May 4, 1948. W. M. SIESEL 2,441,038

TORQUE OVERLOAD RELEASE DEVICE

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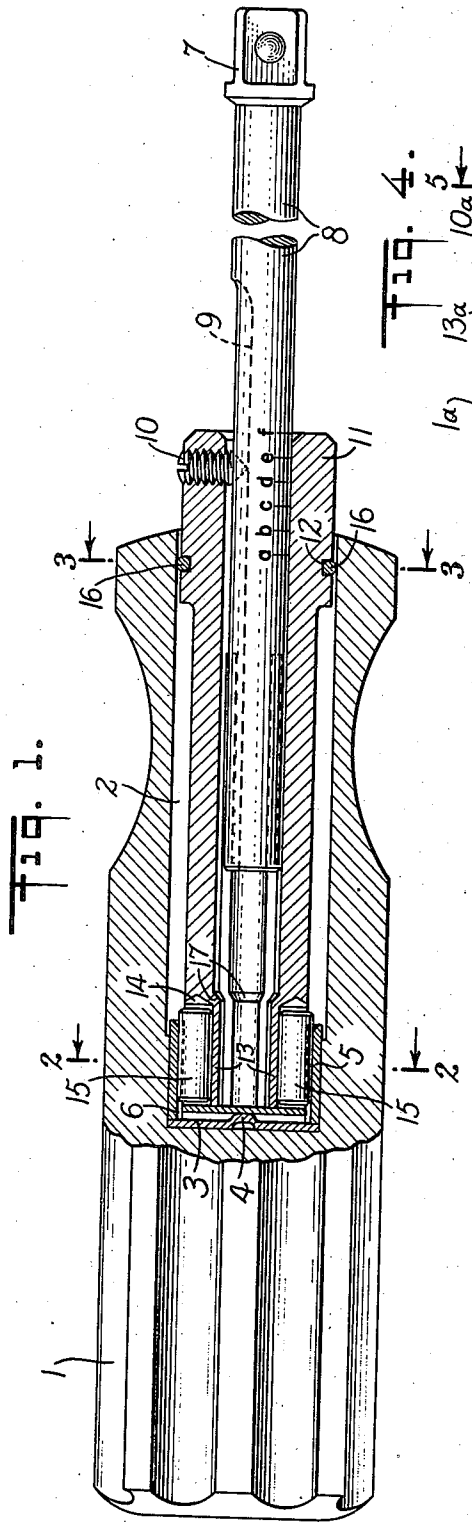


Fig. 1.

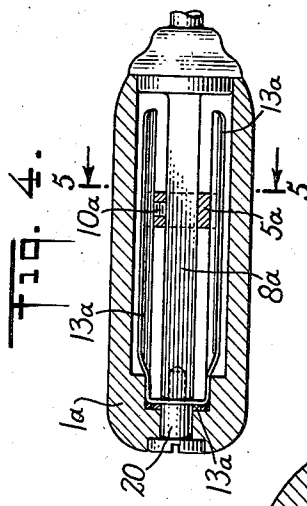


Fig. 4.

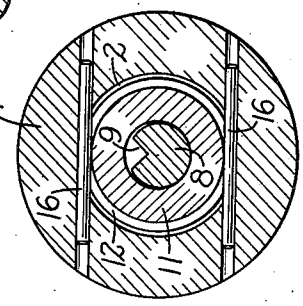


Fig. 3.

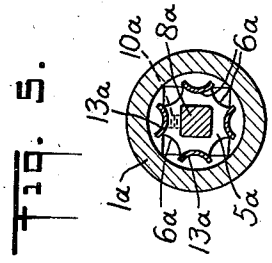


Fig. 5.

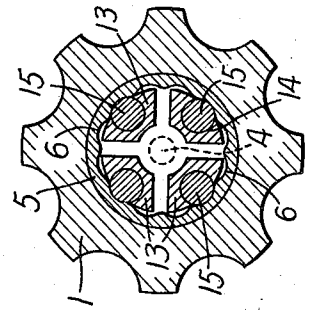


Fig. 2.

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TORQUE OVERLOAD RELEASE DEVICE

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4 Claims. (Cl. 64—29)

1

The present invention relates to an improvement in torque overload release devices.

