

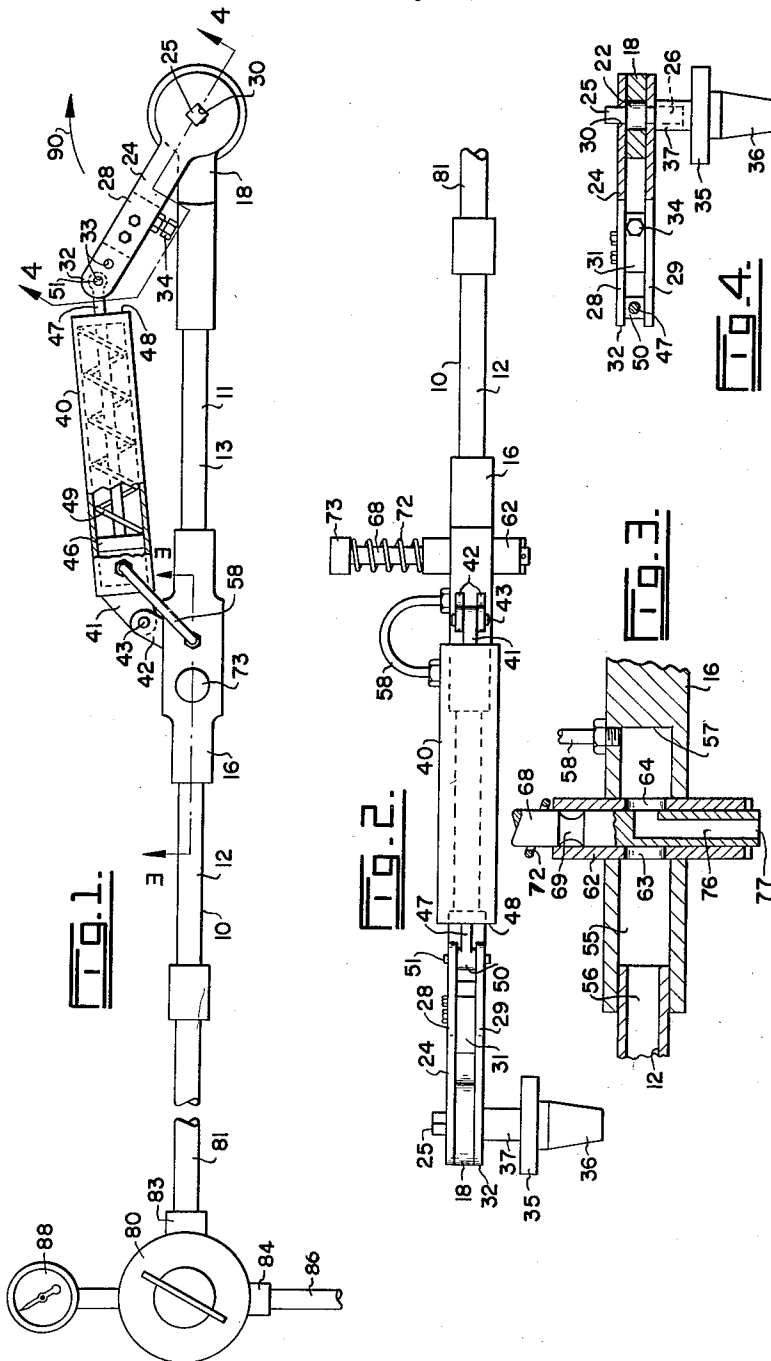
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FLUID OPERATED PREDETERMINED LOAD RELEASE TORQUE WRENCH

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1

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FLUID OPERATED PREDETERMINED LOAD RELEASE TORQUE WRENCH

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This invention relates to a fluid operated predetermined load release torque wrench.

The main object of the present invention is the provision of a wrench which may be used to apply exactly a desired degree of torque to a nut or bolt being turned by it.

