

[54] **TORQUE CONTROL ADAPTOR FOR RATCHET WRENCH**

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[58] Field of Search **81/52.4 R, 52.4 A; 64/29**

[56] **References Cited**

UNITED STATES PATENTS

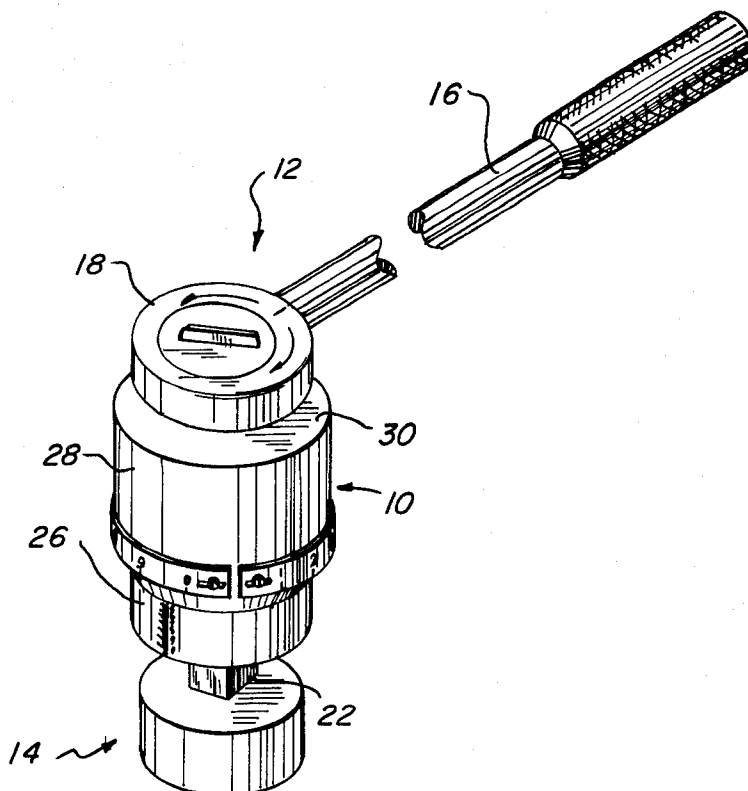
1,126,219	1/1915	Hupp	64/29
1,298,504	3/1919	Hollingshead	81/52.4 R
1,828,370	10/1931	Huddle	64/29
2,527,517	10/1950	Barker et al.	81/52.4 R
2,576,069	11/1951	Hoag et al.	81/52.4 R

