

May 27, 1958

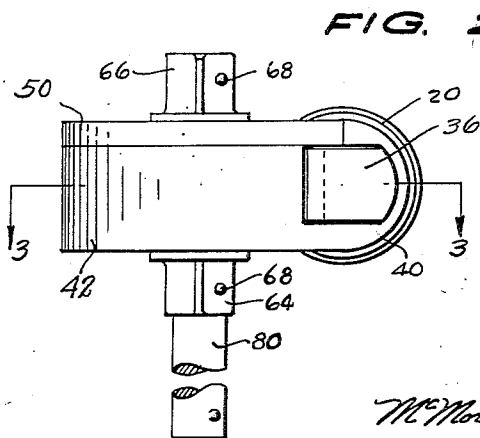
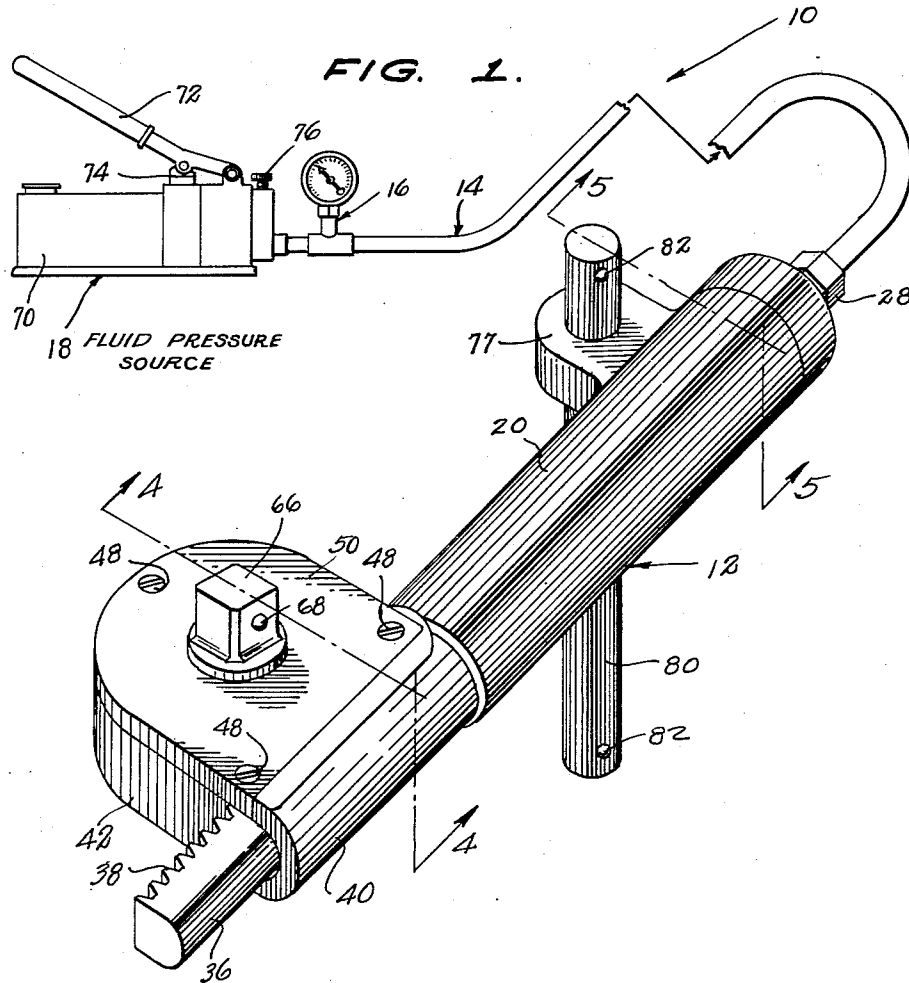
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2,836,090

FLUID PRESSURE OPERATED TORQUE WRENCH

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2 Sheets-Sheet 1



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FIG. 3.

