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TORQUE INDICATING TOOL

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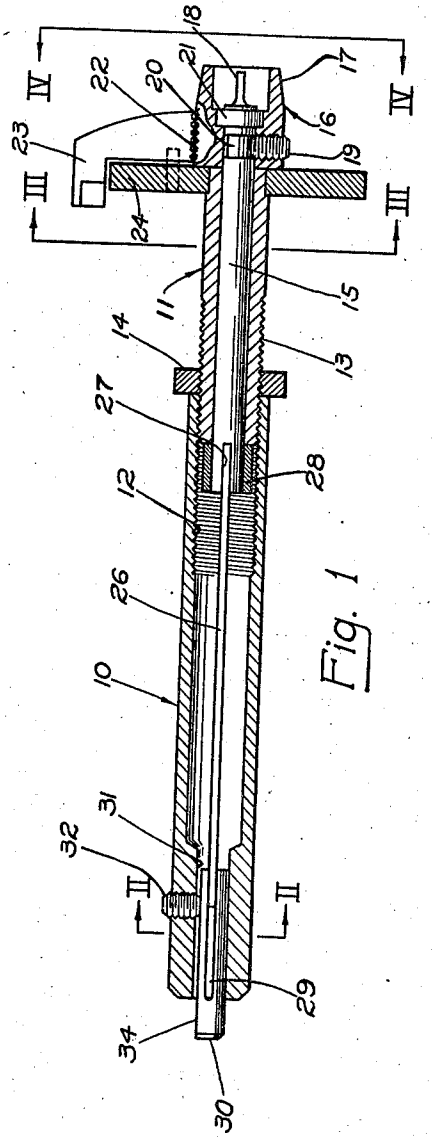


Fig. 1

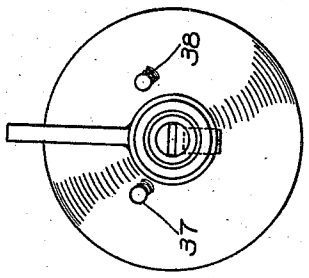


Fig. 4

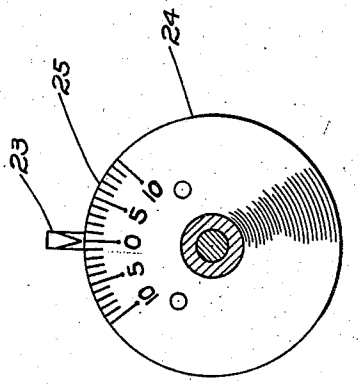


Fig. 3

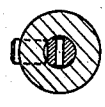


Fig. 2

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TORQUE INDICATING TOOL

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4 Claims. (Cl. 73—139)

This invention relates to tools for applying a known torque to nuts, screws, etc., and is particularly useful in a tool of the screw-driver type in which the handle extends coaxially with the screw or nut being turned.

An object of the invention is to provide a particularly simple, reliable and inexpensive torque indicating tool that is relatively accurate and can be easily adjusted for purpose of calibration.

Other more specific objects and features of the invention will appear from the detailed description to follow of a specific embodiment of the invention as illustrated in the drawing.

Briefly, the present invention comprises a hollow handle having a shaft journaled in its forward end, which shaft carries a screw-driver bit or a wrench on its forward end, the shaft being connected to the handle by a torsion spring extending between the rear end of the shaft and the rear end of the handle so that when torque is applied to the handle, the handle yields with respect to the bit or tool to an extent proportional to the torque that is applied. An indication of the torque is obtained by providing a dial on the forward end of the handle and a pointer connected to the bit or wrench, so that the exact relative movement between the handle and the bit is indicated by the extent of movement of the pointer with respect to the dial.

Tools of this general type are not broadly new, but the present tool incorporates details of construction that improve the efficiency and reliability of the tool, make it easy and inexpensive to manufacture, and provide for ready adjustment for calibration purposes. These details will become apparent from the following description with reference to the drawing, in which:

Fig. 1 is a longitudinal section through a tool in accordance with the invention;

Fig. 2 is a cross-section taken in the plane II—II of Fig. 1;

Fig. 3 is a cross-section taken in the plane III—III of Fig. 1; and

Fig. 4 is an end view taken in the plane IV—IV of Fig. 1.

