May 23, 1939. A. I. DUNN 2,159,354

TORQUE WRENCH

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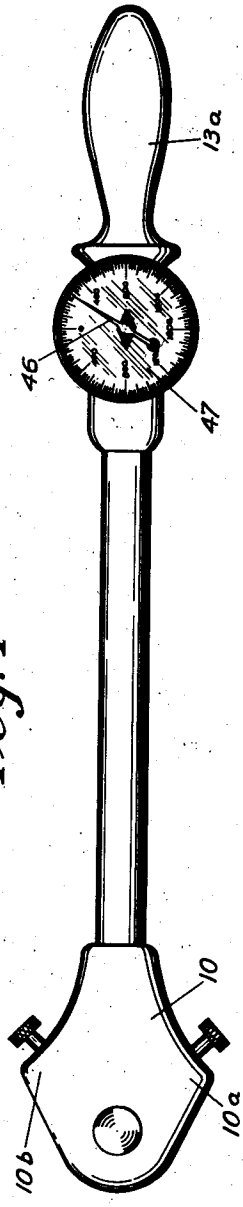


Fig. 1

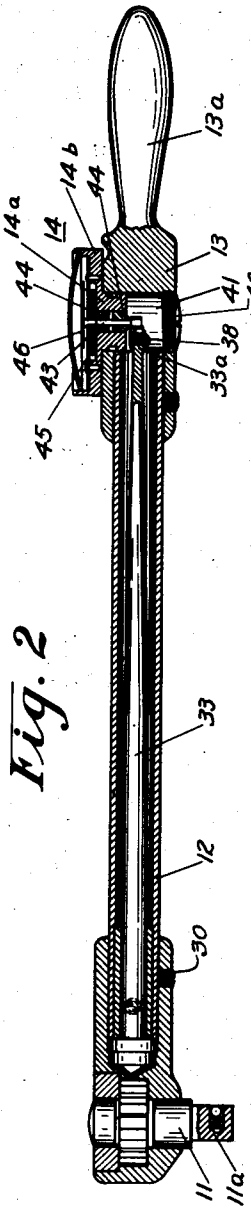


Fig. 2

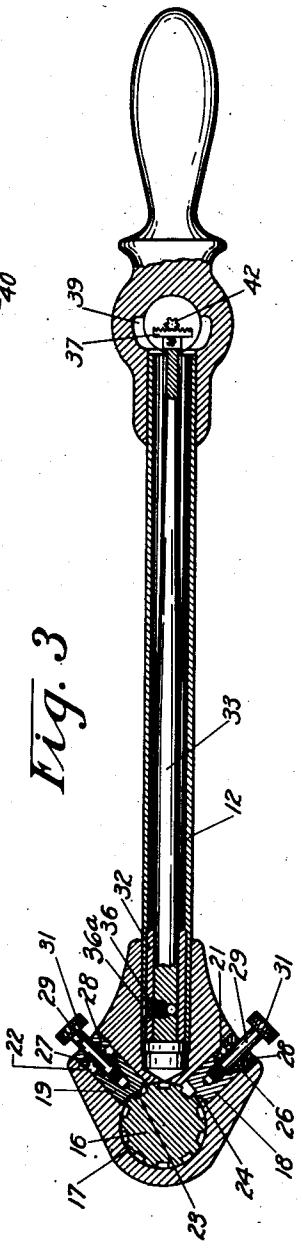


Fig. 3

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5 Claims. (Cl. 265—1)

This invention relates to wrenches, and more particularly to a wrench for indicating the amount of force or torque applied to the handle in rotating or attempting to rotate a nut or the like engaged by the wrench.

This application is a continuation in part of my application Serial No. 136,048, filed April 10, 1937.

It has been found, for instance, in the tightening of nuts on cylinder heads of internal combustion engines, or in assembling precision devices such as air-craft engines and the like, that it is very desirable to tighten the nuts and bolts of such devices to certain known degrees.

It is a general object of my invention to provide a mechanical torque measuring wrench in which deformation of the parts of the wrench is employed in indicating the torque applied to the wrench.

It is also an object of my invention to provide a wrench of the above character in which the parts are protected from mechanical injury.

Another object of my invention is to provide a torque indicating wrench of extremely simple construction and in which there is a minimum of friction.

Another object of my invention is to provide a torque indicating wrench of increased accuracy over devices known to the prior art.

Another object of my invention is to provide a torque indicating wrench in which the operator, in using the wrench, grips the wrench at one point only so that the readings are always accurate and correct.

Another object of my invention is to provide a torque indicating wrench in which the torque measuring instrument is located in a position where it is out of the way when engaging the work and where it is protected from mechanical injury.

Other and further features and objects of the invention will be more apparent to those skilled in the art upon a consideration of the accompanying drawing and following specification, wherein is disclosed a single exemplary embodiment of the invention, with the understanding, however, that such changes may be made therein as fall within the scope of the appended claims, without departing from the spirit of the invention.

In the drawing:

Figure 1 is a plan view of a wrench constructed according to a preferred embodiment of my invention.

Figure 2 is a view in vertical section through the wrench shown in Figure 1, and

Figure 3 is a view in horizontal section through the wrench shown in Figure 1.

A device constructed according to a preferred embodiment of my invention includes a head 10, in which a ratchet shaft or socket shaft 11 is received, and this head serves also as a means for receiving a hollow handle 12 at right angles to the socket handle shaft 11. The opposite end of the handle 12 is received in an indicator base 13. A grip 13a comprises an extension of the indicator base 13 and an indicator 14 is received in the indicator base 13.