Another object is the provision of a fluid operated torque wrench which may be set so that it cannot apply more than a desired torque during operation, said wrench also including means for adjusting the degree of torque as desired.

Power operated torque wrenches have been used prior to this invention. However, with such wrenches it was possible to apply more torque to a nut or bolt than was actually desired. The present torque wrench does not have this disadvantage since it may be set so that no matter what happens no more than the desired torque may be obtained. This eliminates any possibility of damage being caused by carelessness or neglect during operation of the wrench.

A fluid operated torque wrench according to this invention comprises a handle, a shaft rotatably mounted in an end of the handle and extending transversely thereof, an arm connected to the shaft and angularly disposed relative to the handle, and a cylinder connected to the handle at a point remote from the shaft. A piston is slidably mounted in the cylinder and has a rod extending therefrom through an end of the cylinder, said rod being connected to the arm. A passage is formed in the handle, and a tube extends from one end of the passage to the cylinder to direct fluid into the latter to move the piston rod outwardly thereof. An adjustable pressure control valve is provided having an inlet and an outlet, said outlet being connected to the opposite end of the passage, means suitable connects the valve inlet to a fluid pressure source, and a control valve is located in the passage and is operable selectively to direct pressure fluid to the cylinder and to direct fluid from the latter out of the passage.

An example of this invention is illustrated in the accompanying drawings, in which,

Figure 1 is a plan view of the torque wrench,

Figure 2 is a side elevation of the wrench,

Figure 3 is an enlarged section taken on the line 3—3 of Figure 1, and

Figure 4 is a section taken on the line 4—4 of Figure 1.

Referring to the drawings, 10 is a fluid operated torque wrench having a handle 11 of any desired shape. In this example, the handle comprises tubular sections 12 and 13 separated by a valve casing 16, and a flat outer section 18 at its outer end.

A shaft 22 is rotatably mounted in the outer handle section 18 and extends transversely thereof. An arm 24 is connected to this shaft in any desired manner, and is angularly disposed relative to the handle, see Figure 1. The shaft may have squared sections 25 and 26 projecting from its opposite ends beyond the surfaces of handle section 18, see Figure 4. In this case, arm 24 is formed of two parallel side plates 28 and 29 having aligned square holes 30 therein fitting over the squared sections of the shaft so that movement of the arm causes the shaft to rotate. Plates 28 and 29 are positioned on opposite sides of handle section 18, and a spacer block 31 is positioned

2

between said plates at a point spaced inwardly from the outer or free ends 32 thereof. Rows of holes 33 are formed in the plates 28 and 29, the holes of one plate being aligned with corresponding holes in the other plate.

These rows of holes extend longitudinally of their respective arms. A stop 34 is mounted on the side of the arm facing the wrench handle.

Either or each of the squared sections 25 and 26 of the shaft may have a socket opening out from its outer end for receiving a nut or the head of a bolt. However, it is preferable removably to secure sockets of different sizes to these squared ends as is common with socket wrenches. Figure 4 shows a standard ratchet 35 having a socket 36 removably secured thereto. This ratchet is provided with a connector 37 adapted to fit over either of the squared sections 25 or 26 so that the ratchet is operated when the shaft 22 is rotated. Ratchet arrangements of this type are well known in the socket wrench field.

A cylinder 40 is pivotally mounted near one end on the handle casing 16. In this example, the cylinder and casing are provided with lugs 41 and 42 which overlap and are pivotally connected by a pin 43. The cylinder has a piston 46 slidably mounted therein from which a piston rod 47 projects, said rod slidably extending through the outer end 48 of the cylinder. A spring 49 on the piston rod urges the piston away from cylinder end 48. Suitable means is provided for connecting the outer end of this rod to the adjacent outer end of arm 24. One way of doing this is to provide the rod with a head 50 on its outer end through which a pin 51 extends, said pin also extending through one pair of aligned holes 33 of the arm.

