

[54] **WRENCHING APPARATUS AND METHOD**

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[58] Field of Search.....**81/54, 57.44, 53, 55, 57.32, 81/57.39; 29/407**

[56] **References Cited**

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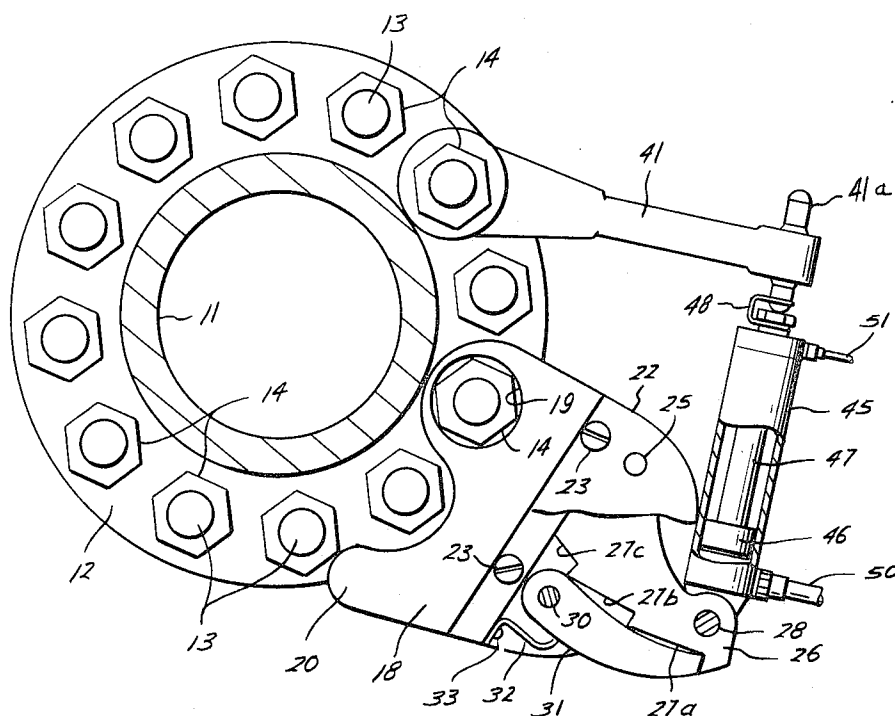
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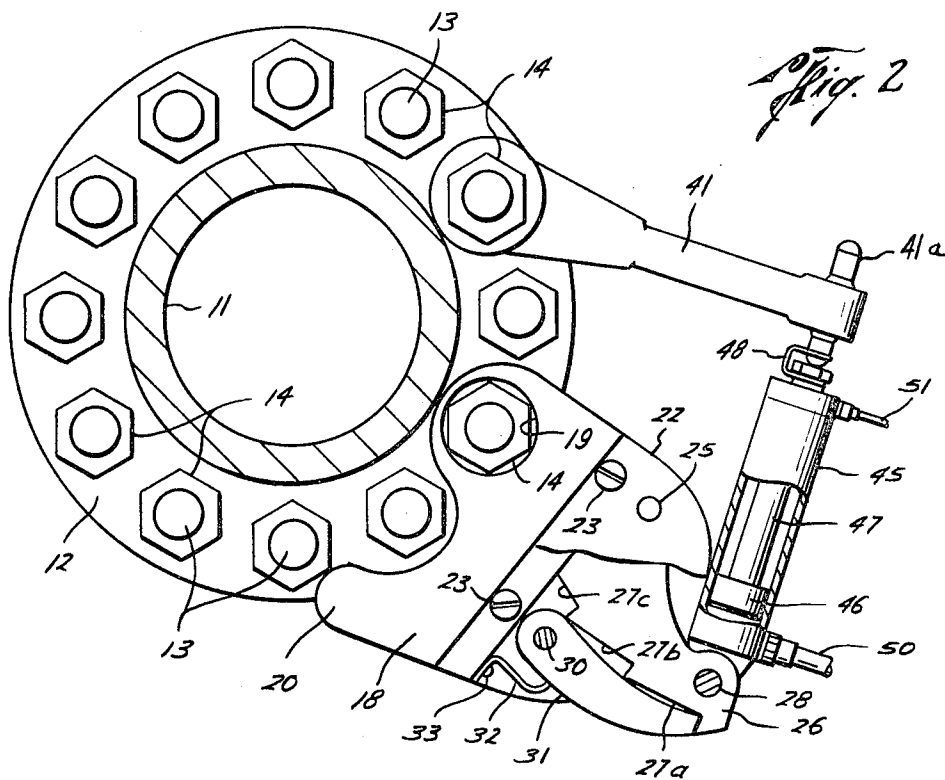
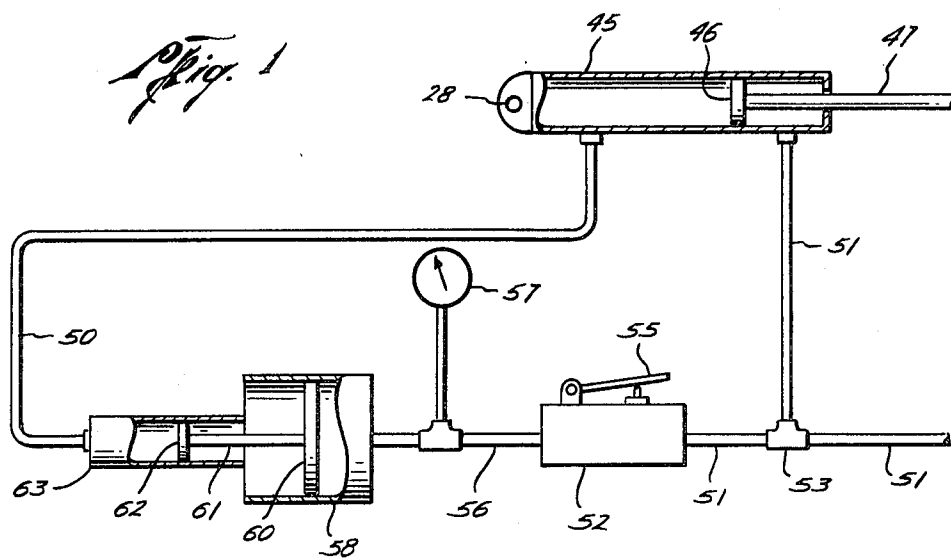
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[57] **ABSTRACT**