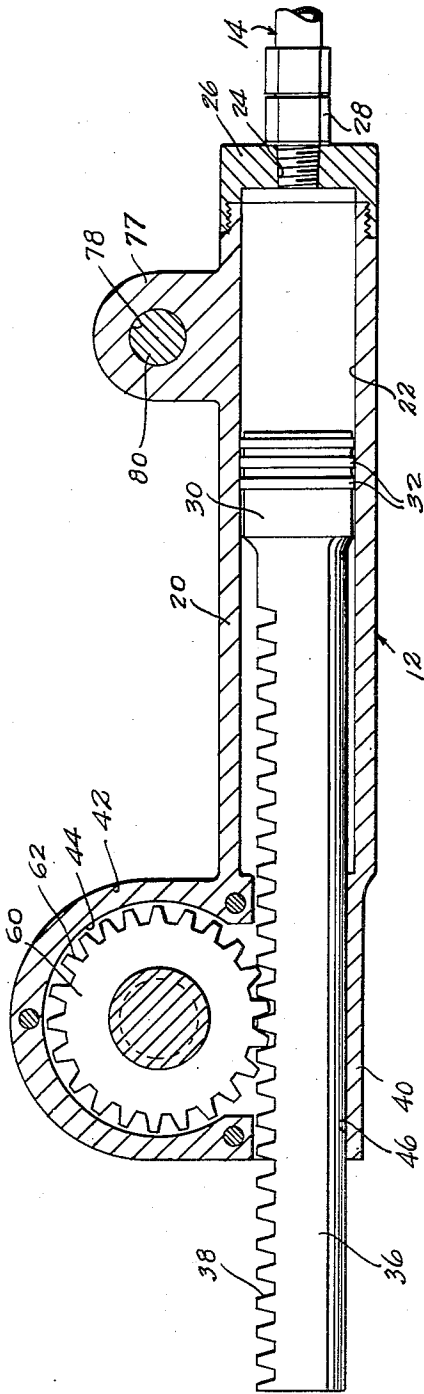


FIG. 5.

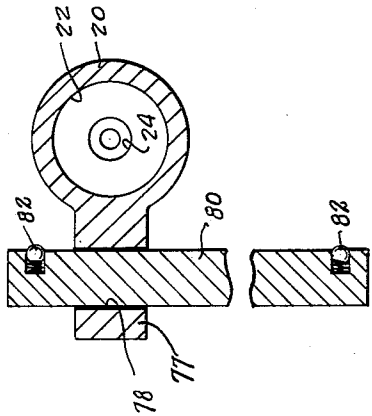
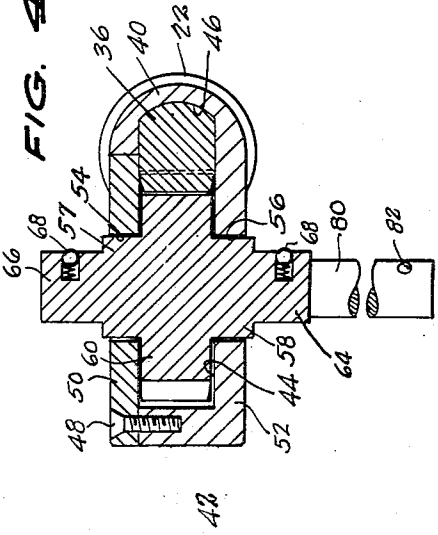


FIG. 4.



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FLUID PRESSURE OPERATED TORQUE WRENCH

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3 Claims. (Cl. 81—54)

This invention relates to an improved fluid pressure operated torque wrench for use in limited and confined spaces.

The primary object of the invention is to provide a more practical and efficient wrench of this kind which is more easily manipulable and operated, and which is simpler in construction, being composed of a small number of simple and easily assembled and disassembled parts.

Another object of the invention is to provide a fluid pressure operated wrench of the character indicated above which can be made in well-finished, rugged, and serviceable forms at relatively low cost, is easily used and maintained, and is highly acceptable for the purpose intended.

These together with other objects and advantages which will become apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part thereof, wherein like numerals refer to like parts throughout the several views, and in which:

Figure 1 is a schematic perspective view of a fluid pressure operated torque wrench of the invention including means for operating the same;

Figure 2 is a forward end elevational view of the torque wrench of Figure 1;

Figure 3 is a longitudinal sectional view taken substantially on line 3—3 of Figure 2;

Figure 4 is a vertical transverse sectional view taken substantially on line 4—4 of Figure 1; and

Figure 5 is a vertical transverse sectional view taken substantially on line 5—5 of Figure 1.

