July 19, 1966 E. T. ABLE ETAL 3,261,198

IMPACT WRENCH CHECKERS

Filed July 9, 1964 2 Sheets-Sheet 1

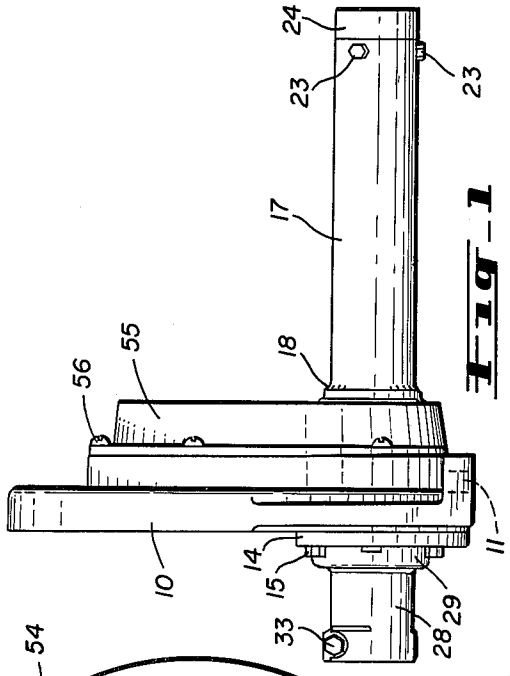

Fig-1

