

June 1, 1948.

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2,442,359

SIGNAL TYPE TORQUE INDICATING WRENCH

Filed July 8, 1944

FIG. 1

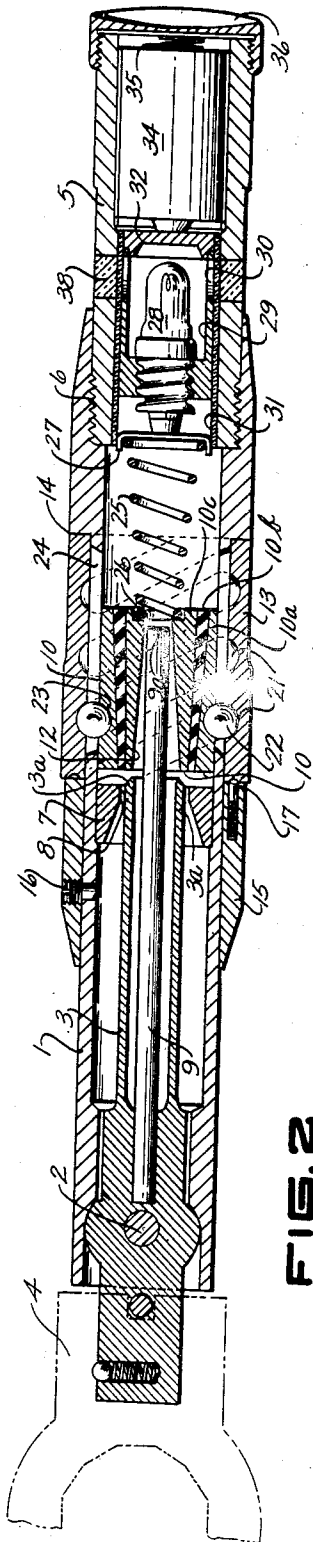
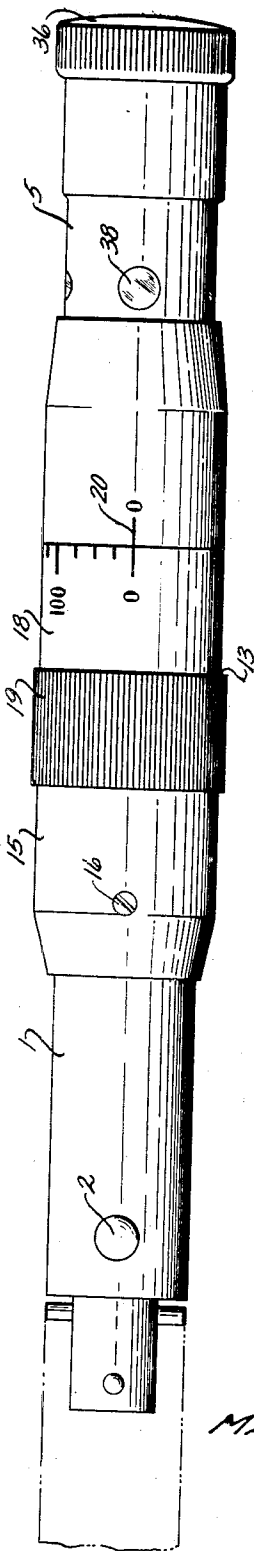


FIG. 2



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2,442,359

SIGNAL TYPE TORQUE INDICATING WRENCH

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Application July 8, 1944, Serial No. 544,128.

8 Claims. (Cl. 81—52.5)

(Granted under the act of March 3, 1883, as
amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to improvements in torque indicating wrenches of the type disclosed in my copending application Serial No. 544,127, filed July 8, 1944, wherein a signal means is incorporated responsive to flexure of an element of the wrench under a predetermined applied torque load.

