April 9, 1946. T. O. RUEB 2,398,330

TORQUE WRENCH

Filed Feb. 21, 1944

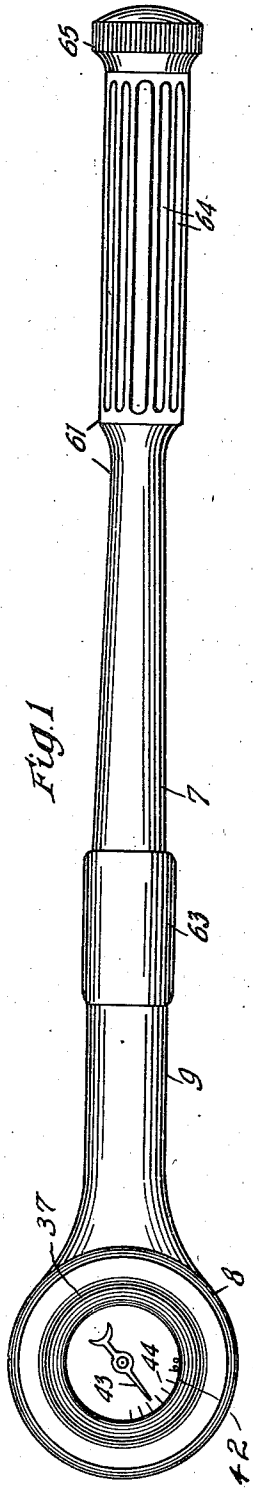


Fig. 1

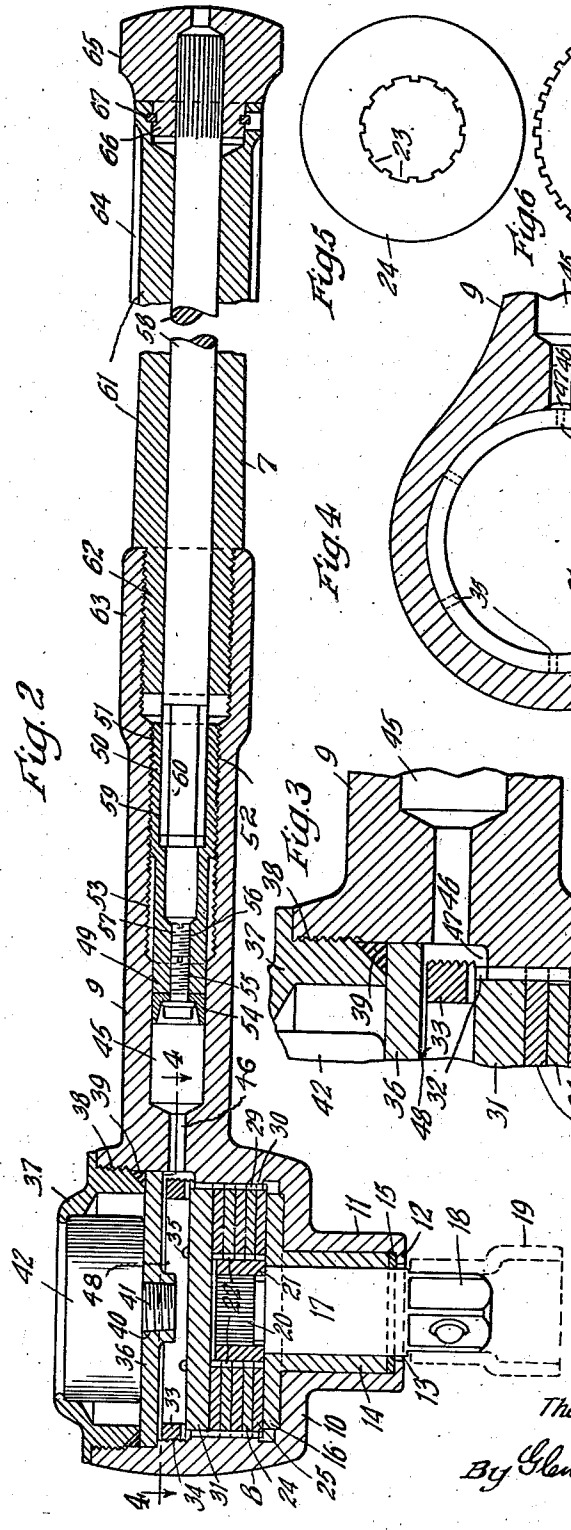


Fig. 2

Fig. 5

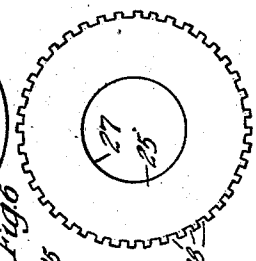


Fig. 6

Fig. 4

Fig. 3

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Patented Apr. 9, 1946

2,398,330

UNITED STATES PATENT OFFICE

2,398,330

TORQUE WRENCH

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Application February 21, 1944, Serial No. 523,266

6 Claims. (Cl. 64—30)

This invention is a wrench adapted for the usual purposes and provided with means whereby it may be set to give any desired torque to be applied to a nut, bolt, or the like. It has been found to be highly objectionable in many instances, and particularly in connection with the tightening of cylinder heads, to apply unequal pressure on the different studs or nuts or to apply excessive pressure thereon. Torque measuring wrenches have heretofore been proposed and used whereby the operator, by observing a scale on the wrench, may measure the amount of torque which is being applied. These wrenches are objectionable in that it requires the operator to watch the gage and to stop pulling at the desired time, thus leaving it to the skill of the operator to determine when the proper torque has been applied. In many instances, it may also be difficult for him to observe the scale when the nuts or screws are in confined or out of the way places.

In accordance with the present invention, I provide means whereby the wrench may be set to give a predetermined torque and when such torque or strain is reached, the wrench will slip or the handle turned without exerting any further or excessive pressure. For this reason, the wrench may be used on nuts which are more or less hidden or may be used in more or less dark places where it would be impossible or inconvenient to see the gage, and the operator will know that when the handle slips, the proper or exact stress will have been applied to the part being turned.