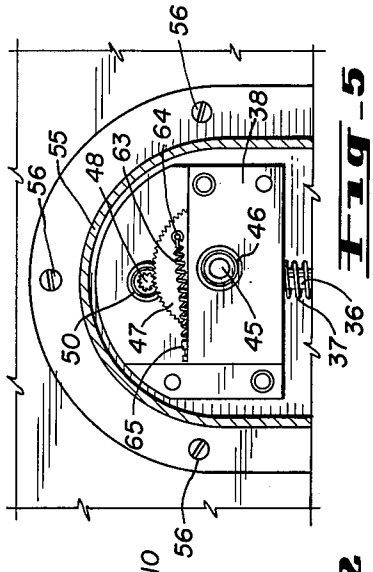

Fig-5

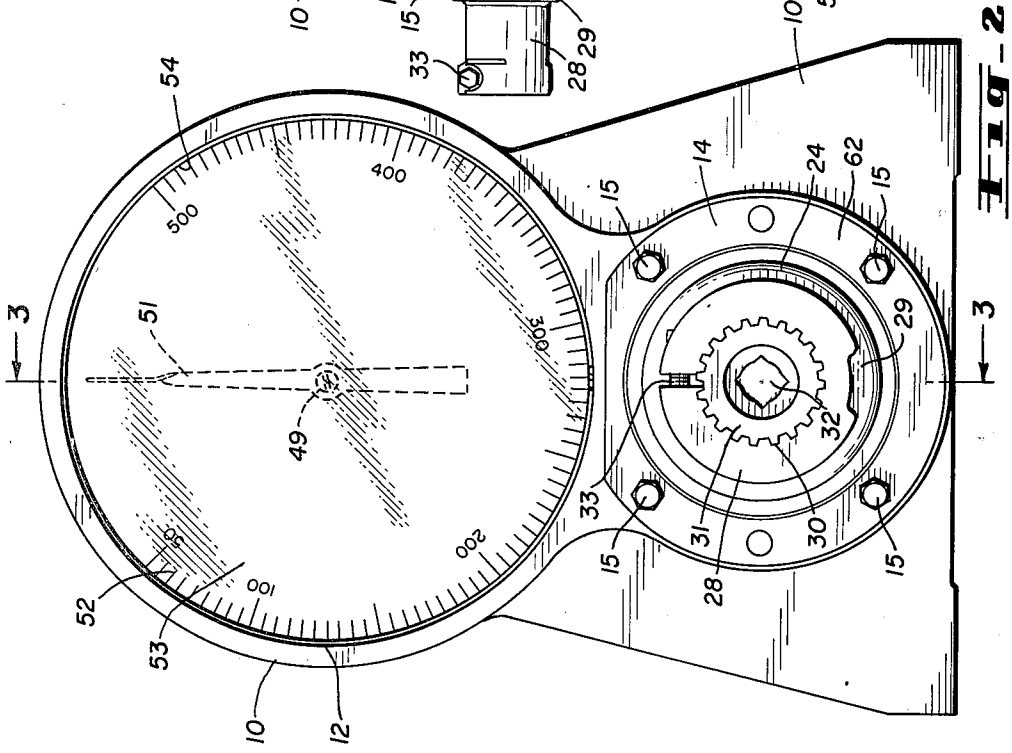

Fig-2

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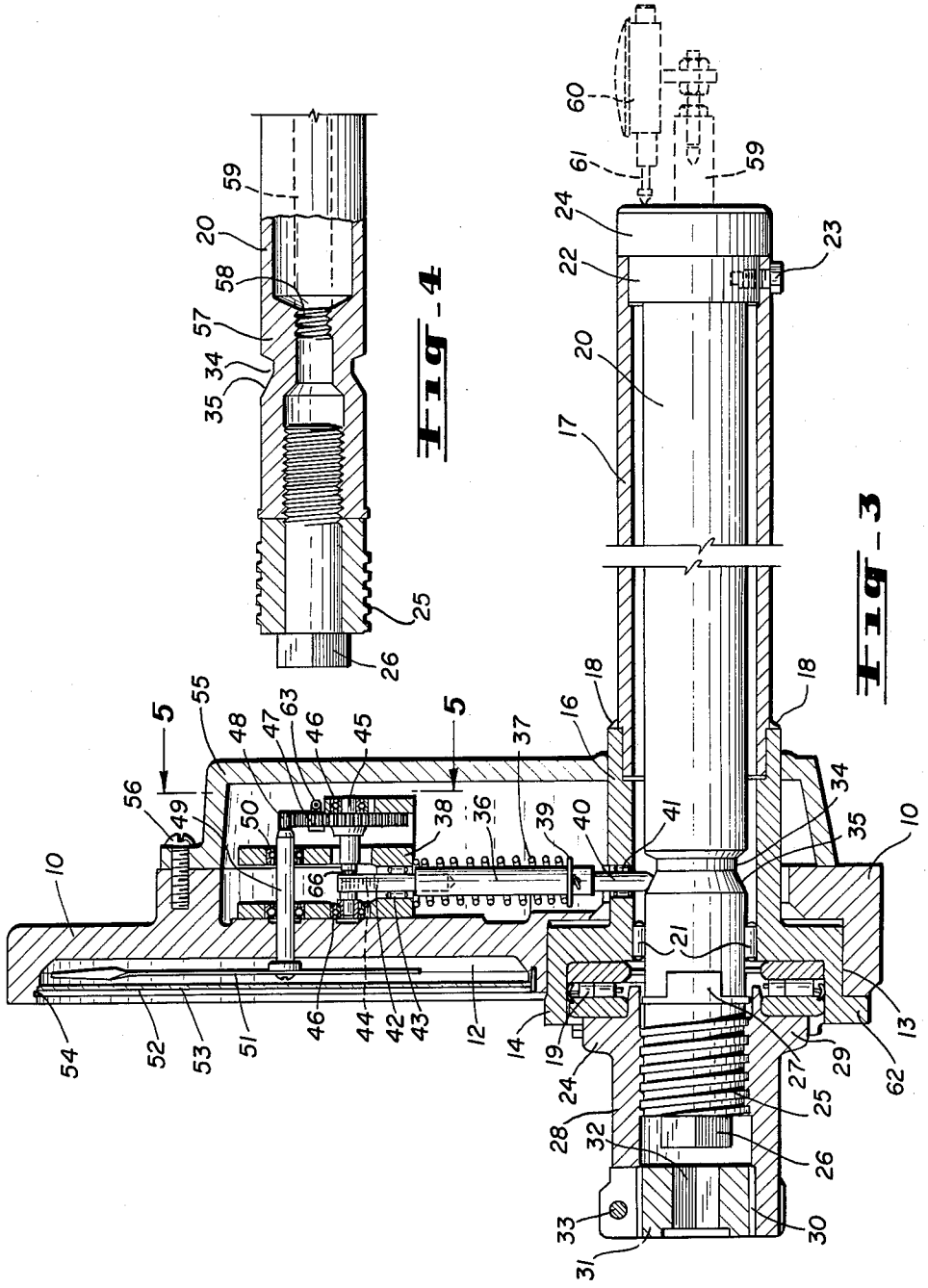