A wrenching apparatus useful in tightening and loosening threaded connectors such as nuts or bolts which are closely adjacent, including one portion which is arranged for mounting over a nut which is to be rotated and another portion which is arranged for mounting over an adjacent nut and which is arranged to prevent rotation thereof. Means in the form of an hydraulic cylinder is interposed between the two portions which, upon actuation causes rotation of one portion relative to the other and thereby causes rotation of the nut which is being loosened or tightened. The method includes steps of placing a wrench over one of the nuts and an anchor and reaction plate over an adjacent nut and exerting a power force between the two portions, whereby the wrench is rotated thereby turning the first nut.

13 Claims, 10 Drawing Figures





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Fig. 3

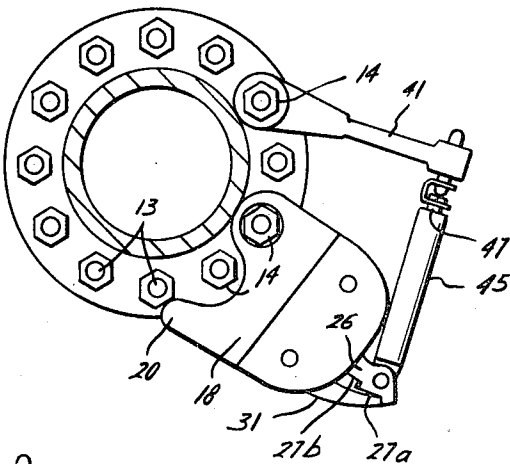


Fig. 4

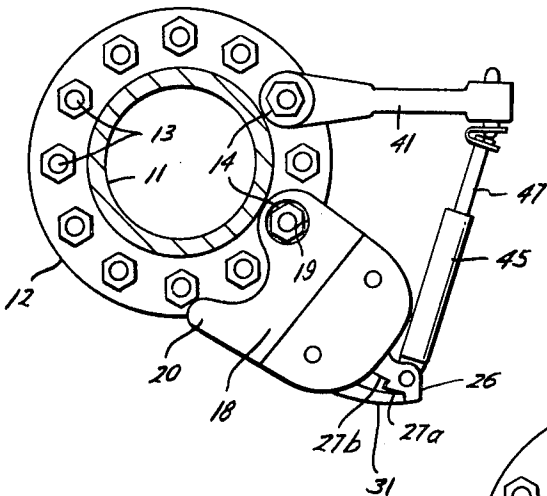


Fig. 5

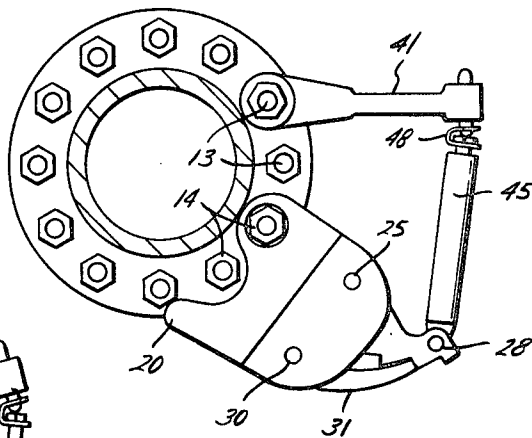
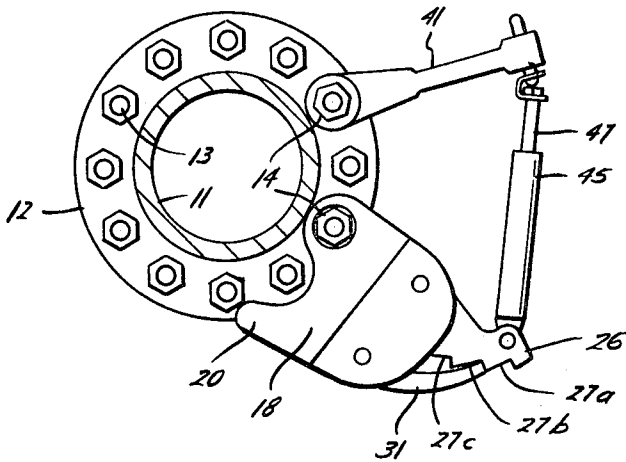


