EXTENSIBLE TORQUE BAR

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EXTENSIBLE TORQUE BAR
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Filed Dec. 1, 1958, Ser. No. 777,235
2 Claims. (Cl. 81—177)

This invention relates to a varyingly extensible bar or tool for the transmission of an applied torque, particularly adapted for use in conjunction with pneumatic suppliers of torque. In the use of wrenches and like torque applying tools, it is often necessary or convenient to have a member through which a torque may be transmitted at distance between its source of application and the tool immediately applying it. Since the need for such device may arise from many different situations, it is desirable to have the device of such nature that its length may be varied. The general type of tool is known to persons skilled in the art.

Such an extensible bar must be simply and readily adjustable to a desired length and also must be strongly and rigidly constructed to transmit an applied torque without damage to itself. With the advent of extensive use of mechanical suppliers of torque, particularly of the pneumatic type, many existing torque bars have been found not sufficient to withstand an applied torque without failure, or else have used an extensive system of a complex nature. An object of the instant invention is to provide an extensible torque bar of simple, economical and novel construction.

A further object of this invention is to provide a torque bar which, in relation to its size, will transmit a relatively great torque, particularly of an impact nature, without structural failure.

A further object of this invention is to provide a tool of the aforesaid nature which may be simply and readily extended or contracted to be adapted to a particular use.

A further object of this invention is to provide, in a tool of the aforesaid nature, a locking mechanism which will prevent the extensible rod from coming out of the tool tube.

While the foregoing are the principal objects and purposes of this invention, other and lesser objects will readily be seen from the detailed description thereof which follows.

Reference is now made to the accompanying drawings, wherein like numbers of reference refer to similar parts throughout, and in which:

Figure 1 is a vertical surface view of the invention.

Figure 2 is a central vertical cut-away view of Figure 1 taken on the line 2—2 in the direction indicated by the arrows thereon.

Figure 3a is a partially cut-away vertical cross-sectional view of the locking mechanism of the invention in a locked position, taken on the line 3—3 of Figure 1 in the direction indicated by the arrows thereon.

Figure 3b is a similar partially cut-away vertical cross-sectional view of the locking mechanism of the invention in an unlocked position, again taken on the line 3—3 of Figure 1 in the direction indicated by the arrows thereon.

Figure 4 is a horizontal cross-sectional view of the socket holder taken on the line 4—4 of Figure 1 in the direction indicated by the arrows thereon.

Figure 5 is a horizontal cross-sectional view through the locking mechanism taken on the line 5—5 in the direction indicated by the arrows thereon.

Figure 6 is a horizontal cross-sectional view through the tool body taken on the line 6—6 in the direction indicated by the arrows thereon.

Figure 7 is a horizontal cross-sectional view through the tool body and engaging end of the torque rod taken on the line 7—7 in the direction indicated by the arrows thereon.

In the following description the term "forward" is used to refer to the portion of a member most proximate to the socket holder 20; the term "rearward" to refer to the portion of a member most distant from the socket holder 20; the term "inward" refers to the portion of a member most proximate to the longitudinal axis of the torque rod 18 and the term "outward" to refer to the portion of a member most distant from said axis; these terms are intended to have no other or secondary connotation.

Referring now to the drawings in greater detail, and particularly to Figures 1 and 2, a preferred embodiment of our tool will be seen.

The body or torque tube 10 is a relatively elongate cylinder and has a square channel 17, axially aligned, extending longitudinally therethrough. The shape of the channel 17 is not critical, and any non-circular channel will serve the purpose. We, however, prefer the square channel illustrated because of ease of construction and the resulting relatively great resistance to a shearing torque shown by the torque tube 10. For convenience sake the torque tube 10 is constructed with an equal diameter over its entire length, with knurling 11, 12, 13, 14, at the rearward end to aid in gripping the tube, and with a hole 15 at the same end to provide a means for hanging or applying a torque wrench thereto. The relative size of the tube 10 and the channel 17 therein and the material from which it is constructed must be so regulated as to give the tube 10 sufficient resistance to a shearing torque of the magnitude for which the tool is to be used. The tube 10 may be of any desired length. The hole 15 may be used for insertion of a rod (not shown) to aid in manually applying a torque to the torque tube 10, although a torque is more commonly applied to said tube 10 by some external source (not shown) adapted to be operatively connected to the tube 10 by a fixture inserted within the rearward part of the channel 17. The channel 17 is of such size as to receive the ordinary fixtures of commerce.

