Aug. 25, 1959 J. E. DE SELMS 2,900,811

HYDRAULIC TORQUE TOOL

Original Filed Dec. 19, 1949 2 Sheets-Sheet 1

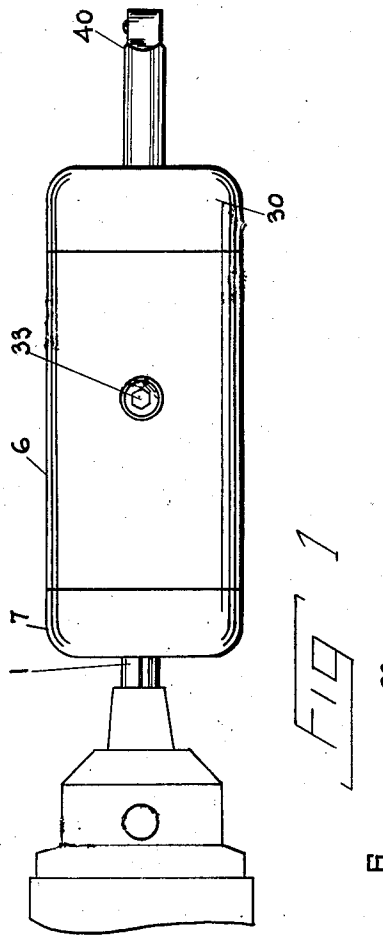


FIG 1

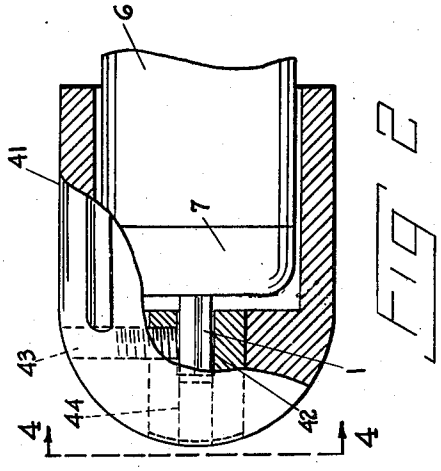


FIG 2

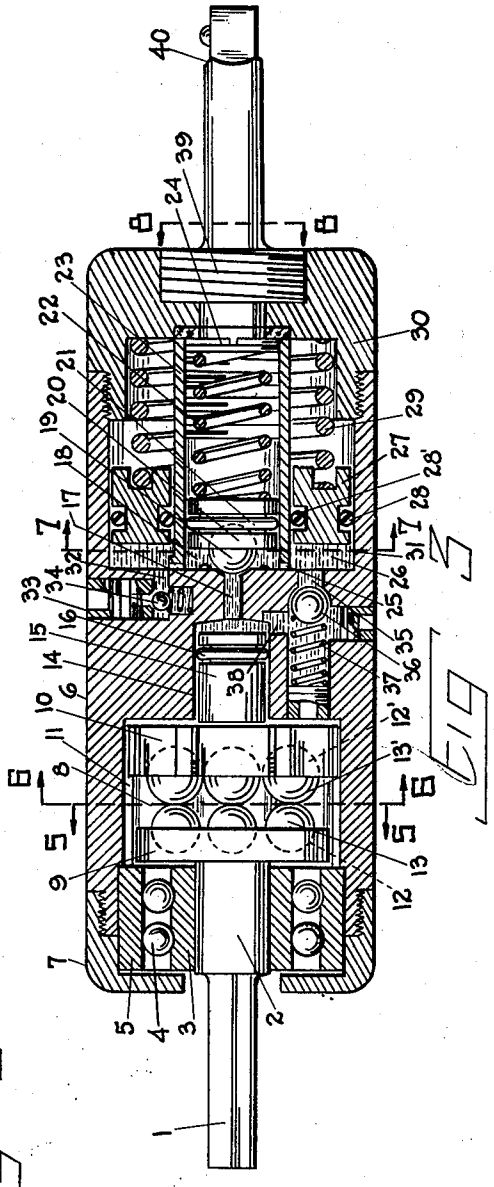


FIG 3

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HYDRAULIC TORQUE TOOL

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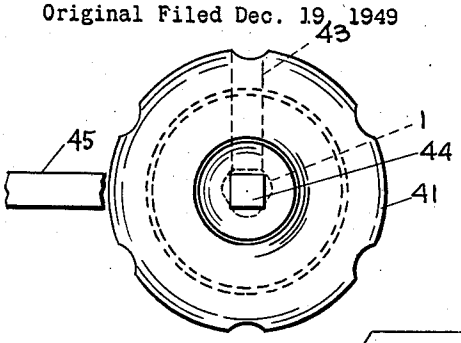