Torque indicating wrenches are per se old in the art and in one form of construction of which I am aware, the point at which the indicating mechanism becomes operative to indicate the applied torque is adjusted by varying the effective length of a flexure or beam member which transmits the torque from a handle to a work head. This form of construction is satisfactory where the torque range is small but requires an excessive length of wrench where the torque range is large, such as is encountered in the aircraft field.

In my copending application, torque indicating wrenches are disclosed in which the operating point of the torque indicating signal system is changed as desired by initial variation of the spacing of electrical controlling contacts, rather than by varying the length of the flexure member, a lost motion travel of the handle relative to the flexure member being employed to vary the spacing.

In accordance with the present invention, the point of indication of the applied torque may be predetermined within a large torque range primarily by adjusting the relative spacing of electrical contacts in the indicator mechanism prior to torque applying movement of the handle member, the lost motion thereof being eliminated.

Other features of the invention will become apparent from the detailed description herein. Such features form part of the copending application hereinabove mentioned and, accordingly, will not be claimed in this application.

In the drawings:

Figure 1 is a longitudinal cross section of the wrench; and

Figure 2 is an exterior view thereof.

Referring to the figures of the drawing, 1 is a cylindrical wrench body having pivotally mounted at 2 therein a generally tubular flexure element 3 which extends outwardly of the body 1 and is adapted for attachment to a suitable work head 4. A handle 5 is secured to body 1 as by threads 6.

A stress applying ring 7 is permanently secured within the interior of body member 1 as by

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a force bit. The free end 3a of flexure element 3 is disposed with slight clearance or a sliding fit through the throat 8 of the stress applying ring 7 whereby torque stresses applied to handle 5 are transmitted to flexure element 3. A contact rod 9 is rigidly supported within flexure element 3, concentrically spaced therein, and extending beyond the tubular portion thereof and having a free end 9a extending into a sleeve 10. Sleeve 10 is supported within body 1 for reciprocal movement relative to the free end 9a of contact rod 9 and is a composite of three relatively secured sleeves 10a, 10b and 10c. Sleeve 10a is provided with an external peripheral groove 23; sleeve 10b is composed of an insulating material; and sleeve 10c is provided with an internal tapered surface 12. The free end 9a of contact rod 9 may be considered as stationary relative to the torque axis of the work head 4 whereby movement of the handle 5 in a torque applying direction causes flexure of flexure element 3 while bringing the tapered surface 12 into engagement with the free end 9a of contact rod 9 for a purpose to be described. Obviously, the relation holds true although the wrench as a whole may be rotating about the torque axis of work head 4. The reciprocal movement of sleeve 10 is obtained by rotary adjustment of a sleeve 13 supported on body 1 between shoulder 14 thereon and a collar 15 secured to body 1 as by a screw 16. A ratchet coaction indicated generally at 17 is provided between abutting edges of sleeve 13 and collar 15 for the purpose of securing sleeve 13 at any desired angular position. A scale 18 calibrated in torque units and a knurled surface 19 are provided on the exterior of the sleeve 13. An index mark 20 on body 1 coacts with the scale 18 for convenience in setting the wrench to signal at a desired applied torque. Sleeve 13 is provided with an internal spiral groove 21, coacting with spherical bearings 22 rotatably secured in the peripheral groove 23 provided externally on sleeve 10a. Spherical bearings 22 are maintained in a diametrically opposed relationship by longitudinal slots 24 cut through the wall of body 1. It will be appreciated that rotation of sleeve 13 produces, by virtue of spiral groove 21, a longitudinal thrust on spherical bearings 22, the thrust being transmitted therethrough to sleeve 10 by means of peripheral groove 23 whereby said sleeve 10 can be reciprocated in a direction depending upon the direction of rotation of sleeve 13.

A spring 25 is compressively stressed between a recess 26 in the outer face of sleeve 10c and a cup

27 in electrical contact with the center terminal of a signal lamp 28. Signal lamp 28 is threadably secured within a housing 29 having ports 30 and being slidably disposed within a colored, translucent plastic sleeve 31.

