Jan. 24, 1956 R. G. WOODS 2,731,865

PREDETERMINED TORQUE RELEASE SOCKET WRENCH

Filed Feb. 15, 1954

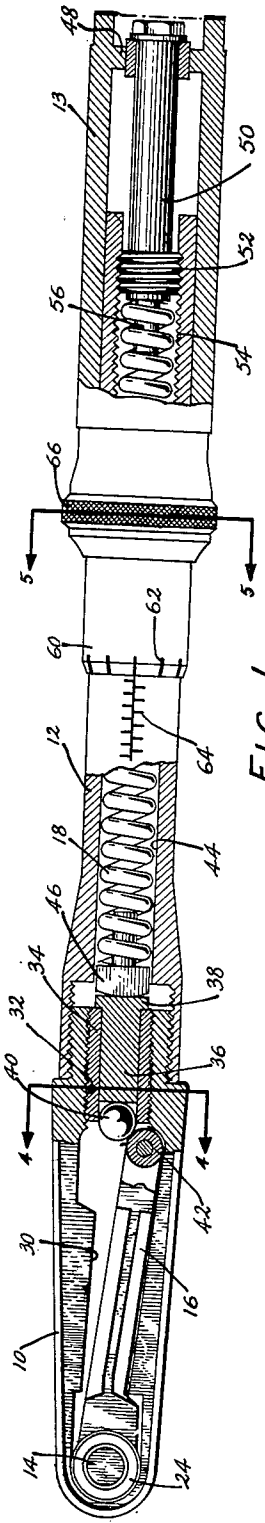


FIG. 1

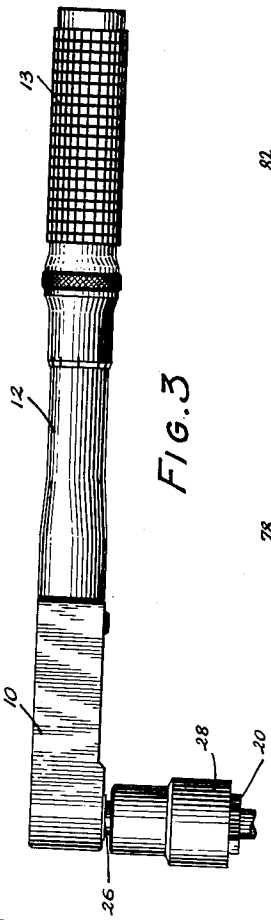


FIG. 3

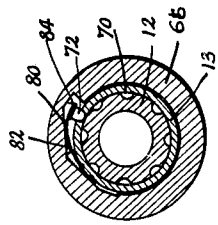


FIG. 6

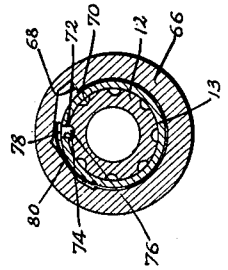


FIG. 5



FIG 7

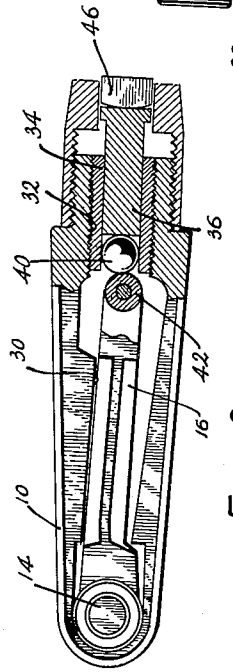


FIG. 2

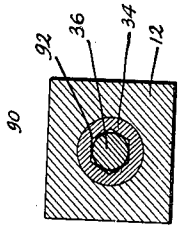


FIG. 4

INVENTOR.
ROBERT GLEN WOODS
BY Francis A. Utecht, Jr.
ATTORNEY.

United States Patent Office

2,731,865

Patented Jan. 24, 1956

2,731,865

PREDETERMINED TORQUE RELEASE SOCKET WRENCH

Robert Glen Woods, Huntington Park, Calif., assignor to Jo-Line Tools Inc., South Gate, Calif., a corporation of Ohio

Application February 15, 1954, Serial No. 410,112

5 Claims. (Cl. 81—52.4)

The present invention relates generally to wrenches and more particularly to an improved form of adjustable torque wrench.

