May 24, 1955 R. L. STUART 2,708,836

ADJUSTABLE DRIVE CLUTCH

Filed Jan. 12, 1954

Fig. 1.

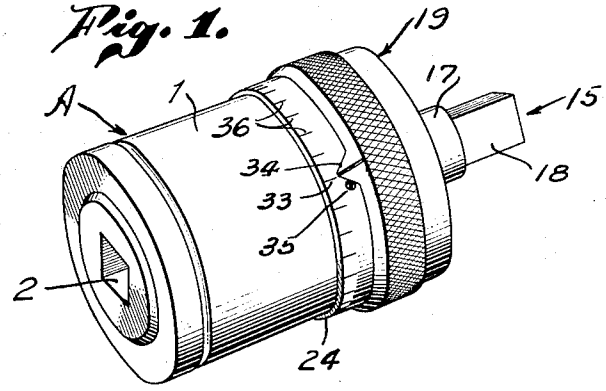


Fig. 2.

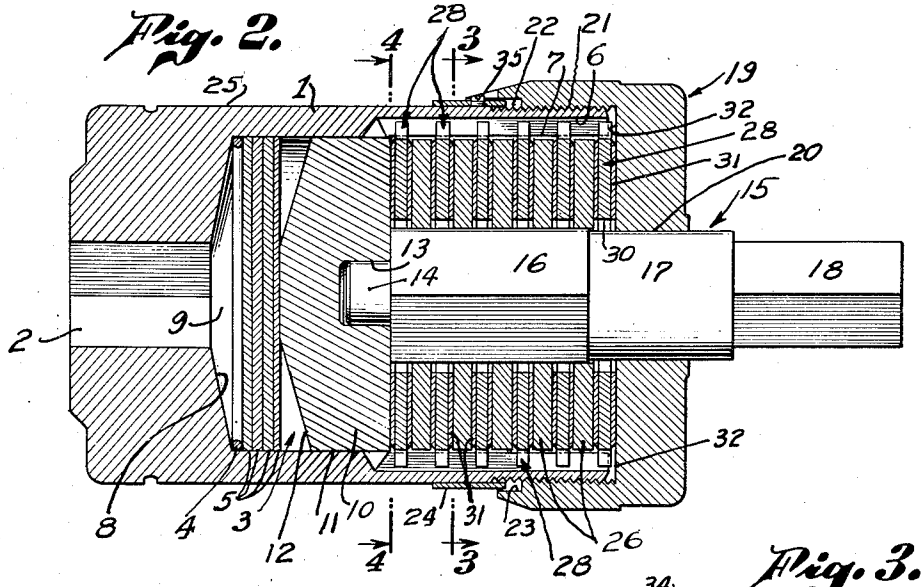


Fig. 3.

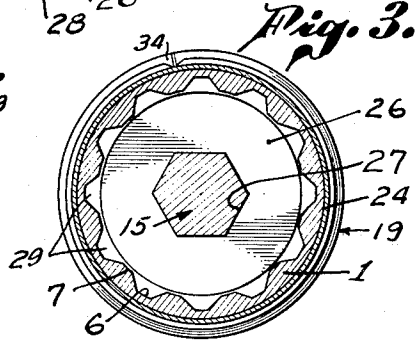


Fig. 4.

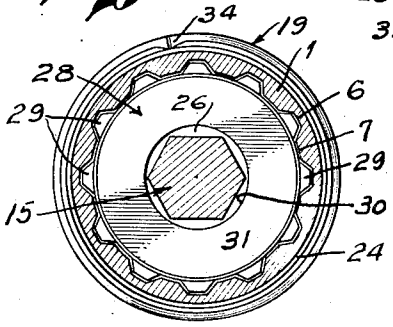
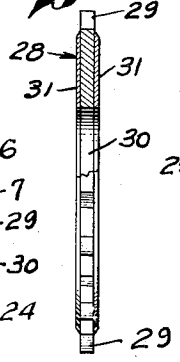


Fig. 5.



INVENTOR.
ROGER L. STUART,
BY
Lie D. Larrabee
his ATTORNEY.

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ADJUSTABLE DRIVE CLUTCH

Roger L. Stuart, Los Angeles, Calif., assignor of one-half to Donald V. Myers, Los Angeles, Calif.

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6 Claims. (Cl. 64—30)

My invention relates particularly to an adjustable drive clutch, and particularly to that type of attachment for use, and association, with socket wrenches whereby the torque applied to a nut, bolt or other device may be governed or limited to a predetermined degree or value, and which device has come to be known as a torque wrench.

An object of my invention is to provide a novel torque wrench in which the torque to be applied to a nut may be easily and quickly, as well as accurately predetermined by setting the torque guage, so that all nuts tightened by the wrench when so set, will all be subjected to the same degree of torque, tightness or stresses.

