Feb. 14, 1956 R. G. WOODS 2,734,411

PREDETERMINED TORQUE RELEASE SOCKET WRENCH

Filed Feb. 15, 1954 2 Sheets-Sheet 1

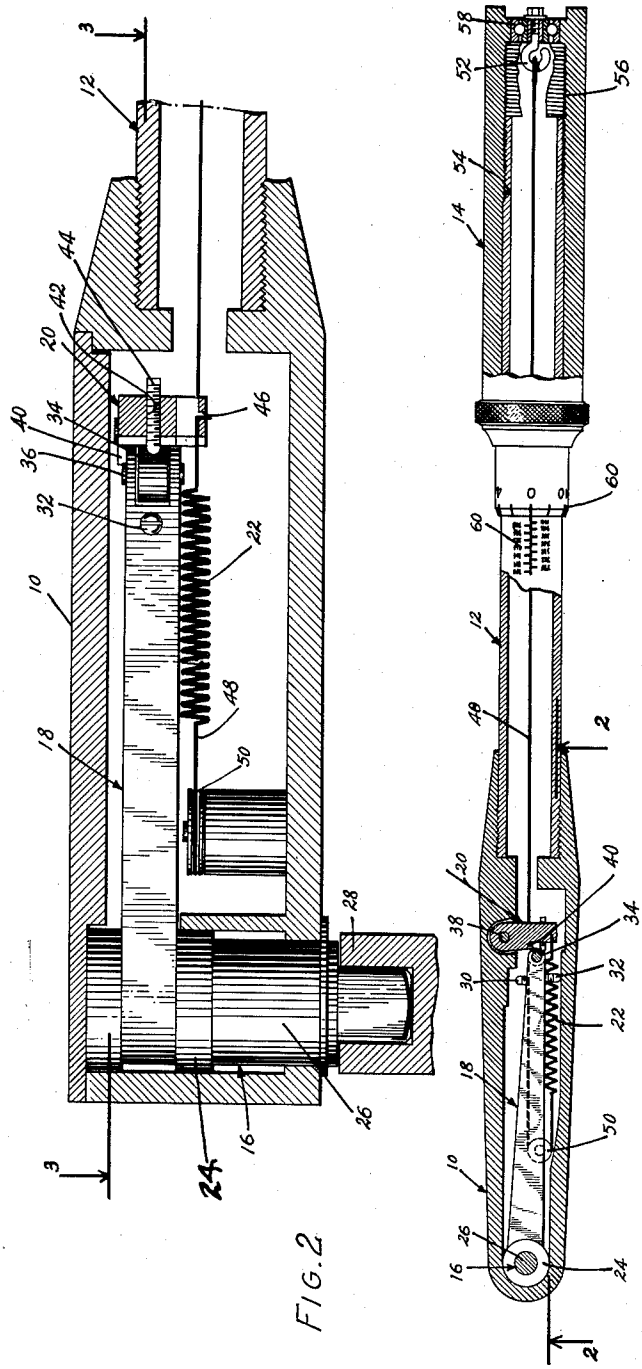


FIG. 2

FIG. 1

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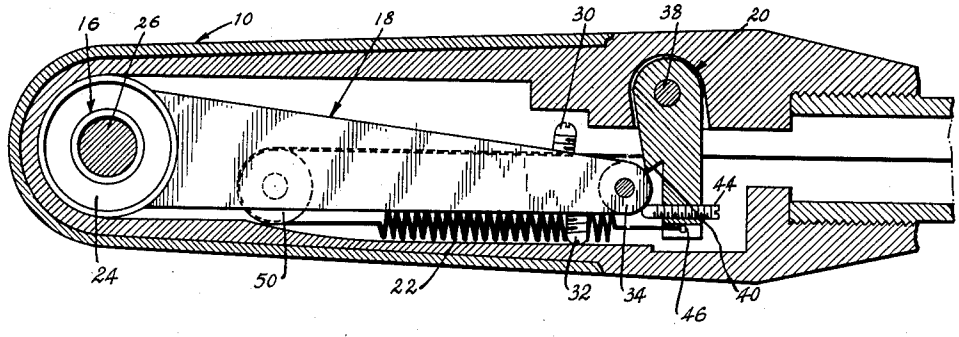