A very large number of adjustable torque wrenches are undergoing daily use in many industries. Generally, these adjustable torque wrenches include a load-engaging member and a spring which resists the movement of the load-engaging member, until a desired amount of torque is applied thereby. The imposition of such torque upon the load-engaging member overcomes the force of the spring and the latter is deformed, thereby permitting a limited movement of the load-engaging member to occur. Such movement provides an indication that a desired amount of torque has been applied to the load.

After a certain amount of usage, it becomes necessary to replace the original spring with a new one. This involves a major difficulty, because of the wide variation in spring rates encountered with commercially available springs. While all springs of a similar commercial classification ostensibly have identical characteristics, as a practical matter this is not true. The spring rates of such springs actually vary widely from one another. Because of such spring rate variation, it is often impossible to satisfactorily effect calibration of the wrench by adjustment of the spring alone.

It is a major object of the present invention to provide an adjustable torque wrench having novel means to compensate for the wide variation in the spring rates of commercially available springs.

Another object is to provide an extremely accurate adjustable torque wrench of compact size and light weight which is economical of construction.

A further object of the invention is to provide an adjustable torque wrench having means for varying the amount of spring force being applied to the load-engaging member that permits the operator to receive an indication of such force by any one of his senses of sight, hearing or touch. Accordingly, the wrench may be utilized even under conditions of darkness.

An additional object is to provide an adjustable torque wrench which is simple of design and rugged of construction whereby it may afford a long and useful service life.

These and other objects and advantages of the present invention will become apparent from the following detailed description of a preferred embodiment thereof, when taken in conjunction with the appended drawing wherein:

Figure 1 is a top view of an adjustable torque wrench embodying the present invention, which view is partly broken away in horizontal section;

Figure 2 is a fragmentary view similar to Figure 1, but showing the parts of the wrench disposed in a different position;

Figure 3 is a reduced side elevational view of said wrench;

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

Figures 5 and 6 are vertical sectional views taken on line 5—5 of Figure 1 and showing the relative movement of the parts thereof as the torque setting of the wrench is being adjusted; and,

Figure 7 is an enlarged view of a detail of Figures 5 and 6.

Referring to the drawings, the preferred form of wrench embodying the present invention broadly comprises a head 10, a tubular lever 12 rigidly extending away from the rear end of the head and having a handhold 13; a load-engaging member 14 pivotally mounted by the front end of the head 10; a generally rearwardly extending arm 16 keyed to the load-engaging member 14; and means (to be fully described hereinafter), including a spring 18 for resiliently resisting counter-clockwise rotation of the free end of the arm 16 as torque is applied to an object, such as a bolt head 20, by the load-engaging member 14. Such torque is applied by moving the handhold 13 in a clockwise direction from its position of Figure 1.

More particularly, referring to Figures 1 and 2, the front end of the head 10 mounts a suitable bearing 24 for supporting a shaft 26. The shaft 26 in turn serves to rigidly couple the load-engaging member 14 and the front of the arm 16. The load-engaging member 14 may take the form of a socket 28 for receiving the head 20 of a bolt or nut, however this member may also take other forms without departing from the scope of the invention. A stop element 30 is formed at one side of the head interior for restraining counter-clockwise movement of the arm 16 beyond its position of Figure 2. The rear of the head 10 is formed with a threaded bore 32 wherein is disposed an externally threaded adjustment bushing 34.

The adjustment bushing 34 slidably encompasses a backing element or plunger 36 that is formed with a cab 38 at its rear end. An abutment member or ball 40 is loosely disposed adjacent the front end of the plunger 36 in contact with a roller 42 carried by the rear of the arm 16. The plunger 36 and ball 40 are constantly resiliently biased toward the roller 42 by the helical compression spring 18. The spring 18 is disposed within an axial bore 44 of the lever 12. A pad element 46 may be interposed between the front of the spring 18 and the rear of the plunger 36.

