United States Patent [19]

Bergquist

[11] **3,839,928**

[45] **Oct. 8, 1974**

[54] **PREDETERMINED TORQUE RELEASE WRENCH**

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[73] Assignee: **Pendleton Tool Industries, Inc.,** Los Angeles, Calif.

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[21] Appl. No.: **357,695**

[52] **U.S. Cl.** ..... **81/52.4 R**

[51] **Int. Cl.** **B25b**

[58] **Field of Search** ..... 81/52.4 R, 52.5

[56] **References Cited**

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FOREIGN PATENTS OR APPLICATIONS

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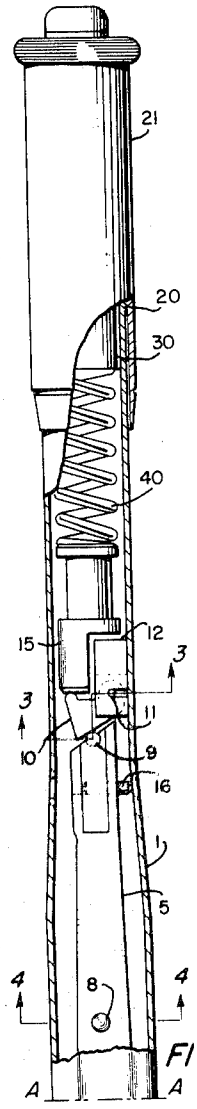
Primary Examiner—James L. Jones, Jr.

Attorney, Agent, or Firm—Walter C. Vliet; David W. Tibbott

[57] **ABSTRACT**

A predetermined torque release wrench which may be used to apply a torque to a fastener. The wrench includes an arm connected to the ratchet head of the wrench with a variable spring set cam lever arrangement. The cam lever is pivoted in the wrench case. The arm overcomes the resistance of the cam lever when a predetermined torque is reached.