FIG 4

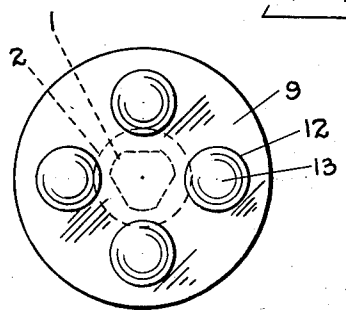


FIG 5

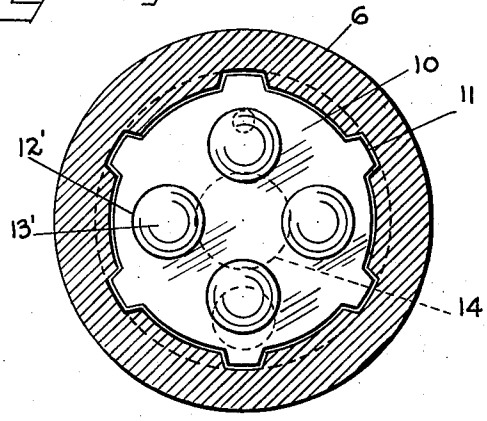


FIG 6

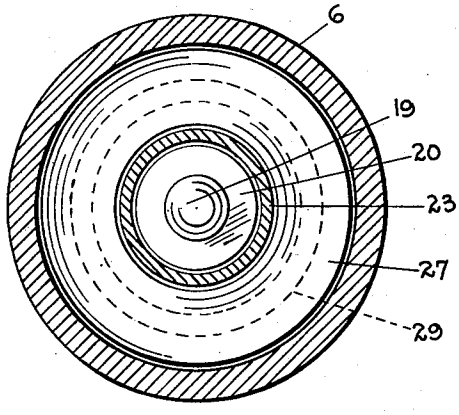


FIG 7

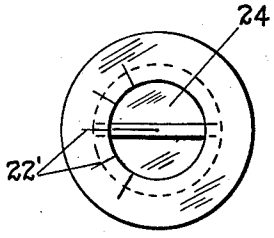


FIG 8

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United States Patent Office 2,900,811 Patented Aug. 25, 1959

2,900,811

HYDRAULIC TORQUE TOOL

Jesse E. De Selms, deceased, late of Wichita, Kans., by Evelyn De Selms Brandon, Wichita, Kans., sole heir

Substitute for abandoned application Serial No. 133,904, December 19, 1949. This application May 11, 1959, Serial No. 812,555

1 Claim. (Cl. 64—28)

This invention relates in general to torque tools and in particular to a hydraulic torque tool in which the rotative force imparted to a fastening member such as a bolt, nut, screw or the like, or to a tap, die, or drill bit, can be predetermined and will not be exceeded.

The prior art shows many forms of torque tools, some spring operated, some of the hydraulic type, and others employing friction clutches, etc.

The invention contemplates employment of a combination hydraulic, compression spring and friction principle, the objects of the invention being, first; to provide a hydraulic torque tool in which a soft, cushioning, but positive rotative action is imparted to the driven member.

Second; to provide positive force cutoff means whereby only a predetermined rotative force can be imparted to the driven member.

Third; to provide in a torque tool of the class described, a clutch in which one member thereof is connected directly to a power source and the other member is connected directly to the driven member, the relation between the members of the clutch being varied by hydraulic means.

Fourth; to provide a torque tool which may be power or hand driven with equally accurate results and with no danger of exceeding the torque force desired.

Fifth; to provide a torque tool, use of which will eliminate all impact between the tool and the element being tightened, as all impact force will be absorbed within the tool.

Other objects and advantages as well as the construction and operation of the invention will be apparent by reference to the following description in connection with the accompanying drawings in which:

Fig. 1 is a elevational view of a hydraulic torque tool with one end carried in a chuck which may be on a power driven machine or on a hand driven device.

Fig. 2 is a fragmentary elevational view of one end of the torque tool and an adapter for hand operation, parts being broken away to better illustrate certain other parts.

Fig. 3 is a longitudinal cross sectional view through the hydraulic torque tool.

Fig. 4 is an end view of the device shown in Fig. 2, taken along lines 4—4.

Fig. 5 is a cross sectional view on lines 5—5 of Fig. 3.

Fig. 6 is a cross sectional view on lines 6—6 of Fig. 3.

Fig. 7 is a cross sectional view on lines 7—7 of Fig. 3.

Fig. 8 is an end view of the torque adjusting nut and indicia face taken on lines 8—8 of Fig. 3 with the socket wrench end removed.

Referring now to the drawings by numerals of reference 1 designates the clutch shaft, the exposed portion of which is preferably triangular in cross section to fit a chuck. The internal portion 2 of the shaft is secured to race 3 of the bearing 4, the other race 5 being securely held at end of housing or body 6 by cap 7 threadedly engaging the housing.

A clutch chamber 8 is provided in the housing 6, the clutch comprising a flange 9 on the internal end of shaft 1. A clutch disk 10 is carried on splines 11 in the clutch chamber whereby said clutch disk may move longitudinally on said splines while rotating with the housing.

Ball recesses 12 and 12' are provided in the flange 9 and disk 10 and balls 13 and 13' are carried in these recesses. The clutch action will be explained hereinafter.

Located in a reduced central bore or piston chamber 14 is a clutch piston 15 having a suitable seal 16. A passage 17 connects reduced piston chamber 14 with enlarged piston chamber 18. A ball 19 valves passage 17 and is carried by piston 20, having seal 21, and normally urged toward passage 17 by torque adjusting spring 22.