One object thereof has been to provide a more rugged and durable tool for the purpose and one which is simple and economical to manufacture. A further object has been to provide in such a device, means whereby the torque overload releasing capacity thereof may be adjusted or set to any desired degree or point within a wide range, or to any predetermined point therein, as by reference to a set of markings. Another object is to provide a device of dimensions so small that it can be encompassed in the handle or body of a tool of ordinary size.

One embodiment of my invention as applied to the construction of a hand tool of the wrench or screw driver type, is described in the following specification and illustrated in the attached drawings wherein—

Figure 1 is a view in elevation with outer portions broken away and inner portions shown partly in central longitudinal section;

Figure 2, a transverse section on the line 2—2 of Figure 1;

Figure 3, a transverse section on the line 3—3 of Figure 1;

Figure 4, a view in longitudinal section of another embodiment of my invention; and

Figure 5, a cross sectional view taken on the line 5—5 of Figure 4.

Referring to the drawings, a tool according to my invention includes driving means and driven means and, in effect, a slip transmission which may be adjusted to operate up to any predetermined torque overload within the limits for which the tool is designed. Likewise, the parts at either side of the transmission are reversible in function in that the driven means may be employed as the driver and vice versa.

Where the tool embodying the invention is a wrench, as shown in Figure 1 for example, the driving means for that purpose includes a handle 1 having a central longitudinal recess 2. At the inner end of said recess 2 is a washer 3 having a centrally located protrusion 4. A detent member, shown as a ring 5, is fixed in the inner end of said recess 2 with one edge seated against washer 3. The interior surface of said ring 5 is provided with longitudinal grooves 6 which, with the ridges between them, form in effect a corrugated or irregular bearing surface arranged to engage bearing portions of the driven means.

The driven means, as shown, includes a wrench having a head 7 and a shank 8, said shank having a longitudinal V-shaped groove 9, which receives the inner end of a set screw 10 when shank 8 is operatively assembled with a collet 11 having a peripheral groove 12.

As seen in Figure 2, the inner end of collet 11 is divided into four parallel segments or arms 13

2

arranged around the central bore of the collet which is made of such material, steel for example, as will impart a resilient or springy quality to said arms. End portions of said arms provide spaced outwardly extending protuberances or ridge-like bearings to engage said bearing surfaces of ring 5. Each of the free ends of said arms 13, in the embodiment shown, is provided with a longitudinally extending recess 14 which holds a roller bearing 15. Said recesses open through end surfaces of said arms and also through outwardly exposed lateral surfaces thereof so that when the roller bearings 15 are mounted therein, as shown, peripheral portions of said bearings form in effect ridge-like protuberances which project beyond said outer lateral surfaces.

The collet 11 is retained in the handle 1 by means of pins 16 extending across portions of said peripheral groove 12, so that said collet is free to rotate but is locked by said pins against endwise displacement. When assembled with ring 5, the angularly spaced bearings, as rollers 15, carried by said collet normally yieldingly engage the adjacent grooves 6.

The central bore of said collet is of reduced diameter at its end portion adjacent the rollers 15, thus forming a shoulder 17 on each arm 13 against which the inner end of shank 8 is seated at one extreme position of adjustment thereof. Said shank may be moved along the bore of said collet to any other desired position of adjustment in relation to the free ends of said arms 13 and secured in such position by set screw 10.

In operating the above described structure as a wrench, rotation of the handle 1 will be imparted to collect 11 and thence to shank 8 through the rollers 15, or other suitable projecting bearing portion of said arms 13, until the resistance becomes such that said arms 13 are flexed inwardly, or toward center, by the ridges of detent ring 5 which then ride or slip over the engaged surfaces of rollers 15.

When shank 8 is adjusted with its inner end seated against shoulders 17 of arms 13, the parts are substantially locked so that no yield occurs in normal use. Said shank 8 may be moved to and from any desired or predetermined position of adjustment to vary the effective length of said arms and thus vary their spring characteristics or torque overload releasing capacity, but should ordinarily allow a substantial spring arm length beyond the end of the shank 8. A range of normal adjustments is indicated by the fiducial markings, *a*, *b*, *c*, *d*, *e* and *f*, for example. The proper arm length for any given torque is determined by the section modulus of the spring arm used and by the material used.

