

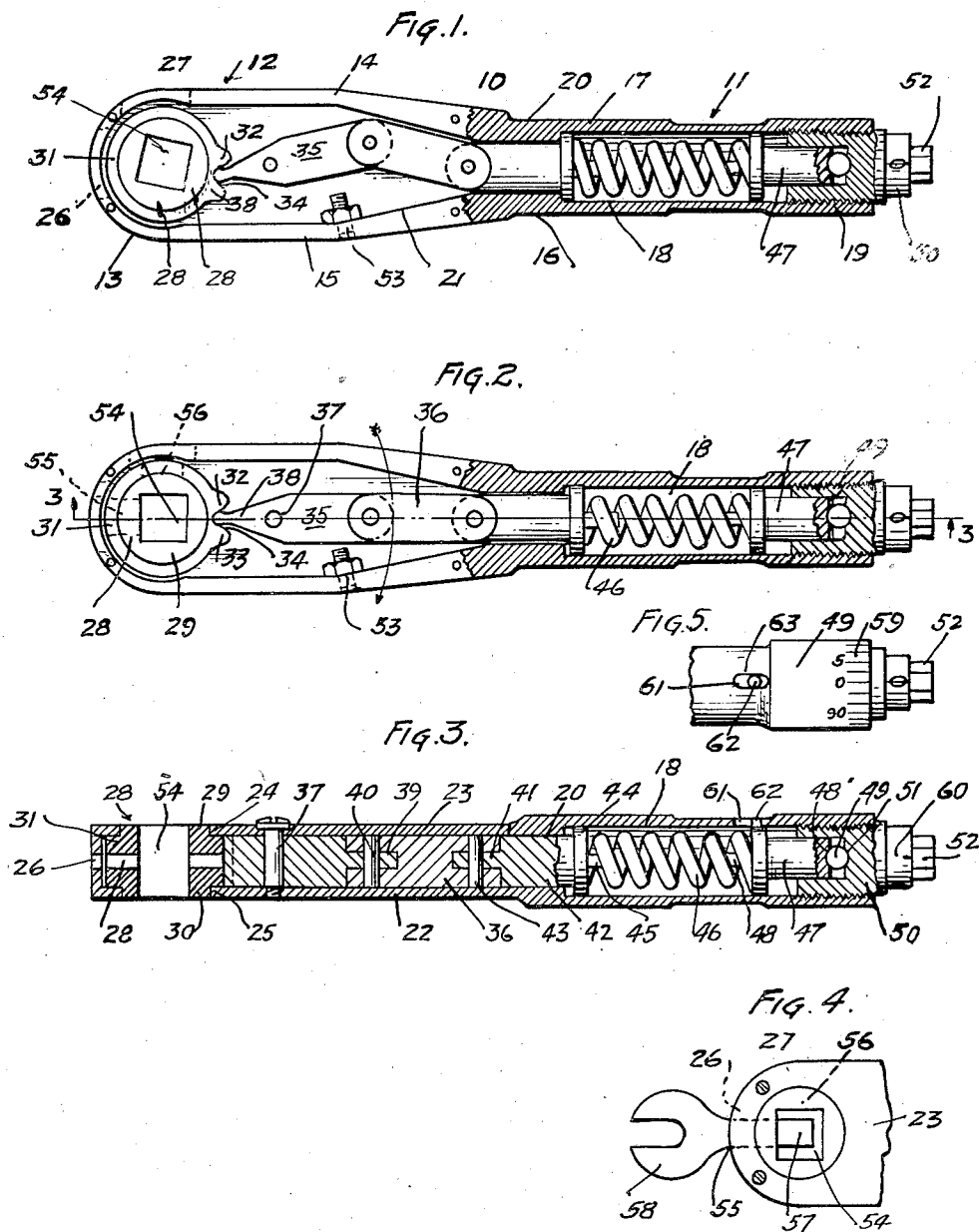
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SET TORQUE WRENCH

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SET TORQUE WRENCH

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2 Claims. (Cl. 81—53)

This invention relates to a wrench and particularly pertains to a set torque wrench.

