

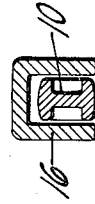
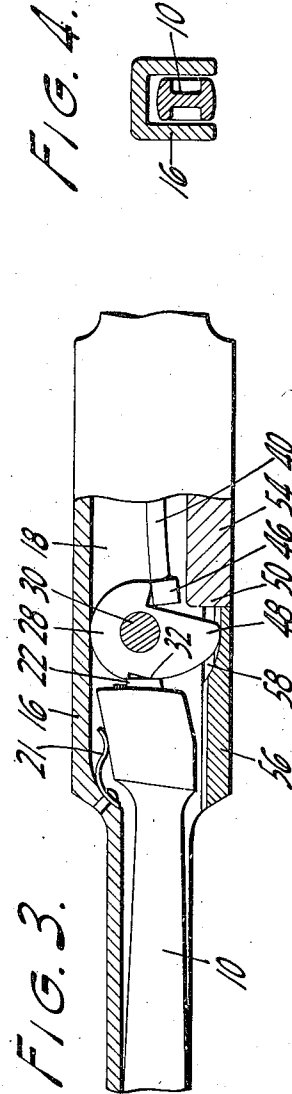
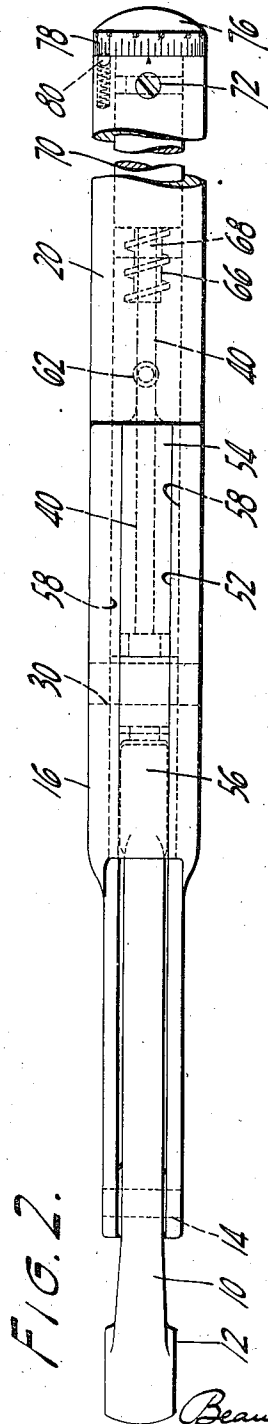
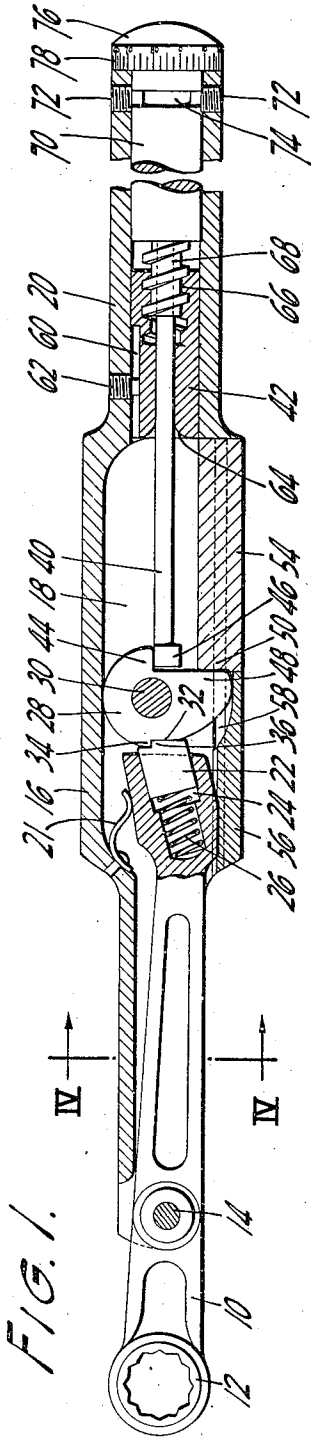
Nov. 3, 1942.

T. A. COONEY

2,300,652

TORQUE WRENCH

Filed April 25, 1942



INVENTOR
Thomas A. Cooney
BY
Bean, Brooks, Buckley & Bean.
ATTORNEYS

UNITED STATES PATENT OFFICE

2,300,652

TORQUE WRENCH

Thomas A. Cooney, Buffalo, N. Y.

