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TENSIOMETER

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Fig. 1.

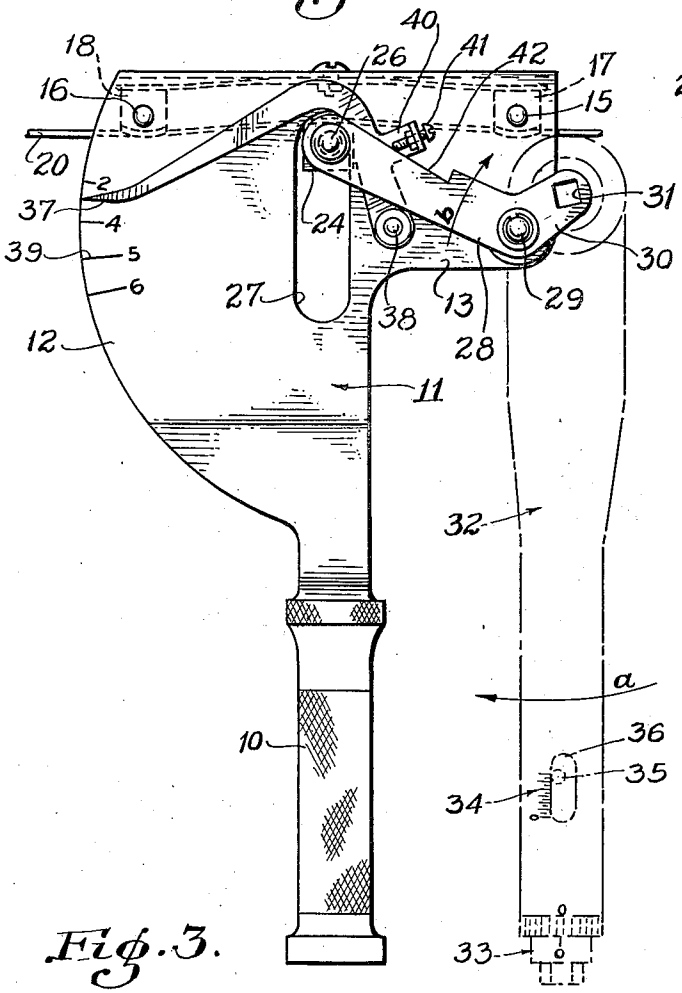


Fig. 2.

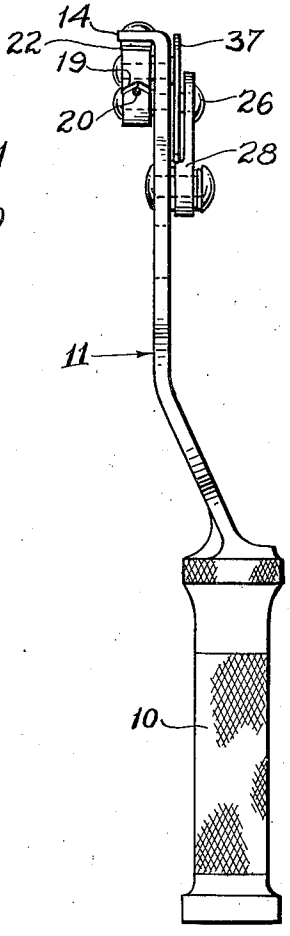
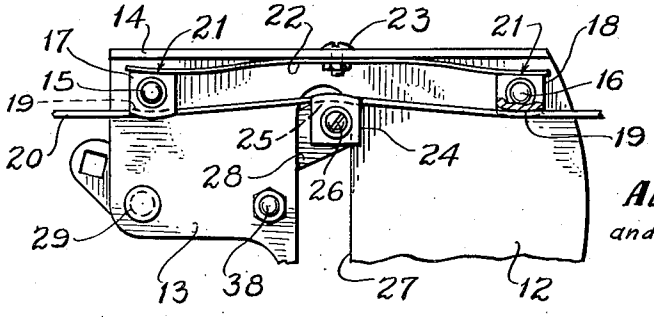


Fig. 3.



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TENSIOMETER

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5 Claims. (Cl. 73—144)

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This invention relates to tensiometer.

In the construction and maintenance of various equipment, and particularly airplanes, it is necessary to rig them with cables, which are maintained under a desired tension and are used for the purpose of bracing the structural parts of the ship or for operating controls. In each instance it is necessary to maintain the cables, guy wires and the like, under a predetermined minimum tension. Various types of tensiometers have been designed for this purpose. These instruments are for the most part expensive and must be carefully handled in order to prevent injury and misadjustment of the parts. At the present time there is in use a type of wrench which applies a predetermined amount of torque to an object to be rotated. It has been found desirable to provide a convenient piece of equipment with which such a wrench may be used to perform the functions of a tensiometer and to make it possible to quickly and accurately ascertain whether or not a cable has been drawn sufficiently tight to be under a predetermined minimum tension. It is the principal object of the present invention, therefore, to provide a tool having adjustable indicating means thereon and elements to engage a cable, and which tool may be easily assembled with a torque set wrench whereby the wrench may function to indicate when a minimum desired tension has been imposed upon the cable.