Referring first to Fig. 1, the tool therein disclosed comprises a hollow handle consisting of a rear section 10 and a forward section 11 which are interconnected by screw threads. Thus the rear handle section 10 is of larger diameter than the front handle section 11 and is internally threaded, as indicated at 12, to engage external threads 13 on the front section. The two sections can be locked together in a desired position of adjustment by means of a lock nut 14.

The front handle section 11 rotatably supports a shaft 15 which extends out of both ends of the handle section 11. There is secured to the front end of the shaft 15 a guard member 16 having on its outer end an annular flange 17 which surrounds a screw-driver bit 18 formed integrally with the shaft 15. The guard 16 can be locked in any desired position of rotation on the shaft 15 by a set screw 19 which engages a groove 20 in the shaft 15. A shoulder 21 is formed integrally on the shaft 15 between the annular groove 20 and the bit 18 for transmitting end thrust from the bit 18 to the guard 16. The rear end of the guard 16 bears against the front end of the front handle section 11 to prevent rearward movement of the shaft 15 with respect to the handle.

Secured to the guard 16, as welding 22, is a pointer 23 which cooperates with a dial 24 secured to the forward end of the front handle section 11. As best shown in Fig. 3, the rear face of the dial 24 bears graduations 25 indicating the position of the pointer 23 with respect to the dial 24.

The rear end of the shaft 15 is connected to the front end of a flat leaf spring 26 which extends longitudinally within the rear handle section 10. The forward end of the spring 26 is slidably fitted in a slot 27 in the rear end of the shaft 15. A collar 28 is press-fitted on the rear end of the shaft 15 surrounding the slot 27 for performing the two functions of: (1) preventing a spreading of the slotted rear end portion of the shaft in response to torque between the shaft and the spring 26; and (2) to act as a thrust bearing on the rear end of the shaft 15 to prevent forward movement of the shaft within the front handle section 11.

The rear end of the spring 26 is adjustably connected to the rear end of the rear handle section 10. Thus the rear end of the spring extends into a slot 29 in a bushing 30 which is slidably fitted in an aperture 31 in the rear end of the rear handle section 10.

The slot 29 is dimensioned to freely slidably receive the leaf spring 26 to permit longitudinal adjustment of the bushing 30 with respect to both the rear handle section 10 and the leaf spring 26. When the bushing has been positioned in a desired longitudinal location, it is securely locked in that position by tightening a set screw 32 which is threaded into the wall of the rear handle section 10. The bushing 30 is provided with one flat side 34 parallel to the slot 29 and the lock screw 32 bears against this flat

side, thereby preventing rotation of the bushing with respect to the handle. When the lock screw 32 is tightened, it not only locks the bushing 30 against either rotational or longitudinal movement with respect to the handle, but it also clamps the rear end of the leaf spring firmly in the slot 29 in the bushing.

The particular tool disclosed in the drawing is intended to measure torque applied in either direction, and to this end the pointer 23 is normally positioned at a mid or zero point on the scale 25. Application of torque in either direction between the handle and the bit 18 angularly displaces the handle with respect to the bit by an amount depending upon the torque applied and the stiffness of the spring 26. The scale 25 may be calibrated to read the torque in any well known units, such as inch-pounds, inch-ounces, foot-pounds, etc.

The instrument can be calibrated in either one of two ways, both of which involve changing the effective length of the leaf spring 26 between the inner end of the bushing 30 and the rear end of the shaft 15. If the effective length of the spring 26 is reduced, its stiffness is increased and vice-versa.

One method of adjustment is to loosen the set screw 32 and slide the bushing 30 either forwardly thereby shortening the effective length of the spring 26, or rearwarly, to lengthen it, and then re-tighten the lock screw 32 to hold the bushing in the new position of adjustment.

Another method is to change the relative positions of the handle sections 10 and 11 by relatively rotating them. Obviously, this is done by first loosening the lock nut 14 and then rotating the rear handle section 10 relative to the front handle section 11. Obviously the handle 10 must be rotated through one or more revolutions during each adjustment in order to normally dispose the pointer 23 opposite the zero mark on the scale 25. This method is, therefore, best suited for coarse ajustments of the calibration. A fine adjustment can then be had by shifting the bushing 30.