Application April 25, 1942, Serial No. 440,487

7 Claims. (Cl. 81-53)

This invention relates to wrenches, and more particularly to improvements in torque indicating wrenches designed to signal to the operator thereof attainment of a predetermined load upon screws, nuts, studs, and the like.

One of the objects of the present invention is to provide an improved torque wrench which is adapted to signal the operator thereof whenever the wrench-delivered torque equals a predetermined order. Another object of the present invention is to provide an improved wrench of the character described which is adapted to continue to function as a rigid wrench subsequent to exceeding the load recorded by the signal mechanism. Another object of the invention is to provide an improved wrench of the character described which is adapted to operate in reverse direction with unimpaired facility. Another object of the present invention is to provide a wrench of the character described incorporating an improved adjustment mechanism for regulating the signalling action thereof. Another object of the present invention is to provide a wrench of the character described wherein the structural elements thereof are of simple and rugged form and of such design as to be easily and economically manufactured and assembled into the complete wrench and/or disassembled for parts repair or replacement with improved facility. Other objects and advantages of the invention will appear from the specification hereinafter.

In the drawing:

Fig. 1 is a longitudinal section through a wrench of the invention;

Fig. 2 is a side elevation of the wrench of Fig. 1;

Fig. 3 is a fragmentary section similar to Fig. 1 showing the signalling mechanism of the wrench in a condition next preceding a signalling operation thereof; and

Fig. 4 is a section taken along line IV-IV of Fig. 1.

The drawing illustrates the invention in conjunction with a wrench bar 10 carrying a box type wrench head indicated at 12. It will be understood that the wrench head carried by the bar 10 may be of any desired form, such as any other type of box wrench, or open end wrench, or ratchet head, or the like. Thus, it will be appreciated that the wrench 10 may be provided of any required form and dimension.

The wrench bar 10 is pivotally mounted by means of a pin and bearing connection 14 upon one end of the wrench body member 16. The body 16 is a generally tubular member having an enlarged signal mechanism chamber portion 18

intermediately of its ends and an operator grip or handle portion 20 at the end thereof opposite to the wrench bar carrying end. The wrench bar 10 extends beyond the pivot connection 14 into the wrench body 16, and a leaf spring 21 extends from one side of the wrench body to normally bias the inner end of the wrench bar toward the opposite side of the wrench body as illustrated in Fig. 1.

The wrench bar carries at its inner end portion a pawl 22. The pawl 22 is slidably mounted within a recessed portion 24 of the wrench bar, and a compression spring 26 is disposed behind the pawl so as to resiliently urge the latter to move outwardly to bear against a cam 28 which is rotatably mounted within the wrench body by means of a transverse pivot pin 30. The cam 28 is provided with a recessed surface portion 32 contiguous to an outstanding shoulder 34; and the pawl 22 is provided with an outwardly extending abutment portion 36 which is adapted to normally engage beneath the shoulder 34 of the cam when the parts are in the relative positions illustrated by Fig. 1.

A cam control cantilever spring 40 is anchored by means of a bushing 42 at one of its ends within the handle portion 20 of the wrench housing so that the cantilever spring extends therefrom to exert a lifting pressure under a shoulder portion 44 of the cam 28 which extends therefrom in substantially diametrically opposed relation with respect to the shoulder 34 thereof. The cam contacting end portion of the spring 40 is preferably formed with an enlarged head 46 to provide firm bearing connection between the spring and the cam and to minimize the effects of wear thereon. Thus, it will be understood that the spring 40 tends to resist clockwise rotation of the cam as viewed in Figs. 1 and 3, while the pawl 22 of the wrench bar normally engages the cam to prevent counterclockwise rotation of the cam relative to the wrench bar.

Upon application of the wrench head upon the cap of a screw or a nut or the like, and rotation of the wrench body in clockwise direction as viewed in Figs. 1 and 3, the wrench head will be operated to screw the element being acted upon into its intended position of assembly. Upon its arrival into tightened position the member being acted upon by the wrench will develop resistance to the wrench operation of such an order as to cause the wrench bar 10 to pivot within the wrench body 16 against the holding action of the cam 28 as influenced by the cantilever spring 40. As the screw resistance forces exceed the holding

forces of the spring 40 of the wrench, the pawl 22 acts against the shoulder 34 of the cam so as to rotate the cam in clockwise direction against the action of the cantilever spring 40 toward the position of the mechanism which is illustrated in Fig. 3. It will be noted that as the cam rotates in this manner the shoulder 34 of the cam moves out of bearing contact with the shoulder 36 of the pawl by reason of pressure of the surface portion 32 of the cam against the pawl, and that thereupon the cam is freed to rotate in counterclockwise direction as viewed in Fig. 3 relative to the pawl 22 under the energy stored within the cantilever spring 40. Consequently, as soon as the cam shoulder 34 disengages from the abutment 36 of the pawl, the cam snaps backwardly from the position of Fig. 3 so that the shoulder portion 34 of the cam lies below the upper shoulder portion of the abutment 36 of the pawl. As an incident to this snap action the lower extending end portion 48 of the cam hammers against an anvil portion 50 of the wrench body.