FIG. 3

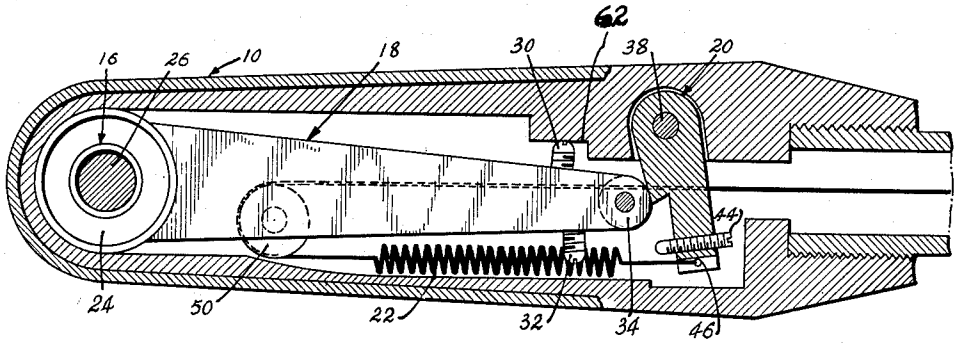


FIG. 4

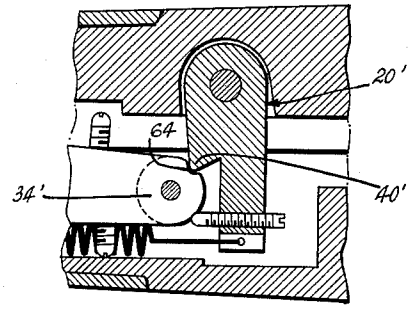


FIG. 5

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United States Patent Office 2,734,411 Patented Feb. 14, 1956

2,734,411

PREDETERMINED TORQUE RELEASE SOCKET WRENCH

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Application February 15, 1954, Serial No. 410,113

6 Claims. (Cl. 81—52.4)

The present invention relates generally to wrenches and more particularly to an improved form of adjustable torque wrench.

A very large number of adjustable torque wrenches are undergoing daily use in many industries. Generally, these adjustable torque wrenches include a load-engaging member and a spring which resists the movement of the load-engaging member until a desired amount of torque is applied thereby. The imposition of such torque upon the load-engaging member overcomes the force of the spring and the latter is deformed, thereby permitting a limited movement of the load-engaging member to occur. Such movement provides an indication that a desired amount of torque has been applied to the load.

After a certain amount of usage, it becomes necessary to replace the original spring with a new one. This involves a major difficulty, because of the wide variation in spring rates encountered with commercially available springs. While all springs of a similar commercial classification ostensibly have identical characteristics, as a practical matter this is not true. The spring rates of such springs actually vary widely from one another. Because of such spring rate variation, it is often impossible to satisfactorily effect calibration of the wrench by adjustment of the spring alone.

A major object of the present invention is to provide a new and improved torque wrench of the adjustable type.

Another object is to provide an adjustable torque wrench having novel means to compensate for the wide variation in the spring rates of commercially available springs.

An important object of the present invention is to provide an adjustable torque wrench of compact size and light weight which is economical of construction. This object is accomplished in part by the provision of a wrench capable of utilizing a spring of minimum size and strength for a maximum load-applying rating of the wrench.

An additional object of the invention is to provide an adjustable torque wrench which is simple of design and rugged of construction whereby it may provide a long and useful service life.

These and other objects and advantages of the present invention will become apparent from the following detailed description, when taken with the appended drawings, wherein:

Figure 1 is a top view of a preferred form of adjustable torque wrench embodying the present invention, the top of said wrench being broken away in horizontal section so as to illustrate its internal construction;

Figure 2 is an enlarged vertical sectional view taken on line 2—2 of Figure 1;

Figures 3 and 4 are horizontal sectional views taken on lines 3—3 of Figure 2 in order to illustrate the movement of the parts of said wrench during a torque-applying operation; and,

Figure 5 is a section, partly broken away on lines

3—3 of Figure 2 showing a modified form of construction of said wrench.

