub adapter to enable the use of the gearing of the tool on different size hub adapters so as to fit hubs of various sizes.

Still another object of the invention is to provide a gear operated wrench for removing retainer nuts from vehicle wheels and for replacing the nuts thereonto in controlled torque relation so the exact tightness of each and every wheel retainer nut will be known.

Still another object of the invention is to provide a gear operated tool for retainer nuts which is readily supported in operating position and which may be readily used by a single person to remove or replace wheel or lug retainer nuts of vehicle wheels.

Still another object of the invention is to provide a wrench which may be driven either in geared relation or by direct drive by changing positions of the handle.

With these objects in view and others which will become manifest as the description proceeds, reference is to be had to the accompanying drawings in which like reference characters designate like parts in the several views thereof, in which:

FIG. 1 is a fragmentary, elevational view of a dual vehicle wheel, with parts broken away and with parts shown in section to bring out the details of construction of the gear operated wrench and the manner in which the wrench operates on a nut of a dual wheel;

FIG. 2 is a fragmentary, elevational view of a gear housing, and showing a portion of the housing broken away to bring out the details of construction;

FIG. 3 is a fragmentary, front elevational view of a wheel, showing the gear housing mounted thereon, and showing the gear housing supported on the wheel.

With more detailed reference to the drawings, the numeral **1** designates generally a vehicle wheel, such as a truck wheel, which has pneumatic tires thereon. The numeral **2** designates a fragmentary portion of a hub as mounted on the usual truck axle (not shown), which hub has dual wheels **4** and **6** mounted thereon, with the wheel **4** being the interior wheel and wheel **6** being the exterior wheel. A wheel stud bolt **8** is secured to hub **2** by nut **10**. The wheel stud bolt **8** has a bevel faced head **12** intermediate the length thereof, the bevel of which head **12** is complementary to the bevel surrounding circumferentially spaced holes within the inner face of wheel **4**. The outer face of the wheel **4** also has a complementary bevel to complementally engage with the bevel **14** of hollow nut extension **16**. The hollow nut extension **16** has a bevel **18** on the opposite side from bevel **14** to complementally engage the bevel surrounding circumferentially spaced holes on the inside of wheel **6**, as will best be seen in FIGS. 1 and 4. The outer face of wheel **6** has a bevel to complementally engage with the bevel face **20** of nut **22**, as will best be seen in FIG. 1.

The geared wrench, as shown in FIGS. 1 to 3, is generally designated by the numeral **24**, which wrench comprises a removable gear set **25** and **26**, which gears are encased within a housing **28**. The housing **28** is attached to a cylindrical hub adapter **30**, which hub adapter **30** has a tubular member **33** mounted on a side thereof. The housing **28** is positioned exteriorly of the outer end of hub **2** so as to center the tubular member **33** and the wrench drive shaft **32** in axially aligned relation with the axis of the stud bolts **8** within the bolt circle. In this manner a socket, such as a hexagon socket **34**, may be detachably secured to a squared end of wrench drive shaft **32** with each end of the drive shaft **32** being squared, as will best be seen in FIGS. 1 and 3, so that the drive shaft **32** may be readily removed from gear **26** which has a complementary squared socket **36** therein. A smaller squared socket **38** is also within the gear **26** axially thereof so as to enable a handle, which may be in the form of a crank **40** or a torque handle **42**, to be secured within the squared socket **38** of gear **26**, or within a squared socket **44** within pinion gear **25**. The gears **25** and **26** are each journaled within bushings within housing **28** so that the teeth thereof will be in engaged or meshed relation. The handles **40** and **42** each has a squared projection **41** and **43**, respectively, thereon to engage either the squared socket **38** or the squared socket **44**.

The hub adapter **30** has an end plate **31** in the end thereof which is apertured to receive bolts **46** therethrough, onto which bolts **46** wing nuts **48** are screwthreaded.