The handhold 13 is concentrically disposed upon the rear portion of the lever 12 and includes a rear wall 48 that rigidly mounts an axially extending rod 50. The front portion of this rod 50 is of enlarged diameter and is formed with external threads 52 that are engaged with complementary threads 54 formed within the rear portion of the lever bore 44. With this arrangement, rotation of the handhold 13 upon the lever 12 will effect concurrent axial movement of the handhold relative to the lever. The front end of the handhold rod 50 is formed with a boss 56 that supports the rear end of the spring 18. Accordingly, rotation of the handhold upon the lever will effect expansion or contraction of the spring and thereby vary its compressive force.

In operation, the socket 28 is engaged with a load, such as the bolt head 29 and the lever 12 is urged in a clockwise direction from its position of Figure 1. As torque is applied to the bolt head, the shaft 26 and its attached arm 16 tend to rotate in a counter-clockwise direction from their position of Figure 1. This tendency is resisted by the compressive force of the spring 18 acting against the roller 42 by means of the plunger cap 38 and the ball 40. When the resistance of the bolt head against further tightening reaches a certain value, the roller 42 will cam the ball 40 rearwardly and the arm 16 will move in a counter-clockwise position against the stop 30, as shown in Figure 2.

It should be understood that the amount of torque applied to the bolt head 29 before the arm 16 undergoes initial counter-clockwise movement is controlled by the compressive force being exerted by the spring 18 against the rear end of the plunger 36. This compressive force is in turn controlled by the relative positions of the handhold 13 and the lever 12.

In order to provide a visual indication of the relative positions of the handhold 13 and the lever 12, the front of the handhold integrally mounts an index ring 60 having scaler markings 62 adapted to be utilized in conjunction with complementary scaler markings 64 formed on the lever. These markings 62 and 64 may constitute vernier graduations reading in foot-pounds and should be so coordinated with the spring rate of spring 18 and the geometry of the wrench as to provide an indication of the amount of torque being applied by the load-engaging member 14 when the arm 16 begins a counter-clockwise movement. Hence, before a bolt-tightening operation is started, the handhold 13 is rotated upon the lever 12 until the markings 62 and 64 are set at the desired foot-pound reading.

Under certain circumstances, e. g., during a military operation, it may be necessary that the wrench be utilized under conditions of darkness. Accordingl, the preferred form of wrench incorporates means for providing the operator with an indication of the settings of vernier graduations 62 and 64 that may be recognized by either his sense of hearing or of touch. Referring to Figures 5 and 6, a lock ring 66 is journaled by the front portion of the handhold 13 for relative rotation thereon. This lock ring 66 is formed with a pocket 68 that extends radially outwardly from one point on its inner periphery. The portion of the lever 12 underlying the locks ring 66 is formed with a plurality of circumferentially-spaced axially extending grooves 70. These grooves 70 are adapted to receive the inner end of a locking button 72 that is slidably disposed within a bore 74 formed in the handhold 13. As shown in Figure 7, this locking button 72 is generally T-shaped in side elevation, having a generally cylindrical shank 76 and a head 78. The opposite end of the shank 76 is of rounded configuration corresponding to the curvature of the lever grooves 70. A spring finger 80 is retained at one of its ends by the handhold 13. The free end of this spring finger 80 is constantly biased radially outwardly and it is also in constant engagement with the head 78 of the locking button.