Referring to the drawings and particularly Figure 1 thereof, the preferred form of adjustable torque wrench embodying the present invention broadly comprises a head **10**, a lever **12** rigidly extending away from the rear of the head and having a handhold **14**; a load-engaging member **16** pivotally mounted by the front portion of the head **10**; a generally rearwardly extending arm **18** rigidly secured to the load-engaging member **16**; a tripping finger **20** pivotally mounted by the head **10** for rotation toward and away from the free end of the arm **18**; and, a spring **22** attached to the free end of the tripping finger **20** so as to constantly bias its intermediate portion into contact with the free end of the arm **18**. The tripping finger **20** and spring **22** resiliently resist counter-clockwise rotation of the free end of the arm **18** as torque is applied to an object, such as a bolt head, by the load engaging member **16**. Such torque is applied by moving the lever **12** in a clockwise direction from its position of Figure **1**.

More particularly, the front end of the head **10** mounts a suitable bearing **24** for supporting a shaft **26**. The shaft **26** in turn serves to rigidly couple the load-engaging member **16** and the front of the arm **18**. The load-engaging member **16** may include a socket **28** for receiving the head of a bolt. However, this member may take other forms without departing from the scope of the invention. Stop elements **30** and **32** may be disposed at either side of the arm **18** for restraining movement thereof beyond its two positions of Figures 3 and 4. The free end of the arm **18** mounts a roller **34** by means of a vertically extending pin **36**.

The tripping finger **20** is pivotally secured to one side of the head **10** adjacent the free end of the arm **18** by a vertically disposed pivot pin **38**. The intermediate portion of this finger is formed with a pointed projection **40** that is in contact with the periphery of the roller **34**. The tripping finger **20** is formed with a threaded bore **42** between its free end and the pointed projection **40** for receiving a set screw **44**. The purpose of this set screw **44** will be fully set forth hereinafter. The free end of the tripping lever is formed with a hole **46** to receive one end of the spring **22**.

The spring **22** is of the helical tension type and its front end is secured to a flexible element such as a cable **48**. From its point of attachment to the spring **22**, the cable **48** extends around a pulley or sheave **50** that is mounted below the arm **18**. As shown in Figure 1, the cable extends rearwardly from the pulley **50** through the interior of the lever **12** to a hook **52** mounted by the handhold **14** at the rear of the lever.

The handhold **14** is of tubular configuration and its inner periphery is formed with internal threads **54** which are engaged with complementary external threads **56** formed on the rear portion of the lever **12**. Accordingly, rotation of the handhold upon the lever will effect concurrent axial movement of the handhold relative to the lever. The rear end of the handhold **14** mounts a bearing **58** that supports the hook **52**. With this arrangement, rotation of the handhold upon the lever will serve to stretch or contract the spring **22** by virtue of the latter's attachment to the cable **48**. In order to provide a visual indication of the relative positions of the lever **12** and the handhold **14**, suitable vernier graduations **60** may be applied to these members. These vernier graduations may read in inch-pounds or foot-pounds and should be so coordinated with the spring rate of the spring **22** and the geometry of the wrench as to provide a visual indication of the amount of torque being applied by the load-engaging member **16** when the arm **18** begins a counter-clockwise movement. Hence, before a bolt-tightening

operation is started, the handhold **14** is rotated upon the lever **12** until the graduations **60** are set at the desired reading.

In operation, a socket **28** is engaged with a load, such as the bolt head, **24**, and the lever **12** is urged in a clockwise direction from its position of Figures 1 and 3. As torque is applied to the bolt head, **24**, the shaft **26** and its attached arm **18** tend to rotate in a counterclockwise direction from their original positions. This tendency is resisted by the tensile force of the spring **22** acting against the arm roller **34** by means of the tripping finger **20**. When the resistance of the bolt head **24** against further tightening reaches the desired value, however, the roller **34** will cam the tripping finger in a counterclockwise direction to its position of Figure 4, the stop element **30** restraining further movement of the parts once it engages the side of the head at **62**. Such movement of the arm **18** and the tripping finger provide an indication that the desired amount of torque has been applied to the bolt head.

As noted previously hereinbefore, it will periodically be necessary to calibrate the wrench for the particular spring **22** being utilized therewith. The present invention contemplates novel means for effecting such calibration, which means includes the set screw **44** mounted by the tripping finger **20**.

