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TORQUE INDICATING WRENCH ADAPTER

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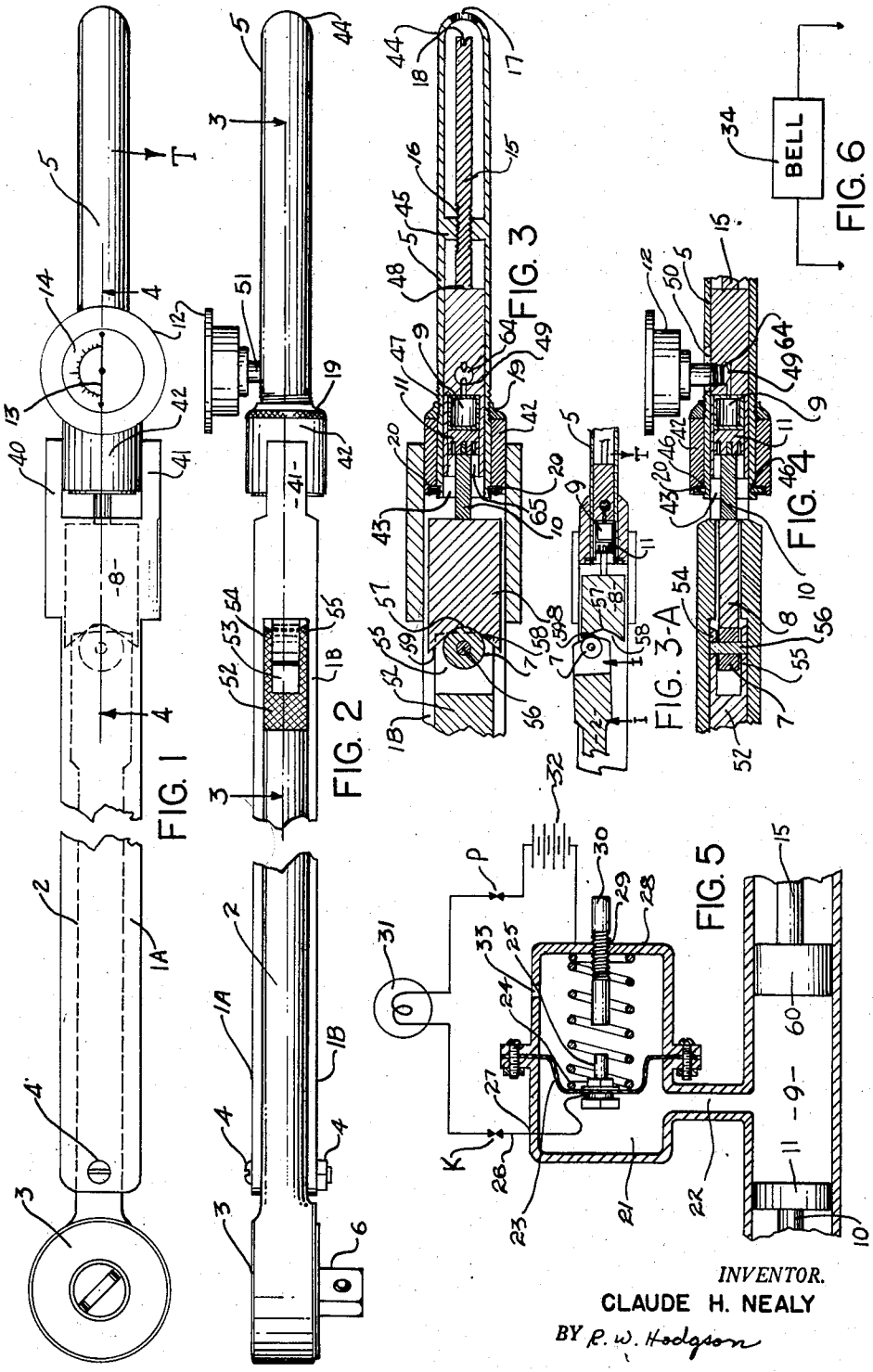


FIG. 1

FIG. 2

FIG. 3

FIG. 3-A

FIG. 4

FIG. 5

FIG. 6

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TORQUE INDICATING WRENCH ADAPTER

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9 Claims. (Cl. 73—139)

This invention relates to hand tools equipped with torque indicating devices and, more particularly, to an adapter, which can be fitted to conventional wrenches including those of the ratchet type, having an extension handle with a torque pressure indicating gauge incorporated therein.

The importance in industry of the torque wrench as a precision tool is well known to all persons familiar with the general arts of mechanical fabrication and assembly, but as is also well known to persons familiar with the tooling industry, the spring tensioned mechanically actuated torque pressure indicators incorporated in many of the presently available wrenches leave much to be desired from the standpoints of accuracy and consistent operation.