The objects of this invention are to provide an improved wrench of the kind indicated which will be simple and durable in construction and accurate in operation; to provide a wrench which may be pre-set to deliver any desired torque; to provide a wrench having a clutch for transmitting the power to the part being operated on; to provide a wrench having a friction plate clutch for transmitting torque to the work piece; to provide a wrench having a clutch for transmitting work torque to the work piece, and hydraulic pressure means for regulating the amount of strain which may be transmitted by the clutch; to provide a wrench having hydraulic or liquid operated means for measuring and controlling the torque; to provide novel means for regulating the fluid pressure; and to provide such other advantages and improvements as will appear in the following description.

In the accompanying drawing illustrating this invention,

Fig. 1 is a plan view;

Fig. 2 is a longitudinal sectional view shown on an enlarged scale with parts broken away;

Fig. 3 is a detail of a portion of the clutch compression chamber and the fluid passageway leading thereto;

Fig. 4 is a sectional detail taken substantially on the line 4—4 of Fig. 2; and

Figs. 5 and 6 are plan views of the clutch discs.

The wrench 7 has a barrel or cylindrical head 8 provided with a handle portion 9 which may be formed integrally therewith or secured thereto in any desired manner. It is substantially closed at one end by a bottom 10 having a cylindrical projection 11 with an inwardly extending flange or shoulder 12 at the end thereof which defines a central opening 13. A bushing 14 fits closely in the projection 11 and terminates at a short distance from the flange 12. This bushing is preferably made of some special steel or alloy which may be highly finished or polished. A washer 15 fits between the end of the bushing and the flange. The bushing has an outwardly extending annular flange 16 that rests on the inner surface of the bottom 10, the arrangement being such that there will be a tight closure between the bushing and other parts so that there will be no leakage. A short shaft or driven member 17 is rotatably mounted in the sleeve or bushing 14 and is preferably lapped or finished to make an extremely tight fit therewith. This shaft may have an angular extension 18 to coact with wrench sockets 19 or may be otherwise arranged to connect with the parts to be turned.