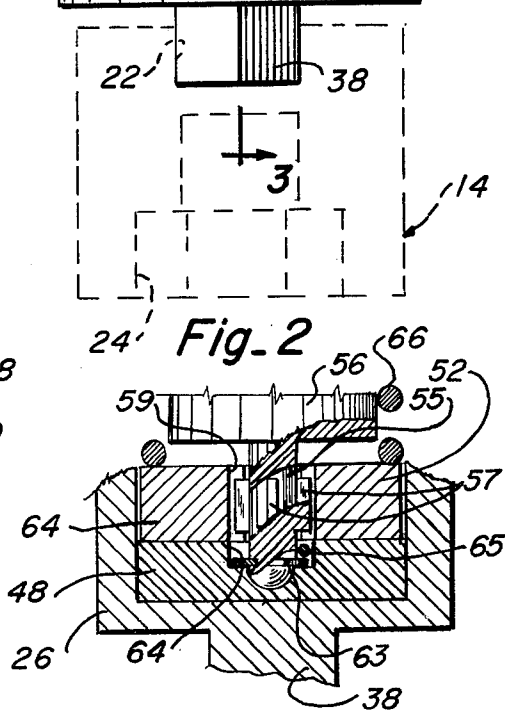
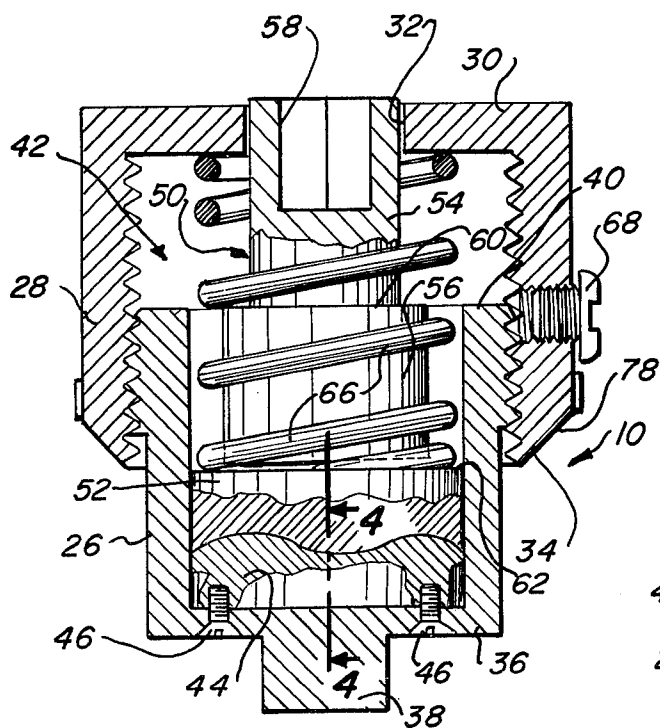
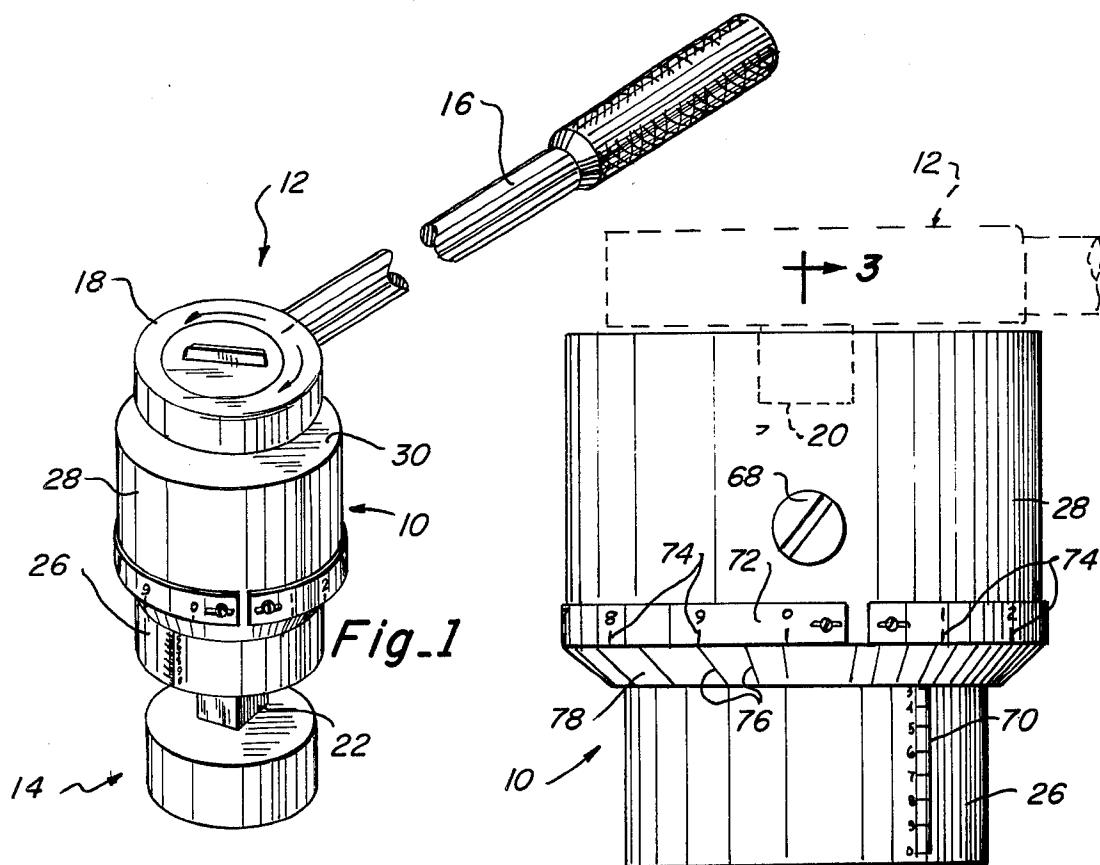
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[57] **ABSTRACT**