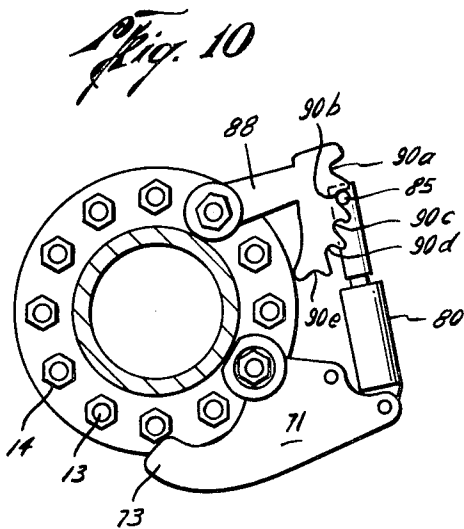
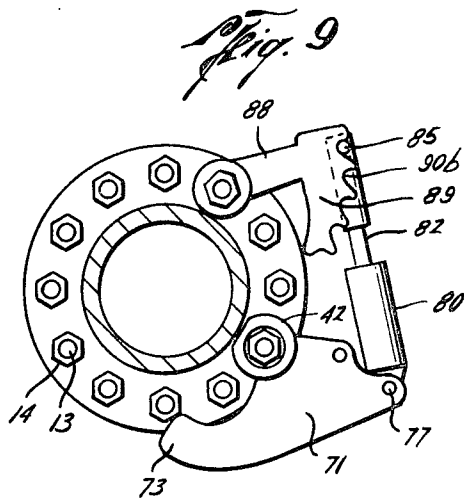
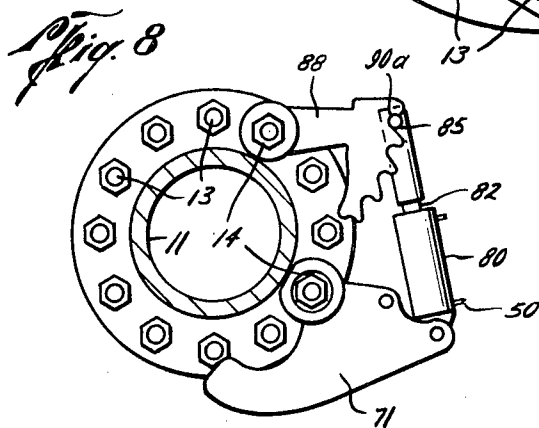
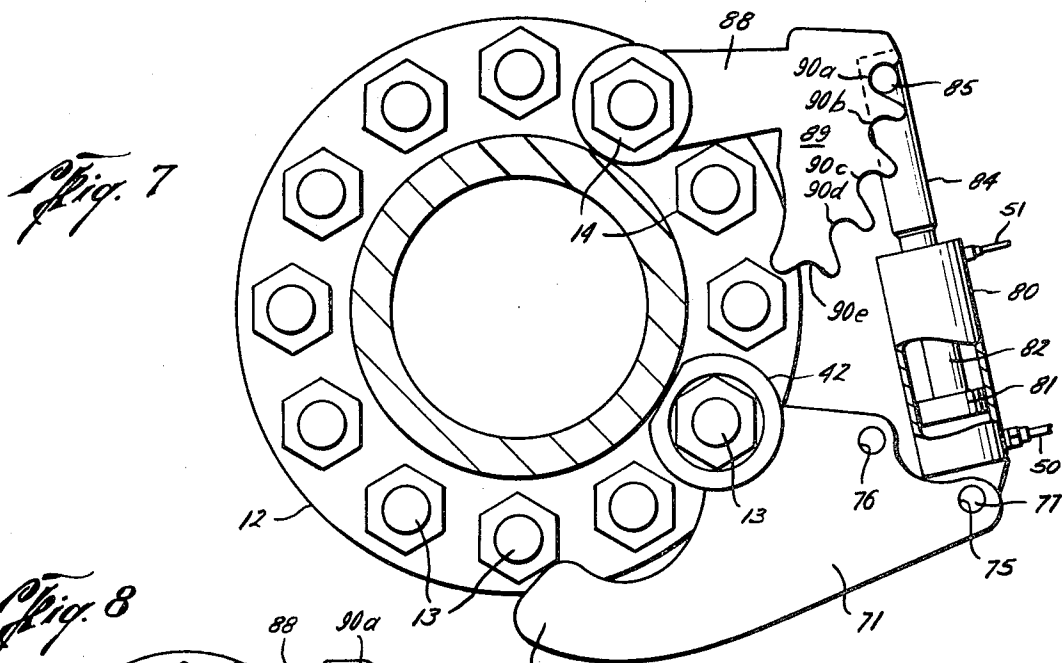
Fig. 6



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WRENCHING APPARATUS AND METHOD

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to an apparatus for wrenching threaded connectors such as nuts mounted on bolts holding flanges together, for example. Particularly, this invention relates to an improved apparatus and method for wrenching one of a plurality of nuts which are closely adjacent to each other and which utilizes power means for accomplishing such a rotation.