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IMPACT WRENCH CHECKERS

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5 Claims. (Cl. 73—1)

This invention generally relates to a device for checking the output of torque measuring wrenches and more particularly for checking the output of power driven impact wrenches. Impact wrenches are power-driven wrenches designed for tightening threaded connections, such as screws, bolts, nuts, etc. by imparting rotation thereto through a rapid series of impacts until a predetermined load has been placed upon the work piece. It is necessary to accurately and uniformly preset such wrenches to the desired maximum delivery torque and, since the impacts of the wrenches are only momentary, it is difficult to determine their maximum output.

The principal object of this invention is to provide an impact wrench checker to which a power driven impact wrench may be applied and which will accurately indicate the maximum torque output of the wrench.

Another object of the invention is to provide such an impact wrench tester which will indicate upon a dial the output torque of the wrench being tested and which will retain the maximum indication until reset.

A further object of the invention is to provide an impact wrench checker that will be adaptable to various sizes of wrenches and to wrenches of either clockwise or counter-clockwise rotation.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention, reference is made to the accompanying drawing which forms a part hereof. Like numerals refer to like parts in all views of the drawing and throughout the description.

In the drawing:

FIG. 1 is a side elevational view of the improved wrench checker;

FIG. 2 is an enlarged front elevational view of the checker of FIG. 1;

FIG. 3 is a vertical, longitudinal section therethrough taken on the line 3—3, FIG. 2;

FIG. 4 is a fragmentary, detail, longitudinal, section through the forward extremity of a tension bar employed in the checker to be later described; and,

FIG. 5 is a fragmentary detail section taken on the line 5—5, FIG. 3.

The impact wrench checker of this invention employes an anchor housing **10** adapted to be mounted upon any sturdy work table support through the medium of suitable mounting bolts inserted through mounting openings **11** in base flanges projecting oppositely outward from the housing **10**.

The housing **10** is formed with a circular gauge cavity **12** in its upper portion with an anchor cavity **13** therebelow. An anchor bearing cup **14** is inset in the anchor cavity **13**. The bearing cup is provdied with a forward peripheral flange **62** which is bolted to the housing **10** through suitable cap screws **15**. A tubular anchor sleeve **16** is formed on and extends concentrically rearward from the anchor bearing cup **14** and is welded, as indicated at **18**, to the forward extremity of an elongated anchor tube **17** which extends rearwardly from the housing **10**. An annular thrust bearing assembly **19** is positioned in the bearing cup **14**. An enclosing mechanism

cover **55** is secured to the back of the housing **10** by suitable cap screws **56**.

A tension bar **20** extends throughout the combined length of the anchor tube **17** and the anchor sleeve **16**. The tension bar is hollow throughout the major portion of its length. The hollow terminates adjacent the forward extremity in a solid portion **57** as shown in FIG. 4. The tension bar **20** is mounted in suitable roller bearings **21** in the anchor sleeve **16** and extends forwardly within, but out of contact with, the thrust bearing assembly **19**. The rear extremity of the tension bar **20** has an enlargment **22** which is rigidly locked in a counter-sink in the rear extremity of the anchor tube **17** by suitable locking screws **23**. An enlarged head **24** is formed on the rear terminus of the tension bar **20** which bears against the rear extremity of the anchor tube **17** to prevent forward movement of the rear extremity of the tension bar. Thus, it can be seen that the rear extremity of the tension bar is fixedly locked and anchored against movement in any direction with reference to the housing **10**. The forward extremity, however, can move longitudinally in the bearings **21** when tension is applied to the tension bar **20**.