It will be apparent that, for some purposes, equivalent effects may be obtained in use with a

torque release device having certain of the parts inverted. For example, the corrugated or irregular bearing surface may be outwardly exposed and the bearings on the spring arms may extend inwardly to ride thereon. In such case, adjustment of the spring characteristics of said arms as by varying their effective length, may be made by a sleeve, or the like, embracing portions of said arms, or, as shown in Figure 4, the sleeve may be slidable with respect to the spring arms to contact closer or farther from their tied ends.

One advantage of the construction embodying my invention is that it is so compact as to be readily embodied in numerous types of existing structures. Its application to screw drivers and so-called "spiral" or "Yankee" screw drivers and the like is obvious from what has been said above. It is applicable in power tools and special power drives as well as in hand tools.

A further advantage of the above described structure over previously known devices for a similar purpose is that the use therein of rollers, or other extended bearing members instead of ball bearings, for example, reduces the tendency to roll down the detent surfaces and thus alter the torque transmitting factor of the device as a whole.

As shown in Figures 4 and 5 a socket wrench or screw driver, or "Yankee" drill is provided with a shank 8*a* squared or of any other desired non-circular cross-section. Slidably mounted on this shaft is a sleeve or ring 5*a* provided with longitudinal grooves 6*a* on its external surface and having its central opening fitted to the shank 8*a*. A set screw 10*a* serves to secure the sleeve or ring 5*a* in any desired longitudinal position along shank 8*a* in order to use a longer or shorter effective spring arm length. Spring strips 13*a* are bent to U-form as shown and overlapped in perpendicular position. The extended side arms of these spring members are also bent in cross-section to present a convex inner face for engagement with the grooves 6*a* in the ring 5*a* and are suitably hardened to provide the desired spring and resistance to wear. These overlapped spring members are received and engaged in the cruciform opening at the upper end of the handle as most clearly shown in Figure 5 and the assembly is held together by the screw 20.

In the use of this device, the torque is transmitted from the handle 1*a* through the spring arms 13*a* and the grooved ring 5*a* to the shank 8*a* and through it to the actual tool. If, however, the torque supplied exceeds a predetermined maximum load, the spring arms 13*a* are cammed out by the ring 5*a* and the handle thereafter turns relative to the shank 8*a*.

The device of the present invention also affords advantages over others of known types in that its torque overload release factor supplied by the spring arms of the collet remains substantially constant whereas, coiled springs, or the like, may tend to vary with repeated use. Furthermore, the above described construction whereby torque release adjustment is effected involves a minimum of parts; and calibrations for predetermined values of torque release can be readily and accurately made and relied on.

What I claim is:

1. A torque overload release device comprising a driving member and a driven member, one of said members including a collet having a head portion and a longitudinally slit portion extending in coaxial relation from said head portion, with a central bore substantially uniform in cross-section throughout a substantial portion of the length of said slit portion when in operative relation, and the other of said members including a detent ring, said detent ring and at least one free end portion of said collet being provided one with at least one protuberance and the other with cooperating surface having at least one recess from true circular form for each protuberance and adapted to receive said protuberance therein, said members being assembled with such protuberance yieldingly engaging said recessed surface, a shank slidably fitted in the bore of said collet, thereby supporting against inward flexing the adjoining portions of the collet, and means for securing said shank in various positions of longitudinal adjustment in relation to said collet.

2. A torque overload release device comprising a driving member and a driven member, one of said members including a collet having a head portion and a slit portion forming angularly spaced segmental arms extending in parallel relation from said head portion with a central bore extending therethrough of substantially uniform cross-section throughout a substantial portion of its length when in operative relation and with protuberant bearing faces on free end portions of said segmental arms, and the other of said members including a detent provided with an annular bearing engaging surface with recesses at angular spacing corresponding to the spacing of said protuberant faces, said members being assembled with said protuberant bearing faces yieldingly engaging in said recesses of the detent, and a shank telescoped closely into said bore whereby to support adjoining portions of said segmental arms against inward flexing and adjustable in relation thereto to vary the torque release controlling effect of said arms as transmitted through said bearings.

3. A torque overload release device as defined in claim 2 wherein the shank is provided with an indicating scale whereby the torque transmissible thereby is indicated by the axial position of said shank with respect to said bore and said device further comprises means for releasably securing said shank at any of a substantial range of telescope positions.

4. A tool which comprises a hollow handle, the torque overload release device as defined in claim 1 telescoped into said handle with the detent secured thereto and said collet rotatable therein and operative tool means secured to the outer end of said shank.

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