A torque control adaptor for a ratchet driven socket wrench is designed to be placed between the ratchet wrench and a removable socket unit and includes a compression spring which holds a drive disk in contact with a friction disk. The drive disk is operably connected to the ratchet wrench and the friction disk is operably connected to the socket unit whereby when the wrench is pivoted in operation, the drive disk turns the friction disk and the socket unit until a given torque overcomes the spring compression causing the drive and friction disks to slip. The adaptor may be adjusted to vary the spring compression whereby the torque at which the drive and friction plates slip can be selected.

1 Claim, 4 Drawing Figures





TORQUE CONTROL ADAPTOR FOR RATCHET WRENCH

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to hand operated tool devices and more particularly to a torque control adaptor for attachment to a hand operated ratchet wrench to control the maximum torque output of the wrench.

2. Description of the Prior Art

Ratchet type wrenches have long been in use for tightening nut and bolt type fasteners and in many instances, it has been desirable to obtain a uniform tightness for a plurality of such fasteners without breaking the nut or twisting the bolt. Examples of numerous devices designed for this purpose are found in U.S. Pat. Nos. 1,328,087 of C. C. LeChot; 2,576,069 of Goag, et al.; 2,527,517 of Barket, et al.; and 1,298,504 of Hollingshead.

OBJECTS OF THE INVENTION

It is an object of the present invention to provide a new and improved device for controlling the torque transmitted from a pivotal wrench to a rotative type fastener.

It is another object of the present invention to provide a torque control adaptor for placement between a ratchet wrench and a removable socket unit whereby the maximum torque output of the socket is adjustable.

It is still another object of the present invention to provide an adjustable torque control adaptor for a ratchet type wrench wherein a calibrated scale is provided for visually displaying the maximum torque output of the wrench for a given setting.

It is another object of the present invention to provide a torque control adaptor of simplified construction which is reliable in operation.

SUMMARY OF THE INVENTION

The present invention comprises a durable, compact torque control adaptor assembly which is quickly and easily mounted upon a conventional ratchet type wrench and includes means for retaining a socket unit so that the torque applied to the socket through the adaptor unit will not surpass a preselected level. The assembly has a pair of axially movable housing members which confine a compression spring such that the compression spring biases a drive disk against a friction disk in transmitting rotary motion through the assembly. The drive disk is keyed to the drive shaft for unitary rotation therewith and the drive shaft is adapted to be releasably mounted upon the output shaft of a ratchet wrench. The friction disk is secured to one of the housing members so as to be operably connected to the output shaft of the torque control assembly which releasably receives a conventional socket unit. The drive and friction disks each have confronting wave surfaces whereby rotative or pivotal movement applied to the drive disk is imparted to the friction disk until the torque on the drive disk exceeds a predetermined level and causes the drive disk to overcome the spring compression allowing the drive disk to slip relative to the friction disk. Beyond this predetermined torque level, rotative movement of the drive disk is not transmitted

to the socket unit so that the output torque applied to the socket unit is limited selectively.

Each of the housing members carries a calibrated scale which in cooperation visually indicate to an operator of the device the maximum torque level output obtainable at a particular relative relationship of the two housing members. Further, a set screw operatively interconnecting the housing members is provided to selectively immobilize the housing members relative to each other to maintain a predetermined selected maximum torque output for the assembly.