Referring to the drawings in detail, the illustrated fluid pressure operated torque wrench, indicated generally at 10, includes a torque wrench 12 to which is connected a hose 14 leading from a fluid pressure torque indicating gauge 16, which in turn is connected to a fluid pressure source, indicated generally at 18.

The torque wrench 12 comprises an elongated cylinder 20 having a bore 22 closed at the rear end by a threaded cap 26 having a threaded central opening 24 therein. Threaded in the opening 24 is a nipple 28 to which is connected a flexible hose 14. Working in the cylinder bore 22 is a piston 30 which has thereon a plurality of sealing rings 32. The piston 30 is fixed on the rear end of an elongated rack bar 36 which has along one side thereof longitudinally spaced rack teeth 38. As seen in Figures 1 and 3, the forward end of the cylinder 20 is reduced, as indicated at 40, and has a reduced bore portion 46 which conforms to and slidably and non-rotatably supports the rack bar 26.

The reduced forward end portion 40 of the cylinders 20 includes a laterally extending substantially semi-circular flat housing 42 including a circular recess 44, see Figure 3, which opens at one side into the reduced bore portion 46 of the cylinder 20. The open side of the housing 42 is closed by a cover plate 50 secured

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by studs 48, and the cover plate 50 and the bottom wall 52 of the housing 42 have therein aligned axial bores 54 and 56, respectively. The aligned bores 54 and 56 have journaled therein stub shafts 57 and 58, respectively, on opposite sides of a pinion gear 60, whose teeth 62 are meshed with the rack teeth 38 of the rack bar 36. The stub shafts 57 and 58 terminate in polygonal bosses 64 and 66, respectively, rectangular as shown in Figure 1, for example. The bosses have in their sides spring-urged ball detents 68 for holding on the bosses 64 and 66, desired wrench sockets (not shown).

The fluid pressure source 18, which can be of any suitable motor operated or manually operated form, as shown as including a cylinder 70 having pivoted thereon a manual lever 72 connected to a piston 74 and operable for supplying fluid pressure through the gauge 16, and the hose 14 to the wrench cylinder 20. The scale of the gauge 16 is graduated to indicate foot-pounds of torque applied to the wrench 12. The cylinder 70 of the fluid pressure source 18 incorporates therein manual pressure relief valve means 76 for relieving the pressure in the wrench cylinder 20, after a bolt, nut, or the like has been tightened by the wrench at a predetermined torque, to enable manual retraction of the rack bar 36, to set it for another tightening operation, either by pushing the rack bar 36 into the cylinder 20, or by rotating the pinion gear 60 by application of a tool to one of the bosses 64 and 66.

In order to obtain reverse rotation or loosening of a nut or bolt, the pertinent wrench socket (now shown) is removed from one of the bosses 64 and 66 and applied to the other boss, and the socket then applied to the nut or bolt concerned.

Fixed on and extending laterally from the rear end portion of the cylinder 20, at the same side and in the same plane as the housing 42, is a lug 76 having therein a transverse bore 78, see Figures 3 and 5, in which is slidably engaged a removable rod 80 having in a side thereof at opposite ends thereof spring-urged ball detents 82 which retain the rod 80 in the bore 78. When pressed inwardly, the detents permit removal of the rod 80 from the lug 76. The rod 80 is provided for engagement with a portion of such as an engine block, to prevent vagrant rotation of the wrench while a rotatable fastening element is being tightened or loosened.

In operation, with the rack 36 in the position of Figure 3, and the rod 80 bearing against a piece of machinery in which a nut or bolt is to be tightened down, a wrench socket is placed on the boss 64, Figure 2, and slipped over the nut or bolt to be tightened, whereupon the lever 72 is pressed downwardly toward the cylinder 70, resulting in the actuation of the piston 74 to force fluid through the hose 14 into the cylinder 20 and move the rack 36 and pinion gear 60 to tighten down the nut or bolt. After this is done, the valve means 76 is opened, the wrench socket is then removed from the tightened nut or bolt and the boss 64. The rack is then manually pushed back into the cylinder 20 and is then ready for another tightening operation. The amount of pounds pressure employed for tightening down the bolt or nut is read upon the gauge 16.

