United States Patent [19]

Wilson

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[54] **HAND STAR WRENCH**

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[52] **U.S. Cl.** **81/175,** 81/125

[51] **Int. Cl.** **B25b 13/16**

[58] **Field of Search** ..... 81/53.2, 74, 121 R, 175, 81/90 P, 90 AB, 177 G, 177 C; 145/61 C, 61 EA, 61 L; 29/281

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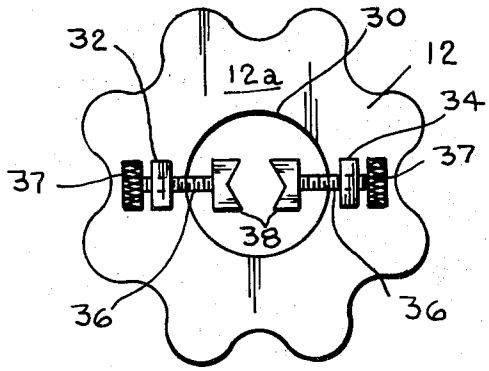
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Assistant Examiner—James G. Smith
Attorney, Agent, or Firm—Pravel & Wilson

[57] **ABSTRACT**

A manual wrench for use as a high speed, low torque drive apparatus for making and breaking threaded connections and an increased leverage handle for applying high torque, low speed application in making or breaking threaded connections.

2 Claims, 10 Drawing Figures



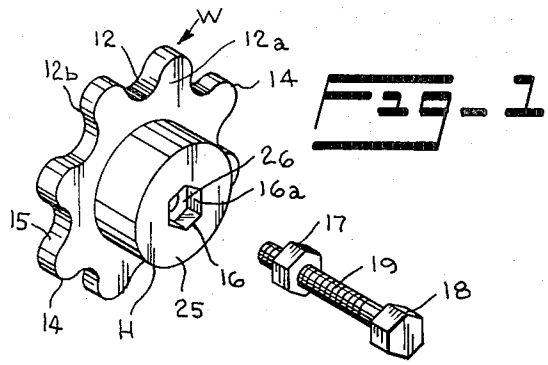


Fig. 1

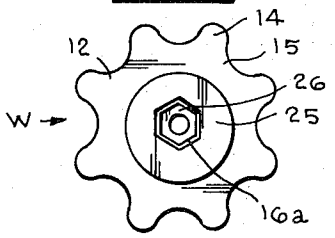


Fig. 2

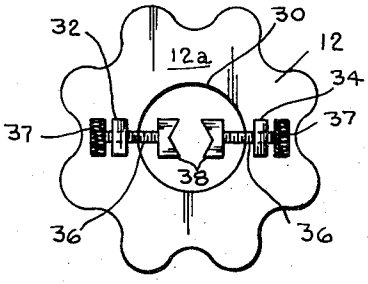


Fig. 5

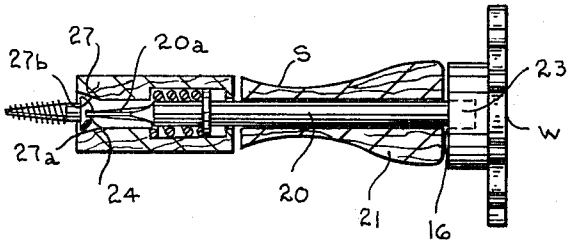


Fig. 3

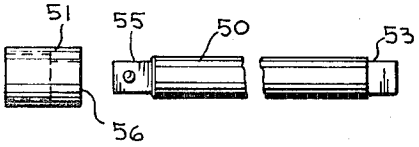


Fig. 6

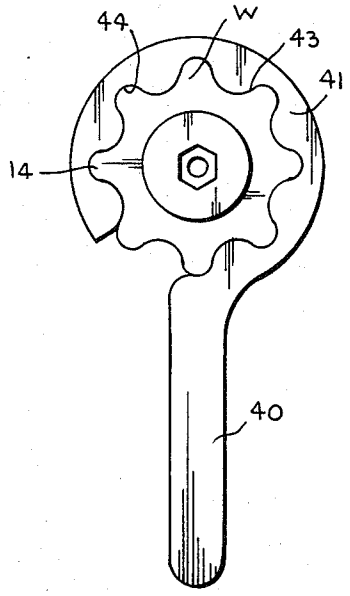


Fig. 4

Fig. 7

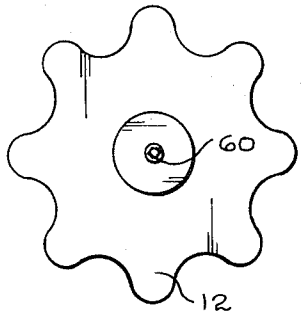
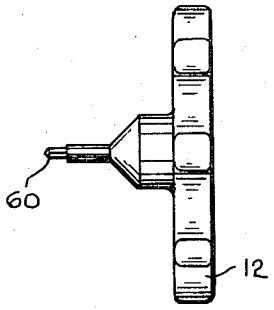