Sleeve 31 may be permanently secured within handle 5, if desired. A cap 32 abuts the outer extremity of the housing 29 and electrically contacts the center electrode of a dry cell 34. The negative casing electrode of dry cell 34 is grounded through a spring 35 and an end cap 36. The positive center electrode of dry cell 34 is electrically insulated from ground by means of insulating sleeve 10b and sleeve 31. It will be apparent from the foregoing that a relative angular movement between the contact rod 9 and sleeve 10, whereby a contact is produced between the free end 9a and the tapered surface 12 of sleeve 10c will complete a circuit lighting the signal lamp 28, the current assumedly starting at the positive center terminal of battery 34, and passing, respectively, through cap 32, housing 29, signal lamp 28, cup 27, spring 25, sleeve 10c, contact rod 9, flexure member 3, body 1, handle 5, end cap 36, and spring 35, to the negative casing terminal of battery 34. Rays from signal lamp 28 are visible to an operator through ports 30, sleeve 31, and ports 38 provided in handle 5.

In operation, sleeve 10 is reciprocated by rotation of sleeve 13 to some position wherein the free end 9a of contact rod 9 has a particular concentric spacing relative to some adjacent portion of the tapered surface 12 within sleeve 10c, the specific radial distance depending on the degree of rotation of sleeve 13 as determined by indicium of the scale 18. As the handle 5 has torque force applied thereto, the throat 8 of stress applying ring 7 will be brought into abutment with the free end 3a of the flexure member 3 by virtue of the pivotal relationship provided at 2 between body 1 and flexure element 3. The torque stress is thus transmitted to flexure element 3 causing deflection thereof, contact rod 9 being relatively inflexible and sufficiently spaced from the surrounding internal bore of flexure member 3 as not to be affected by said deflection.

With the flexing of flexure element 3, a simultaneous decreasing of the distance between the free end 9a of contact rod 9 and an adjacent portion of the tapered surface 12 of sleeve 10c occurs, ultimately producing electrical contact therebetween, whereby a circuit will be completed through lamp 28, the illumination thereof being visible to the operator, all as heretofore described.

It will be evident from consideration of the structure that the position shown for sleeve 10 in Figure 1 corresponds to a low torque, since a relatively small deflection of flexure element 3 will occur prior to the occurrence of an electrical contact between the free end 9a of contact rod 9 and an adjacent portion of the surrounding tapered surface 12 provided in sleeve 10c. Conversely, when sleeve 10 is at the extreme right-hand position, as related to the view shown on Figure 1, the concentric spacing between free end 9a and an adjacent portion of the tapered surface 12 will be relatively large whereby a greater deflection of flexure element 3 will be required to produce electrical contact, corresponding to a high torque. Accordingly, the degree of flexure of the flexure element 3 is determined by the position of sleeve 10 relative to the free end 9a for the purpose of realizing a signal at a desired

torque within the upper and lower limits of the torque range.

Having thus disclosed my invention, what I claim as new and desire to protect by United States Letters Patent is:

1. In a torque indicating wrench, a handle member for applying a torque force, a flexure member for transmitting said torque to a work head and adapted for flexure under torque load, a pivotal relationship provided between said members, torque predetermining means for energizing a signal in response to application of a predetermined torque comprising initially spaceable elements wherein a first element is substantially secured against motion relative to said work head when torque is applied thereto and comprises a rod having a free end, a second element comprising an internally tapered sleeve encompassing said free end and being axially adjustable relative thereto whereby an initial concentric spacing is provided therebetween, said internally tapered sleeve being angularly movable relative to said free end in response to torque applying motion of said handle member, contact between said free end and the surface of the internal taper of said sleeve being operative to energize said signal, whereby energization thereof is responsive to a degree of torque force proportional to a degree of flexure of said flexure member as predetermined by the initial concentric spacing provided by axial adjustment between said free end and said internally tapered sleeve.