In various mechanical assembling operations, and particularly in ordnance and aircraft work it is necessary to tighten bolts and nuts rapidly and at the same time to insure that the parts have been screwed together to produce a desired holding action without applying an excessive degree of torque which would tend to weaken or fracture the threads of the parts being tightened. Various devices have been provided to operate in connection with wrenches whereby the degree of torque applied by the wrench is indicated either audibly or visibly. Devices of this character tend to increase the co-ordination and efficiency of the operator and it has been found desirable to provide means which will indicate automatically on the wrench when the selected amount of torque has been applied, this indication being imparted to the handle grip of the wrench so that the operator will be sensible of the indication without observing dials, needle, or other indicating members. It is also desirable to provide a wrench which may be set to a desired tension so that the wrench cannot exert a pressure greater than a predetermined set pressure and so that this maximum set pressure may be indicated to the operator.

It is the principal object of the present invention therefore to provide a torque wrench fitted with simple and effective means whereby the wrench may be set to a predetermined maximum torque and will thereafter function to operate upon threaded members to be tightened to that maximum torque only, and to indicate when the maximum torque has been reached.

The present invention contemplates the provision of a wrench body having a rotary element mounted at one end thereof to engage an element to be rotated or to carry interchangeable wrench heads, the opposite end of the body carrying a handle grip within which adjustable means are assembled to establish and control the torque of the wrench.

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

Figure 1 is a view in plan showing the assembled wrench with the cover removed and the parts in a normal position.

Fig. 2 is a view in plan showing the wrench with its cover removed and the parts in a maximum torque position.

Fig. 3 is a view in central longitudinal section taken through the wrench on the line 3—3 of

Fig. 2 and shows the details of construction of the wrench.

Fig. 4 is a fragmentary view showing the application of a demountable head.

Fig. 5 is a fragmentary view in elevation showing the end portion of the handle and the micrometer calibrations.

Referring more particularly to the drawing, 10 indicates a wrench body at one end of which is a hand grip 11. The wrench body is preferably made of steel and includes a case 12. The case 12 is formed with a wall along its perimeter. One end of the case has a substantially semi-circular wall portion 13 and opposite side wall portions 14 and 15. The side wall portions taper toward each other and terminate in an end portion 16. Formed integral with the end portion 16 is a tubular handle 17. The tubular handle has a central bore 18 internally threaded at its outer end as indicated at 19 and communicating with a bore 20 of reduced diameter which extends through the portion 16 and into the cavity 21 formed by the walls along the perimeter of the case. The handle 17 and the bores 18 and 20 are in longitudinal alignment and are centrally aligned with the longitudinal axis of the cavity 21 in the case. The wall portion 13 which is at the opposite end of the case from the bore 20 represents an arcuate length greater than 180° for a purpose to be hereinafter described. The case 12 has a floor 22 on one side thereof and is provided with a cover plate 23 on the opposite side thereof. The floor and the cover plate are formed at one end with relatively large complementary openings 24 and 25 respectively, which openings are in axial alignment, the axis intersecting the longitudinal center of the case and being at right angles thereto. Formed through the end of the arcuate wall section 13 is an elongated slot or opening 26, the median line of which is coincident with the longitudinal center line of the case. A similar opening 27 is formed to the side of the case and with its median line substantially at right angles to that of the opening 26, both of said median lines being radially disposed with relation to the axis of the openings 24 and 25. Mounted within the openings 24 and 25 is a rotary head 28. This head is formed with opposite cylindrical extensions 29 and 30 which have a rotating fit within the openings 24 and 25 respectively. The opposite faces of these cylindrical portions lie flush with the opposite faces of the assembled body structure 10. Intermediate the cylindrical portions 29 and 30 is a substantially cylindrical portion 31 of larger diameter which is