Fig. 8



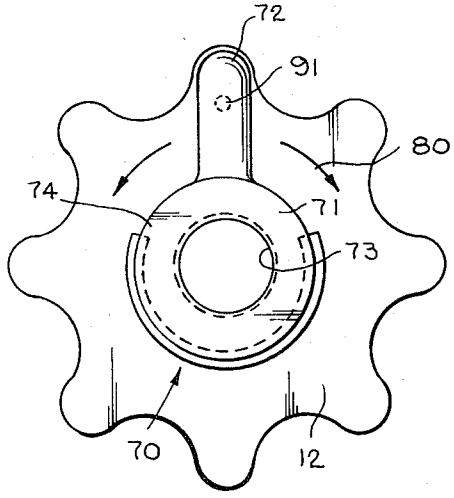


Fig. 9

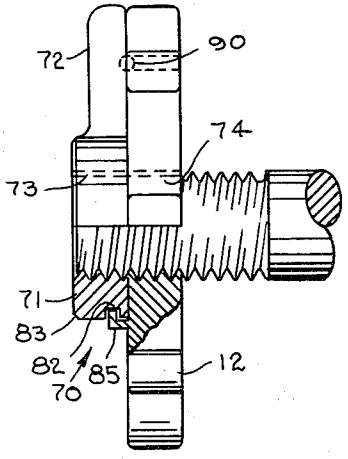


Fig. 10

HAND STAR WRENCH

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention pertains to manual wrenches for connecting and disconnecting threaded members such as bolts, nuts, screws and other threaded connection members.

2. Description of the Prior Art

Of the many varieties of wrenches and tools for rotating a threaded workpiece which have been available in the prior art, such as socket wrenches, open end wrenches, box end wrenches, crescent wrenches, vice grip wrenches and other adjustable devices, none of such prior art has provided a wrench such as that of the present invention which is suitable both for high torque, low speed operation as well as for low torque, high speed operation in connecting and disconnecting nuts, bolts, screws, and other threaded members.

SUMMARY OF THE PRESENT INVENTION

The present invention provides a new and improved hand star wrench comprising a disc or plate-type housing with a plurality of circumferentially spaced radially extending projections which may be engaged by the finger tips for manually rotating such disc or housing. The disc or housing includes a centered receptacle which is either hexagonal, square or some other standard shape for engaging the head of a nut, bolt, screw of other threaded connecting member. A drive handle or leverage device which will afford some mechanical advantage is also provided that engages the circumferentially spaced and radially projecting members or lugs for rotating the disc either clockwise or counterclockwise to enable a mechanical advantage to be applied to the wrench when high torque is required.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an isometric view showing the wrench of the present invention positioned for engaging a bolt;

FIG. **2** is a plan view of the wrench illustrated in FIG. **1**;

FIG. **3** is a side view of the wrench shown operably connected to a screw driver for rotating the screw driver;

FIG. **4** is a plan view of the wrench with the mechanical advantage lever arm attached thereto;

FIG. **5** is a plan view of an alternate embodiment of the wrench of the present invention with adjustable jaws;

FIG. **6** is an adapter for connecting a standard socket wrench to the wrench drive apparatus of the present invention;

FIG. **7** is a plan view of an alternate embodiment of the present invention showing a key drive projecting from the wrench handle;

FIG. **8** is a scale view of the wrench shown in FIG. **7**;

FIG. **9** is a plan view of a wrench having a locking means on the wrench handle; and

FIG. **10** is a partial sectional view showing additional details of the wrench apparatus illustrated in FIG. **9**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The wrench apparatus of the present invention, designated genrally W in FIGS. **1** and **2** of the drawings comprises a plate or disc-shaped member **12** having a front **12***a* and a back side **12***b* and having a plurality of circumferentially spaced radially extending projections **14** formed thereon. Such projections **14** are separated by inwardly extending indentations or depressions **15** so as to form a hand-held wrench which is readily engageable for holding for movement by one's finger tips.