The tension is applied through the medium of an externally threaded tension bar adapter **25** which is rigidly bolted to the forward extremity of the tension bar through the medium of an axial bolt **26**. The tension bar adapter **25** is formed with tenons **27** which fit into receiving mortises in the forward extremity of the tension bar to prevent relative rotative movement therebetween. An internally threaded nut **28** is threaded upon the externally threaded tension bar adapter **25**. The nut **28** is provided, at its rearward extremity, with a flange **29** which bears against and extends within the thrust bearing **19**, so that rotation of the nut will apply tension to the tension bar **20**.

The nut **28** extends forwardly of the head of the bolt **26** and this forwardly extending portion contains a splined cavity **30** for receiving a splined drive socket element **31** having a concentric square passage **32** for receiving the square output shaft of an impact wrench. The drive socket elements **31** are interchangeable for different sizes of output shafts on impact wrenches and are rigidly locked in position in the nut **28** by means of a suitable clamp screw **33**.

It can be seen from the above that if the output shaft of an impact wrench is inserted in the passage **32** of the drive socket element **31**, and operated, it will rotate the nut **28** at each impact of the wrench causing it to climb the threads on the tension bar adapter **25** to apply, through the medium of the bolt **26**, tension upon the tension bar **20** to stretch the latter forwardly.

A measurement of the forward movement of the forward extremity of the tension bar is used in this invention to provide an indication of the maximum torque developed by the impact wrench. This is accomplished by forming a circumferential groove **34** in the tension bar adjacent the forward extremity thereof. The groove **34** is provided with an inclined, forward wall **35** against which the lower extremity of a vertical sensing rod **36** is constantly urged through the medium of a compression spring **37**. The spring **37** is compressed between a suitable gear frame **38**, mounted on the back of the housing **10**, and a spring washer **39** mounted on the sensing rod **36**.

The lower extremity of the sensing rod **36** has a reduced diameter portion **40** which extends through a roller bearing **41** into contact with the inclined wall **35** of the groove **34**. The upper extremity of the sensing rod is drilled to receive a toothed rack rod **42** which extends upwardly into the gear frame **38** through a suitable antifriction bearing **43**. Rack teeth **44** are milled into one side of the rack rod **42** and mesh with pinion teeth formed in

a rack pinion shaft **45** mounted in suitable bearings **46** in the gear frame **38** so that vertical movements of the sensing rod **36** will be translated into rotary movements of the rack pinion shaft **45**.

These vertical movements of the sensing rod are multiplied through the medium of a spur gear **47** mounted on the rack pinion shaft **45** and meshing with a pinion **48** formed on a pointer shaft **49** mounted in suitable bearings **50** in the gear frame **38** and extending forwardly into the gauge cavity **12**. An index pointer hand **51** is mounted on the forward extremity of the pointer shaft **49** to indicate positions upon an annular scale **52** on a transparent dial face **53** which is circumferentially adjustable in the open face of the gauge cavity **12** by means of a suitable, removable mounting ring **54**.

It can be seen that if an impact wrench is applied to the drive socket element **31** and operated, the nut **28** will be rotated in a clockwise direction to react against the thrust bearing assembly **19** to cause the internal threads thereon to act against the external threads on the tension bar adapter **25** to impart a stretch on the tension bar **20**. This stretch will move the inclined side wall **35** of the groove **34** forwardly allowing the reduced portion **40** of the sensing rod **36** to descend. This downward movement is transmitted from the rack rod **42** and through the gear train to the pointer **51** causing it to rotate counterclockwise to give an indication on the index dial **52** of the maximum impact which has been applied by the wrench.

