

[54] TORQUE WRENCH

[76] Inventor: Alvin J. Behrens, 25325 117 Place
S.E., Kent, Wash. 98031

[22] Filed: Aug. 6, 1973

[21] Appl. No.: 386,153

[52] U.S. Cl. 81/52.4 R

[51] Int. Cl. B25b

[58] Field of Search 81/52.4, 55

[56] References Cited

UNITED STATES PATENTS

1,565,754	12/1925	Orth.....	81/52.4
3,012,456	12/1961	Dracka.....	81/52.4 R
3,535,958	10/1970	Larson.....	81/52.4 R

FOREIGN PATENTS OR APPLICATIONS

351,090	8/1937	Italy.....	81/55
---------	--------	------------	-------

Primary Examiner—James L. Jones, Jr.

[57] ABSTRACT

This torque wrench comprises a rotatable, driven work-engaging member having a work-engaging lug end portion. An axially aligned, first threaded bore extends into said driven member from the other end portion thereof with a serrated first ring face disposed thereon, the teeth thereof having equal lengths and equal angles therebetween.

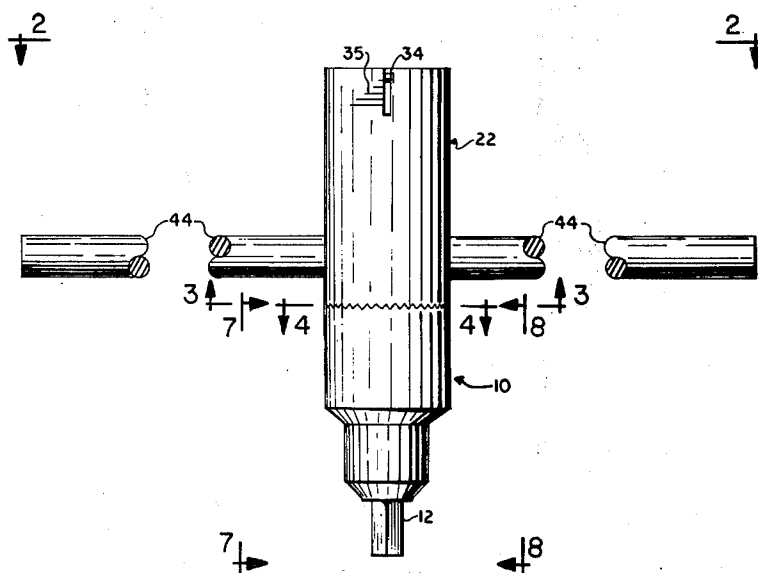
An axially aligned, second bore extends into a rotatable driving member and from one end portion thereof, terminating in a seat short of the other end portion thereof, an axially aligned third bore, of lesser diameter, extends through said seat. A headed bolt, slidably fitting the second bore, extends through said second and third bores and threadedly engages threads of the first bore. A second serrated ring face, disposed on the driving member, has teeth mating those of the first ring face.