A circular ball hole 32, adapted to receive the ball 31, and with a diameter slightly larger than that of the ball 31, is provided in the forward portion of the torque tube 10. The axis of this hole 32 is perpendicular to and passes through two opposite corners of the square chamber of the tube body 10.

The torque rod 18 has a central circular-cross-sectional cylindrical body with a circular collar 19 and square socket holder 20 at its forward end and a square engaging member 21 at its rearward end as illustrated. The collar 19 is somewhat larger than the channel 17 so as to prevent the torque rod 18 from passing in a rearward direction through the channel 17. The socket holder 20, as illustrated, is adapted to receive an ordinary socket wrench of commerce (not shown). As the occasion arises, this member obviously may be adapted to receive various other tools. The cylindrical body of the torque
rod 18 is of such size that its diameter is substantially equal to the length of one of the sides of the square channel 17, so that it is supported by the sides of the channel 17. The square engaging member 21 is of such size as to fit snugly within the channel 17 but yet provide for an easy longitudinal motion therein in response to hand pressure.

The body of the torque rod 18 is provided with a series of spaced depressions 22 of elliptoidal shape, having the longer axis thereof in a direction parallel with that of the axis of the torque rod 18. The spacing of these depressions 22 will regulate the extension of the torque rod 18 as hereafter described and may be such as required in a particular application. The depressions 22 are arranged with the longer elliptoidal axis thereof parallel to the axis of the torque rod 18 and disposed so as to be parallel with one of the corners of the square member 21 and thereby parallel to one of the corners of the channel 17.

The depth and shape of these depressions 22 must be such as will make the top of the ball 31 flush with the outside of the torque tube 10 when the ball 31 is resting in the bottom of the depression 22.

The locking sleeve 24 is a hollow cylindrical member, as illustrated, adapted to slidably fit about the torque tube 10. The outside sleeve 24 is preferably knurled to facilitate gripping and moving by hand. Internally, the locking sleeve 24 has a rearward inwardly projecting rim 28, a ball chamber 26 immediately forward thereof, a medial inwardly projecting ball rim 25 forward thereof, and a forward spring chamber 27. The locking sleeve 24 is slidably supported on the torque tube 10 by the two rings 28, 25, and is restrained in its lateral movement thereon by the split-wire retaining ring 23 which is supported in the groove 16 in the surface of the torque tube 10. This groove 16 is so positioned that the forward edge of the locking sleeve 24 is coincident with the forward edge of the torque tube 10 when the sleeve is in a normal locked position.

The ball chamber 26 is of such width as will accommodate the ball 31 and of a depth sufficient to allow the body of the torque rod 18 to pass beneath the ball 31 when the ball 31 rests against the outer wall of the ball chamber 26.

A cylindrical compression spring 29 is adapted to fit about the torque tube 10 and within the forward spring chamber 27 of the locking sleeve 24. The spring 29 is somewhat longer than the spring chamber 27 but is restrained from moving in a forward direction by the collar 30. This collar 30 is of such dimension as will allow a pressed fit about the forward end of the torque tube 10. The collar 30 extends outwardly therefrom to come into slidable contact with the inside of the spring chamber 27. Thus, the locking sleeve 24 will normally remain in a position illustrated in Figure 3a with the rearward portion against the retainer ring 23, but can be forced forward against the compressive force of the spring 29 to a position illustrated in Figure 3b.

The ball 31 is spherical in shape and of such relative dimension as to allow the movements hereinafter specified for it.

We prefer to construct the various parts of our invention from steel, particularly a tool type steel. The material is not critical, however, and other materials having similar properties would serve the purpose of our invention equally well.