The valve casing 16 of the handle is provided with a fluid chamber 55 extending longitudinally of the handle and communicating at one end at 56 with the interior of the tubular handle section 12. The opposite end 57 of this chamber is connected by a tube 58 to one end of cylinder 40 on the side of piston 46 remote from the piston rod. Suitable valve means is provided for controlling the flow of fluid, usually air, through chamber 55. This is in the form of a tube 62 extending transversely through the casing and chamber 55, said tube having aligned ports 63 and 64 therein communicating with the chamber. A plunger 68 is slidably mounted in the tube and has a reduced section 69 which may be moved into and out of alignment with ports 63 and 64. A spring 72 on plunger 68 between tube 62 and a head 73 on the outer end of the plunger normally keeps the reduced section 69 away from the ports, and at this time, a passage 76 in the plunger is in communication at one end with port 64. The opposite end of this passage opens out from the end of the plunger, as indicated at 77.

An adjustable pressure control valve 80 is connected by a tube or hose 81 to the outer end of handle section 12. This tube or hose may be of any desired length, and it may be rigid or flexible. In any case, valve 80 is the type which may be set to permit fluid to pass from its outlet 83 at a set pressure, regardless of the pressure at which fluid is supplied to its inlet 84. The inlet of the valve may be connected by a hose 86 to a suitable source of fluid, said fluid usually being air supplied under pressure greater than is necessary to operate the wrench. The valve includes a dial 88 which indicates the pressure setting thereof.

If the tool is required to produce an exact degree of torque, it will be necessary to take into consideration the spring 49. The amount of pressure necessary to compress the spring would have to be calculated and this information made available to the operator. For example, this pressure could be stamped on the cylinder so that the indicated pressure could always be added to the amount of pressure to be applied to the nut.

When it is desired to tighten a nut on a bolt without

applying more than a desired degree of pressure, the control valve 80 is set to that particular pressure, plus the pressure necessary to compress spring 49. Then the socket 36 of ratchet 35 is placed over the nut. The air pressure is now turned on so that air passing through tube 81 enters the handle section 12 and chamber 55 of the wrench. This air is at the pressure set by the valve. The wrench is operated by depressing plunger 68 to bring the reduced section 69 into registry with ports 63 and 64 of tube 62. The air moves piston 46 and, consequently, the outer end of arm 24 outwardly in the direction of arrow 90 in Figure 1. If the piston reaches the end of its travel before the nut is tightened, plunger 68 is released so that spring 72 moves it upwardly to bring passage 76 into registry with port 64 and that part of chamber 55 which is in communication with cylinder 43 through tube 53. This allows the air in the cylinder to be expelled to atmosphere as spring 49 urges the piston towards the pivoted end of said cylinder. Stop 34 limits this movement of the piston. From this it will be seen that by alternately depressing and releasing plunger 68, the nut will be tightened through the action of ratchet 35. When resistance of the nut equals the pressure of the air, the nut will not be turned any further. Therefore, this wrench may be operated without any fear of tightening the nut beyond the desired pressure. If it is desired to change the distance arm 24 is moved each time the valve plunger is depressed, pin 51 is changed to another set of aligned holes 33 in the arm. The stroke is shortened when the pin is moved inwardly of the arm, and lengthened when it is moved in the opposite direction.

What I claim as my invention is:

1. A fluid operated maximum load release torque wrench comprising a handle, a shaft rotatably mounted in an end of the handle and extending transversely thereof, an arm connected to the shaft and angularly disposed relative to the handle, a cylinder connected to the handle at a point remote from the shaft, a piston slidably mounted in the cylinder and having a rod extending therefrom through an end of the cylinder, said rod being connected to the arm, said handle having a fluid chamber therein, a tube extending from one end of the chamber to the cylinder to direct fluid into the latter to move the piston rod outwardly thereof, an adjustable pressure control valve having an inlet and an outlet, said outlet being connected to the opposite end of the chamber, means for connecting the valve inlet to a fluid pressure source, and a control valve in the chamber operable selectively to direct pressure fluid to the cylinder and to direct fluid from the latter out of the chamber.