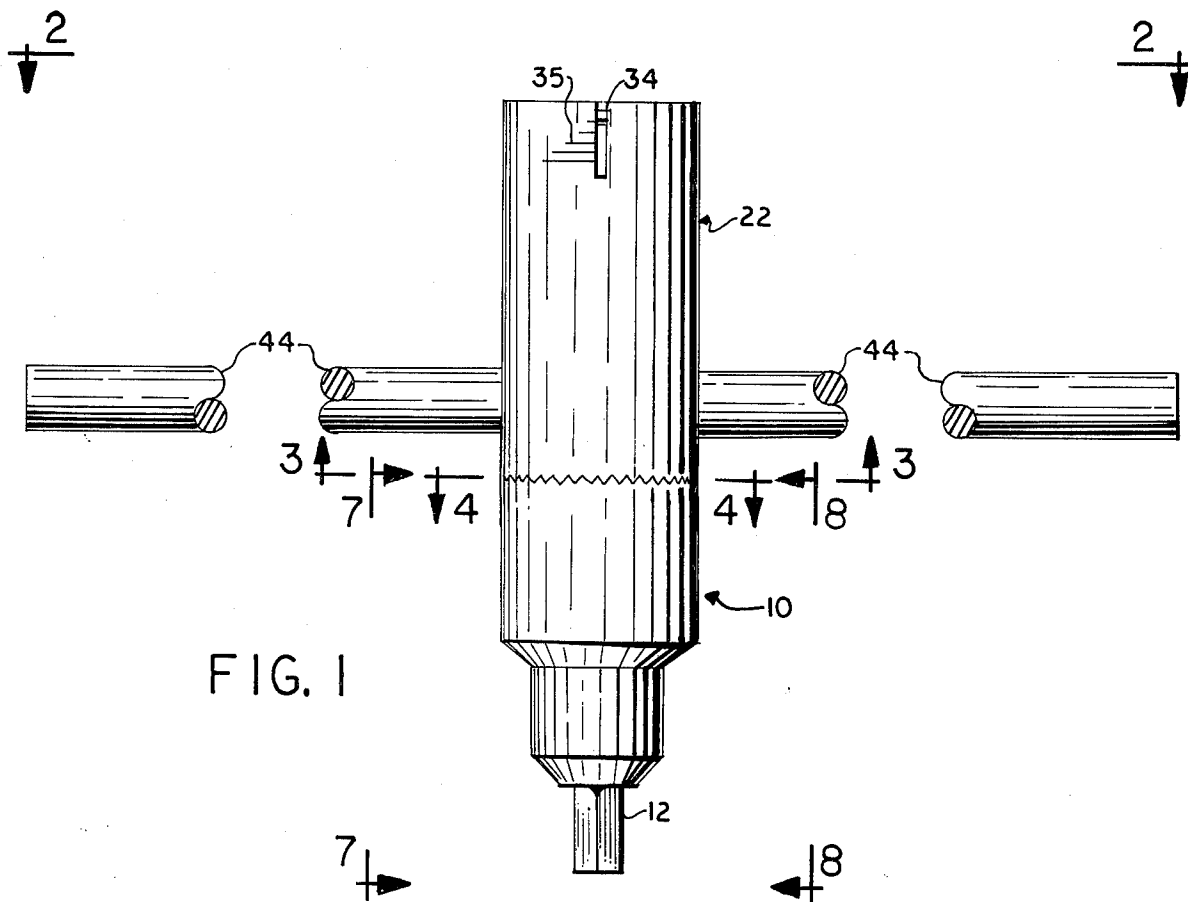
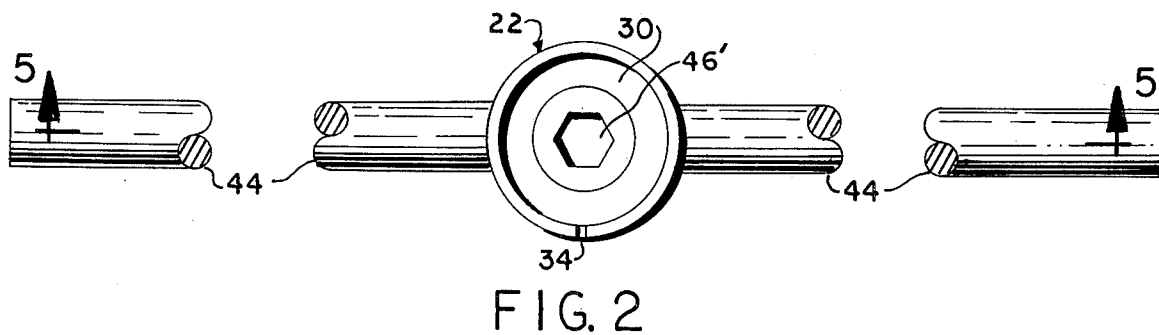
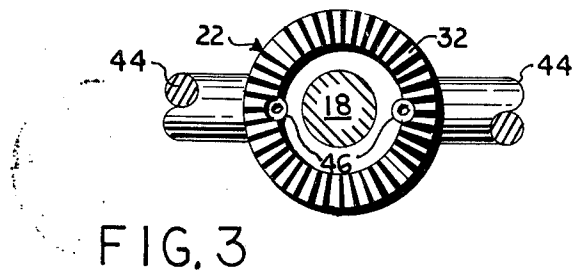
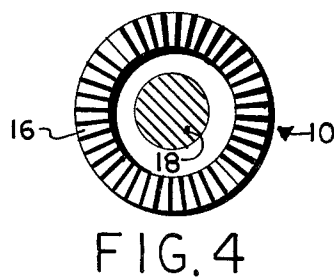
Preferably spring washers are stacked on said bolt with a bearing between them and the bolt head.