Other objects, advantages and capabilities of the present invention will become more apparent as the description proceeds taken in conjunction with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the torque control adaptor of the present invention mounted upon a ratchet wrench and having a socket unit connected thereto.

FIG. 2 is an enlarged side elevation of the torque control adaptor of the present invention with a ratchet wrench and socket shown in phantom lines.

FIG. 3 is an enlarged vertical section taken along line 3—3 of FIG. 2 with parts broken away for clarity.

FIG. 4 is a vertical section taken along line 4—4 of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, the torque control adaptor assembly 10 of the present invention is seen mounted upon a conventional ratchet-type hand operated wrench 12 having a conventional socket unit 14 releasably connected thereto. The ratchet type wrench 12 has a handle 16 connected through suitable ratchet gears (not shown) in a housing 18 to an output shaft 20 of square transverse cross-section. The socket unit 14 comprises a generally cylindrically shaped element with a square recess 22 in one end wall adapted to receive a mating drive shaft and a generally hexagonally shaped or other suitably shaped recess 24 in the opposite end wall adapted to receive a nut or other fastener component whereby the fastener can be selectively rotated in a tightening or loosening operation.

The torque control adaptor assembly 10 includes cylindrical inner and outer housing members 26 and 28 respectively which are threadedly interconnected as shown in FIG. 3. The outer housing member 28 has an end wall 30 with a circular access opening 32 there-through and an opposite open end 34. The internal cylindrical wall of the outer housing member is threaded along its entire length. The inner housing member 26 has a closed end wall 36 with an outwardly and axially directed centrally located output shaft 38 of square transverse cross-section. The opposite end 40 of the inner housing member is open and external threads are provided along a portion of the length of the inner housing member commencing at the open end 40 thereof. The inner housing member has an outer diameter substantially equal to the inner diameter of the outer housing member and the threaded surfaces of the housing members are threadedly engaged to allow the housing members to be moved axially relative to each other by rotating one housing member relative to the other.

The inner and outer housing members 26 and 28 respectively define an enclosed chamber 42 therebetween in which the working components of the torque control adaptor assembly 10 are confined. A friction disk 44 having a diameter equivalent to the inner diameter of the inner housing member 26 is seated on the end wall 36 of the inner housing member and anchored thereto by a pair of screw fasteners 46 extending through the end wall 36. The friction disk 44 which is best seen in FIG. 4, has a raised peripheral rim 48, the top surface of which forms a substantially sinusoidal wave, FIG. 3.

A drive shaft 50 disposed in the internal chamber 42 of the assembly has an exposed cylindrical end portion 54 at one end protruding into the circular opening 32 in the end wall of the outer housing member 28, a cylindrical extension rod 55 at the opposite end with a plurality of circumferentially spaced longitudinally extending splines 57 protruding radially away therefrom, and an intermediate cylindrical body portion 56 interconnecting the drive disk 52 and the exposed end portion 54. A cylindrical drive disk 52 having a centrally located axial cylindrical bore 59 therethrough is keyed to the extension rod 55 for unitary rotation therewith by a plurality of radially spaced longitudinally extending slots adapted to slidably receive the splines 57.

The drive disk 52 is of a diameter equivalent to the diameter of the friction disk 44 and is of similar construction in that it has a raised peripheral rim 64 of generally sinusoidal wave form such that the wave surfaces of the rims 64 and 48 on both the drive disk and the friction disk respectively, normally mesh in continuous engagement as shown in FIG. 3.