A housing H is provided with the wrench W which projects laterally from the side **12***a* and which is positioned centrally with respect to the plate W. Such housing H is provided with an aperture or opening **16** that is positioned approximately at the center of the plate member W so that rotation of such plate member W by the hand or other means will cause the housing H to revolve around the axis of the aperture **16.** As shown in FIG. **1** of the drawings, such aperture or opening **16** is formed with a plurality of wrench faces **16***a* which are provided for engaging the faces of a nut **17** or the faces on the head of a bolt such as **18.** Thus, it will be appreciated that with a nut **17** inserted into the aperture **16** rotation of the housing H by means of rotating the plate W will cause such nut **17** to turn so as to drive the nut **17** with respect to the threaded bolt **19.** It will be appreciated that the wrenches of the present invention will be made with various standard size aperture **16** for receiving standard nut sizes **17** whether graduated in fractions of an inch or metric sizes. Also, it will be appreciated that the wrench may be made with a large aperture for receiving large size nuts which are tightened by striking with a hammer so as to provide a replaceable strike surface for tightening and loosening such large nuts. Also, as shown in FIG. **2** of the drawings, the wrench faces **16***a* are slightly tapered inwardly from the outer end **25** to the inner end **26** so as to provide a slightly wedge-shaped or tapered shaped receptacle for receiving the nut **17,** the bolt head **18,** or some other workpiece. The inwardly inclined or tapered side **16***a* of the receptacles **16** will cause the size of the opening to reduce from the front side or opening **25** to the rear end **26** so that by moving the wrench with respect to the workpiece, it may be readily gripped or wedged into the aperture to facilitate establishing a firm connection between the wrench W and the workpiece. Further, the inner end **26** or other parts of the wrench are preferably magnetized or made of magnetic material to facilitate holding the workpiece in the wrench.

With respect to the FIG. **3** embodiment of the wrench apparatus of the present invention, there is shown a screw driver designated generally S which comprises a screw drive shaft **20** rotatably mounted in a tubular handle **21.** The front end **20***a* of the screw drive shaft comprises a standard screw engaging member which is a standard blade (as shown) or may be a cross or "Phillips Head" drive or some other configuration as desired. The rear end **20***b* of the shaft **20** projects rearwardly from such tubular handle and is provided with a hexagonal or other non-circular drive member **23** which is shown inserted into the corresponding shaped aperture or opening **16** of the housing H. Thus, with the wrench W connected to the screw driver S, it may be turned to drive the screw driver S either clockwise or counterclockwise. A counter bore **27** is provided in the handle **20** for receiving a circular pad **27***a* which has a concave conical or spherical inner

surface 27*b* for engaging the edge of the screw head to functionally hold such screw in position for driving.

FIG. 5 of the drawings shows the variable jaw embodiment of the apparatus of the present invention which includes a central opening **30** that extends through the plate **12** and which has a pair of lugs or projections **32** and **34** formed on or secured to the side **12***a* of such disc-shaped wrench **12.** The projections **32** and **34** are provided with threaded passages (not shown) for receiving the threaded shafts **36.** Each of such threaded shafts **36** is provided with a knurled turning knob or head **37** on its outer end and with jaws **38** on its inner end for engaging a workpiece such as a nut **17,** a bolt head **18** or some other workpiece, as desired. It will be appreciated that the opposed jaws **38** may be moved diametrically together or apart to connect the wrench W to the workpiece and that with jaws locked on the workpiece, rotation of the disc **12** will rotate the jaws and the workpiece attached thereto.

FIG. **4** illustrates a leverage or mechanical advantage device which may be used to increase the torque which may be applied with the wrench W. Such leverage handle **40** includes a circular portion **41** which has an inner serpentine surface **43** which conforms to the outer serpentine surface on the hand star wrench W so as to interengage the plurality of radially extending projections **14** with corresponding recesses **44** in the circular member **41.** As shown in FIG. **4** of the drawings, the circular member **41** is provided with a relieved or open section so as to facilitate inserting and removing the member **41** with respect to the wrench W. However, it will be appreciated that the member **41** can completely encircle the wrench W to form in effect a box end type wrench for gripping and turning the disc **12.** With the FIG. **4** embodiment, it will be appreciated that the leverage handle will provide a substantial mechanical advantage to increase the amount of torque which may readily be applied to the workpiece by the wrench W.

FIG. **6** illustrates an attachment for connecting the shaft **50** which may be used to connect a socket drive apparatus **51** to the wrench W. Such shaft **50** is preferably provided a square head **53** which is insertable into the receptacle **16** in the wrench W for connecting such shaft **50** to the wrench W. The opposite end of the shaft **50** is also provided with a standard square drive **55** which is insertable into a corresponding square opening **56** in the socket **51** for rotating such socket. Thus, with the shaft or adapter **50,** the wrench W may be used to drive a standard socket such as **51.**

FIGS. **7** and **8** show another embodiment of the hand wrench of the present invention with a drive member **60** which projects from one side of the hand star wrench body **12.** The drive member **60** is shown positioned approximately at the center of such hand star wrench and being formed with a hexagonal configuration for insertion into a hexagonally shaped opening in threaded screws and other connecting members. However, it will be appreciated that drive members of other configurations than the hexagonal one shown in the drawings can also be employed with the hand star wrench handle **12.** For example, the drive projection **60** can be square, may be formed in the configuration of a cross or some other configuration, as desired.