Thus, the tension applied by the wrench upon the screw operation is momentarily relaxed and the cam simultaneously hammers against the anvil 50 to provide both an audible signal and a vibrational signal to the operator of the wrench to indicate the fact that the predetermined desired tension limit upon the screw operation has been reached. It will be understood, however, that if the operator desires to continue the screw operation he may do so by simply continuing application of pressure upon the wrench, and that in such case the wrench bar 10 will be pivoted relative to the body 16 so as to compress the spring 21 while the inner end of the wrench bar moves into position against the corresponding inner wall of the housing 16, whereupon the wrench is adapted to function as a rigid tool to transmit whatever forces the operator may apply thereto. It will be understood that the inner end portion of the wrench bar 10 may be so formed and dimensioned as to provide only a limited space between the pawl carrying end portion of the wrench bar and the upper wall portion of the wrench housing 16 between positions of signalling and rigid tool operation, whereby subsequent to operation of the signalling mechanism the wrench may be converted into a rigid wrench through only slightly further movement of the wrench bar 10 relative to the housing 16.

To enable the wrench to be employed in reverse direction, as for backing off a screw or the like, and to facilitate initial assembly of the wrench mechanism and/or subsequent disassembly thereof for parts repair or replacement purposes, the wrench body 16 is preferably slotted along its bottom surface as indicated at 52 (Fig. 2) and provided thereat with closure plates 54-56. The plates 54-56 are each provided with flange portions extending in opposite edges thereof for sliding engagement with correspondingly grooved portions 58 in the wrench body at opposite sides of the cutaway portion thereof. The closure plate 54 is arranged to be slidably inserted upon the body member prior to assembly of the cam 28 thereon, and the closure plate 56 is adapted to be slidably mounted upon the body member as a final step of the wrench assembly process. Preferably, as shown in the drawing, the closure plate 54 may be formed to include the anvil portion 50 hereinabove referred to, and it will be understood that this part will preferably be made of hardened steel or other suitable metal for the purpose explained hereinabove. Thus, it

will be understood that subsequent to complete assembly of the wrench mechanism and mounting of the closure plate 56 thereon, the plate 56 is adapted to function as a stop device to cooperate with the pawl carrying end portion of the wrench bar 10 so as to provide in effect a rigid wrench structure in connection with operation of the wrench in reverse direction as for "backing off" purposes referred to hereinabove.

It will be understood that the degree of resistance to cam rotation which is exerted by the cantilever bar 40 will predetermine the order of tension which may be applied through the wrench upon a screw operation prior to disengagement of the cam-pawl mechanism and operation of the signalling means. Hence, adjustment of the cantilever spring 40 to vary the cam motion resisting action thereof will automatically function to adjust the wrench mechanism to indicate correspondingly varied tension exerting conditions. For this purpose the cam lever spring mounting bushing 42 is arranged to be longitudinally slidable within the housing portion 20 so that the length of the free end portion of the spring 40 which extends from the bushing may be varied at will to regulate the stiffness thereof and to accordingly regulate the cam movement resistance thereof. The bushing 42 is slotted at 60 to engage about the inner end of a set screw 62 extending through an adjacent wall portion of the wrench body, whereby the bushing 42 is held against rotation about its longitudinal axis relative to the wrench body.

The bushing 42 is preferably bored as indicated at 64 to provide a rounded funnel-like opening through which the spring 40 extends from the bushing. Thus, the bearing engagement of the spring against the end of the bushing under spring deflected conditions will be of improved order. At its opposite end the bushing is counterbored and tapped as indicated at 66 to receive in screwthreaded relation therein a threaded end portion 68 of an adjustment member 70 which is rotatably carried within the handle portion 20 and maintained against endwise displacement relative thereto by means of set screws 72 or the like extending through the handle housing into a peripherally grooved portion 74 of the adjustment member. The adjustment member 70 extends through the open end portion of the handle housing 20 and carries thereat a head 76 which is preferably calibrated as at 78 to provide convenient readings of adjustment turnings of the member 70. Thus, it will be understood that simple rotation of the adjustment head 76 by the operator of the wrench will result in corresponding endwise displacement of the bushing 42 which supports the fixed end of the cantilever spring 40, whereby the length of the free end portion thereof may be conveniently varied to regulate the stiffness thereof and to thereby regulate the cam control action thereof as explained hereinabove. As illustrated at 80, a spring pressed ball detent device is preferably arranged within the handle portion 20 to cooperate with peripherally arranged recesses under the cap of the adjustment head 76, whereby the latter will normally remain in any adjusted position thereof. Thus, it will be understood that accidental displacement of the adjustment head from any previously adjusted position will be prevented without interfering with manual rotation of the adjustment head for adjustment purposes as explained hereinabove.