My invention has been made with the foregoing considerations in mind and can be said to have a plurality of important objectives.

One important object of my invention is the provision of a device adapted to indicate accurately the amount of torque pressure applied by a conventional wrench.

Another important object of my invention is the provision of a device of the character described which is adapted to utilize a fluid pressure gauge in the measurement of effective torque pressure.

A further important object of my invention is the provision of a device of the character described having means for translating the torque of a wrench under tension into lineal pressure and the lineal pressure, in turn, into fluid pressure.

An additional object of my invention is the provision of a device of the character described being adapted for attachment to a conventional wrench such as a long handled ratchet wrench.

In brief, the device of my invention includes an extension handle which is pivotally attached to a conventional wrench adjacent the work engaging end thereof by a pair of spanner members disposed on opposite sides of the wrench and having a slidable concave cam member disposed between the spanner members adjacent the inner end of the extension handle.

The outer end of the conventional wrench handle is provided with an axio-diametric slot extended inwardly from the outer end thereof in which a roller is mounted on a diametrically disposed shaft positioned centrally of the slot.

The spanner members are dimensioned so that the roller in the end of the wrench handle is disposed centrally of the concave surface of the cam member. This cam is movable axially within the extension handle and has a connecting rod and piston attached thereto, the latter interfitting within a cylindrical recessed bore of a cylindrical insert also disposed interiorly of the extension handle.

Thus when the wrench is fixed in a work-engaging position and tension is applied to the extension handle, the extension handle tends to pivot relative to the workpiece whereas the conventional wrench handle tends to remain stationary until the roller in the end thereof engages one arcuate side of the concave cam and presses it longitudinally into the extension handle, thereby increasing the fluid pressure within the collapsible elastomeric chamber which is, in turn, measured by a fluid pressure gauge suitably calibrated in terms of torque pressure applied to the extension handle.

Certain variations of the embodiment disclosed herein and further important objects of my invention will be apparent in the following detailed specification when examined together with references made therein to the drawings, in which:

Figure 1 is a diagrammatic plan view showing the torque indicating extension handle of my invention attached to a ratchet wrench;

Figure 2 is a side elevational view of the wrench shown in Figure 1 showing the manner in which the roller at the end of the wrench handle engages the cam in the center of the extension handle;

Figure 3 is a longitudinal section taken along the line and in the direction indicated by the arrows 3—3 in Figure 2;

Figure 3–A is a schematic diagram showing the change in positioning of the parts when the extension handle pivots relative to the wrench handle;

Figure 4 is a longitudinal sectional view taken along the line and in the direction indicated by the arrows 4—4 in Figure 1;

Figure 5 is a schematic sectional diagram illustrating the operation of a pressure sensitive switch adapted to operate a signal light, and

Figure 6 designates schematically a bell alarm which may be substituted for operation by the switch shown in Figure 5.

Reference is again made to Figures 1 and 2 collectively showing an extension handle and torque indicating device constructed according to my invention which is designated in general by the numeral **5** and is seen attached to a wrench including a handle **2** and a ratchet head **3** and work engaging member **6**. The extension handle **5** is attached to the wrench adjacent its ratchet head **3** by means of a pair of spanner members **1–A** and **1–B** which are pivotally attached as shown at **4** and are terminated at their ends spaced therefrom in extended sections **40** and **41** which serve to hold the spanners **1–A** and **1–B** in spaced relationship and also to attach them mutually to a tubular collar member **42**.

A tubular handle member **5**, as best seen in Figures 3 and 4, is open at one end **43** and closed at the other end **44**, and is supported interiorly intermediate thereof by a solid through section **45** having an interiorly threaded axial bore therethrough, as indicated at **16** in Figure 3. The open end of the tube **5** is entered through the collar **42** and is held therein by a snap ring **20** which is engaged within a circumferential groove **46** best seen in Figure 4, and a lock ring **19** which is engageable with the extended threads **47** on the exterior of the tube **5** as seen in Figure 3, is tightened against the edge of the collar **42** opposite from the snap ring **20** to hold the handle **5** in fixed relationship to the collar and thereby to the extended sections **40** and **41** and to the spanner members **1–A** and **1–B**.

A cylindrical insert **61**, as is clearly illustrated in Figures 3 and 4, is closed at one end **48** and is positioned slidably within the extension handle member **5** with its open end adjacent that of the handle as indicated at **43**, and is held in position longitudinally of the handle **5** by a positioning rod **15** which has outwardly extended threads as seen at **16** engageable with the threaded inner bore of the solid section **45** interiorly of the extension handle. An axially aligned aperture **17** is provided in the closed end **44** of the extension handle **5** to provide access to a slot

18 in the end of the rod 15 by which it may be rotated through the threads 16 to move the cylindrical insert 61 and in turn the collapsible elastomeric chamber 9 contained therein in the direction of the aperture 43 of the extension handle 5. The collapsible elastomeric chamber 9 is slidably positioned within the cylindrical recessed bore portion 65 of the cylindrical insert 61 and communicates interiorly with the fluid pressure gauge 12 through an aperture 49. The piston 11, with the connecting rod 10 interfitting therein, and the elastomeric chamber 9 are slidably positioned within said cylindrical recessed bore 65 of the cylindrical insert 61.