When the aforedescribed parts are disposed in their positions of Figure 5, the shank 76 of the locking button 72 will be disposed within one of the lever grooves 70 so as to lock the handhold 13 and lever 12 against relative rotation. The locking button 72 is retained within this lever groove by virtue of the fact that the intermediate portion of the spring finger 80 is in abutment with the shallow portion 82 of the lock ring pocket 68 whereby its free end is held in a radially inwardly disposed position. In order to permit the handhold 13 to rotate relative to the lever, the lock ring 66 is rotated slightly in a counter-clockwise direction from its position of Figure 5 to that of Figure 6 so as to dispose the deep portion 84 of the pocket 68 adjacent the intermediate portion of the spring finger 80. The free end of the spring finger will then flex radially outwardly so as to free the locking button 72 for radially outward movement. Such movement will occur when the handhold is rotated upon the lever; the sides of the lever groove 70 exerting a camming action upon the shank 76. As long as the lock ring 66 remains in its position of Figure 6, the rounded end of the shank 76 will ride upon the outer periphery of the lever 12, dropping into each of the grooves 70 and subsequently rising therefrom. The movement of the locking button into and out of each of these grooves is accompanied by a clearly audible clicking sound, and additionally, it may readily be felt by the operator. Conveniently, the distance between the grooves 70 can be so selected that each click will indicate a definite change in foot-pounds or inch-pounds.

As noted previously hereinbefore, it is necessary to calibrate the wrench for the particular spring 18 being utilized therewith. The present invention contemplates means for effecting such calibration. This means includes the adjustment bushing 34, the plunger 36, the ball 40 and the roller 42.

Referring to Figure 1, it should be noted that the initial point of contact between the ball 40 and the roller 42 controls the amount of force being applied to the ball by the roller during a bolt tightening operation. Thus, assuming that a constant counterclockwise force were to be applied to the arm 16 through the socket 28, and the point of contact between the ball and the roller should be moved to the left in Figure 1, the amount of rightwardly-directed force being applied to the ball by the roller would increase. This results from the fact that the wedging angle between the roller and ball would be reduced as this point of contact moves to the left. Because of such increase, an increased amount of compressive force would have to be exerted by the spring 18 against the plunger cap 38 in order to prevent initial counter-clockwise arm movement. Conversely, if the point of contact between the ball 40 and the roller 42 is moved to the right relative to its original position less compressive spring force would be required in order to prevent such initial arm movement. Accordingly, it will be observed that by varying the position of the point of contact between the roller and the ball, the mechanism may be adjusted to provide the same torque per unit of spring compression regardless of a variation in the spring rate of the particular spring being utilized. The point of contact between the ball 40 and the roller 42 is readily varied by screwing the adjustment bushing toward or away from the roller.

Referring to Figure 4, it should be particularly noted that the adjustment bushing 34 is formed with a polygonal passage 90 for carrying the plunger 36. This affords at least a two point contact between the plunger and the bushing and thereby permits a lower unit loading than if the passage 90 were of circular cross-section. The voids 92 in the passage also permit air to pass between the interior of the head and the lever bore 44 during a torque applying operation without interfering with the lubrication of the plunger and without effecting compression of the air contained within the confines of the lever 12.

From the foregoing description, it will be apparent that there has been provided an effective and useful adjustable torque wrench which may be readily calibrated to different spring rates. It will be further apparent that various modifications and changes may be made with respect to the preferred embodiment of the wrench without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. An adjustable torque wrench, comprising: a head; a load-engaging member pivotally mounted at the front of said head; a lever extending away from the rear of said head; an arm member rigidly secured to said load-engaging member and extending rearwardly therefrom; a roller carried by the free end of said arm; an adjustment bushing carried by the rear of said head and having a passage; a plunger slidably disposed within said passage for movement toward and away from said roller; a ball disposed within the front portion of said passage and at the rear portion of said roller; resilient means for constantly biasing said plunger forwardly toward said roller; and means for adjusting said bushing toward and away from said roller.

2. An adjustable torque wrench, comprising: a head, a load-engaging member pivotally mounted at the front of said head; a lever extending away from the rear of

said head; an arm member rigidly secured to said load-engaging member and extending rearwardly therefrom; a roller carried by the free end of said arm; an adjustment bushing threadedly carried by the rear of said head for movement toward and away from said roller, and said bushing having a passage; a plunger slidably disposed within said passage for movement toward and away from said roller; a cap formed at the rear of said plunger; a ball disposed within the front portion of said passage and interposed between the front of said bushing and the rear portion of said roller; a compression spring interposed between said cap and said lever for constantly biasing said plunger forwardly toward said roller; and means for varying the compressive force of said spring.