In the form of the device here shown, I have incorporated a ratchet mechanism in the head 10. This ratchet mechanism includes a ratchet wheel 16 having square teeth 17. The pawls 18 and 19 are received in bores 21 and 22 which are formed in outwardly flared portions 10a and 10b of the head 10. These pawls are so arranged that when one of the pawls is in engagement with a tooth as indicated at 23, the other pawl 24 is riding on top of the tooth. Thus, half steps of ratcheting are secured.

The pawls 18 and 19 are biased inwardly by means of springs 26 and 27 which bear against the pawls 18 and 19 and against caps 28 received in the cylindrical bores 21 and 22. Pins 29, having knurled heads 31, have a threaded engagement with the pawls 18 and 19 and the pawls may be rotated by means of these knurled heads 31 so that the ratchet wheel 16 may be rotated in either direction as desired by oscillating the handle 12 or may be locked with reference to the head 10. A squared end 11a is provided on the end of the ratchet shaft 11 to engage sockets in accordance with the usual practice.

A split sleeve 32 is received within the handle 12 within the head 10 and this split sleeve is anchored to the large end of a tapered shaft 33, this shaft 33 being of course, located within the hollow handle 12. The shaft is tapered so that a maximum of clearance between the shaft and handle is afforded at the free end of the shaft. The hollow handle 12 is made of resilient material, as will hereinafter appear. One locking means for locking the split sleeve 32 with reference to the shaft 33 is a set screw and ball indicated at 36.

When the set screw 36 in the head 10 is screwed tightly into place against the hollow handle 12 it not only holds that member in place but deforms it enough to grip and hold rigidly the split sleeve 32 and the shaft 33.

The outer end of the tapered shaft 33 is provided with a split enlarged end 33a adapted for receiving the gear rack 37, the gear rack being secured in place by means of the machine screw 38. The gear rack is located within an enlarged chamber 39 within the indicator base 13 and access to the chamber 39 may be had through the transverse bore 41 which passes through the indicator base 13. The bore 41 may be closed by the threaded plug 40.

A movable cylindrical portion 14a of the indicator 14 is received within the bore 41 and is held in place by a ball and spring inserted through the base 13 and abutting against the cylindrical portion 14a. The spring tension may be changed by means of a screw which holds the spring and ball in place, thus allowing the indicator to be set at zero, all in accordance with the usual practice. The shell 14b of the indicator abuts against the outer face of the base 13. The gear rack 37 engages a pinion 42 located on the pinion shaft 43 and the pinion shaft 43 is rotatably mounted in bearings 44. An indicator needle 46 is secured to the outer end of the shaft 44 and of course rotates over the dial 47 in accordance with movement of the free end of the shaft 33 with reference to the indicator base 13. A hair spring 45 is provided to take up any lost motion or backlash between the pinion 42 and rack 37.

It may readily be understood that if the socket handle 11a is engaged on a socket and the socket engaged to a nut, bolt or the like and pressure applied to the handle 13a, the flexible handle 12 will move with reference to the shaft 33. If the direction of the force applied is at right angles to the axis of the socket handle 11, the relative movement of the handle 33 with reference to the shaft will cause the gear rack 37 to rotate the pinion 42 to cause movement of the indicator needle 46 over the dial 47.

The grip 13a is so formed and arranged that it constitutes the handiest place for the operator to grasp the wrench in tightening or loosening a nut. In calibrating the dial 47, the distance from the central portion of the grip 13a to the center line of the socket handle 11 may be considered the lever arm for rotating the handle. The dial may then be calibrated with markings corresponding to the number of inch-pounds applied at the grip 13a, the number of inches being considered as the distance from the center of the grip to the axis of the handle 11. Obviously the dial may be calibrated in any suitable manner as in inch-pounds, foot-pounds, centimeter-grams or any other units of measurement.

Although I have described a specific embodiment of my invention, it is apparent that modifications thereof may be made by those skilled in the art. Such modifications may be made without departing from the spirit and scope of my invention as set forth in the appended claims.

I claim as my invention:

1. In a torque indicating wrench, a head, a socket post engaged by the head, a hollow flexible handle fixed to the head, a shaft within the handle and rigidly engaged within the head, a grip member fixed on said handle, an indicating device mounted within the grip member, the shaft being coextensive with the handle, and means operatively engaging the free end of the shaft to the indicating means for driving the indicating means.

2. In a torque indicating wrench, a head, a flexible hollow handle fixed to the head, a grip member having an opening transversely therethrough, the grip member being fixed to the handle, an indicating device mounted within the opening, a shaft coextensive with the handle and located within the handle, means for rigidly engaging the shaft at the head end of the wrench and a rack and pinion for driving the indicating device from the free end of the shaft.

3. In a torque indicating wrench, a head, a flexible hollow handle secured within the head, a grip member at the other end of the hollow handle, an indicating means mounted within the grip member, a shaft coextensive with the handle and secured within the handle and head, and means for operatively connecting the indicating means with the free end of the shaft.

4. In a torque indicating wrench, a head, a nut engaging means on the head, a flexible hollow handle engaged to the head, a sleeve within the hollow handle and the head, a shaft engaged within the sleeve, a grip member mounted on the opposite end of the hollow handle from the head, an indicating means mounted within the grip member, and a rack and gear for driving the indicating means from the free end of the shaft.

5. In a torque indicating wrench, a head, a flexible hollow handle member fixed to the head, an instrument base on the flexible handle member opposite to the head, a shaft rigidly engaged within the head and extending through the handle, an indicating means mounted in the instrument base, and geared means for transmitting relative movement between the free ends of the shaft and handle to the indicating means to indicate the relative degree of such movement.

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