2. A fluid operated maximum load release torque wrench comprising a handle, a shaft rotatably mounted in an end of the handle and extending transversely thereof, squared sections on the ends of the shaft projecting from the handle, an arm having at least one square hole therein fitting over one of the shaft sections, said arm being angularly disposed relative to the handle, a cylinder pivotally connected to the handle at a point remote from the shaft, a piston slidably mounted in the cylinder and having a rod extending therefrom through an end of the cylinder, said rod being connected to the arm, said handle having a fluid chamber therein, a tube extending from one end of the chamber to the cylinder to direct fluid into the latter to move the piston rod outwardly thereof, an adjustable pressure control valve having an inlet and an outlet, said outlet being connected to the opposite end of the chamber, means for connecting the valve inlet to a fluid pressure source, and a control valve in the chamber operable selectively to direct pressure fluid to the cylinder and to direct fluid from the latter out of the chamber.

3. A fluid operated maximum load release torque wrench comprising a handle, a shaft rotatably mounted in an end of the handle and extending transversely thereof, squared sections on the ends of the shaft projecting from the handle, an arm in the form of two parallel side

plates between which the handle extends, aligned square holes in the arm plates fitting over the squared sections of the shaft, said arm being angularly disposed relative to the handle, a cylinder pivotally connected to the handle at a point remote from the shaft, a piston slidably mounted in the cylinder and having a rod extending therefrom through an end of the cylinder, said rod being connected to the arm, said handle having a fluid chamber therein, a tube extending from one end of the chamber to the cylinder to direct fluid into the latter to move the piston rod outwardly thereof, an adjustable pressure control valve having an inlet and an outlet, said outlet being connected to the opposite end of the chamber, means for connecting the valve inlet to a fluid pressure source, and a control valve in the chamber operable selectively to direct pressure fluid to the cylinder and to direct fluid from the latter out of the chamber.

4. A fluid operated maximum load release torque wrench comprising a handle, a shaft rotatably mounted in an end of the handle and extending transversely thereof, an arm connected to the shaft and angularly disposed relative to the handle, a cylinder connected to the handle at a point remote from the shaft, a piston slidably mounted in the cylinder and having a rod extending therefrom through an end of the cylinder, said rod being connected to the arm, said handle having a fluid chamber therein, a tube extending from one end of the chamber to the cylinder to direct fluid into the latter to move the piston rod outwardly thereof, an adjustable pressure control valve having an inlet and an outlet, said outlet being connected to the opposite end of the chamber, means for connecting the valve inlet to a fluid pressure source, a tube extending transversely through the handle and the chamber therein, aligned ports in the tube communicating with the chamber, a plunger in the tube having a reduced section, said plunger being spring loaded normally to keep the reduced section thereof out of line with the tube ports, and a passage in the plunger opening out from an end thereof and normally communicating with the portion of the handle chamber to which the tube from the cylinder is connected.

5. A fluid operated maximum load release torque wrench comprising a handle, a shaft rotatably mounted in an end of the handle and extending transversely thereof, an arm connected to the shaft and angularly disposed relative to the handle, said arm having a line of holes near its outer end and extending longitudinally thereof, a cylinder pivotally connected to the handle at a point remote from the shaft, a piston slidably mounted in the cylinder and having a rod extending therefrom through an end of the cylinder, means removably connecting the rod to one of the arm holes, said handle having a fluid chamber therein, a tube extending from one end of the chamber to the cylinder to direct fluid into the latter to move the piston rod outwardly thereof, an adjustable pressure control valve having an inlet and an outlet, said outlet being connected to the opposite end of the chamber, and means for connecting the valve inlet to a fluid pressure source, and a control valve in the chamber operable selectively to direct pressure fluid to the cylinder and to direct fluid from the latter out of the chamber.

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