A fluid pressure gauge 12 is mounted as shown in Figures 1, 2 and 4 with its face upright with respect to the wrench 3 when positioned in the normal work-engaging position, and is affixed in the cylindrical insert interiorly threaded axial bore 64 adjacent to the side of the collapsible elastomeric chamber 9 as can best be seen in Figure 4, and communicates interiorly therewith through an aperture 49 as shown in Figure 4. A longitudinal slot 50 is provided in the periphery of the tubular handle 5 through which the attachment nipple 51 of the gauge 12 is movable as the collapsible elastomeric chamber 9 is moved within the interior of the cylindrical insert 61, lying within the extension handle 5, by rotation of the rod 15. It should be noted that even after lock nut 19 has been locked, the handle 5 can be swivelled to any desired position within a full 360 degree range so that the gauge 12 may be placed in a visible position irrespective of the position of the wrench, as necessitated by various types of working positions, thus providing a highly desirable feature not present in prior art torque wrenches.

As can be seen from an examination of the figures, the positioning of the extension members 40 and 41 relative to the spanner members 1–A and 1–B is effective to provide a rectangular opening therebetween in which the cam plate 8 having the connecting rod 10 and piston 11 extended therefrom into the cylindrical insert 61 is longitudinally slidable, the piston being correspondingly slidable within the cylindrical insert 61.

Reference is again made to Figure 2 showing the handle 2 of the ratchet wrench 3, in which it will be seen that its outer end 52 is provided with a slot 53 disposed between the upper and lower terminal sections 54 and 55. Within the notch 53 a roller 7 is journalled on a shaft 56 disposed vertically between the terminal portions 54 and 55 of the end 52 of the handle 2. The roller 7, as is most clearly indicated in the Figures 3, 3–A, 4 and in phantom in Figure 1, engages and is normally seated within the arcuate center of the concave adjacent edge 58 of the cam plate 8. The cam 8 is normally held tightly against the roller 7 because of the residual pressure remaining within the collapsible elastomeric chamber 9.

The operation of the device is clearly indicated in the purely schematic diagram of Figures 3–A which shows the reaction occurring when the work engaging member 6 of the ratchet 3 in Figure 2 is engaged with a workpiece and tension is applied to the handle extension 5 in the direction indicated by the arrow T in Figure 1. As seen in Figure 3–A tension on the handle 5 in the direction indicated by the arrow T tends to cause the extension handle assembly to pivot at the point 4 as the handle member 2, because of its engagement with the workpiece, exerts opposing resistance to the rotation of the extension handle indicated by the arrows I—I, thus moving the roller 7 away from the arcuate center 57 of the cam plate 8 toward the extended edge 59 thereof, thereby forcing the cam plate 8 and the piston member 11 attached thereto in the direction of the adjacent arrow inwardly of the collapsible elastomeric chamber 9.

Inward movement of the piston 11 within the cylindrical insert 61 increases the fluid pressure in the collapsible elastomeric chamber 9, which in turn is measured by the needle 13 of the gauge 12 moving across the scale 14 which is suitably calibrated to interpret the fluid pressure in terms of the torque applied to the extension handle 5.

A variation of the above described embodiment employing a pressure sensitive switch, is shown schematically in Figure 5 in which a cylinder 9 is provided with an adjustable end plug 60 affixed to the end of the positioning rod 15, the piston 11 being movable through the opposite end thereof. A pressure chamber 21 communicates interiorly with the cylinder 9 by means of the passage 22. The chamber 21 is enclosed by a casing including half shells 27 and 28 disposed on opposite sides of a diaphragm 23 which is normally disposed inwardly of the chamber 21 by tension of a coil spring 24 disposed between the inner surface of the diaphragm 23 and the inner surface of the casing shell 28 spaced therefrom.

A first electrode 25 is disposed centrally of the diaphragm and a second electrode 30 is threadable as seen at 29 into the casing shell 28 in axial alignment with the first electrode. An aperture 33 opens outwardly of the casing shell 28 to provide ingress and egress of atmospheric air required by movement of the diaphragm occasioned by increased pressure within the cylinder 9.

Circuit means are provided directing current from one terminal of a battery to the second electrode 30 in the casing shell 28 and from the other terminal of the battery to an electric lamp 31 and thence to the first electrode 25 in the center of the diaphragm 23. Rotation of the electrode 30 in the thread 29 in the casing shell 28 makes it possible to space the electrodes so that any predetermined pressure within the cylinder 9, and consequently any torque pressure respective thereto exerted on the extension handle of the wrench, is effective to bring the electrodes into contact and complete the battery circuit through the lamp 31 to provide a visible signal to the operator of the wrench.