The ball 19, piston 20 and spring 22 are positioned in cylinder 23, an adjustment screw 24 threadedly carried at the end of the cylinder and bearing against the adjustment spring 22. Suitable indicia 22' provide for indication of adjusted torque position.

A plurality of openings 25 lead from the piston chamber 18 to an accumulating chamber 26, in which an accumulator piston 27, having sealing rings 28 and 28', is positioned. Spring 29 bears against piston 27 and housing end cap 30 and urges the piston into fluid 31 compressing position.

Filler opening 32, with filler plug 33 and check valve 34, provides means for initial filling of the torque tool with hydraulic fluid and maintenance of the proper amount of fluid in the tool.

The accumulator chamber 26 connects with the clutch piston bore 14 through passage 35 having a ball check 36 and spring 37, the check valve chamber 38 connecting with the clutch piston bore 14.

The end cap 30 threadedly receives a tool carrying member 39 with shank 40 on which any suitable tool such as a socket wrench, screw driver end or the like may be removably secured.

When the hydraulic torque tool is to be manually operated, a handle 41 may be slipped over the housing 6, clutch shaft 1 being positioned in opening 42 of the handle, a set screw 43 adapted for tightening against the clutch shaft 1. A square broached insert 44 may be employed to receive a suitable lever 45 (a fragment of which is shown in Fig. 4) whereby additional leverage may be obtained when the torque is too great to overcome by hand.

With the hydraulic torque tool provided with the proper amount of fluid and the adjustment screw 24 set for the correct torque desired, the tool is ready for operation. Except for the connection through the clutch the tool has two independently rotatable portions; the clutch shaft 1 and race 3 with its balls 13 comprising one rotatable portion and the entire remainder of the tool comprising the other rotatable portion.

The fluid 31, under pressure exerted by accumulator piston 27, normally urges clutch piston 15 against clutch disk 10 and balls 13' toward balls 13 and flange 9, the balls tending to intermesh. Until the torque becomes too great, rotation of the clutch shaft 1 will cause balls 13 bearing against balls 13' to impart a rotary movement to clutch disk 10 and to housing 6 through splined connection 11.

When the force necessary to turn the nut or bolt or screw or the like, which is being applied, becomes greater than desired, housing 6 will cease its rotative movement and balls 13' will ride up on balls 13 forcing clutch disk 10 and clutch piston 15 against the body of fluid 31, opening ball valve 19 and exerting pressure against the piston 20 and the accumulator piston 27, ball check valve 36 providing one way flow of fluid from the accumulator chamber 26 to the clutch piston bore 14.

It will be seen that the force of the torque tool will be built up until the reactive force of the element being tightened or acted upon becomes great enough to overcome the compression of springs **22** and **29**, pressure of fluid **31**, and the friction of balls **13** working against balls **13'**. The degree of force exerted by the operator of the tool against the part being tightened will not have any bearing or effect on the operation of the tool and will not alter the torque force at which it will lose its rotative action.

The operation of the hydraulic torque tool is positive both in its tightening action and in its torque breaking action so that excessive and damaging forces cannot be imparted to the element being tightened. High rotative speeds on the clutch shaft, after the proper torque has been applied to the fastening device or element on which the tool is being used, will merely cause clutch flange **9** with its balls **13** to spin with a minimum contact surface against balls **13'**. All the parts will be self lubricated from the hydraulic fluid sealed in the tool.

The device can be used in an extremely expeditious manner for applying bolts, nuts and screws to a definite amount of ounce pounds, inch pounds or foot pounds of torque. It can be used for starting taps, for threading and is very useful for drilling, where drill bit breakage can be almost totally eliminated.

It will also be seen that by use of the hydraulic means impact on the element being tightened will be eliminated, the hydraulic means absorbing any impact which may occur.

It is obvious that changes in form, proportion, and details of construction may be resorted to without departing from the spirit of the invention and all rights are reserved to such changes as come within the scope of this specification and the claim which follows.

This application is a substitute for abandoned application, Serial No. 133,904 filed Dec. 19, 1949.

What is claimed as new and is desired to be covered by Letters Patent is:

A hydraulic torque tool comprising a body, a rotatable shaft extending from one end of the body, a clutch between the body and the rotatable element, said clutch including a pair of parallel plates, one plate being carried by the body and longitudinally slidable therein, the other plate being carried by the rotatable element, ball bearings carried by each of the plates, said ball bearings intermeshing when the first mentioned plate is urged toward the other plate, a reduced piston chamber in the body concentric with the clutch, an enlarged piston chamber, an accumulator chamber in the body adjacent the enlarged piston chamber, a check valve chamber in the body adjacent the reduced piston chamber, a passage between the piston chambers, a passage between the reduced piston chamber and the check valve chamber, and a passage between the enlarged piston chamber and the accumulator chamber, a valve in the passage between the piston chambers opening toward the enlarged piston chamber, a valve in the passage between the accumulator chamber and the check valve chamber opening toward the check valve chamber, and a spring-urged piston in the accumulator chamber exerting pressure on the fluid therein.

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