The exposed end portion 54 of the drive shaft has an axial recess 58 in its free end with the recess being of square transverse cross-section and of a standard size adapted to mate with and receive the square shaped output shaft 20 of the ratchet-type wrench 12 whereby rotative movement of the output shaft 20 of the wrench will impart corresponding movement to the drive shaft 50 of the torque control adaptor. The end portion 54 of the drive shaft of the assembly is of slightly smaller diameter than the intermediate body portion 56 defining an annular shoulder 60 at the juncture and similarly, the diameter of the intermediate body portion 56 is slightly smaller than the diameter of the drive disk 52 defining an annular shoulder 62 at the juncture.

The friction disk has a centrally located generally cylindrical recess 61 in its upper face which is aligned with the bore 59 in the drive disk and is adapted to receive the lower terminal end of the extension rod. The terminal end of the extension rod has an annular groove therein which seats a split ring 63, a lock pin 65 passing transversely through the friction disk and the recess 61 overlies the split ring 63 and thereby retains the terminal end of the extension rod in the recess 61.

It will, therefore, be seen that the drive disk 52, being keyed to the drive shaft 50 of the adaptor assembly, can be releasably and operably connected to the output shaft 20 of the ratchet-type wrench 12 so that rotational movement of the output shaft 20 will impart a corresponding rotational movement to the drive disk 52. The friction disk 44, which is connected to the inner housing member 26 and thus integral with output shaft 38 of the adaptor assembly, is normally also caused to rotate in unison with the output shaft 20 of the ratchet wrench via the drive disk, due to the mesh-

ing sinusoidal surfaces of the drive and friction disks.

The drive disk 52 is biased or urged into meshing engagement with the friction disk by a compression spring 66 which is circumferentially mounted upon the drive shaft 50 of the adaptor assembly 10 with one end seated upon the top surface of the drive disk 52 and its opposite end in abutting engagement with the inner surface of the end wall 30 of the outer housing member 28. The inner diameter of the compression spring 66 is substantially the same as the outer diameter of the body portion 56 of the drive shaft so that the compression spring is retained in a desired surrounding concentric relationship with the drive shaft. It will be appreciated that relative axial movement of the inner and outer housing members compresses and releases the compression spring to vary the axial pressure exerted upon the drive disk by the compression spring and thus the pressure with which the drive disk is urged against the friction disk. It will, therefore, be appreciated, that rotative movement applied to the drive shaft 50 of the assembly is imparted to the output shaft 38 of the assembly through the engagement of the drive disk and friction disk but when the torque on the drive shaft 50 exceeds a certain level, dependent upon the axial relationship of the inner and outer housing members, the compressive force of the spring is overcome and the drive disk and friction disk are allowed to slip and thereby rotate relative to each other so that the output shaft of the unit is no longer rotated in unison with the drive shaft. It is important to appreciate that the drive disk is axially slidable relative to the extension rod 55 of the drive shaft so that axial force applied to the drive shaft during use of the device will not affect the pressure with which the drive disk is forced against the friction disk.

A set screw 68 is threadedly received in a threaded radial opening in the cylindrical side wall of the outer housing member 28 and is adapted to be screwed into tight engagement with the cylindrical surface of the inner housing member 26 so that rotative and thus axial movement of the outer member relative to the inner member can be prevented and the compressive force of the spring 66 against the drive disk 52 fixed. In this manner, the torque above which the rotative movement of the drive shaft will not be imparted to the output shaft, can be selected and maintained for a series of operations.

Referring to FIGS. 1 and 2, it will be seen that a calibrated linear scale 70 is provided on the outer surface of the inner housing member 26 and extends in a longitudinal or axial direction. A circumferential band 72 is mounted upon the outer surface of the outer housing member 28 and has a calibrated scale 74 adapted to cooperate with the scale 70 on the inner housing member via straight line etchings 76 on a bevelled surface 78 at the lower end of the outer housing member. In this manner, the scale 70 on the inner housing member can serve as a principal scale and the scale on the outer housing member as a fine adjustment scale. One complete rotation of the outer housing member relative to the inner housing member will advance the lower edge of the outer housing member one unit along the scale 70 on the inner housing member and the circumferential relationship of the housing members will indicate on the fine adjustment scale 74 fractions of a full unit.