The present invention contemplates the provision of a unitary tool having a handle and gripping means thereon for engaging a cable at fixed points on one side of the cable and a movable element for engaging the cable at an intermediate point upon the opposite side of the cable, said element being capable of adjustment for cables of different diameters and being provided with means whereby a set torque wrench may be assembled temporarily with the movable element to make a tension test.

The invention is illustrated by way of example in the accompanying drawing in which:

Figure 1 is a view in side elevation showng the cable engagng tool with which the present invention is concerned and indicating the application of a set torque wrench with relation thereto.

Fig. 2 is a view of the tool taken edgewise to show the handle and the offset position of the plate carrying cable engaging means.

Fig. 3 is a fragmentary view showing a portion of the tool as seen from the opposite side indicated in Fig. 1, and more fully disclosing the fixed and movable cable engaging elements.

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Referring more particularly to the drawing, 10 indicates a handle. This handle is formed integral with a body plate 11 here shown as having an arcuate portion 12 and a transverse portion 13, which extends laterally of the longitudinal axis of the handle and at opposite sides of said axis. The upper edge of the plate 11 is bent at right angles to the body of the plate, as indicated at 14, and provides a stiffening and mounting member which is also at right angles to the longitudinal axis of the handle. Extending through the portion 13 of the plate adjacent the flange and near opposite ends of the plate are pins 15 and 16, respectively. These are disposed with their axes parallel and normal to the plane of the plate. Mounted upon the pins are saddle blocks 17 and 18, respectively. Each saddle block is formed with an arcuate groove 19 in its lower face to receive a cable 20, which is to be tested. The saddle blocks have an upper flat face 21 against which a leaf spring 22 rests. This spring is secured to the under face of the flange 14 by a bolt 23. Disposed in the same plane with the blocks 17 and 18 and substantially midway the distance between these blocks is a saddle block 24 which has an arcuate grooved upper face 25. This engages the cable 20 substantially midway between the centers of the blocks 17 and 18 and rests against the diametrically opposite side of the cable 20 from that against which the grooves 19 of the blocks 17 and 18 rest. The lower saddle block 24 is mounted upon a pivot pin 26 having an axis parallel to pins 15 and 16. The pin 26 extends through a slot 27 in the plate 13 and is carried by the free end of a pressure lever 28. The pressure lever 28 is carried by a fulcrum pin 29 extending through the plate 13. A lever extension 30 is formed integral with the lever 28 and is disposed at a suitable angle thereto. This extension is formed at its free end with a squared opening 31. The squared opening 31 receives a squared pin carried by the head of a set torque wrench, indicated by dotted lines at 32. This wrench embodies the principle disclosed in U. S. Patent No. 2,172,561 issued to Frederick P. Kruse on September 12, 1939, and its details are shown generally in Patent No. 2,365,486 issued to Harry P. Morris on December 19, 1944. It will be understood that in this type of wrench an adjusting plug 33 creates a desired compression of a spring carried within the handle of the wrench and tends to hold the head of the wrench against rotation with relation to the wrench handle and body until a predetermined resistance is offered to the head of the wrench, whereby the handle

will turn. In this type of wrench a calibrated scale 34 is inscribed on the handle. A pointer pin 35 extends through a slot 36 in the handle and moves along the slot and the graduated scale as torque force is applied to rotate the handle and the wrench head.

Mounted upon the plate 13 is a pointer 37 which is carried upon a pivot 38 and has a point at its free end to move with relation to a graduated scale 39 carried by the arcuate portion 12 of the plate 11. The graduations 39 represent different sizes of cable 20 which are to be tested, and when the cable 20 is unflexed the top saddle blocks 17 and 18 and the lower saddle block 24 will be disposed so that their arcuate faces will contact the cable. When this takes place the pointer 37 should be in register with the graduation on the scale 39 agreeing with the diameter of the cable 20. In order to provide adjustment for the pointer to cause it to register with the graduations of the scale 39 a bracket 40 is carried on the leg of the pointer 37 and is fitted with an adjusting bolt 41. The bolt 41 engages upper face 42 of the pressure lever 28 and will ride therealong as the lever 28 swings.