As indicated in Figure 6, a bell 34 providing an audible signal, may be substituted at the points indicated by the arrows K—P in the circuitry previously described.

Numerous modifications and variations of the present invention will occur to those skilled in the art after a careful study hereof. All such, properly within the basic spirit and scope of the present invention are intended to be included and comprehended herein as fully as if specifically described, illustrated and claimed herein.

The exact compositions, configurations, constructions, relative positionings, and cooperative relationships of the various component parts of the present invention are not critical, and can be modified substantially within the spirit of the present invention.

The embodiments of the present invention specifically described and illustrated herein are exemplary only, and are not intended to limit the scope of the present invention, which is to be interpreted in the light of the prior art and the appended claims only, with due consideration for the doctrine of equivalents.

I claim:

1. A wrench assembly having means incorporated therein for indicating the amount of torque pressure imposed thereby, comprising: a wrench including work engaging elements and an elongate handle extended therefrom having an axial slot disposed inwardly from the end spaced from said work engaging elements, said slot in said handle being in substantial alignment with the plane of movement of said handle; a roller journalled on a diametrically disposed shaft positioned centrally of said slot; a yoke assembly including a tubular extension handle and a pair of parallel longitudinally extended spanner members affixed to opposite sides of said extension handle and pivotally attached to said wrench adjacent said work engaging elements thereof; a cam plate slidably disposed between said spanner members adjacent said extension handle, said cam having an inwardly disposed concave edge the center thereof being disposed against the outer periphery of said roller; a cylindrical pressure chamber controllably slidably and lockably disposed interiorly of said tubular ex-

tension handle with its open end adjacent said cam plate, and connecting rod and piston means extended outwardly from said cam and being slidable within said cylindrical pressure chamber, and fluid pressure gauge means communicating interiorly with said pressure chamber.

2. The invention in accordance with claim 1 in which said gauge is fixedly attached by conduit means to said cylindrical pressure chamber, said conduit means being entered through a longitudinal slot in the side of said extension handle member whereby said conduit and gauge are free to move longitudinally of said handle when said pressure chamber is controllably moved axially interiorly of said handle.

3. The invention in accordance with claim 2 and being further characterized by a boss member integrally formed interiorly of said extension handle, said boss having an internally threaded axial bore therethrough; an axial opening in the outwardly extended end of said extension handle, an externally threaded shaft being entered therethrough and inwardly rotatable through said threads in said boss into engagement with the closed end of said cylindrical pressure chamber.

4. The invention as set forth in claim 3 in which said pressure sensitive gauge is provided with a dial bearing indicia indicating the torque pressure applied to said extension handle in order to develop the fluid pressure present in said cylindrical pressure chamber.

5. A pressure indicating torque wrench, comprising: a wrench having work engaging means at one end and a handle extended longitudinally therefrom having a slot disposed axially inwardly from the outward end thereof; a roller mounted on a diametrically disposed shaft interiorly of said slot, said roller being aligned in the plane of movement of said handle when exerting tension upon a work piece; a generally tubular extension handle axially disposed outwardly from said wrench and pivotally attached thereto adjacent the work engaging end thereof by a pair of spanner members being disposed on opposite sides of said wrench; a cam plate slidably disposed between said spanner members adjacent the inner opening of said tubular extension handle, said cam having a concave inwardly disposed surface bearing centrally against

said roller; a recessed cylinder disposed interiorly of said handle member; a connecting rod and piston extended outwardly from said cam plate and being slidable within said recessed cylinder, and pressure-responsive output means effectively responsive to the fluid pressure within said cylinder.

6. The invention in accordance with claim 5 in which said pressure-responsive output means is fixedly attached by conduit means to said recessed cylinder, said conduit means being entered through a longitudinal slot in the side of said extension handle member whereby said conduit and pressure-responsive output means are free to move longitudinally of said handle when said recessed cylinder is controllably moved axially interiorly of said handle.

7. The invention in accordance with claim 6 in which said pressure-responsive output means comprises a pressure chamber having a diaphragm disposed therein, said diaphragm having a first electrode extended from the center thereof and being movable under predetermined pressure into contact with a second electrode, normally spaced apart therefrom, whereby current is directed to electrical signal means.

8. The invention in accordance with claim 7 in which said electrodes are effective under predetermined pressure to direct current to an electrically operated lamp to provide a visible signal to the operator of said wrench.

9. The invention in accordance with claim 6 in which said electrodes are effective under predetermined pressure to direct current to an electrically operated bell to provide an audible signal to the operator of said wrench.

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