A calibrated window is disposed in the driving member visibly indicating the presence therethrough of a marked portion on the headed bolt, to indicate the extent of compression of the spring means, and to show the then wrench torque setting.

Screw receiving bores are provided in the driven member. One thereof extends upwardly and into the path of travel of the headed bolt and limiting its extent of travel to an adjusted amount and the maximum torque setting of the wrench, and another thereof extends inwardly and against the shank of the headed bolt and thus locking said headed bolt against inadvertent turning.

2 Claims, 8 Drawing Figures





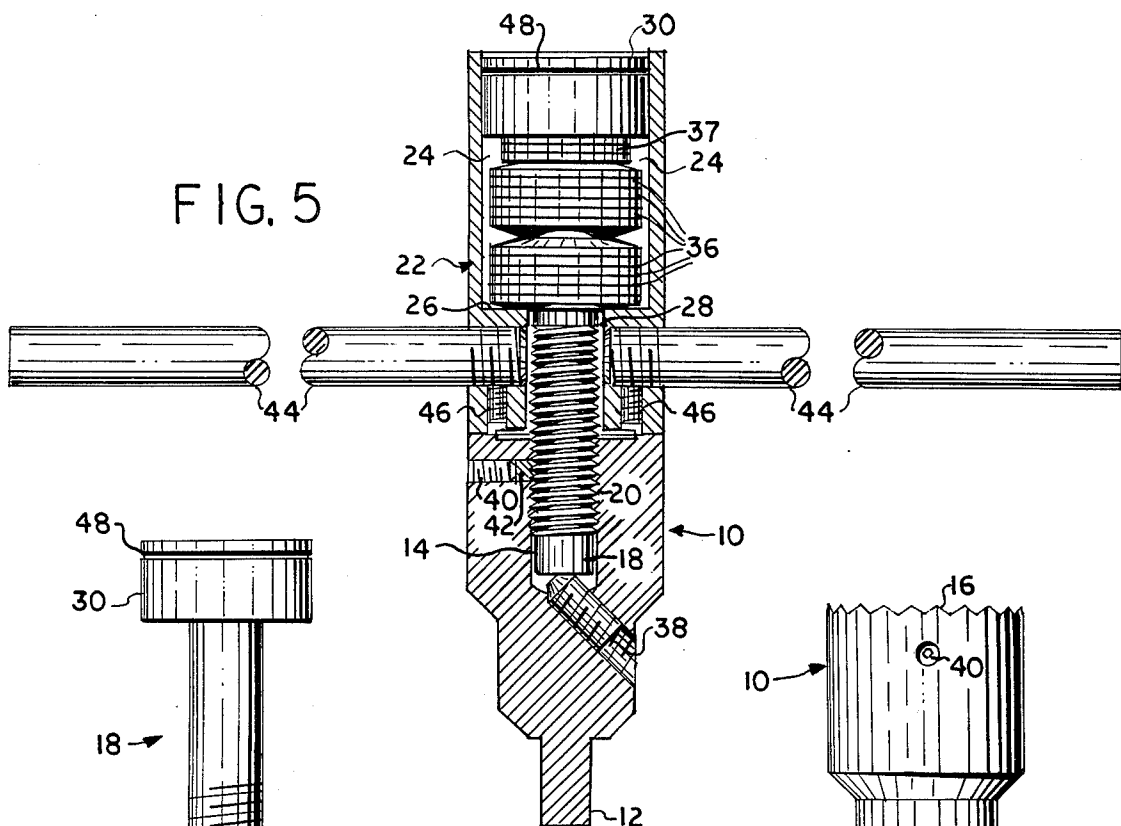
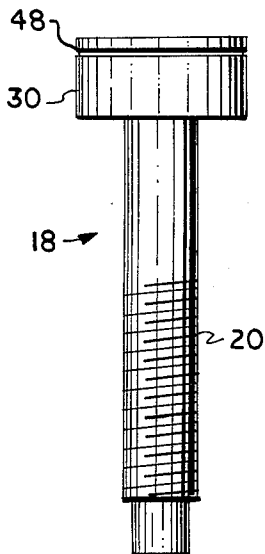
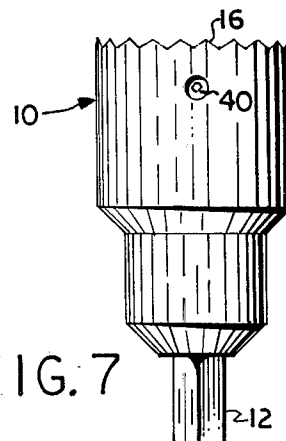
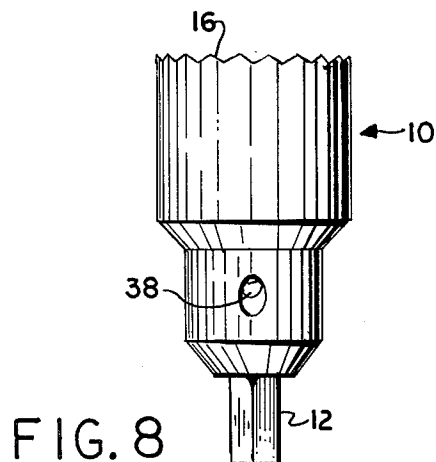