The inner end of the shaft 17 has an extension 20 which is serrated or knurled to make a tight fit with a collar 21 which engages therewith and which abuts against the upper surface of the flange 16. The outer surface of the collar 21 has a plurality of longitudinal ribs 22 which engage with correspondingly shaped slots or recesses 23 in friction clutch plates or discs 24 as shown in Fig. 5. A plurality of such clutch plates are preferably provided to coact with intermediate clutch plates 25 as shown in Fig. 6. These plates have central holes 27 that fit freely over the collar 21 and are provided with peripheral notches of recesses 28 which engage with longitudinal ribs 29 on the inner surface of the bore 30 of the head 8 as shown in Figs. 2 and 3. The topmost or inner clutch plate 31 is thicker than the other plates or discs and is also provided with peripheral recesses 32 for engagement with the ribs 29. This plate has no central opening and serves somewhat as a piston for transmitting the hydraulic pressure to the other clutch plates.

A ring 33 is threaded to engage with corresponding threads 34 in the head 8 and is positioned above the plate 31. This ring has a plurality of radial channels 35 in its lower face to permit the fluid to pass outwardly to its outer periphery. The head or cylinder 8 is closed at the top by a cover 36 that fits closely in the bore that is slightly enlarged above the ring 33 to provide a shoulder for receiving the cover. The cover is fastened in position by an adapter ring 37 having threads 38 for engagement with corresponding threads in the upper end of the head 8. A gasket or sealing material 39 makes a tight closure between the adapter and the cover and the inner surface of the head.

The cover 36 has a central threaded hole 40 for receiving the stem or connector 41 of a pressure gage 42 which is held in position and protected by the adapter ring 37 as shown. This pressure gage is of any ordinary or preferred construction and has the usual hand 43 which coacts with a scale 44 to register pressure, the scale being preferably calibrated to indicate foot pounds.

The projection or handle portion 9 has a cylinder 45 which is connected by means of a hole 46 with the interior of the head 8 below the cover 36. A vertical channel 47 is also provided so that the fluid may pass freely into the compression chamber 48 between the cover 36 and the clutch plate 31. A piston 49 engages with the cylinder 45 and has an enlarged outer end portion 50 which is provided with fine threads 51 for engagement with similar threads 52 in the enlarged bore 53 which extends outwardly from the cylinder. The piston is provided at its inner end with the usual leather washer 54 which is held in position by a screw 55 that has an enlarged head fitting in the cupped portion of the leather to expand the same. This screw engages with a tapped hole 56 and has a slot in its inner end so that it may be engaged by a screw driver inserted through said hole for tightening the same. It is held in tightened position by a lock screw 57 which is also threaded to fit in the tapped hole 56.

The piston 49 has a slip fit driving connection with a rod 58 by means of which it is turned. This connection comprises a hexagonal socket 59 in the end of the piston member which is engaged by the correspondingly shaped end portion 60 of the rod 58. The rod is mounted in the handle 61 which has a threaded end 62 that engages with the correspondingly threaded enlarged portion 63 of the handle portion 9. The handle 61 is preferably grooved or corrugated as shown at 64 to provide a suitable grip. The outer end of the rod 58 is securely connected to a knob or button 65 as by means of a pressed fit so that it may be turned by such knob. The knob has a reduced portion 66 that rotatively engages with the end of the handle 61 and these parts are held against longitudinal movement by any suitable means such as a spring ring 67.