FIGS. **9** and **10** show yet a further embodiment of the present invention comprising a locking member **70** mounted for rotation adjacent one face of the wrench body **12.** The locking member designated generally **70** comprises a ring **71** having a handle or operating lever **72** and a threaded opening **73** which is adapted to be moved or turned concentrically with respect to the threaded opening **74** in the wrench housing or body **12.** The ring **71** has a groove **82** in the edge **83** which receives the shoulder **85** on the housing **12.** When the openings **73** and **74** are positioned so their respective threads are aligned with respect to one another, the spring loaded detent **90** is inserted into the opening **91.** Thereafter, movement of the operating lever or handle **72** in a clockwise direction as indicated by the arrow **80** will cause the threads in opening **73** to tighten with respect to the threads in the opening **74** and thereby bind or grip any threaded workpiece, such as a nipple or the like, which extends through both openings **73** and **74.** Thereafter, with the workpiece locked to the wrench handle or body **12,** rotation of the wrench will rotate the workpiece therewith.

In the operation of the apparatus of the present invention, it will be appreciated that in many instances it is desirable to either hold a workpiece such as a nut **17** while a bolt **18** is being threaded into the nut **17,** or in many other instances once the threaded connection has been made it is desirable to have a means for applying low torque to the threaded nut **17** for quickly running it up on the threaded shaft **19.** In many instances it is either inconvenient or undesirable or in some instances simply impossible to apply sufficient torque with one's fingers to the nut **17** to thread it on the shaft **19** but on the other hand the torque requirements are really not enough to warrant the use of a standard wrench for making the connection and the mechanic or operator is faced with the frustrating situation of either having to struggle to make the connection simply manually with his finger tips or to become engaged in a long, involved laborious process of turning the nut **17** with a standard wrench which provides far more torque than the situation demands. Thus, it will be appreciated that the wrench W of the apparatus of the present invention provides an apparatus which will enable one to apply the required amount of torque to a workpiece such as a nut **17** and yet which is operable manually by one's finger tips so as to enable the mechanic to make the threaded connection very quickly on the shaft **19.** Thus, it can be understood that the nut **17** can be spun up or run up very quickly on the shaft **19** until the high torque requirements of the final fastening steps are encountered at which time the leverage or mechanical advantage device illustrated in FIG. **4** of the drawings may be connected to the wrench handle W so that additional torque may then be applied to the workpiece via the wrench W so as to tighten the workpiece and complete the connection.

While various standard types of threaded connectors have been illustrated in the drawings such as the standard hexagonal bolt head **18** and nut **17** and the standard screw drive apparatus **22,** it will be appreciated that the wrench W may be used with substantially type of threaded connector such as a Phillips screw driver, an Allen wrench or some other variety of work engaging drive apparatus.

The foregoing disclosure and description of the invention are illustrative and explanatory thereof, and various changes in the size, shape and materials as well as in the details of the illustrated construction may be

made without departing from the spirit of the invention.

What is claimed is:

1. A wrench conprising:

a substantially circular wrench plate having a plurality of circumferentially spaced radially extending projections thereon, said radial projections having inwardly extending indentations for operative engagement by finger tips therewith; and,

a wrench plate aperture in said wrench plate having a plurality of wrench faces formed therein for engaging a workpiece for imparting rotation to such workpiece, said wrench faces being movably mounted with respect to said wrench plate whereby the opening between said wrench faces may be adjusted for receiving and connecting to various size workpieces.

2. A wrench comprising:

a substantially circular wrench plate having a plurality of circumferentially spaced radially extending projections thereon, said radial projections having inwardly extending indentations for operative engagement by the finger tips therewith; and,

a wrench plate aperture in said wrench plate having a locking plate mounted therewith for rotation adjacent said wrench plate for engaging a workpiece, said locking plate having a locking plate aperture overlapping said wrench plate aperture in said wrench plate, and an offset gripping means for moving said locking plate so as to misalign the locking aperture in said locking plate relative to said wrench plate aperture in said wrench plate and thereby gripping the workpiece extending through the misalignment of said wrench plate aperture and said locking plate aperture for imparting rotation to such workpiece.

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