The friction between the threads on the nut **28** and the threads on the tension bar adapter **25** together with the friction at the thrust bearing assembly **19** prevents the return of the nut **28** between impacts of the wrench so that the index pointer hand **51** remains stationary at the maximum indication on the scale until reset. The resetting is accomplished by reversing the wrench to unscrew the nut **28** to release the tension in the tension bar **20**.

The checker can be adapted to various sizes of wrenches by interchanging the splined drive socket elements **31**. The checker can also be adapted to test left hand wrenches by replacing the nut **28** and the tension bar adapter **25** with a left hand threaded nut and a left hand threaded adapter. Thus, the checker can be efficiently adapted to check the output of all types of impact wrenches.

The transparent dial face **53** can be released and rotated by removing the mounting ring **54** so that the scale **52** can be rotated to accurately place the index markings in proper relation to the index pointer hand **51** before use. This can be accomplished by applying a load to the drive socket element **31** with a torque wrench of known accuracy and then rotating and setting the dial face with the reading on the dial face corresponding to the reading on the torque wrench. It can also be accomplished by a pre-setting kit including a deformation meter **60** provided with an actuating plunger **61**. The meter **60** is mounted on the extremity of a pre-setting rod **59** which can be threaded into a threaded socket **58** in the solid portion **57** of the tension bar **20** so as to project from the rear extremity of the latter as shown in broken line in FIGS. 3 and 4. For presetting purposes, the plunger **61** is placed against the head **24** and the meter **60** is set on the pre-setting rod **59** so that the meter indicates "0" when all loose play has been removed between the wrench and the tension bar **20**. The dial face **53** is then set in accord with the meter indications. The pre-setting kit forms no part of the present invention.

A tension spring **63** is tensioned between an eccentrically positioned dowel pin **64**, in the spur gear **47**, and an attachment screw **65** in the gear frame **38**. This spring constantly maintains the teeth **66** of the rack pinion shaft **45** in contact with the teeth **44** on the rack rod **42** so that there is no lost motion between the sensing rod **36** and the gear train when the sensing rod starts to descend. The spring **63** also resists wavering vibration of the pointer hand under the vibration of the impact wrench.

While a specific form of the improvement has been described and illustrated herein, it is to be understood that the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:

1. A wrench checker comprising: a housing; an anchor tube fixedly mounted at its forward extremity in said housing and extending rearwardly therefrom; a tension bar extending longitudinally within said anchor tube; locking means affixing the rear extremity of said tension bar to said anchor tube; an annular thrust bearing in said housing surrounding the forward portion of said tension bar; a rotatable internally threaded nut on the forward extremity of said tension bar and bearing against said thrust bearing; wrench engaging means on said nut for imparting rotation to said nut to cause it to react against said thrust bearing to stretch said tension bar longitudinally; and gauge means actuatable in consequence of the stretch imparted to said tension bar to indicate the amount of torque being applied to said nut by said wrench.

2. A wrench checker as described in claim **1** in which the wrench engaging means comprises a drive socket element removably mounted in said nut and provided with a non-round socket in axial alignment with said tension bar to receive the drive element of a socket wrench and a releasable locking means for locking said drive socket element against rotation in said nut.

3. A wrench checker as described in claim **1** having a tension bar adapter removably mounted on the forward extremity of said tension bar and extending into said nut, said adapter having external threads engaging the internal threads of said nut to impart tension to said tension bar in consequence of rotation of said nut.

4. A wrench checker as described in claim **3** having a bolt extending through said adapter and into said tension bar for holding the former onto the latter and means on said adapter engaging said tension bar for preventing relative rotation therebetween.

5. A wrench checker as described in claim **1** in which the gauge means comprises: a groove formed in said tension bar at right angles to the axis thereof; a forwardly inclined wall in said groove; a sensing rod slidably mounted in said housing; spring means urging one extremity of said sensing rod against said forwardly inclined wall; and indicating means connected with the other extremity of said sensing rod to indicate the amount of movement of said sensing rod occasioned by longitudinal movement of said tension bar.

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