In operation of the present invention the testing tool is constructed and assembled as shown in Fig. 1, after which the squared pin carried by the head of the wrench 32 is positioned within the squared opening 31 at the end of the lever extension 30. When the set torque wrench 32 has been assembled with the testing tool, as shown in Fig. 1, the handle 10 of the testing tool and the handle 36 of the wrench will be substantially parallel. The handle of the wrench may be swung outwardly to lower the lower saddle block 24 so that the cable 20 to be tested may be laid in the grooves 19 of the upper saddle blocks 17 and 18, after which the handle of the wrench 32 may be swung in the direction of the arrow *a* shown in Fig. 1. This will bring the arcuate groove 25 of the saddle block 24 in contact with the cable 20. The tension of the cable may then be tested. It should be explained that the set torque wrench has been adjusted by manipulation of the plug 33 so that the spring within the handle of the wrench will be under a desired tension, as indicated by the point of register of the indicator pin 35 with the calibrations of the scale 34. Thus, assuming that each calibration indicates ten pounds, it will be evident that by tightening the plug 33 to force the pin 35 along the slot 36 as the spring is compressed it will indicate the amount of compression on the spring, and that when a counter-force acts against the spring of the tool the indicating pin 35 will move along the slotted opening 36 toward the zero point.

In performing a testing operation it will be assumed, by way of example, that the wrench is set for a torque load of sixty pounds. The wrench is then applied to the lever arm 30 and the handle of the wrench 32 and the handle 10 of the testing tool then are forced toward each other. As this takes place torque is imparted through the wrench 32 to the free end of the lever extension 30. This tends to swing the pressure lever 28 in the direction of the arrow *b* and forces the saddle block 24 against the cable 20 at the opposite sides of the points of contact of the cable with the saddle blocks 17 and 18. The result will be that the tension of the cable 20 will tend to resist the force of the saddle block 24 as the saddle block 24 moves to flex the length of cable forming a span between the saddle blocks

17 and 18. As the tension of this length of cable resists movement of the saddle block 24 the lever 28 will be held against rotation on its pivot 29 and the wrench body and handle 32 will be caused to rotate around the head of the wrench which will be held immovable by the squared pin extending into the opening 31 of the lever extension 30. As the wrench handle rotates the mechanism within the wrench will force the index pointer 35 along the slotted opening 36 and toward the zero graduation. Assuming that the pointer 35 reaches the zero graduation a force of sixty pounds will have been applied to the free end of the lever extension 30 and a suitable force will have been applied to the saddle block 24 due to the leverage existing between the lever arms 30 and 28. If the pointer 35 moves from its set position to the zero graduation on the scale 34 this will indicate that the cable 20 is under a minimum tension represented by the initially set position of the pointer 35 on the wrench 32. After the test has been made the wrench can be removed so that it is ready for any other use desired, and due to the fact that the testing tool is rugged in construction it may be placed away without fear of accidental damage and without the parts losing their adjustment.

Some types of set torque wrenches may have an element in them which tends to "break" when a predetermined amount of torque force has been applied to the torque wrench and is being resisted by an element rotated by the wrench. When this type of wrench is used the desired tension test may be made in the same manner as herein described, with the exception that when the tension of the cable resists a predetermined amount of force the wrench will "break" and indicate that the cable has at least the desired amount of tension.

It will thus be seen that the testing tool here disclosed is simple in construction and of a design which makes it possible for the tool to be easily adjusted for use in testing the tension of cables of various diameters, the said tool being operable in connection with a torque set wrench whereby expensive and delicate testing equipment is eliminated.

While we have shown the preferred form of our invention as now known to us, it will be understood that various changes may be made in combination, construction and arrangement of parts by those skilled in the art, without departing from the spirit of our invention as claimed.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. Means for testing a cable, said means acting in combination with a set torque wrench and including a frame structure, a rigid handle connected thereto, a pair of relatively fixed cable engaging elements mounted on the frame structure to rest against one side of a cable, a movable cable engaging element to rest against the opposite side of a cable to be tested and engage the same at a point substantially midway between said fixed elements, a bell crank pivotally mounted on the frame of said tool and carrying the movable element at the end of one lever arm thereof, the end of the opposite lever arm receiving a rotatable member of a set torque wrench, whereby when the handle of the wrench and the tool are forced toward each other the movable cable contact will be forced against the cable until the set torque magnitude of the wrench has been reached.

2. A tensiometer attachment for a set torque

wrench, comprising a frame plate, a handle rigid therewith, a pair of relatively fixed saddle blocks spaced from each other on said plate to engage one side of a cable to be tested, a movable saddle block to engage the opposite side of a cable to be tested, a bell crank carrying the movable saddle block at the end of one of its arms and being pivotally mounted upon said frame plate, the opposite arm of the bell crank being designed to receive engaging means from the head of the set torque wrench, whereby when an effort is made to force the handle of the tool and the wrench toward each other there will be a tendency to swing the bell crank on its pivot and force the movable saddle block against the cable.

3. The structure of claim 2 including a graduated scale carried upon the body plate, and a

pointer pivotally mounted upon the body plate to swing over the graduated scale and being moved with the movable saddle block.

4. The structure of claim 2 including a graduated scale carried upon the body plate, a pointer pivotally mounted upon the body plate to swing over the graduated scale and being moved with the movable saddle block, and means for adjusting said pointer with relation to the scale and the movable saddle block.

5. The structure of claim 2 in which the body plate is offset with relation to its handle, whereby the handle of the wrench will be in substantially the same plane as the handle of the tool.

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