FIG. 6

FIG. 7



TORQUE WRENCH

BACKGROUND OF THE INVENTION

Prior Art practices of limiting the pressure exerted by specific wrenches by shortening the leverage, or the length of such a wrench, have proven faulty due to the various strength of particular individuals using wrenches. Thus, torque wrenches are finding increasing use in various fields. In some fields, such as the adjusting of the pinion gear sockets of lathe chucks of turning machines or lathes, no practical torque wrenches have been available because of the lack of compactness of the wrench or the failure to provide a wrench which would fit into the spaces generally available in such a field. Also, torque wrenches, turnable in either a right- or left-hand direction and with audible indication means of the reaching of a given torque in either direction have not, heretofore, been available. Other background shortcomings which indicate the need for the present invention will later become apparent herein.

SUMMARY OF THE INVENTION

The present invention is characterized by a relatively compact wrench for use in tightening left- or right-hand threaded nuts or bolts and with an audible indication response when a desired torque has been reached. I have provided a satisfactory torque wrench which may be used where substantial torque is required in turning nuts and where space is very limited for use of a wrench, such as in the chucking of parts in either direction of the pinion gear sockets of lathe chucks.

In general, the invention provides for a driving member adjustably spring loaded to a driven member. The driven member has a work-engaging lug at one end portion thereof and a first axial bore extending into the driven member from the other end portion thereof. The first bore is threaded and the face on the other end portion is provided with a first serrated ring face and the adjacent faces of the teeth of such serrations form isosceles angles. The driving member has an axially aligned second bore extending inwardly from one end portion and terminating in a shoulder. A third bore is axially aligned with, and smaller than, the second bore and extends from said shoulder through the other end portion of the driving member. The said other end portion of the driving member has a second serrated ring face mated with the first ring face of the driven member. A headed bolt mounts spring means, preferably, in the form of disc spring members, and said bolt passed through the second and third bores and is threadedly connected with the first bore and this comprises the spring loading between the driving and driven members. Visual means indicate the extent of compression of the spring means, set screw means limit the extent of compression of the spring means, other set screw means maintain a given compression of the spring means, and particular manually operable handle means are provided.

Other features of my invention will become inherent or implicit as the detailed description of my invention proceeds in connection with the drawings, wherein like reference numerals relate to like parts, and wherein:

THE DRAWINGS

FIG. 1 is an elevational view, with parts broken away, of a device embodying my invention;

FIG. 2 is a plan view taken substantially on broken line 2—2 of FIG. 1;

FIG. 3 is a fragmentary bottom plan view and taken substantially on broken line 3—3 of FIG. 1;

FIG. 4 is a top plan view and taken substantially on broken line 4—4 of FIG. 1;

FIG. 5 is a sectional view with parts shown in elevation and taken substantially on broken line 5—5 of FIG. 2;

FIG. 6 is a detached elevational view of the headed bolt embodied in this invention;

FIG. 7 is an elevational view and taken from a given side of the driven member; and

FIG. 8 is a view similar to FIG. 7 but taken from the opposite side of the driven member.