of a thickness representing the space between the inner faces of the floor 22 and the plate 23 respectively. This prevents the rotating head 28 from becoming displaced. At one side of the rotating head 28 and formed integral with the cylindrical portion 31 are lugs 32 and 33 between which a radial seat 34 is formed. This seat extends in the general direction of the longitudinal axis of the body structure 10 and toward the handle 11. Mounted within the cavity 21 is a lever 35 and a link 36. The lever 35 is secured upon a pivot pin 37 which extends through the cover plate 23 and is threaded into the floor 22 the axis of the pin being parallel to the rotating axis of the head 28 and lying in a plane in the longitudinal center of the body 10. At one end of the lever 35 is a finger 38 which extends into the seat 34 on the rotating head 28. The end of the finger is rounded so that as the head 28 rotates the finger may swing around the axis 37 without binding. The opposite end of the lever 35 is formed with an extension 39 of reduced thickness. This extension projects into the forked end of the link 36. A connecting pin 40 extends through the forked end of the link 36 and the extension 39 of the lever 35 to connect the lever and the link pivotally. The opposite end of the link 36 is similarly constructed and receives an extension 41 of a piston rod 42. The rod 42 reciprocates within the bore 20 of the body of the structure and is pivoted to the link 36 by a pin 43. The end of the rod 42 opposite the extension 41 has an enlarged collar 44 which fits within the bore 18 of the handle and limits the movement of the rod 42 through the bore 20. A pin 45 extends longitudinally of the end of the rod 42 and into the bore 18. Positioned within the bore 18 is a helical tension spring 46 which rests against the end of the piston rod 42 at one end and against a plug 47 at the opposite end. The plug 47 is fitted with a pin 48. The pins 45 and 48 extend into the opposite ends of the spring 46 and center it. The plug 47 is formed at its outer end with a concaved ball seat 48' to receive a ball 49. The plug extends into a threaded adjusting cap 50 which is threaded into the bore 19 of the handle 11. A concaved seat 51 is formed within the bore adjusting cap and between the seats 48' and 51 a ball 49 is held. The cap 50 projects beyond the end of the tubular handle 11 and is fitted with a squared head 52 by which the cap may be rotated.

For purposes to be hereinafter set forth a stop screw 53 is threaded through the side wall 15 of the body 10 of the wrench and limits the swinging movement of the lever 35 as shown in Fig. 2 of the drawing. The rotary head 28 of the wrench is provided with a central opening 54 which is here shown as being square. This opening is to accommodate the head of a nut or bolt. It is to be understood that the opening may be of any desired or necessary configuration. Formed through the side wall of the rotary head are slots 55 and 56. These slots are in the plane of the slots 26 and 27 of the body of the wrench and may receive the shank 57 of interchangeable wrench heads 58.

In order to properly adjust the tension of the spring 46 suitable graduations 59 are formed around the circumferential end face of the handle 11 and cooperate with a pointer mark 60 upon the cap 50. Formed through the side walls of the handle 11 are slotted openings 61. A pin 62 extends through these openings and the plunger 47.

Graduations 63 are made upon the body of the handle 11 along the slotted openings 61 so that an index groove 64 in the end of the pin 62 may be brought to register therewith and will indicate spring tension imposed upon the spring 46 by the cap 50.