To loosen a tightened down nut or bolt the operating procedure above set forth is the same, except that the wrench socket is placed upon the boss 66 and slipped over the tightened nut or bolt.

The foregoing is considered as illustrative of the principles of the invention. Since numerous modifications and changes will readily occur to those skilled in the art, it is not intended or desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and

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equivalents may be resorted to, as fall within the scope of the appended claims.

What is claimed is:

1. In a fluid pressure operated wrench, an elongated cylinder having a forward end and a rear end and an axial bore, closure means closing the rear end of the cylinder bore, a reduced portion on the forward end of the cylinder having therein a reduced bore portion aligned with and opening into the cylinder bore, a piston working in the cylinder bore having thereon a forwardly extending rack bar smaller in diameter than the piston and sliding in said reduced bore portion, said rack bar having therealong rack teeth facing one side of said reduced cylinder portion, means precluding rotation of said rack bar relative to said reduced cylinder portion and the cylinder, a housing fixed on said one side of said reduced cylinder portion and projecting laterally therefrom, said housing having a bottom wall and an open side facing said bottom wall, a cover plate secured to said one side, said cover plate and said bottom wall having aligned axial bores, a pinion gear in said housing between said bottom wall and said cover plate having stub shafts on opposite sides thereof journaled in related ones of said axial bores, said pinion gear having teeth meshed with said rack teeth, polygonal wrench socket receiving bosses on said stub shafts, and means for admitting and releasing fluid pressure to the cylinder between the piston and the rear end of the cylinder.

2. In a fluid pressure operated wrench, an elongated cylinder having a forward end and a rear end and an axial bore, closure means closing the rear end of the cylinder bore, a reduced portion on the forward end of the cylinder having therein a reduced bore portion aligned with and opening into the cylinder bore, a piston working in the cylinder bore having thereon a forwardly extending rack bar smaller in diameter than the piston and sliding in said reduced bore portion, said rack bar having therealong rack teeth facing one side of said reduced cylinder portion, means precluding rotation of said rack bar relative to said reduced cylinder portion and the cylinder, a housing fixed on said one side of said reduced cylinder portion and projecting laterally therefrom, said housing having a bottom wall and an open side facing said bottom wall, a cover plate secured to said one side, said cover plate and said bottom wall having aligned axial bores, a pinion gear in said housing between said bottom wall and said cover plate having stub shafts on opposite sides thereof journaled in related ones of said axial bores, said pinion gear having teeth meshed with said rack teeth, polygonal wrench socket receiving bosses on said stub shafts, and

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means for admitting and releasing fluid pressure to the cylinder between the piston and the rear end of the cylinder, and arm means on and extending laterally from said cylinder for engagement with a portion of a workpiece on which the wrench is used, for preventing vagrant rotation of the wrench relative to the workpiece during operation of the wrench.

3. In a fluid pressure operated wrench, an elongated cylinder having a forward end and a rear end and an axial bore, closure means closing the rear end of the cylinder bore, a reduced portion on the forward end of the cylinder having therein a reduced bore portion aligned with and opening into the cylinder bore, a piston working in the cylinder bore having thereon a forwardly extending rack bar smaller in diameter than the piston and sliding in said reduced bore portion, said rack bar having therealong rack teeth facing one side of said reduced cylinder portion, means precluding rotation of said rack bar relative to said reduced cylinder portion and the cylinder, a housing fixed on said one side of said reduced cylinder portion and projecting laterally therefrom, said housing having a bottom wall and an open side facing said bottom wall, a cover plate secured to said one side, said cover plate and said bottom wall having aligned axial bores, a pinion gear in said housing between said bottom wall and said cover plate having stub shafts on opposite sides thereof journaled in related ones of said axial bores, said pinion gear having teeth meshed with said rack teeth, polygonal wrench socket receiving bosses on said stub shafts, and means for admitting and releasing fluid pressure to the cylinder between the piston and the rear end of the cylinder, and arm means on and extending laterally from said cylinder for engagement with a portion of a workpiece on which the wrench is used, for preventing vagrant rotation of the wrench relative to the workpiece during operation of the wrench.

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