It will be understood that in lieu of the specific dimensional arrangements illustrated by the drawing the relative proportions of the operative elements of the mechanism may be varied to suit any desired condition of use. For example, the distance of the pivot connection 14 from the point of engagement with the cam 28, and the stiffness characteristics of the spring 40, and the form and dimensions of the cam and pawl mechanisms may be readily varied to suit different conditions of use. Preferably, each wrench will be accompanied by a set of differently sized cantilever springs and bushings similar to the spring 40 and bushing 42 illustrated and described hereinabove, so as to enable the wrench to be employed in connection with a wide variety of uses. Also, it will be understood that complete sets of wrench heads will preferably be furnished to accompany each wrench of the invention for similar reasons, and that although only one form of the invention has been shown and described in detail, it will be apparent to those skilled in the art that the invention is not so limited but that various changes may be made therein without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. A torque indicating wrench comprising a wrench head, a wrench body member, a pivot connection mounting said wrench head immediately of its ends upon said body member, a pawl movably mounted upon said wrench head, spring means carried by said wrench head and bearing against said pawl to urge the latter to move outwardly of said wrench head, a cam rotatably mounted upon said body member and having an outstanding shoulder portion adapted to normally engage said pawl for bearing laterally thereagainst, flex bar means mounted upon said body member and having an elastic force transmitting portion thereof arranged to engage said cam and to resist rotation of said cam away from cam shoulder and pawl engaging relation, abutment means carried by said cam adapted to rotate into registry with said pawl and to depress said pawl against the action of said spring means upon rotation of said cam against the action of said flex bar whereby said cam shoulder is released from engagement with said pawl and allowed to rotate in response to the forces of said flex bar, said cam having a hammer portion extending radially thereof and adapted to hammer against a portion of said body member incident to such released rotation of said cam to provide an audible and vibrational signal of the release to the operator of the wrench, and means carried by said body member for adjusting the elastic force characteristics of said flex bar.

2. A torque indicating wrench comprising a wrench head, a wrench body member, a pivot connection mounting said wrench head upon said body member, a pawl movably mounted upon said wrench head, elastic force means carried by said wrench head and bearing against said pawl to urge the latter to move outwardly of said wrench head, a cam rotatably mounted upon said body member and having a shoulder portion adapted to normally engage said pawl for bearing laterally thereagainst to resist motion of said cam relative to said pawl in one direction, spring means mounted upon said body member and having an elastic force transmitting portion thereof arranged to engage said cam and to resist rotation of said cam in opposite direction, means carried

by said cam adapted to depress said pawl against the action of said elastic force means upon rotation of said cam against the action of said spring means whereby said cam is released from said pawl holding action and allowed to rotate in response to the forces of said spring means, said cam having a hammer portion extending therefrom and adapted to hammer against a portion of said body member incident to such released rotation of said cam, and means carried by said body member for adjusting the elastic forces delivered by said spring means.

3. A torque indicating wrench comprising a wrench head, a wrench body member, a pivot connection mounting said wrench head upon said body member, a latch movably mounted upon said wrench head, spring means carried by said wrench head and urging said latch to move relative to said wrench head, a cam rotatably mounted upon said body member and having a shoulder portion adapted to normally engage said latch for bearing laterally thereagainst to resist rotation of said cam in one direction, elastic flex means mounted upon said body member and having an elastic force transmitting portion thereof arranged to engage said cam and to resist rotation of said cam in opposite direction, means carried by said cam adapted to depress said latch against the action of said spring means upon rotation of said cam against the action of said flex member whereby said cam is released from the latch holding action and allowed to rotate in response to the forces of said flex member, said cam having a hammer portion extending therefrom adapted to hammer against a portion of said wrench incident to such released rotation of said cam to provide an audible and vibrational signal to the operator of the wrench, and means carried by said body member for adjusting the elastic force characteristics of said flex member.