When the wrench is to be prepared for use, the cylinder and compression chamber are filled with any suitable liquid such as oil, and the pressure gage screwed into position and fastened by its adapter ring. The gage is preferably calibrated in foot pounds which may be done by attaching an arm and weight or weights to the shaft or stem 17 and turning the knob 65 until sufficient pressure is developed in the pressure chamber to cause the clutch to hold such weight. After the gage scale has been calibrated, all that is necessary for the operator to tighten a nut to a predetermined degree is to set the scale to the desired point. Then when the handle is turned for tightening the nut, it will be tightened to the predetermined amount at which point the clutch will slip and prevent any further strain on the nut. In this way, all of the nuts in a group, as for instance, those used in connection with a cylinder head may be tightened to exactly the same degree. The friction plates or discs of the clutch are preferably lapped until they are very smooth and the contact of such lapped surfaces will cause a certain amount of friction which, of course, is increased or decreased by the hydraulic pressure. The ring 33 fits sufficiently close to the pressure plate 31 to prevent undue separation of the clutch members while at the same time permitting sufficient freedom for them to act in the desired manner. The channels 35 and the grooves around the clutch plates will permit a limited amount of oil to pass down around the plates and prevent their becoming too dry for efficient operation and also to prevent rusting of the same.

From this description, it will be apparent that my improved wrench may be made so that it will be particularly sturdy and durable and will provide means whereby any desired torque may be given to a work piece and further turning will be prevented by the slipping of the clutch.

While I have shown and described a preferred form of my invention, changes may be made in the details of construction or in the arrangement of the parts in order to adapt the same for different conditions or uses, and therefore I do not wish to be limited to the particular construction shown and described except as specified in the following claims.

I claim:

1. A torque measuring wrench, comprising a cylindrical head, a multiple disc clutch mounted in said head, a work engaging member rotatably mounted in the head and driven by said clutch, said head having a compression chamber for receiving liquid for applying pressure to the clutch, a pressure gage connected with the chamber for measuring the pressure, a handle extending outwardly from the head, a pump in the handle having a passageway leading to the compression chamber, and means for actuating the pump to regulate the pressure on the liquid which is in the pump and compression chamber.

2. A torque wrench comprising a head having a fluid chamber therein, a hydraulic pressure gage carried by said head, a friction plate clutch mounted in the head, fluid in the chamber for actuating the clutch and also being in communication with the gage, work driving means carried by the head and actuated by said clutch, a handle for turning the head and pressure means within the handle communicating with the pressure chamber for placing pressure on the fluid.

3. In a hydraulic torque wrench, the combination of a head having an annular chamber therein, a handle extending laterally from the head, having a cylinder communicating with the chamber, a piston coacting with the cylinder, fluid in said chamber and cylinder to be compressed by said piston, means carried by the handle for actuating the piston, a friction plate clutch mounted in the head and adapted to be acted upon by the fluid in the chamber, a pressure gage connected with the chamber for indicating the pressure therein, a shaft rotatably mounted in the head and connected with the clutch whereby it may be turned, and means for connecting the shaft with a part to be turned.

4. In a torque wrench, the combination of a head having an annular chamber therein, a pressure gage connected with said chamber, a multiple disc clutch mounted in the head below the chamber, a stem rotatably mounted in the head and driven by said clutch, a pressure plate forming one wall of the chamber and coacting with the clutch plates to transmit pressure thereto, a handle extending from the head and having a cylinder formed therein, a passageway leading from the cylinder to the chamber, fluid in the chamber and cylinder, a piston having threaded engagement with the inner wall of the handle, a rod extending outwardly through the handle and having a slip driving connection with the cylinder, a knob secured to the end of the rod and rotatably connected with the hande, and means for preventing longitudinal movement of the knob with respect to the handle.

5. A device, as per claim 4, in which the piston is provided with a leather washer, a screw engaging with a central threaded hole in the piston and having a head for expanding the washer, said screw having a slot on its inner end for turning the same, and a set screw also engaging with said threads for fastening the first named screw in position.

6. A torque wrench, comprising in combination, a head having a chamber therein, a handle extending from the head, having a cylinder communicating with the chamber, a piston coacting with the cylinder, fluid in said chamber and cylinder adapted to have pressure applied thereto by said piston, means for actuating the piston, a friction plate clutch mounted in the head and adapted to be controlled by the fluid in the chamber, the surfaces of the plates of said clutch being smoothly finished to insure close contact, a pressure gage connected with the chamber for indicating the pressure therein, a shaft rotatably mounted in the head and operatively connected with the clutch and adapted to be connected with the part to be turned by the wrench.

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