In the oil industry, various installations are made on pipe and the like, for example, which must meet severe use requirements and high pressure requirements. Apparatus of this type is normally held together by threaded connectors which often times must be manipulated under severe working conditions. For example, during the drilling of oil wells, it is conventional to have a drilling rig arranged such that at the wellhead there are a number of devices in the wellhead stack for controlling the well during the drilling thereof in the eventuality that abnormal pressure levels are encountered in the borehole. Inclusive of this type of apparatus are blow-out preventatives, which are normally held in position in the wellhead unit by flange connections to apparatus above and below. These flanges are normally held together by a plurality of bolts having threaded nuts thereon. The assembly, maintenance and disassembly of these flanges and bolts and nuts has heretofore been a slow, tedious and, above all, hazardous operation.

The attachment of one companion flange to another is effected by the installation of a plurality of a required size and number of threaded stud bolts through bolt holes provided in the flanges for this purpose. Each stud passes through both flanges and threaded nuts are installed on both ends of each stud bolt and are drawn down upon the flanges with sufficient torque power imparted to the nuts to prestress each stud bolt sufficiently to effect a seal between the flanges and a ring gasket therebetween.

Because of the unusual configuration of the individual blow-out preventives, for example, the working space adjacent to some of the bolts and nuts is extremely limited, so much in fact that, in some cases, some of the bolts have to be inserted in one flange before the two flanges are brought together. For this and other reasons, it has been, up until now, practically impossible to use power tools such as common impact wrenches to draw the nuts down upon the studs with proper final make-up torque. The present prior art method utilized to accomplish this operation is limited to the use of the most rudimentary and crude hand tools. For example, a box-end wrench known as a striking wrench is placed on the nut to be turned, and a sledge hammer is then utilized for driving the striking wrench by impact. It is obvious, therefore, that it is impossible to measure or to control the torque applied to the bolts. It also follows that it is almost impossible to measure or control the prestress tension on the stud bolts. Bolts have been known to have been prestressed so highly that the prestress, plus the stress resulting from internal pressure, have caused yielding of the steel in the bolts, destroying the seal between the flanges and permitting the release of the entrained or enclosed

fluids in the blow-out preventor. On the other hand, there have been cases where bolts not prestressed highly enough have stretched elastically under internal pressure, with the same results. Thus, the accomplishment of the task by the best method heretofore available has, on occasion, been self-defeating with disastrous results.

Generally, when striking the wrench as discussed above, one person will hold the wrench in place on the nut and another person will strike the wrench vigorously with a hammer or other heavy object. The area of operation is generally undesirable because the material in use and being installed is slick from oil, grease, mud and other foreign matter. There is no available sure footing for the workmen to stand upon. Under these conditions, a slight movement, slip, loss of balance or miscalculation by any person involved can result in an accident which is harmful either to the workmen or to the material or both. As a result, many people have been injured by accidents resulting from these crude operations, either by being struck by the hammer or by slippage of the wrench.

In addition to the hand-held tool described above, there are impact wrenches, but none of them utilize means for backing up the wrench to eliminate many of the hazards encountered. U.S. Pat. No. 3,083,598 is generally representative of the state of the art.

SUMMARY OF THE INVENTION

It is therefore an object of this invention to provide an improved apparatus and method for wrenching one of a plurality of adjacent nuts or threaded connectors. The apparatus of this invention includes a first member or anchor and reaction plate having a portion thereof arranged for positioning over a first one of the threaded connectors and having means for limiting rotation of the first member. This apparatus also includes a wrench portion having one end thereof arranged for positioning over another of the threaded connectors or nuts, which is to be rotated. Means are also included which are cooperative with the first member or anchor and reaction plate and with the wrench portion and which are arranged for exerting a relative force between the two, whereby upon actuation of the force means, one of the nuts can be rotated, either to be tightened or to be loosened. The arrangement is such that the first member, or anchor and reaction plate, provides a back-up for the force or power means when the latter is engaged with the wrench portion. The power means is preferably in the form of an hydraulic cylinder, having one end operatively connected to the anchor and reaction plate and having another portion arranged to contact the wrench portion.