In use, the torque control assembly 10 is mounted upon the ratchet wrench 12 by inserting the square out-

put shaft 20 of the ratchet wrench into the square recess 58 in the exposed end of the drive shaft 50 of the assembly and then connecting the socket 14 to the adaptor assembly by inserting the output shaft 38 of the adaptor assembly into the square recess 22 in the end of the socket unit. The set screw 68 is then loosened and the inner and outer housing members rotated relative to each other until the desired compression of the spring 66 is indicated on the calibrated scales 70 and 74 by the relative positions of the housing members. When the desired compression is selected, the set screw 68 is tightened to retain the relative positions of the housing members and the ratchet wrench is then operated in a conventional manner to tighten a nut or other fastener (not shown) received in the hexagonal recess 24 of the socket unit. When the unit or other fastener has been tightened the preselected amount, the torque applied to the drive shaft will overcome the spring compression allowing the drive and friction plates to slip relative to each other so that the torque applied to the drive shaft is no longer transmitted to the nut.

Although the present invention has been described with a certain degree of particularity, it is understood that the present disclosure has been made by way of example and that changes in details of structure may be made without departing from the spirit thereof.

What is claimed is:

1. A torque adaptor for a ratchet driven socket wrench comprising, in combination:

- a housing having inner and outer cylindrical members threadably joined for selected axial movement, each of said inner and outer members having one end wall and one open end to define an enclosed chamber therebetween, the end wall of said outer member having an opening therethrough and the end wall of the inner member having an outwardly directed non-circular centrally located axial extension output shaft, and a set screw threadably received in an opening in the in the cylindrical wall of said outer member, said set screw being adapted to be tightened against the cylindrical wall of said inner member to selectively fix the axial relationship of said inner and outer members,
- a friction disc anchored to the inner surface of the end wall of the inner housing member, said friction disc having a surface of wave form configuration along a peripheral area on the face of the disc which is exposed to said enclosed chamber, said friction disc having an outer diameter substantially equal to the inner diameter of the inner housing member, and said friction disc having a central

cup-shaped recess defined therein,

a drive element having a drive disc slidably mounted thereon at one end in abutting relationship with said friction disc and a reduced diameter shaft portion at the opposite end thereof protruding into the opening in the end wall of said outer housing member, the end of said shaft portion which protrudes into the opening in the end wall of the outer housing member having a recess of square cross-section adapted to releasably receive a square shaft on a ratchet driven wrench,

spline means operatively coupling said drive disc and said drive element, said drive disc having a surface of wave form configuration along a peripheral area on the face thereof which abuts the friction disc so that the wave form surfaces on the friction disc and drive disc are in abutting face-to-face relationship, the end of said drive element adjacent said drive disc having a terminal end sized for bearing reception in the central cup-shaped recess in said friction disc for transmitting axial forces directly between said drive element and said axial extension shaft,

a compression spring surrounding the shaft portion of the drive element in concentric relationship therewith, said compression spring abutting said drive disc at one end and the end wall of said outer housing member at the opposite end to bias said drive disc against said friction disc whereby rotative torque movement applied to said drive element effects corresponding rotative torque movement of the axial extension shaft on the housing until the torque applied to said drive element overcomes the spring compression thereby allowing the drive disc and friction disc to rotate relative to each other, means rotatably securing said drive element terminal end within said friction disc central recess for preventing axial separation of said drive element terminal end from said friction disc while permitting relative rotation therebetween, and

a calibrated scale on a external surface of said outer housing member and a calibrated scale on an external surface of said inner housing member, said calibrated scales being adapted to cooperate in visually displaying the relative relationship of the inner and outer housing members whereby the compression spring can be adjusted selectively to determine the desired rotative torque between said friction disc and said drive disc independently of axial forces applied between said drive element and said axial extension output shaft.

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