ABSTRACT: A predetermined torque release wrench which may be used to apply a torque to a fastener in either rotary direction. The wrench includes an arm connected to the ratchet head of the wrench and a spring pressed cam and follower arrangement. The arm overcomes the resistance of the cam and follower arrangement when a predetermined torque is reached. An arrangement is provided for varying the profile of the cam to permit calibration of the wrench.
TWO-WAY TORQUE WRENCH

BACKGROUND OF THE INVENTION

This invention relates to torque wrenches and more particularly to a predetermined torque release wrench which may be used to apply a torque in either rotary direction.

A major concern with all torque wrenches is accuracy. It is essential in torque release wrenches that the wrench release at the desired torque. Although great care may be exercised in the manufacture of these wrenches, manufacturing tolerances are such that accuracy of the wrench is not always assured. Even if the wrench is accurate when it leaves the factory, repeated use will often result in the development of inaccuracies. It is therefore essential that some arrangement for calibrating the wrench be provided to correct any inaccuracies which may result from manufacturing or may develop from repeated use of the wrench.

Although two-way torque wrenches are known and it is known to provide some means for calibrating these wrenches, such calibration means have not been altogether satisfactory. One prior two-way torque wrench is shown in U.S. Pat. No. 3,165,014. The calibration arrangement shown in this patent has the disadvantage that except in one position of adjustment, there will be a certain amount of play in the release mechanism. Such play will interfere with the accuracy of the wrench.

SUMMARY

It is therefore the primary object of this invention to provide a novel torque wrench capable of being calibrated in order to maintain accuracy.

It is another object of this invention to provide a novel arrangement for calibrating a torque wrench.

The foregoing and other objects will be carried out by providing a torque wrench comprising: a hollow handle; a work engaging member rotatably mounted on said handle; an arm operatively connected at one end to said work engaging member and longitudinally extending into said handle and adapted to rotate relative to said handle; a plunger longitudinally movable in said handle and positioned opposite the other end of said arm; one of said arm and plunger having a roller mounted thereon adjacent the other of said arm and plunger; the other of said arm and plunger being bifurcated at its end near said one of said arm and plunger; the legs of the bifurcated end defining a recess in which said roller is normally seated; means for urging said plunger toward said arm for releasably restraining said arm from rotating in either of two directions whereby an applied torque which tends to rotate said arm relative to said handle creates a longitudinal camming force on said plunger tending to move said plunger away from said arm to thereby release said arm for rotation relative to said handle; and means for adjusting the spacing between the legs of the bifurcated end to thereby adjust the amount of applied torque necessary to release said arm for rotation relative to said handle.

BRIEF DESCRIPTION OF THE DRAWING

The invention will be described in connection with the annexed drawing wherein:

FIG. 1 is a sectional view of a torque wrench constructed in accordance with the present invention;

FIG. 2 is a plan view of the work head of the present invention;

FIG. 3 is a sectional view taken on the line 3-3 of FIG. 1;

FIG. 4 is a sectional view taken on the line 4-4 of FIG. 1;

FIG. 5 is a fragmentary sectional view of a portion of the wrench showing certain parts after release of the wrench when a torque is applied in one direction; and

FIG. 6 is a view similar to FIG. 5 showing certain parts after release of the wrench when a torque is applied in the opposite direction.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In general, the wrench of the present invention is similar to that shown in U.S. Pat. No. 3,140,623, issued to W. E. Van Hoose, except that it is capable of having a torque applied in either rotary direction and is provided with apparatus for calibrating the wrench to insure accuracy.

Referring to the drawing, there is shown a two-way torque wrench which includes a tubular handle 1. A work head, generally indicated at 2, is rotatably mounted on the handle 1.

The work engaging member 2 is shown in the form of a ratchet head including a stud 3 and a lever 4 for reversing the direction of torque transmission. The head is conventional and need not be described in detail.

An arm 5 has one end fixed to the work engaging member 2 and extends longitudinally into the handle 1. The arm 5 and hence the work head 2 are pivotally connected to the handle 1 by means of a pivot pin 6. A pair of bearing balls 8 are provided for aiding the swinging movement of the arm 5. The other end of the arm 5 is bifurcated to provide a pair of spaced apart legs 10. A hardened pin 11 is mounted on each of the legs 10 and defines with the legs a recess 12.

A plunger 15 is slidable mounted in the handle 1 and positioned adjacent the arm 5. A roller 16 is rotatably mounted on the plunger 15 by means of a pin 17 for rolling contact with the pins 11 of the arm 5. A plurality of bearing balls 18 are secured in the plunger 15 to insure that the plunger 15 will slide easily along the inside of the wrench handle 1 in a manner similar to that set forth in U.S. Pat. No. 3,140,623.

The end of the tubular handle 1 opposite the work head 2 is suitably threaded at 20 and a sleeve 21 having internal threads 22 is threadedly attached to the handle 1. The sleeve 21 is also internally threaded at 23 and an adjusting sleeve 24 is threadedly secured thereto by means of threads 25. A lock screw 28 is threadedly secured to the adjusting sleeve 24. A cylindrical member 30 is positioned in the handle 1. A pin 31 fits in a groove (not shown) on the inside of the handle 1 to permit the member 30 to slide in the handle 1 but prevents the member 30 from rotating relative to the handle 1. The cylindrical member is provided with a reduced diameter portion 32 which fits into a bore 26 in the adjusting sleeve 24. The member 30 is provided with a suitable bore 33 which threadedly received a spring biased lock screw 34. The outer end of the screw 34 is provided with a tang 35 to permit the screw 34 to be easily rotated. The outer end 35 fits within a counter bore 27 in the adjusting sleeve 24. Lock pins 38 are slidable mounted in the sleeve 24 and adapted to fit into dimples in the member 30.