The method of this invention includes mounting a wrench over one of the adjacent nuts and mounting a reaction plate over an adjacent one of said nuts and applying a force therebetween whereby the wrench is rotated while the reaction plate is held stationary. Using an hydraulic cylinder for applying the force between the reaction plate and the wrench, the method includes applying a pressurized fluid to the cylinder to cause extension thereof. The method may additionally include retracting the hydraulic cylinder, adjusting the effective distance between the reaction plate and the wrench, and reapplying the pressurized fluid to the cylinder. During application of the pressurized fluid,

the pressure thereof may be monitored as an indication of the torque applied to the nut.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic drawing showing the hydraulic and air system of the apparatus of this invention.

FIG. 2 is a top plan view, portions of which are broken away, showing one preferred embodiment of the apparatus of this invention mounted on nuts on a flange and positioned for operation.

FIG. 3 is a top plan view similar to FIG. 2 and showing the first sequence step in the operation of the apparatus.

FIG. 4 is a top plan view similar to FIG. 3, but showing the hydraulic cylinder extended and the wrench portion of the apparatus rotated through an initial arc.

FIG. 5 is a top plan view similar to FIG. 4, but showing the hydraulic cylinder retracted and ready for another wrenching step.

FIG. 6 is a top view similar to FIG. 5, but showing the hydraulic cylinder once again extended and the nut further wrenched.

FIG. 7 is a top plan view of an alternate preferred embodiment of the invention, shown mounted on nuts on a flange similar to those in FIG. 2.

FIG. 8 is a top plan view similar to FIG. 7 showing the tool in the initial operation stage.

FIG. 9 is a top plan view of the tool shown in FIG. 7 and FIG. 8, but shown with the hydraulic cylinder extended and the nut rotated through an initial arc.

FIG. 10 is a view similar to FIGS. 6, 7, 8 and 9, but showing the tool in position for the second rotational step.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 2, there is shown a blow-out preventer collar 11 having a connecting flange 12 attached thereto, which flange is adjacent a second flange (not shown), with the two flanges held together by a plurality of closely spaced bolts 13 which are arranged in circular fashion about the flange 12 in closely spaced arrangement, and each having a threaded connector in the form of a nut 14 mounted thereon.

The apparatus of this invention is shown in position on two of the nuts 14 in preparation for loosening another one of the nuts 14. There is a first member or anchor and reaction plate 18 having a circular opening 19 therein of a size to fit over one of the nuts 14. Plate 18 is provided with means for preventing rotation thereof in a first direction and this conveniently takes the form of a lug portion 20 which is arranged to abut another one of the adjacent nuts 14 and, hence, to prevent rotation of plate 18 in a clockwise direction, as shown in FIG. 2.

Plate 18 has attached thereto a cylinder adapter plate 22, which attachment is made by means of screws 23 passing through plate 22 and plate 18. It is to be understood that adapter plate 22 may also have a mating plate therebelow, as shown in FIG. 2, to facilitate assembly and operation of the tool.

Cylinder adapter plate 22 has a pin hole therein in which is mounted ratchet pin 25, on which is mounted for rotation ratchet plate 26 having a plurality of ratchet notches 27a, 27b and 27c on the rearward side

thereof, the purpose of which will be explained hereinafter. The outward end of ratchet plate 26 is provided with a pin hole, in which is mounted a cylinder pin 28 which pivotally supports one end of a power means which will be described hereinafter. Cylinder adapter plate 22 also has an opening therethrough in which is mounted pawl pin 30, on which is rotationally mounted pawl 31 which is arranged to successively engage one of the notches 27a, 27b and 27c during operation of the tool. Pawl 31 is biased in a counter-clockwise rotational direction, as viewed in FIG. 2, by operation of a spring 32 which is arranged for engaging the back of pawl 31 at one end and which is attached at the other end by cap screw 33 to anchor and reaction plate 18.

Further, the apparatus of this invention also includes a wrench 41 having one portion arranged for engagement with an adjacent nut 14, as shown in FIG. 2, whereby, upon rotation of wrench 41, nut 14 is rotated therewith. The other end of wrench 41 is provided with a pin hole in which is mounted a connector pin 41a, each end of which is provided with a hemispherical configuration for engagement by the actuation means which will now be described.

The apparatus of this invention also includes means cooperative with anchor and reaction plate 18 and its associated elements and with wrench 41 for exerting a relative force therebetween. This means conveniently takes the form of a hydraulic actuating cylinder 45 which is attached at the lower end, as shown in FIG. 2, to pivot pin 28. Cylinder 45 has mounted therein a double acting piston 46 which, in turn, is connected to a push rod 47 which extends out the upper end of cylinder 45. The upper end of push rod 47, as shown in FIG. 2, is provided with a concave end which is arranged to receive and engage one of the hemispherical ends of pin 41a, as shown. The end of push rod 47 may be flexibly held in contact with an end of pin 41a by a flexible spring-type clip 48 which is arranged for frictionally engaging external recesses on the ends of pin 41a and push rod 47.