4 Claims, 6 Drawing Figures



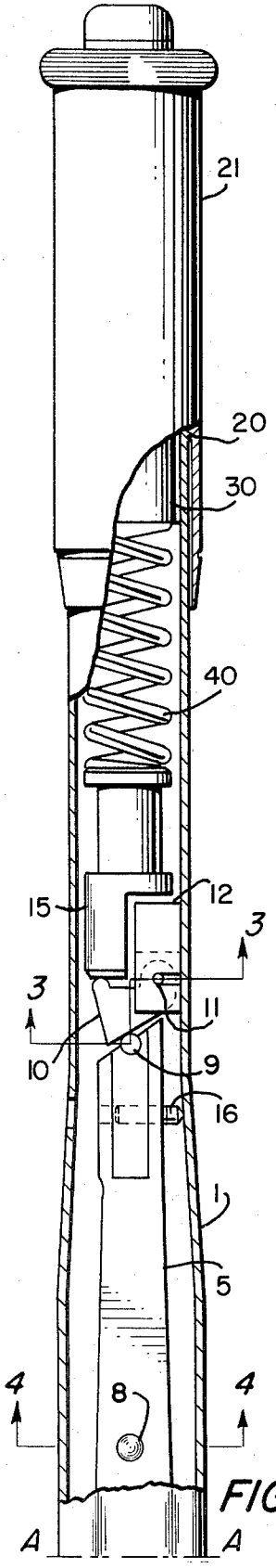


FIG. 1

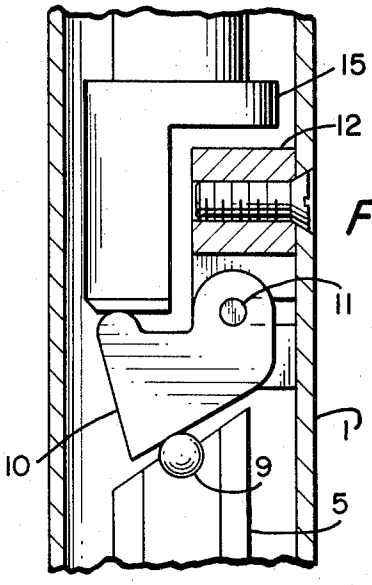


FIG. 5

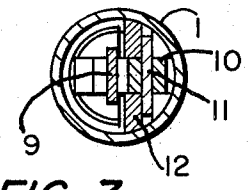


FIG. 3

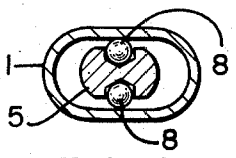


FIG. 4

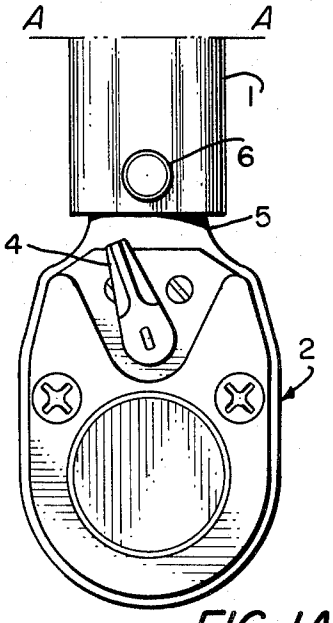


FIG. 1A

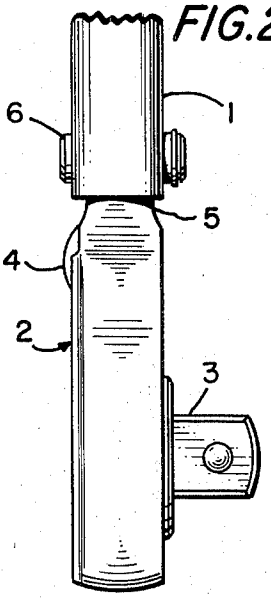


FIG. 2

PREDETERMINED TORQUE RELEASE 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 to a fastener.

A major concern with all torque wrenches is accuracy and repeatability. The wrench must release at the desired torque under all conditions. The prior art has taught various cam release mechanisms which freely act on and are restrained by a spring loaded plunger.

The accuracy of the prior art wrenches was therefore dependent on the free movement of the spring loaded plunger. It was soon determined that by nature of the cam release mechanisms used a side load as well as an axial load was transmitted to the plunger. Various devices such as ball bearings were used to minimize the side wall friction developed. These devices have proved only partially satisfactory and are subject to variations if foreign matter is present.

SUMMARY OF INVENTION

It is therefore the primary object of this invention to provide a novel torque wrench which has a high degree of accuracy and repeatability by minimizing the side load transmitted to the spring loaded plunger by the cam release mechanism.

The foregoing and other objects will be carried out by providing a torque wrench comprising: a 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 along said handle and adapted to rotate relative to said handle; a cam lever means for releasably restraining said arm away from rotating relative to said handle, said cam lever being substantially restrained by said handle in directions perpendicular to the longitudinal axis and substantially free to move longitudinally; a resilient means for urging said cam lever in said longitudinal direction towards the position of restraining said arm from rotation.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a sectional view of a torque wrench constructed in accordance with the present invention and shown prior to release.

FIG. 1A is a continuation of FIG. 1.

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

FIG. 3 is a sectional view taken along line 3—3 of FIG. 1.

FIG. 4 is a sectional view taken along line 4—4 of FIG. 1.

FIG. 5 is a fragmentary sectional view of the wrench showing the area wherein the invention lies after release.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The operation and description of the invention in the form of the preferred embodiment shown in the drawings may best be understood by referring to FIG. 1 for general assembly and for operation of the related parts. In general, the wrench of the present invention is substantially identical to that shown in U.S. Pat. No. 3,577,815 issued to Clifford A Bergquist except that it

is capable of torque response in one direction and is provided with a unique cam lever means which minimizes the side thrust applied to the torque spring plunger and is the subject of this invention.

Referring to the drawing, there is shown a 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 pivotably connected to the handle **1** by means of pivot pin **6**. A pair of bearing balls **8** are provided for aiding of the swinging movement of arm **5**. The other end of arm **5** is cut off at an angle other than perpendicular to the longitudinal axis of the arm and provided with a hardened contact pin **9**. The cut off angle is selected to assure contact of contact pin **9** with cam lever **10**. Cam lever **10** is mounted to the handle **1** by means of cam pin **11** and cam housing **12**. Rotation of cam lever **10** is resisted by contact with a plunger **15** which is slidably mounted in handle **1** and positioned on the opposite side of cam lever **10** from arm **5**. Calibration screw **16** adjusts the initiation contact point on the cam lever and is utilized to calibrate the wrench release point.