Referring to Figure 3, it should be noted that the initial amount of force applied by the spring **22** to the arm roller **34** through the tripping lever **20** is determined by the point of contact of the projection **40** relative to the arm roller. The farther this point of contact is moved to the left from its position of Figure 3, the greater the force which must be initially overcome by the spring to initiate counterclockwise movement of the arm **18**. Conversely, the farther this point of contact is moved to the right from its position of Figure 3, the smaller the force which must be initially applied to the arm roller **34** by tht spring **22** to initiate such movement. The position of the projection relative to the arm roller determines the wedging angle existing between these members. Control over the position of this point of contact is effected by means of the set screw **44**. Rotating the set screw so as to move it toward the arm roller **34** moves the point of contact to the right in Figure 3, while rotating it in the opposite direction moves the point of contact to the left in Figure 3.

The amount of tensile force initially applied by the spring **22** to the arm roller **34** determines the amount of torque required to initiate counterclockwise movement of the arm **18**. It is essential that for any chosen torque value the particular spring **22** being utilized exert the same initial tensile force despite the fact that the spring rates of such springs are likely to vary considerably. Because of the provision of the set screw **44**, it is possible by varying the point of contact between the projection **40** and the arm roller **34** to apply to the arm **18** the same torque resisting force per unit of spring expansion regardless of a variation in the spring rate of the spring being utilized.

Referring now to Figure 5, there is shown a modified form of arm roller and tripping finger construction. The modified arm roller **34'** is seen to be formed with a notch **64** wherein is disposed the projection **40'** of the tripping finger **20'**. Preferably, the projection **40'** will not be pointed, but instead will be formed with a slight radius. With this arrangement, a lower unit loading between the tripping lever projection **40'** and the arm roller **34'** is made posisble. This is true since the modified form provides a surface to surface contact between the arm roller and the projection rather than a line-to-line contact. More accurate results are also possible with this modified form since the tripping finger **20'** must necessarily always return to the same location on the arm roller **34'** after each torque-applying operation.

It will be apparent that various modifications and changes may be made with respect to the adjustable torque

wrench construction hereinabove described without departing from the spirit of the present invention or the scope of the following claims.

I claim:

1. An adjustable torque wrench, comprising: a head; a load-engaging member pivotally mounted at the front portion of said head; a lever extending away from the rear of said head; a rigid arm member rigidly secured to said load-engaging member and extending generally rearwardly therefrom; a tripping finger pivotally mounted on said head and formed with a pointed projection at its intermediate portion; a set screw mounted on said tripping finger between its free end and said projection that normally engages the free end of said arm member so as to control the wedging angle between said projection and the free end of said arm member; and tension spring means interposed between the free end of said finger and said head for constantly biasing said projection forwardly into contact with the free end of said arm member.

2. An adjustable torque wrench, comprising: a head; a load-engaging member pivotally mounted at the front portion of said head; a lever extending away from the rear of said head; threads formed on the rear portion of said lever; a handhold threadedly carried upon the threads of said lever; a bearing mounted on said handhold; a hook carried by said bearing; a rigid arm member rigidly secured to said load-engaging member and extending generally rearwardly therefrom; a roller mounted on the rear end of said arm member; a tripping finger pivotally mounted on said head at one side of the free end of said arm member, said finger being formed with a projection at its intermediate portion that is in contact with said roller; a tension spring attached to the free end of said tripping finger and extending forwardly therefrom within said head; a flexible element secured to the front end of said spring; and a pulley mounted within said head, said cable passing around said pulley to said hook.

3. An adjustable torque wrench as set forth in claim 2 which includes a set screw mounted on said tripping finger between its free end and said projection that normally engages said roller so as to control the wedging angle between said projection and said roller.

4. An adjustable torque wrench as set forth in claim 2 where said roller is formed with a notch for receiving said projection.

5. An adjustable torque wrench as set forth in claim 4 which includes a set screw between its free end and said projection that normally engages said roller so as to control the wedging angle between said projection and the sides of said notch.

6. An adjustable torque wrench comprising: a head; a load-engaging member pivotally mounted at the front portion of said head; a lever extending away from the rear of said head; a rigid arm member rigidly secured to said load-engaging member and extending generally rearwardly therefrom; a tripping finger pivotally mounted on said head for rotation toward and away from the free end of said arm member; resilient means attached to the free end of said finger for constantly biasing the intermediate portion thereof into contact with the free end of said arm member; and means for adjusting the wedging angle between the intermediate portion of said finger and the free end of said arm member independently of said resilient means.

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