The lower end of cylinder 45, as shown in FIG. 2, is connected to a high pressure hydraulic line 50 and the upper end is connected to a low pressure air line 51. Hence, upon application of high pressure hydraulic fluid through line 50, push rod 47 is extended from cylinder 45, thereby applying a rotational force to wrench 41 to cause unthreading of nut 14 on which the same is mounted. Upon relief of pressure on line 50 and the application of a low air pressure on line 51, push rod 47 is retracted for the next sequential step.

Referring now to FIG. 1, the fluid system for operation of the apparatus will be described. It is to be understood that air line 51 is connected to a constant source of pressurized air at a relatively low pressure level, as would be commonly available around an offshore drilling rig, for example. Air line 51 communicates both with one end of cylinder 45, as shown, and with a Westinghouse model H-3 air valve 52 through T-connector 53. Air valve 52 is provided with a control lever 55 which is hand operated. Upon operation of control lever 55, air pressure is applied to control pressure line 56 which is connected both to air gauge 57 and to master air cylinder 58. Cylinder 58 is of the diaphragm type, which is that sold by Westinghouse Air

Brake Company bearing Model No. P-16013. It has a diaphragm 60 mounted therein which is adapted for application of air pressure to the right-hand side, as shown in FIG. 1, and has connected to the other side thereof a rod 61, the opposite end of which is attached to piston 62 which is arranged for operation in hydraulic power cylinder 63 and which contains hydraulic fluid in the left end, as shown in FIG. 1. Hence, the application of controlled pressure to the right side of cylinder 58 causes exertion of a multiplied pressure to the hydraulic fluid contained in cylinder 63, with the result that a high hydraulic pressure is applied on line 50. The application of high pressure hydraulic fluid to line 50 causes double-acting piston 46 to be extended as shown in FIG. 1. Upon release of control lever 55, the air supply to master cylinder 58 is terminated, with the result that hydraulic pressure is relieved on line 50 and the constant air supply pressure in line 51 causes push rod 47 to be retracted.

Referring now to FIGS. 1-6, operation of the tool will be explained.

It is to be understood that the apparatus of this invention may be utilized for both loosening and tightening nuts, but the description will be first applied to the operation of loosening a nut. The apparatus heretofore described will be mounted on two adjacent nuts 14, in the manner shown in FIGS. 2 and 3, initially. Upon actuation of control lever 55, push rod 47 of cylinder 46 is caused to be extended, as shown in FIG. 4. This extension causes counter-clockwise rotation of wrench 41, as shown, and the loosening of the nut 14 which is being contacted thereby. Thereafter, by manipulation of control lever 55, push rod 47 is caused to be retracted, as described above. During this retraction phase, pawl 31, under the bias pressure exerted by spring 32, is caused to move in a counter-clockwise direction, as shown, which in turn causes a counter-clockwise directional movement of ratchet plate 26, with the result that the end of pawl 31 moves from ratchet notch 27a to notch 27b, as shown in FIG. 5. Hence, the effective distance between wrench 41 and anchor plate 18 is changed without repositioning the physical location of wrench 41 or anchor plate 18. Once again, upon operation of control lever 55, push rod 47 is extended, as shown in FIG. 6, effecting a further turning of the nut 14 surrounded by wrench 41. These sequences of steps are repeated with pawl 31 in notch 27c, with the nut 14 engaged by wrench 41 being further loosened. If the nut 14 being rotated is still difficult to turn, then the wrench 41 may be repositioned in its initial starting position, as shown in FIG. 3, and the series of steps repeated until nut 14 is loosened or removed.

It is to be understood that, while the foregoing description has related to the loosening of a nut, by rotating the apparatus mounted on the nuts 180°, or, in other words, turning the apparatus shown in FIG. 2 over, the nuts 14 may be tightened in the same sequence of steps.

It will be noted that when air pressure is utilized to apply hydraulic pressure to cylinder 45, the controlled air pressure is similarly applied to a gauge 57 which may be used as an indication of the amount of torque being applied to wrench 41. By observation of gauge 57, the operator can accurately gauge the torsion ap-

plied to the nuts as they are tightened and thereby control the amount of tension placed on the bolts. This degree of control is of great importance in connecting flanges where extremely high pressures are encountered, as in oil field operations and related industries. The readings on gauge 57 will be most accurate when push rod 47 is at right angles with the long axis of wrench 41.

Referring now to FIG. 7, an alternate embodiment of the apparatus of this invention will be described. The alternate embodiment of this invention is shown mounted on the same nuts 14 which, in turn, are mounted on the same bolts 13 connecting the same flange 12 as with the previous embodiment.