DESCRIPTION OF A PREFERRED EMBODIMENT

In the drawings, a driven member 10 has a work-engaging lug 12 on one end portion thereof. While such lug 12 is shown as a male fitting, obviously the same may be any conventional female fitting. The driven member 10 has an axially aligned, threaded, first bore 14 (FIG. 5) therein. The first bore 14 extends inwardly from serrated, first ring face 16 (FIGS. 4 and 8) disposed on the other end portion of the driven member 10. A headed bolt 18 (FIGS. 5 and 6) has threads 20 mating with the threaded first bore 14. The teeth of the first serrated ring face 16 have faces which intersect to form isosceles angles or, in other words, the faces are equal and disposed at the same angle to planes parallel to the axis of the first bore 14.

A second bore 24 (FIG. 5) is axially aligned and disposed in a rotatable driving member 22 and is of a larger diameter than the bore 14. This second bore 24 extends inwardly from one end portion of the driving member 22 until it forms a seat 26 in said driving member 22. A third bore 28 is of a size to slidably receive the shank of bolt 18 and connects second bore 24 to the other end portion of the driving member 22. The bolt 18 preferably has a circular head 30 of a contour and size to slidably mate with the cylindrical wall of the second bore 24. The shank of the headed bolt 18 passes through second and third bores 24 and 28 and is threadedly engaged with the first bore 14 in the driven member 10. The other end portion of the driving member 22 is provided with a second serrated ring face 32 (FIG. 3) and the teeth of said serrations mate with the teeth of the serrations of the first ring face 16 of driven member 10.

The driving member 22 is provided with an opening or window 34 to permit visual observation throughout of the relative extent of penetration of the cylindrical head 30 of the bolt 18 in the driving member 22. Before insertion of the bolt 18 in the driving member 22, compression spring members 36, having central apertures are slidably stacked on the shank of bolt 18. Also, a flat, ring-shaped roller bearing 37 is disposed between the underside of the circular head 30 and spring members 36 to reduce friction therebetween and minimize any tendency to turn spring members 36 upon turning of circular head 30 of bolt 18 and vice versa. Thus, as the wrench is being used and torque pressures against the lug 12 are transmitted through the various members to spring members 36, such torque on the spring members 36 will not be transmitted to head 30 because of bearing 37. Thus, any setting of the position of bolt 18 will not be changed because of work

done by the wrench. After the bolt 18, carrying compression spring members 36, is inserted into and through second and third bores 24 and 28, the compression spring members 36 will be disposed between and abut opposed faces—one face being bearing 37 and the other face being seat 26. As the threads on the shank of bolt 18 engage with and travel relative to the threads in the first threaded bore 14 in the driven member 10, the first serrated ring face 16 will be resiliently urged against the second ring face 32 and the extent of pressure will increase with the increased compression of spring members 36 and also the extent of travel of the circular head 30 into the driving member 22 will be increased—the latter will be indicated visually by the relative position of the circular head 30 through the window 34. The exact amount of travel of circular head 30 can be readily determined because of the calibrations 35 on the driving member 22 which are positioned adjacent window 34 and ring groove 48 on head 30.

The spring members 36 are preferably in the form of disc spring washers which are readily obtainable on the market and are sold under the trade name of Belleville disc springs. They may be stacked on the shaft of the bolt 18 in parallel relation with each other (with the concave surfaces all in the same direction), or in series (with two adjacent convex surfaces in back-to-back relation), or in combinations of series-parallel to provide stacked spring columns of desired pressure resistance and desired deflection. Such disc springs are preferred in the present invention as a spring of substantial spring reaction may be thus provided and at the same time with minimum space requirements—all of which permit a compact tool of minimum size and with maximum given torque for such size. The discs 36 are shown in series-parallel in the drawings.

By way of example, and not by way of limitations, a torque wrench must be compact if it is to be used in limited space areas, such as in connection with the pinions on chucks on lathes and at the same time torque pressure of approximately up to 150 foot-pounds may be required in torquing the pinions the desired amounts.

A set screw 38 (FIGS. 5 and 8) is disposed in a fourth threaded bore in driven member 10 and which bore is at an angle to the axis of the first bore 14 so that the forward end portion of set screw 38 will travel into the path of travel of the leading end portion of bolt 18 and thus determine the maximum travel of such bolt 18 and in turn determine the maximum compression of spring members 36. Thus, a maximum torque may be set for the wrench and which may be determined by observation through the window 34 in driving member 22.