2. A torque indicating wrench comprising a handle member having a cylindrical handle portion secured to a cylindrical body portion, a generally tubular flexure member within said body portion pivotally related thereto and having a protruding end adapted for attachment to a work head, torque predetermining means comprising a contact rod secured to said flexure member and having a free end extending therefrom, an internally tapered sleeve within said handle member and axially adjustable relative to said free end, said free end protruding into the internal taper thereof whereby a concentric variable spaced relationship is provided, said internally tapered sleeve being disposed for angular movement with said handle portion relative to said free end whereby contact between said free end and the surface of said internal taper occurs in response to torque applying motion of said handle member and is operative to energize a signal, the degree of said motion being predetermined by the initial concentric spacing provided between said free end and said internal surface and corresponding to a predetermined torque.

3. In a torque indicating wrench, a handle member for applying a torque and a flexure member connected thereto for transmitting said torque to a work head, torque predetermining means for energizing a signal in response to application of a predetermined torque including a pair of contact elements disposed for relative motion to effect engagement therebetween in response to torque applying movement of said handle member, means whereby one of said elements is held substantially stationary relative to said work head during torque applied movement thereof and means whereby the other of said elements is movable with said handle member during torque applying movement thereof, one of said elements having a tapered contact surface, means for adjusting said elements relative to each other so as to provide an initial spacing therebetween by virtue of an approach or reces-

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sion of said tapered surface relative to the other element as determined by the gradation of taper and the direction and degree of adjustment, the arrangement being such that engagement between said elements occurs at predeterminable points on said tapered surface, whereby the torque transmitted through said flexure member is manifested by energization of said signal upon occurrence of contact between said elements.

4. In a torque indicating wrench as set forth in claim 3, wherein one of said elements comprises a rod having a free end and the other of said elements comprises a sleeve slidably disposed relative to said free end and having an internally tapered bore encompassing said free end whereby an initial concentric spacing therebetween is provided by relative axial motion between said elements.

5. In a torque indicating wrench as set forth in claim 3, wherein said flexure member has a relatively inflexible portion at the point of pivotal relationship with said body member, and said contact rod is secured at one end thereof to said relatively inflexible portion and is disposed internally of said flexure member in concentric spaced relation thereto.

6. A torque indicating wrench comprising, a handle member having a relatively movable work head attached thereto, a flexure member of tubular form attached to said work head, spaced abutment means on said handle member engageable with said flexure member to transmit torque from the handle member to the work head, signal actuating means including an electrical circuit closing element secured to said work head and extending axially through the tubular flexure member, an electrical contact element secured to and adjustable longitudinally of said handle member for engagement by said circuit closing element, and the contact face of said contact element being of tapered form for adjustment of the spacing between said elements in the no-load condition of said flexure member.

7. A wrench structure as recited in claim 6, wherein the electrical contact element secured to and adjustable longitudinally of said handle

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member comprises a sleeve slidable in a recess within said handle member and said sleeve being adjustable by means of a rotatable sleeve surrounding a portion of said handle member, together with means to convert the rotatable movement of said rotatable sleeve to a sliding movement of said slidable sleeve.

8. A torque indicating wrench comprising, a handle member having a relatively movable work head attached thereto, a flexure member attached to said work head, spaced abutment means on said handle member engageable with said flexure member to transmit torque from the handle member to the work head, signal actuating means including an electrical circuit closing element secured to said work head, an electrical contact sleeve having a conical inner face adapted to be contacted by said circuit closing element to close an electrical signal circuit, said sleeve being slidably mounted in a recess within said handle member, a rotatable sleeve surrounding a portion of said handle member, means to convert the rotatable movement of said rotatable sleeve to a sliding movement of said slidably mounted sleeve, and means on said rotatable sleeve and said handle to gauge the relative positions of each of said sleeves with respect to said handle member.

MARK HATTAN.

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