This embodiment of the invention also includes a first member having a portion thereof arranged for positioning over one of the nuts 14 and is in the form of reaction and anchor plate 71 which has anchor ring 42 attached thereto which is arranged for fitting over one of the nuts 14 as shown. Plate 71 also has means for limiting rotation thereof in a first direction, which means are in the form of a lug 73 which is arranged to abut against another one of the nuts 14 in the circle of nuts as shown in FIG. 7. The other end of plate 71 is provided with a primary anchor hole 75 at the extreme outward end thereof and an auxiliary anchor hole 76 intermediate thereof, which is located near flange 12 in the operative position as shown. Anchor hole 75 is arranged to receive anchor pin 77 which is arranged for pivotally supporting and connecting to the lower end of actuating cylinder 80. Cylinder 80 has mounted therein a double acting piston 81 having a push rod 82 attached thereto which extends out the other end of cylinder 80. It is to be understood that the operation of cylinder 80, piston 81 and push rod 82 is in all respects similar to the operation of cylinder 45, piston 46 and push rod 47 described in the previous embodiment. Further, it is to be understood that cylinder 80 is provided with appropriate connectors for connecting high pressure hydraulic fluid line 50 to the lower end thereof, as shown in FIG. 7, and low pressure air line 51 at the upper end thereof. Hence, cylinder 80 and related elements are arranged for operation by the fluid system described in FIG. 1, in the same manner as with the preferred embodiment heretofore described.

In the embodiment shown in FIG. 7, push rod 82 is provided with an extension 84 which is provided with a transversely extending pin 85 mounted at the outward end thereof. This embodiment of the apparatus also includes a wrench 88 having one end arranged for fitting over or otherwise engaging a nut 14 for rotation therewith. Wrench 88 is provided with a lateral extension thereof, which extension is designated by the numeral 89 and which is provided with a plurality of notches 90a, 90b, 90c, 90d and 90e. Notches 90a-e all lie in a common plane which is perpendicular to bolt 13 and are generally arranged in a circular fashion equidistant from the central axis of nut 14 on which wrench 88 is mounted. It will be noted that pin 85 is arranged for sequentially engaging notches 90a-e, thereby providing one means for adjusting the effective distance between wrench 88 and plate 71.

Plate 71 is also provided with means for adjusting the effective distance between plate 71 and wrench 88 and this is in the form of auxiliary anchor hole 76 which is

arranged to receive anchor pin 77, to thereby effectively extend the stroke of cylinder 80 and push rod 84 without changing the position of plate 71 or the position of wrench 88 with respect to the nut 14 on which it is mounted.

Referring now to FIGS. 8, 9 and 10, the sequence of operation of the apparatus shown in FIG. 7 will be explained.

Initially, reaction and anchor plate 71 and wrench 88 will be mounted on the nuts 14 as shown in FIGS. 7 and 8. Pin 85 will be engaged with notch 90a, initially, at which point hydraulic pressure is applied through line 50 to extend rod 82, thereby causing rotation of wrench 88 in a counter-clockwise direction and loosening the nut 14 on which wrench 88 is mounted. FIG. 9 shows the tool in the first extended position. Thereafter, push rod 82 is retracted as previously explained and pin 85 is engaged with notch 90b, as shown in FIG. 10. The apparatus is then in position for another actuation step and extension of rod 82 and further turning of wrench 88 and the nut 14 on which it is mounted. This sequence of steps is repeated through the notches 90b, c, d and e without changing the position of plate 71 or its associated nut 14 and without changing the position of wrench 88 relative to its associated nut 14.

It is to be understood that each of the nuts 14 can be successively loosened by changing the position of anchor plate 71 and engaging wrench 88 with another one of the nuts 14. As with the previous embodiment, this alternate embodiment can likewise be used for tightening nuts 14 by inverting the tool 180° and the same sequence of steps repeated.

It will be observed that the notches 90a-e are generally equally spaced relative to each other and are equidistant from the pivot point of wrench 88 that encompasses the nut 14. The apparatus of this invention can be used to rotate a bolt head in the same fashion that a nut has been described as being rotated. It is also to be understood that the grooves and notches 90a-e are in a plane perpendicular to the axis of the bolt 13. The anchor plate 71 provides a definite anchor for the apparatus, which anchor is one of the nuts or bolt heads being serviced in the bolt circle. The tool is so arranged that adequate clearance is provided around the next adjacent nut or anchor bolt. While both embodiments of the tool have been described as operating on the second or third removed nut in a circle of nuts, it is to be understood that the invention is not necessarily so limited and may be arranged for operation on the immediately adjacent nut or bolt.

Plate 71 provides a positive anchor for the power cylinder 80 such that the cylinder 80 and associated parts may be operated in one plane. This definitely locates and anchors power cylinder 80 and associated elements and thereby eliminates reliance upon human elements in determining the angle of approach of push rod 82 and extension 84 relative to wrench 88.

The movement of the handle of wrench 88 could conceivably be accomplished by a single stroke of the piston rod of the power cylinder, but such construction of the invention would be somewhat cumbersome and unwieldy, hence, the preferred embodiment is an arrangement which utilizes a series of short strokes in a ratcheting motion, or a series of ratcheting motions

which can be accomplished with each of the preferred embodiments described.

It is to be further understood that air gauge 57 can be calibrated in pounds-feet of torque and in pounds per square inch of air pressure. In this manner, torque and pounds-feet being applied to the wrench is registered directly thereon.