The various parts of our invention may be formed by methods well known to persons skilled in the art of metal forming.

To assemble the various formed parts, the retainer ring 23, locking sleeve 24, spring 29 and collar 30 are placed over the rear portion of the torque rod 18 which is then inserted in the forward end of the torque tube 10 with the depressions 22 of the rod 18 aligned with the ball hole 32 of the body 10; the retaining ring 23 is then slipped over the tube 10 and forced in place in the groove 16; the ball 31 is then placed in the ball hole 32 and the locking sleeve is placed in position over the body 10 and against the retainer ring 23; the spring 29 is next slipped within the spring chamber 27 and compressed so that the collar 30 can then be pressed into position about the torque tube 10 to complete the assembly.

The operation of our tool is best illustrated in Figures 3a and 3b. Figure 3a shows the tool in a normal locked position. In this position the ball 31 rests in one of the depressions 22 and the locking sleeve 24 is maintained against the retaining ring 23 by the compression spring 29. This positions the central ball ring 25 over the ball 31, thus forcing the ball to remain in the depression 22 and thereby preventing any longitudinal movement of the torque rod 18 relative to the torque tube 10.

If it is desired to shorten or lengthen the tool, the locking sleeve 24 is forced forward until the ball chamber 26 is in a position directly over the ball hole 32. This permits the ball 31 to be moved upward and out of the depression 22 thus permitting a movement of the torque rod relative to the torque tube 10. The ball 31 is moved in this fashion merely by holding the locking sleeve 24 forward with one hand while moving the torque rod 18 with the other hand. As the torque rod 18 is moved the ball 31 is forced into the raised position illustrated in Figure 3b by the curving bottom of the depressions 22; this motion is aided by reason of the aforesaid elliptical shape of the depressions 22.

It should also be noted that the torque rod 18 is prevented from coming out of the torque tube 10 by the ball 31, as the square engaging member 21 at the rearward end of the torque rod 18 cannot pass in a forward direction past the ball 31.

Although the foregoing description is necessary of a detailed specific character in order that a specific embodiment of our invention may be set forth, it is to be understood that the specific terminology and structure are not intended to be restrictive or confining, and re-arrangements of parts and modifications of detail may be resorted to without departing from the essence, scope or spirit of the invention herein.

Having thus described our invention, what we desire to protect by Letters Patent and what we claim is:

1. An extensible torque bar of the character described having, in combination, an elongate cylindrical torque tube with a non-circular channel therein and means for applying a torque thereto; an elongate torque rod having at least one portion thereof adapted to mate with the channel of said torque tube, said torque rod being slidable, non-rotatably carried therein, and having a projecting means for attachment of tools, and spaced depressions disposed longitudinally on the surface thereof; a ball movably communicating through said torque tube to the depressions of the torque rod; and a locking sleeve, slidable within predetermined limits, upon said torque tube and over said ball, having a ball ridge and a ball chamber therein, said locking sleeve being spring biased to a position in which said ball ridge constrains said ball in a depression in said torque rod, but manually slideable to a position in which said ball may move into said ball chamber to permit said torque rod to be moved relative to said torque tube.

2. An extensible torque bar of the character described comprising an elongate cylindrical torque tube having an axially aligned non-circular channel therethrough and means of applying the action of torque thereto; an elongate torque rod supported within said torque tube channel having an end portion thereof adapted to mate with the said channel and be slidable non-rotatably carried therein, said rod having a projecting means for attachment of tools and having spaced depressions extending longitudinally on the surface parallel to the axis thereof, adapted to partially receive a ball; a ball movably communicating through said torque tube to said depressions.
sions in the torque rod; and a locking sleeve slidable within predetermined limits upon said torque tube and over said ball, having a ball ridge and a ball chamber therein, said locking sleeve being spring biased to a position in which said ball ridge constrains said ball in a depression in said torque rod, but being manually slid-
able to a position in which said ball moves into said ball chamber in response to longitudinal movement of said torque rod, to permit said torque rod to be longitudi-
nally moved relative to said torque tube while remaining non-rotatably constrained therein.

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