3. An adjustable torque wrench, comprising: a head; a load-engaging member pivotally mounted at the front of said head; a lever extending away from the rear of said head; an arm member rigidly secured to said load-engaging member; a backing element for retaining said abutment member in engagement with the free end of said arm, said backing element being movably mounted by said head; a handhold threadedly carried by the rear portion of said lever whereby relative rotation therebetween will effect axial movement of said handhold along said lever; a compression spring interposed between the rear of said backing element and said handhold; a lock ring journaled upon said handhold and having a pocket that includes a shallow and a deep portion; a plurality of circumferentially-spaced axially extending grooves formed in said lever adjacent said lock ring; a bore formed in said handhold underlying said lock ring; a locking button formed with a shank that is slidably disposed in said bore for movement in a radial direction, and a head disposed outwardly of said bore; and a spring finger having one of its ends retained by said handhold and having its other end in contact with the head of said locking button, said spring normally being biased radially outwardly and retaining said locking button in one of said grooves when its intermediate portion is adjacent the shallow portion of said pocket but permitting said locking button to ride through said grooves when its intermediate portion is adjacent the deep portion of said pocket whereby said handhold may be rotated relative to said lever.

4. An adjustable torque wrench, comprising: a head; a load-engaging member pivotally mounted at the front of said head; a lever extending away from the rear of said head; an arm member rigidly secured to said load-engaging member; a roller carried by the end of said arm; an adjustment bushing threadedly carried by the rear of said head whereby it may be adjusted toward and away from said roller; a passage of hexagonal cross-section formed through said bushing; a plunger slidably disposed in said passage for movement toward and away from said roller; a handhold threadedly carried by the rear portion of said lever whereby relative rotation therebetween will effect axial movement of said handhold

along said lever; a compression spring interposed between the rear of said plunger and said handhold; a lock ring journaled upon said handhold and having a pocket that includes a shallow and a deep portion; a plurality of circumferentially-spaced axially extending grooves formed in said lever adjacent said lock ring; a bore formed in said handhold underlying said lock ring; a locking button formed with a shank that is slidably disposed in said bore for movement in a radial direction, and a head disposed outwardly of said bore; and a spring finger having one of its ends retained by said handhold and having its other end in contact with the head of said locking button, said spring normally being biased radially outwardly and retaining said locking button in one of said grooves when its intermediate portion is adjacent the shallow portion of said pocket but permitting said locking button to ride through said grooves when its intermediate portion is adjacent the deep portion of said pocket whereby said handhold may be rotated relative to said lever.

5. In an adjustable torque wrench having a head, a load-engaging member mounted at the front of said head, a lever extending away from said head, a handhold threadedly carried by the rear portion of said lever whereby relative rotation therebetween will effect axial movement of said handhold along said lever, and a spring interposed between said head and said handhold, the combination of: a lock ring journaled upon said handhold and having a pocket that includes a shallow and a deep portion; a plurality of circumferentially-spaced axially extending grooves formed in said lever adjacent said lock ring; a bore formed in said handhold underlying said lock ring; a locking button formed with a shank that is slidably disposed in said bore for movement in a radial direction, and a head disposed outwardly of said bore; and a spring finger having one of its ends retained by said handhold and having its other end in contact with the head of said locking button, said spring normally being biased radially outwardly and retaining said locking button in one of said grooves when its intermediate portion is adjacent the shallow portion of said pocket but permitting said locking button to ride throuhg said grooves when its intermediate portion is adjacent the deep portion of said pocket whereby said handhold may be rotated relative to said lever.

References Cited in the file of this patent

UNITED STATES PATENTS

2,172,561	Kruse	Sept. 12, 1939
2,662,436	Harmes	Dec. 15, 1953
2,667,800	Garwood	Feb. 2, 1954
2,680,982	Poutot	June 15, 1954

FOREIGN PATENTS

109,874	Australia	Feb. 20, 1940
717,570	Germany	Feb. 17, 1942
885,795	France	June 7, 1943