This invention provides a novel apparatus and method for effectively tightening and loosening nuts on bolts which have heretofore provided serious problems. This novel apparatus and method will accomplish the desired function with a degree of refinement never heretofore approached. By utilizing a source of mechanical rather than hand power, the speed of operation is increased, and quite importantly, the hazards to life and limb attendant to prior art methods and tools has been eliminated.

Further modifications and alternative embodiments of the invention will be apparent to those skilled in the art in view of this description. Accordingly, this description is to be construed as illustrative only and is for the purpose of teaching those skilled in the art the manner of carrying out the invention. It is to be understood that the form of the invention herewith shown and described is to be taken as the presently preferred embodiment. Various changes may be made in the shape, size and arrangement of parts. For example, equivalent elements or materials may be substituted for those illustrated and described herein, parts may be reversed, and certain features of the invention may be utilized independently of the use of other features, all as would be apparent to one skilled in the art after having the benefit of this description of the invention.

What is claimed is:

1. In apparatus for wrenching one of a plurality of adjacent threaded connectors, the combination comprising:

a first member having a portion thereof arranged for positioning over a first one of said threaded connectors and having means for limiting rotation of said first member;

a wrench having one end thereof arranged for positioning over another of said threaded connectors which is to be rotated;

and, means cooperative with said first member and said wrench for exerting a relative force therebetween, said means including a double acting cylinder and piston assembly operably connected at one end thereof to said first member and having the other end thereof arranged to contact said wrench of said cylinder and piston assembly being arranged to extend when a fluid is applied against a first end of said piston and being arranged to retract when a fluid is applied against the second end thereof;

and, fluid flow control means for applying a first fluid of a first pressure magnitude against said second end of said piston and for selectively and simultaneously applying a second higher pressured fluid against said first end of said piston;

whereby said double acting cylinder is continually urged toward the retracted position in the absence of selective application of said second higher pressured fluid thereto.

2. In apparatus for wrenching one of a plurality of adjacent threaded connectors, the combination comprising:

a first member having a portion thereof arranged for positioning over a first one of said threaded connectors and having means for limiting rotation of said first member;

a wrench having one end thereof arranged for positioning over another of said threaded connectors which is to be rotated;

an hydraulic cylinder and piston assembly having one end thereof operably connected to said first member and having the other end thereof arranged to contact said wrench for exerting a relative force therebetween;

and, means for adjusting the effective distance between said operable connection of said cylinder and piston assembly to said first member and said point of contact of said cylinder and piston assembly on said wrench.

3. In a method for wrenching one of a plurality of adjacent threaded connectors, the combination of steps comprising:

placing a wrench over a first threaded connector to be rotated;

placing an anchor and reaction plate over a second threaded connector adjacent said first threaded connector;

and, exerting a powered force between said wrench and said anchor and reaction plate by mounting a hydraulic cylinder assembly between said anchor and reaction plate and said wrench and applying a pressurized fluid to said cylinder assembly to cause extension thereof;

retracting said hydraulic cylinder assembly;

adjusting the effective distance between said operable connection of said cylinder assembly to said anchor and reaction plate and said point of contact of said cylinder assembly on said wrench;

and, reapplying said pressurized fluid to said cylinder assembly to cause extension thereof.

4. The invention as claimed in claim 3 including:

applying a first fluid of a first pressure magnitude to the end of said cylinder assembly operatively engaging said wrench;

and selectively and simultaneously applying a higher pressured second fluid to the other end of said

cylinder assembly;
whereby said cylinder assembly is continually urged toward the retracted position in the absence of selective application of said higher pressured second fluid thereto.

5. The invention as claimed in claim 1 including: means for reading out the pressure of said first pressured fluid as an indication of the force applied to said connector being rotated.

6. The invention as claimed in claim 1 wherein:

said first fluid is a gas;

and, said second fluid is a hydraulic fluid.

7. The invention as claimed in claim 1 including:

means for adjusting the effective distance between said operable connection of said cylinder and piston assembly to said first member and said point of contact of said cylinder and piston assembly on said wrench.

8. The invention as claimed in claim 2 wherein:

said adjusting means includes a ratchet and pawl assembly operably connected between said first member and said one end of said cylinder and piston assembly.

9. The invention as claimed in claim 8 wherein said ratchet and pawl assembly includes:

a ratchet member pivotally connected to said first member and to said one end of said cylinder and piston assembly;

and, a pawl member pivotally connected to said first member and arranged to contact said ratchet member.

10. The invention as claimed in claim 9 including:

means for maintaining said other end of said cylinder and piston assembly in contact with said wrench.

11. The invention as claimed in claim 2 wherein said adjusting means includes:

a plurality of notches formed on the second end of said wrench, said notches being arranged to receive said other end of said cylinder and piston assembly.

12. The invention as claimed in claim 11 wherein:

said notches are each equally spaced from said one end of said wrench.

13. The invention as claimed in claim 3 including:

monitoring the pressure of said pressurized fluid as an indication of the torque applied to said first threaded connector.

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