Tubular member **33** is secured to the side of hub adapter **30**, so as to receive the axial wrench drive shaft **32** therethrough so that the axis of the tubular member **33** will be in aligned relation with the bolt circle when the hub adapter **30** is fitted on hub **2**. Bushings **33***a* are fitted within tubular member **33** to journal the shaft **32** therein, so upon movement of handles **40** or **42** connected to gear **25**, gear **26** will be driven in a reduced geared relation to turn shaft **32**, and with the socket **34** engaged with nut **22** the nut **22** may be removed from the outer end of

stud bolt **8** or the nut may be screwed into engaged relation with wheel **6**. A squared socket **34***a* is adapted to fit the squared end of hollow nut extension **16** when the squared socket portion thereof is fitted on the square end of wrench drive shaft **32**. It is to be noted that the socket **34***a* is substantially shorter than the hexagon socket **34**, which will enable the socket **34***a* to be readily used on the wrench drive shaft **32**, thereby enabling both the hollow nut extension **16** and the hexagon nuts **22** to be readily removed with the respective sockets.

A ring **50** surrounds hub adapter **30**, which ring **50** has a hook **52** thereon for engagement with a support member **54**, which support member **54** preferably has a plurality of links **56** on the lower end thereof to engage hook **52** so as to support cylindrical hub adapter **30** in axially aligned relation with hub **2**, thereby enabling the unscrewing operation of successive nuts **22** and/or hollow nut extensions **16**, as upon turning the wheel **1**, the support member **54** may be engaged with holes within the wheel **1**, and the ring **50** will slide within a guide-way made between rings **57** on the hub adapter **30**, and since almost 360 degrees of rotation may be had with the ring **50** with respect to the hub adapter **30**, the gear operated wrench may be readily supported, thereby enabling both the nuts **22** and hollow nut extensions **16** to be readily removed.

The form of the gear wrench as shown in FIGS. 1 to 3 embodies a single reduction, preferably about ten to one, so by the use of a wrench handle, preferably a torque wrench handle **42**, approximately one thousand foot pounds of torque can be exerted to tighten or loosen the nuts with approximately one hundred pounds of pressure being applied to the lever, thereby a predetermined amount of torque may be used to tighten the nuts to prevent the fracture of the wheel bolts or the stripping of the threads thereof.

Having thus clearly shown and described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A gear operated wrench for removing retainer nuts from vehicle wheels, comprising:

(a) a cylindrical hub adapter having an end plate rigidly attached and perpendicularly disposed at one end thereof, and adapted to be placed about the hub of the wheel;

(b) a gear housing, including spaced apart, superimposed first and second plates, removably connected together by a wall member;

(c) means forming spaced apart, aligned apertures diametrically through said plates;

(1) a bushing received in each aperture in each plate;

(d) a first gear and a second larger gear suitably journaled in said spaced apart apertures in meshed relationship with each other, said first gear having an extended, centrally located portion thereon which extends through said second plate and is adapted to receive a handle thereon;

(e) said second larger gear having an extended portion forming a squared socket extending through said first and second plates and within one of said bushings;

(f) said first plate rigidly attached to said end plate;

(g) a tubular member rigidly secured adjacent to and parallel to said adapter, and rigidly secured to said end plate, and being in aligned relationship with the last aperture in said first plate to thereby be centrally aligned with one of said squared sockets and adapted to be placed in aligned relationship with a bolt circle having retainer nuts thereon; and

(h) a wrench drive shaft having a squared end at each extremity thereof, one end of said shaft adapted to receive a retainer nut socket and the other end thereof being affixed to said larger gear, whereby said hub adapter may be rotated on the vehicle wheel hub to thereby align said retainer nut socket with a retainer nut, and rotation of said handle will impart rotational movement to said retainer nut socket to thereby drive the retainer nut in a predetermined direction.

2. The device of claim **1**, and further including;

(a) a ring peripherally placed circumferentially about and attached to said hub adapter and including a depending portion rigidly attached so as to form a hook, whereby

(b) said adapter may be partially suspended by said hook from an upper portion of the wheel.

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