The end of the tubular handle **1** opposite work head **2** is identical to that shown in U.S. Pat. No. 3,577,815 and is numbered identically here for ease of reference. The spring **40** acts between the cylindrical member **30** and hence the handle **1**, and the plunger **15** to urge the plunger **15** toward the cam lever **10** and 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 cam lever **10**. As increased torque is applied, contact pin **9** exerts increased force on cam lever **10**. The force tends to cam or rotate cam lever **10** about cam pin **11**. The rotation of cam lever **10** is resisted by contact with plunger **15** which in turn is resiliently urged in contact with the cam lever **10** by spring **40**.

The force of spring **40** is adjustable by means of sleeve **21** suitably threaded **20** which when rotated as described in U.S. Pat. No. 3,577,815 adjusts the tension of spring **40** which determines the degree of resistance to rotation of cam lever **10** and hence the torque which may be applied to stud **3** before the cam lever **10** is rotated out of the way of arm **5**. When the applied torque exceeds the amount required to displace or rotate the cam lever **10**, arm **5** will rotate within the handle **1** causing it to strike a blow on the handle **1**. The blow is the signal to the operator that the predetermined torque on stud **3** has been exceeded.

The advantage of using a cam lever attached to the handle as opposed to having the arm **5** cam directly against plunger **15** can best be appreciated by viewing FIG. **5**. By selection of the cam pin **11** centerline location on the cam lever **10** point of contact line it will be obvious to those skilled in the art that the force applied to the plunger **15** by cam lever **10** will be essentially axial for nominal rotation of the cam lever. Side load forces will be taken in cam pin **11** resulting in rotational friction in cam pin **11** as opposed to undesirable sliding

friction between the plunger **15** and handle **1** as in the case of prior art.

From the foregoing, it is apparent that the objects of this invention have been carried out. Sidewise forces on the spring plunger have been minimized by the unique cam lever of this invention. While the torque wrench of the present embodiment will indicate or have a predetermined torque release in one direction only, it is possible to construct a two-way wrench utilizing the present invention by use of double cams in opposite relationship or other similar use of intermediate camming means.

It will be understood that the embodiment shown is for illustrative purposes and that various modifications and variations in the present invention may be effected without departing from the spirit and scope of the novel concept presented here.

I claim:

1. A torque wrench comprising:

a 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 along said handle and adapted to rotate relative to said handle;

a cam lever means secured by a radially fixed pivot pin to the handle for releasably restraining said arm away from rotation relative to said handle;

a resilient means for urging said cam lever means towards the position of restraining said arm from rotation;

said cam lever means being in point contact with said resilient means in a plane extending substantially perpendicular to the axis of said arm and through said pivot pin so as to impart a thrust on said resilient means acting generally parallel to the axis of said arm; and

said arm is in sliding point contact with a surface of said cam lever means, said surfaces being shaped to provide greater leverage between said arm and cam lever once the cam lever means begin to pivot in the direction of said resilient means thereby allowing the arm to move more easily.

2. 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;

resilient means for urging said plunger towards said arm;

cam lever means intermediate said arm and said plunger for releasably restraining said arm away from rotating relative to said handle, said camming means being substantially restrained by said handle in radial directions about a point of rotation and substantially free to rotate about said point;

said cam lever means being in point contact with said resilient means in a plane extending substantially perpendicular to the axis of said arm and through said pivot pin so as to impart a thrust on said resilient means acting generally parallel to the axis of said arm; and

said arm is in sliding point contact with a surface of said cam lever means, said being shaped to provide greater leverage between said arm and cam lever once the cam lever means begin to pivot in the direction of said resilient means thereby allowing the arm to move more easily.

3. The torque wrench of claim **2** wherein said cam lever means comprises a cam lever secured by fixed pivot pin to said handle.

4. The torque wrench of claim **3** wherein said cam lever is pivotably rotated about a point substantially lying on a line radial to the point of contact between said plunger and said cam lever such that radial forces created by said camming of said arm against said lever are absorbed by said pivot means and circumferential forces being substantially axial in directions relative to said handle and said plunger are absorbed by said plunger.

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