United States Patent

[11] **3,577,815**

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[54] **TWO-WAY TORQUE WRENCH**
11 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **81/52.4**
[51] **Int. Cl.** **B25b 13/46**
[50] **Field of Search** 81/52.4

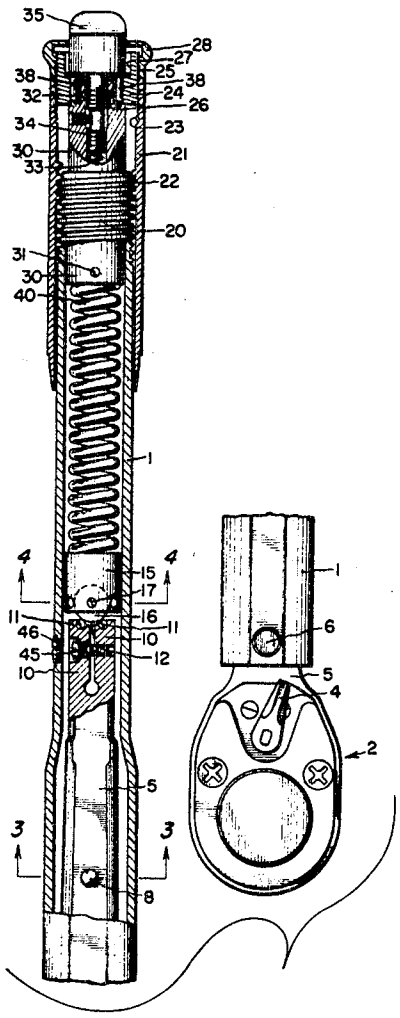
[56] **References Cited**

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2,962,918 12/1960 Van Hoose 81/52.4
3,140,623 7/1964 Van Hoose 81/52.4

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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.



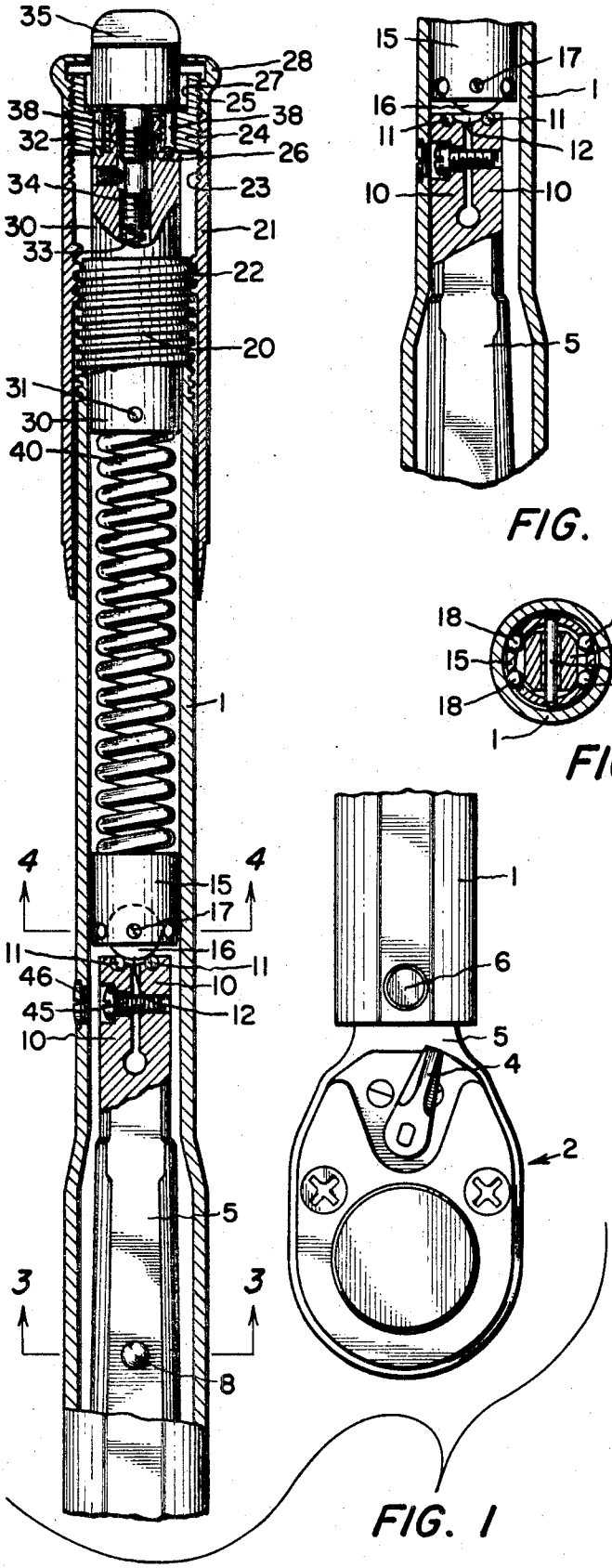


FIG. 1

FIG. 5

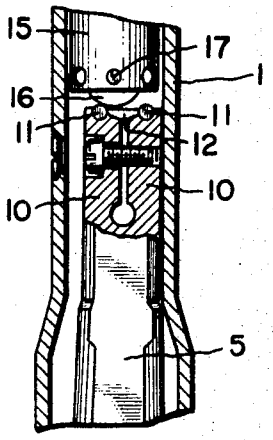


FIG. 6

FIG. 4

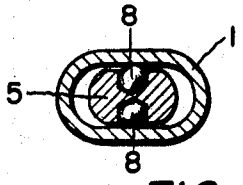


FIG. 3

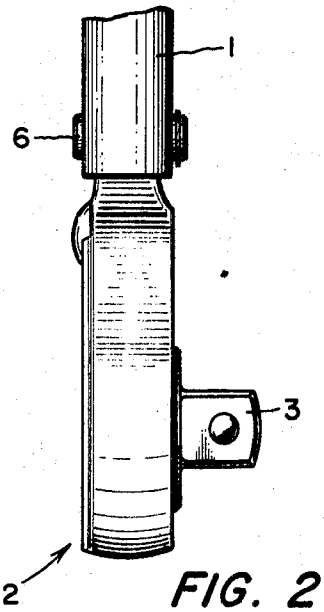


FIG. 2

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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 slidably 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 **16** 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 suitable 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 slidably 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 **1** 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 handle 1. The amount of torque which can be applied before the arm 5 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 shape of the cam defined by the bifurcated end of arm 5 is one factor which determines the torque at which the arm is released. In order to vary the shape of the cam, 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 calibration 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;
means for urging said follower means toward said cam means and resisting rotative movement of said arm;
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.