4. A torque indicating wrench comprising a wrench head, a wrench body member, a pivot connection mounting said wrench head immediately of its ends upon said body member, a pawl slidably mounted within an end portion of said wrench head, spring means carried within said wrench head and bearing against said pawl to urge the latter to move outwardly of said wrench head end, a cam rotatably mounted upon said body member and having an outstanding shoulder portion adapted to normally engage said pawl for bearing laterally thereagainst to resist rotation of said cam in one direction, a flexible cantilever bar mounted upon said body member and having its free end portion arranged to engage said cam and to resist rotation of said cam in opposite direction, said cam being adapted to depress said pawl against the action of said spring upon rotation of said cam against the action of said flexible bar whereby said cam is released from said pawl holding action and allowed to rotate in response to the forces of said flexible bar, said cam having a hammer portion extending therefrom adapted to hammer against a portion of said wrench incident to such released rotation of said cam, and means carried by said body member for adjusting the stiffness characteristics of said flexible bar.

5. A torque indicating wrench comprising a wrench head, a wrench body member, a pivot connection mounting said wrench head immediately of its ends upon said body member, a pawl slidably mounted within an end portion of said wrench head, spring means carried within said wrench head and bearing against said pawl

to urge the latter to move outwardly of said wrench head end, a cam rotatably mounted upon said body member and having an outstanding shoulder portion adapted to normally engage said pawl for bearing laterally thereagainst to resist rotation of said cam in one direction, a flexible cantilever bar mounted upon said body member and having its free end portion arranged to engage said cam and to resist rotation of said cam in opposite direction, said cam being adapted to depress said pawl against the action of said spring upon rotation of said cam against the action of said flexible bar whereby said cam is released from said pawl holding action and allowed to rotate in response to the forces of said flexible bar, said cam having a hammer portion extending therefrom adapted to hammer against a portion of said wrench incident to such released rotation of said cam, and means carried by said body member for adjusting the stiffness characteristics of said flexible bar, said adjusting means comprising a bushing slidably embracing said flexible bar and means for moving said bushing relative to said bar for varying the length of the free end portion thereof.

6. A torque indicating wrench comprising a wrench head, a wrench body member, a pivot connection mounting said wrench head intermediately of its ends upon said body member, a pawl slidably mounted within an end portion of said wrench head, spring means carried within said wrench head and bearing against said pawl to urge the latter to move outwardly of said wrench head end, a cam rotatably mounted upon said body member and having an outstanding shoulder portion adapted to normally engage said pawl for bearing laterally thereagainst to resist rotation of said cam in one direction, a flexible cantilever bar mounted upon said body member and having its free end portion arranged to engage said cam and to resist rotation of said cam in opposite direction, said cam being adapted to depress said pawl against the action of said spring upon rotation of said cam against the action of said flexible bar whereby said cam is released from said pawl holding action and allowed to rotate in response to the forces of said flexible bar, said cam having a hammer portion extending therefrom adapted to hammer against a portion of said wrench incident to such released rotation of said cam, and means carried

by said body member for adjusting the stiffness characteristics of said flexible bar, said adjusting means comprising a bushing slidably embracing said flexible bar and means for moving said bushing relative to said bar for varying the length of the free end portion thereof, said means comprising a screw member threaded into connection with said bushing and adapted to be manually rotated to displace said bushing axially relative to said flexible bar.

7. A torque indicating wrench comprising a wrench head, a wrench body member, a pivot connection mounting said wrench head intermediately of its ends upon said body member, a pawl slidably mounted within an end portion of said wrench head, spring means carried within said wrench head and bearing against said pawl to urge the latter to move outwardly of said wrench head end, a cam rotatably mounted upon said body member and having an outstanding shoulder portion adapted to normally engage said pawl for bearing laterally thereagainst to resist rotation of said cam in one direction, a flexible cantilever bar mounted upon said body member and having its free end portion arranged to engage said cam and to resist rotation of said cam in opposite direction, said cam being adapted to depress said pawl against the action of said spring upon rotation of said cam against the action of said flexible bar whereby said cam is released from said pawl holding action and allowed to rotate in response to the forces of said flexible bar, said cam having a hammer portion extending therefrom adapted to hammer against a portion of said wrench incident to such released rotation of said cam, and means carried by said body member for adjusting the stiffness characteristics of said flexible bar, said adjusting means comprising a bushing slidably embracing said flexible bar and means for moving said bushing relative to said bar for varying the length of the free end portion thereof, said means comprising a screw member threaded into connection with said bushing and adapted to be manually rotated to displace said bushing axially relative to said flexible bar, and screw adjustment calibration means and spring pressed detent means carried by said adjustment screw and said body member.

THOMAS A. COONEY.