If it is desired to fix a specific travel of the bolt 18 or, in other words, a specific setting of the compression of spring members 36 which will provide for a predetermined torque of the wrench, set screw means 40, 42 (FIGS. 5 and 7) may be utilized. Threaded screw part 40 is threadedly engaged in another threaded fourth bore which extends substantially normal to the axis of the first bore 14 in the driven member 10. At the leading end portion of such screw part 40 in the same bore is disposed a sliding pin part 42 formed of softer material, as brass, which may engage with the threads 20 of the bolt 18 without damaging said threads even though urged thereagainst with substantial pressure.

The outer surfaces of circular head 30, and set screws 38 and 40 are provided with hexagonal shaped recesses so the same can be readily engaged by interfitting Allen wrenches for tightening or loosening said members.

Means for turning driving member 22 may comprise two handles 44 which are threadedly engaged in two axially aligned bores in the driving member 22, the common axis of which is the diameter of the driving member 22 and normal to the axis of the first bore 14. The bores in driving member 22 which support handles 44 are in a heavy walled portion thereof, such as in the area of third bore 28. To prevent accidental turning of handle 44, two set screws 46 are disposed in threaded bores in the driving member 22 and which extend inwardly from second serrated ring face 32 parallel to the axis of the first bore 14, and which are threaded to engage the inner end portions of the handles 44.

SUMMARY OF THE INVENTION

In a general way, I have provided a compact torque wrench, which may be used in environs where substantial torque is required on nuts and bolts and pinions, say up to 150 foot-pounds of torque. Heretofore, where a limited space was involved, such as on pinions used on chucks in turning lathes, no torque wrenches were available and an attempt to control maximum torque included the use of handles of minimum length to provide limited leverage. Such practices were not too successful as often, those having extra powerful wrists tended to overtighten the chuck jaws, which often resulted in damage to the chuck wrench or chuck itself and also to the workpiece in cases of fragile, delicate workpieces. With adjustable torque wrenches in such environs, the adjustment will provide for a constant torque despite the differences in strengths of workmen, and the pinions employed may be torqued desired amounts.

The torque wrench of my invention comprises a rotatable driven member 10 having a work-engaging lug 12 at one end portion thereof. Driven member 10 has an axially aligned first bore 14 extending inwardly from the other end portion on which other end portion is disposed on first serrated ring face 16. The faces of each of the teeth of such ring face 16 have the same area, form equal angles to an axis of the first bore 14, and form isosceles angles with each other.

My wrench further comprises a rotatable, driving member 22 having an axially aligned second bore 24 which extends inwardly from one end portion of the driving member 22 and a second, serrated ring face 32 is disposed on said other end portion of the driving member 22. The teeth of the second serrated ring face 32 mate with the teeth on the first serrated ring face 16. Thus, when said teeth are urged toward each other by a resilient pressure means, as disc spring members 36 under tension, and they are subsequently separated when a turning pressure is applied which exceeds the said resilient pressure, then a distinctly audible click or noise will be made as the teeth pass each other because of the relative turning of one as respects the other.

Upon turning of the driving members 22 relative to the driven member 10, the crests of the teeth of serrated face 32 will move up to the crests of the teeth of serrated face 16 and the compression of spring members 36 will be increased. When the crests of the teeth of serrated face 16 pass the crests of the teeth of serrated face 16, there will be a sudden collapse of the

counter pressure resisting the increased spring pressure of spring members 36 resulting in a very substantial audible signal indicating that a preset torque has been attained. This will result whether the turning pressure is in a right-hand direction or in a left-hand direction because of the isosceles angles of the teeth and thus my device is adapted for use in connection with right-hand or left-hand threads or in tightening upon workpieces of internal chucking or external chucking mechanisms.

A headed bolt 18 preferably has a circular head 30, which slidably fits within the second bore 24 and the outer surface of the head 30 is provided with a recess 46' to receive an Allen wrench to turn the headed bolt 18 in either direction for tightening or loosening. The second bore 24 terminates in a seat 26 and a third bore, of lesser diameter and coaxial with the second bore 24, continues through the driving member 22. The bolt 18, having compression spring members 36 stacked thereon, extends through the second and third bores 24 and 28 and thus positions the spring members 36 between two faces, one the underside of bolt head 30 (through bearing 37) and the other, the surface of seat 26. The threaded portion of bolt 18 engages with the first threaded bore 14 in the driven member 10. Handle means 44 are utilized to provide rotary move-member of the driving member 22. The said handle means 44, which connect with the driving member 22, are disposed in a plane which is normal to the axis of the second and third bores 24 and 28 in driving member 22 and said handle means 44 are disposed in planes passing through the third threaded bore in driving member 22. Due to the reduced size of the bore 28, there is more metal at this area and thus greater support for the handle means 44.