It should be apparent that when the lock screw 34 is screwed tight, the pins 38 fit in the dimples in the member 30 and prevent the sleeve 21 from being rotated. When the screw 34 is loosened, the pins 38 will be free to move out of the dimples in the member 30 and the sleeve 21 can be rotated relative to the handle 1. This rotation will either advance or retract the member 30.

A spring 40 acts between the member 30, and hence the handle 1, and the plunger 15 to urge the plunger 15 toward the arm 5.

When the wrench is in use, a torque will be applied to the stud 3 and work engaging member 2 which tends to rotate the arm 5 relative to the handle 1. The arm 5 is prevented from rotating relative to the handle 1 by the cam, which is formed by the legs 10 and pins 11, being blocked by the follower, formed by the plunger 15 and roller 16. The arm will rotate with the handle 1.

As torque is applied, one of the pins 11 presses against roller 16 and a camming action is created which produces a component tending to move the cam follower away from the arm 5 against the spring 40. As the applied torque increases, the rearward force increases until it overcomes the pressure of spring 40 and the plunger moves rearwardly a distance sufficient to permit the arm 5 to be released to rotate relative to
The amount of torque which can be applied before the arm releases can be varied by varying the spring pressure through movement of sleeve 21.

The use of a bifurcated end on the arm 5 and a pair of pins 11 mounted in the legs of the bifurcated end permits the wrench to be used for transmitting torque in either rotary direction. The arm 5 will be released when a predetermined torque is applied in either direction. This feature will be apparent when FIGS. 5 and 6 are compared.

The amount of torque which can be applied before the arm 5 releases can be varied by varying the stage of the cam, as an adjusting screw 45 has been provided. An access opening closed by cap screw 46 is provided in the handle 1. The screw 45 may be loosened or tightened to increase or decrease the spacing between the legs 10 of the bifurcated end. If the legs 10 are moved farther apart, the roller 16 will move deeper into recess 12. On this occurrence, it will be necessary for a greater torque to be applied to release the arm 5. If the adjusting screw 45 is tightened, the follower and roller 16 will be moved out of the recess 12 and a lesser torque will release the arm 5.

It is intended that the adjusting screw 45 be used for calibrating purposes to correct inaccuracies due to manufacturing techniques and to recalibrate the wrench should inaccuracies develop after repeated use of the wrench. During normal use, the torque at which the arm 5 will release is determined by the position of member 30. Suitable calibration marks are provided on the handle 1 for this purpose. As a further means of adjustment and calibration, the adjusting sleeve 24 may be used to increase or decrease the spring pressure.

From the foregoing it is apparent that the objects of this invention have been carried out. A two-way torque wrench has been provided. Inaccuracies may be corrected by proper calibration through adjustment of the shape of the cam formed by the bifurcated end of the arm 5.

I claim:

1. A torque wrench comprising:
a hollow handle;
a work engaging member rotatably mounted on said handle;
an arm operatively connected at one end to said work engaging member and longitudinally extending into said handle and adapted to rotate relative to said handle;
a plunger longitudinally movable in said handle and positioned opposite the other end of said arm;
one of said arm and plunger having a roller mounted thereon adjacent the other of said arm and plunger;
the other of said arm and plunger being bifurcated at its end near said one of said arm and plunger;
the legs of the bifurcated end defining a recess in which said roller is normally seated;
means for urging said plunger toward said arm for releasably restraining said arm away from rotating in either of two directions whereby an applied torque which tends to rotate said arm relative to said handle creates a longitudinal camming force on said plunger tending to move said plunger away from said arm to thereby release said arm for rotation relative to said handle; and
means for adjusting the spacing between the legs of the bifurcated end to thereby adjust the amount of applied torque necessary to release said arm for rotation relative to said handle.

2. The torque wrench of claim 1 wherein said roller is mounted on said plunger and said other end of said arm is bifurcated.

3. The torque wrench of claim 1 wherein a hardened pin is carried by each of the legs of the bifurcated end and said pins engage said roller.

4. The torque wrench of claim 3 wherein said roller is mounted on said plunger and said other end of said arm is bifurcated.

5. The torque wrench of claim 4 wherein said handle defines means for permitting access to said means for adjusting the spacing between the legs of the bifurcated end.

6. The torque wrench of claim 5 wherein said urging means is a spring acting between said plunger and said handle and further comprising means for adjusting the urging force of said spring to thereby adjust the amount of torque necessary to release said arm for rotation relative to said handle.

7. In a torque wrench having a hollow handle, a work engaging member rotatably mounted on said handle, an arm having one end operatively connected to said work engaging member and extending into said handle and adapted to rotate with said work engaging member, and means providing predetermined resistance to rotative movement of said arm comprising:
cam means mounted on the other end of the arm; follower means positioned in the handle adjacent said other end of said arm and in contact with said cam means;
said follower means being movable by said cam means in a direction away from said arm in response to a rotative movement of said arm; and
means for adjusting the profile of said cam means while maintaining continuous contact between said cam means and follower means to thereby adjust the resistance to rotative movement of said arm.

8. In the torque wrench of claim 7, said means for urging said follower means toward said cam means is a spring acting between the handle and said follower means.

9. In the torque wrench of claim 8, said follower means includes a plunger slidably mounted in said handle and a roller rotatably mounted on said plunger.

10. In the torque wrench of claim 9, the other end of said arm is bifurcated and pin means is mounted on each leg of the bifurcated portion of said arm to define said cam means; said pin means being in contact with said roller.

11. In the torque wrench of claim 10, said means for adjusting the profile of said cam means includes means for adjusting the spacing between the legs of the bifurcated end of the arm.