In operation of the present invention the wrench is assembled as shown in the drawing, after which the adjusting cap 50 is tightened until the index mark 60 is brought to register with the graduations 59 representing the number of inch pounds of torque. This also forces the plunger 47 down so that the graduation mark 64 on the pin 62 will register with the graduation 63 disposed along the slot 61 in the handle. This will indicate the number of hundred inch pounds torque adjustment which have been made. Thus the registration of the index mark 60 with a particular calibration 59 will indicate the maximum number of inch pounds to which the wrench is to be pressed. The wrench is then applied to the element which is to be turned and the torque force is delivered in the direction of the arrow *a* as indicated in both Figs. 1 and 2. In the normal position of the wrench parts as shown in Fig. 1 of the drawing, the head 28 is disposed so that its radial seat 34 will be at an angle to the longitudinal center of the wrench in the direction of the application of torque, and that the lever 35 will be disposed angularly of the longitudinal center of the wrench oppositely from that of the radial seat. It will also be noted that link 36 is disposed off center to connect the piston rod 42 and the free end of the lever 35. So long as the member seated within the rotary head 28 and to be rotated does rotate all of the parts of the wrench will remain in the position shown in Fig. 1, since the response to torque force will be less than that required to compress the spring 46. When, however, the rotated part, such for example as the nut, is screwed on to the threads of a complementary member to a point where the parts are sufficiently tightened to resist the torque force applied by the wrench, the rotating head 28 will tend to stand stationary and the wrench will swing around the axis of the rotating head, with the result that the lever 35 will swing around the fulcrum pin 37 and cause the link 36 to tend to swing to a position of longitudinal alignment with the lever. It will be recognized that the lever and the link have a toggle joint action with relation to each other, and as they strain they will force the piston rod 42 longitudinally against the action of the spring 46 and thus will cause a condition of lost motion in the application of torque force by the handle. This will continue until the free end of the lever arm 35 strikes the stop screw 53. It will thus be evident that by this arrangement it will be possible for the operator of the wrench to be advised instantly when a torque force is applied to the wrench which is resisted by the element which is engaged and is being tightened by the rotary head 28. It is to be understood that when desired an interchange of removable heads 58 may be made, as shown in Fig. 4 of the drawing. It will also be recognized that by the use of the structure here disclosed the tension of the spring 46 may be instantly changed to produce any set amount of torque, and that the mechanism is rugged and strong and cannot be easily broken, even though the operator does not heed the warning signal produced by the movement of the toggle joint in the wrench when a maximum set torque has been reached.

While I have shown the preferred form of in-

vention as now known to me, it is to be understood that various changes may be made in the combination, construction, and arrangement of parts by those skilled in the art, without departing from the spirit of the invention as claimed.

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

1. A set torque wrench, comprising a housing having a cavity at one end thereof and being formed with a cylindrical handle at the opposite end thereof disposed in longitudinal alignment with the cavity, said cavity being closed at opposite sides by flat parallel wall sections spaced from each other and through which aligned annular openings occur, a wrench head disposed between said walls and having cylindrical bosses extending oppositely and outwardly through said openings to rotate relative thereto, said head being formed with a central passageway of a configuration to receive an object to be rotated, a pair of spaced radial lugs projecting from the side face of the head within the cavity and forming an intermediate seat normally disposed in the plane of the longitudinal axis of the wrench structure, a lever pivoted between said side wall sections upon an axis normal to the longitudinal axis of the wrench and lying along the plane

of the center line of the wrench, said lever being formed at one end with an operating finger extending into the seat, a link pivotally connected to the opposite end of said lever, whereby the link and lever will form a toggle joint, a pressure rod longitudinally slidable within the handle of the wrench and pivotally connected to the link, a compression spring mounted within the handle and bearing against the end of the pressure rod, a plug resting upon the outer end of said spring, and an adjustable cap threaded into the end of the handle, whereby the tension upon the spring may be varied, said toggle structure being normally held with its elements in angular relation to each other by compression of said spring to hold the wrench head with its lugs and seat disposed at an angle to the longitudinal center of the wrench, whereby a torque force exerted against the handle of a magnitude greater than the set compression of the spring will tend to straighten the toggle and permit relative rotation of the wrench body and handle with relation to the wrench head.

2. The structure of claim 1 including an adjustable stop against which the toggle structure may swing to limit the relative rotation of the wrench body and its head.

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