Preferably, the spring members 36 are in the form of disc spring washers having a central opening therein to provide for the desired spring tension with a minimum of space requirement in their use. Also, a window 34, having calibrations 35 adjacent thereto, is provided so that a predetermined torque can be visually recorded. The bore 24 is larger than the bore 14 so that the bolt 18, having circular disc springs 36 threaded thereon, may be satisfactorily employed. Set screw means 38 and 40, 42 are employed to respectively limit the travel of the bolt 18 and to secure the said bolt 18 against further turning after an adjusted amount of turning has obtained.

There are two additional threaded bores in the driven member 10, which may be here and in the claims identified as fourth threaded bores. One of these bores receives set screw means 40, 42. Both bores are at an angle to the axis of driven member 10. The bore threadedly supporting set screw means 38 is at an acute angle to such an axis starting at lug 12 and coaxially with the bore of the driven member 10. The bore supporting set screw means, comprising set screw part 40 and sliding pin part 42 is normal to the axis of the first bore in driven member 10. The set screw means 38 provides for limiting the torque setting of the wrench, while the set screw means 40, 42 retains any torque setting which has been made.

Obviously, changes may be made in the forms, dimensions, and arrangements of the parts of my invention, without departing from the principles thereof, the foregoing described structure and advantages and results setting forth only preferred forms of embodiment and mode of operation of my invention.

I claim:

1. A torque wrench comprising a rotatable, driven member having a work-engaging lug disposed at one end portion thereof, an axially aligned threaded first bore in said driven member and extending inwardly from the other end portion thereof, and a serrated first ring face on said other end portion and disposed normal to the axis of said first bore, the teeth of said serrated face having sides of equal length and forming equal angles to planes parallel to the axis of the first bore; a rotatable, driving member having an axially aligned second bore extending inwardly from one end portion of the driving member and terminating in a circular seat disposed normal to the axis of said second bore, and a serrated ring face on the other end portion of the driving member, normal to the axis of said second bore, and mating with the serrations on said first ring face; a headed bolt slidably mounted in the second bore, having a threaded shaft extending into and threadedly engaging the threads in the first bore; compression spring means disposed on said shaft of said bolt and having opposed surfaces providing resilient pressures in opposite directions, one surface thereof resiliently urging against said circular seat of the second bore and the other against the underside of said headed bolt; a calibrated window positioned in the driving member through which indicia on the said headed bolt is visible to permit determination of its relative position in the second bore; and manually engagable means carried by said driving member for rotating the same.

2. A torque wrench comprising a rotatable, driven member having a work-engaging lug disposed at one end portion thereof, an axially aligned threaded first bore in said driven member and extending inwardly from the other end portion thereof, and a serrated first ring face on said other end portion and disposed normal to the axis of said first bore, the teeth of said serrated face having sides of equal length and forming equal angles to planes parallel to the axis of the first bore; a rotatable driving member having an axially aligned second bore extending inwardly from one end portion of the driving member and terminating in a circular seat disposed normal to the axis of said second bore, and a serrated ring face on the other end portion of the driving member, normal to the axis of said second bore, and mating with the serrations on said first ring face; a headed bolt slidably mounted in the second bore, having a threaded shaft extending into and threadedly engaging the threads in the first bore; compression spring means disposed on said shaft of said bolt and having opposed surfaces providing resilient pressures in opposite directions, one surface thereof resiliently urging against said circular seat of the second bore and the other against the underside of said headed bolt; a fourth threaded bore disposed in said driven member, extending at an angle to the axis of said first bore and connecting with said first bore, and a threaded screw threaded into said fourth bore and movable into and out of engagement with the shaft of said headed bolt threaded into said first bore, said angle of said fourth threaded bore being acute to a line which is coaxial with the axis of the first bore and which line starts at the area of the work-engaging lug, and the internal end portion of said threaded screw in said fourth threaded bore is disposed in the path of travel of the advancing end portion of said headed bolt in said first bore so that the threaded screw in said fourth bore functions as an adjustable stop for said threaded, headed bolt in said first bore; and manually engagable means carried by said driving member for rotating the same.

* * * * *