The tool is very easily assembled from its component parts as follows: first, the guard 16 is slipped into place on the shaft 15 over the rear end of the shaft until the collar abuts against the shoulder 21, whereupon the set screw 19 is screwed in until it engages in the groove 20 to retain the guard 16 in place. The shaft 15 is then inserted into the front handle section 11, after which the front end of the leaf spring 26 is inserted in the slot 27. Next the collar 28 is pressed onto the rear end of the shaft 15, thereby completing the assembly of the shaft 15 and its associated elements with respect to the front handle section 11.

Prior to the assembly of the shaft 15 in the front handle section 11, the dial 24 is pressed onto the front end of the handle section 11. Assembly is then completed by slipping the bushing 30 onto the rear end of the leaf spring 26 and thereafter screwing the rear handle section 10 onto the front handle section 11.

A pair of stop pins 37 and 38 may be provided on the dial 24, projecting from the forward face of the dial for contacting the pointer 23 and limiting movement of the pointer. This enables the application of torques greater than those the tool is adapted to measure, without damaging the spring 26.

It is to be understood that the flange 17 surrounding the screw-driver bit 18 may be eliminated, if it is so desired, or the bit 18 may be eliminated, and a wrench socket formed either in the guard 16 or on the forward end of the shaft 15, if the tool is to be used with nuts or bolts instead of with screws.

Various modifications can be made in the exact structure shown and described without departing from the invention, which is to be limited only to the extent set forth in the appended claims.

I claim:

1. A tool of the type described comprising: a hollow handle; a shaft rotatably supported in the forward end of said handle and projecting therebeyond; work-engaging means on the forward end of said shaft for engaging a rotatable workpiece coaxial with said shaft; cooperating pointer and dial elements, one secured to the forward end of said handle and the other secured to the projecting portion of said shaft for indicating an angular displacement between said elements; a torsion spring extending longitudinally within said handle and connected at its forward end to the rear end of said shaft for rotation therewith; a coupling element adjustably longitudinally slidable with respect to the rear end of said torsion spring and the rear end of said handle; and a single locking means for locking said coupling element rigidly to both said handle and said torsion spring.

2. A tool as described in claim 1 in which said coupling element comprises a slotted bushing slidably fitted in the rear end of said handle and said torsion spring comprises a flat spring, the slot in said bushing being dimensioned to slidably receive the rear end of said flat spring, and a set screw in said handle adapted to bear against said bushing and compress it into tight engagement with said spring.

3. A tool of the type described comprising: a hollow handle; a shaft rotatably supported in the forward end of said handle and projecting therebeyond; work-engaging means on the forward end of said shaft for engaging a rotatable workpiece coaxial with said shaft; cooperating pointer and dial elements, one secured to the forward end of said handle and the other secured to the projecting portion of said shaft for indicating an angular displacement between said elements; a torsion spring extending longitudinally within said handle and connected at its forward end to the rear end of said shaft for rotation therewith; means for connecting the rear end of said torsion spring to said handle for rotation therewith, said handle comprising a front section in which said shaft is journaled and a rear section of larger diameter to which the rear end of said torsion spring is connected, said sections being adjustably interconnected by external screw threads on said front section engaging internal screw threads in said rear section; and means for locking said sections against relative movement.

4. A tool of the type described comprising: a hollow handle; a shaft rotatably supported in the forward end of said handle and projecting therebeyond; work-engaging means on the forward end of said shaft for engaging a rotatable workpiece coaxial with said shaft; cooperating pointer and dial elements, one secured to the forward end of said handle and the other secured to the projecting portion of said shaft for indicating an angular displacement between said elements; a torsion spring extending longitudinally within said handle and connected at its forward end to the rear end of said shaft for rotation therewith; means for connecting the rear end of said torsion

spring to said handle for rotation therewith, said handle comprising a front section in which said shaft is journaled, and a rear section of larger diameter to which the rear end of said torsion spring is connected, said sections being detachably interconnected with each other; stop means on the front end of said shaft bearing against the front end of said front section; and a collar press-fitted on the rear end of said shaft and bearing against the rear end of said front section for supporting said shaft against longitudinal movement in said front section.

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