Whenever reference is hereinmade, and it will be so made for the sake of convenience and in the interests of shortening the specification and claims, to a "nut" it is to be understood that such term "nut" shall equally apply to a bolt, screw or other device or article with which the wrench may be operatively associated.

An object of the invention is to provide a novel, simple, inexpensive and highly efficient clutch which may be associated with socket wrenches now in common usage whereby the torque applied to such wrench will be predetermined so as to insure uniformity in the tightening of all nuts operated upon by a predetermined torque adjustment of the clutch.

Another object of the invention is to provide a novel torque wrench which is sturdy, will withstand hard usage, and which will maintain high accuracy of adjustment of the torque thereof.

A further object is to provide a novel torque wrench in which the amount of maximum torque to be transmitted may be easily, quickly and accurately adjusted and calibrated within a limited range of predetermined setting or assembly adjustment.

A still further object is to provide a novel torque wrench in which, when the maximum torque to be transmitted is obtained, further operation of the wrench will be silent, and no sounds need to be listened for, and in which no scales, dials or pointers are required to be watched; and which will effectively and automatically be at all times ready for instant use at the torque to which the wrench is set.

Another object is to provide a novel adjustable drive clutch in which all working parts are entirely assembled within a housing thereby eliminating likelihood of any such parts being damaged or the torque setting thereof being varied by rough handling or usage of the device.

And still another object is to provide a novel adjustable drive clutch which is small, rugged, compact and with which unusually high torque adjustment may be obtained.

The invention resides in the parts and combination and arrangement of parts as more fully hereinafter described in detail in the accompanying specification and defined in the claims.

Other objects, advantages and features of invention may appear from the accompanying drawing, the subjoined detail description, and the appended claims.

The accompanying drawing illustrates the invention in a form I at present deem preferable.

Figure 1 is a perspective view of my novel adjustable drive clutch embodying the features of this invention.

Fig. 2 is a longitudinal sectional view, on enlarged scale, of my novel wrench attachment.

Fig. 3 is a transverse sectional view taken on line 3—3, Fig. 2 looking in the direction of the arrows, and on a plane in front of one of the driven disks.

Fig. 4 is a view similar to Fig. 3 but taken on line 4—4, Fig. 2, and on a plane in front of one of the driving disks.

Fig. 5 is an edge view, on enlarged scale and partly in section, of one of the driving disks that has been detached from the assembly.

The torque limiting or adjustable drive clutch A of my invention may have many and varied uses, but it is particularly adapted for use with a wrench socket (not shown) for tightening a nut or stud bolt to a predetermined degree of tightness against or in a piece of work.

The clutch A comprises a housing or driving element or member 1 that has at one end a squared socket 2 to receive the squared shank of a socket wrench handle (not shown) or such other implement, tool or device that is to be associated with, and connected to, the clutch A through the medium of said connecting means 2 for rotating or driving the clutch.

The housing 1 at its other end is provided with a chamber 3, the inner end of which chamber is provided with an annular supporting shoulder, that may be in the form of a split wire ring or insert 4, and against which supporting shoulder the peripheries of a plurality of spring discs or members 5 are supported or pressed. The outer end of chamber 3 is provided with a plurality of longitudinally extending flutes 6, and between each flute or groove 6, a rib 7 extends longitudinally along the interior of, and inwardly into, the chamber 3. The inner end of chamber 3 is tapered, as at 8, from the outer diameter thereof toward the longitudinal axis of chamber 3, to thereby provide an auxiliary chamber 9 between the spring members 5 and the extreme inner end of chamber 3.

An abutment block 10 having an outer diameter 11 for a snug sliding fit with the side walls of chamber 3 is so constructed on its inner face 12, as by beveling, so as to have contact with the central portion of spring member 5. The block 10 is provided with a central recess 13 into which the inner end 14 of a driven shaft 15 is journalled.

The driven shaft 15 comprises a polygonal portion 16 (preferably hexagonal), a circular or cylindrical bearing portion 17 and a square end portion 18 that is adapted to be coupled to any suitable socket or other implement to be rotated.

A cup-shaped end closure member 19 has an axial opening 20 through which shaft 15 extends, and encircles the cylindrical portion 17 of driven shaft 15 and serves to journal the shaft at its outer end. Member 19 is threaded on its inner surface at 21 and which threads 21 engage a series of threads 22 formed on the external periphery of housing 1. The threads 21 and 22 serve to releasably engage the closure member 19 and housing 1 and to allow adjustment of the axial length of the chamber 3.

A portion of the interior of the cup-shaped member 19 at the open end thereof is enlarged at 23 to receive and permit the edge of member 19 to partially overlie a calibration scale 24 that is secured to the exterior surface of

housing 1 by a press fit thereon. The outer surface 25 of housing 1 is of slightly less diameter than that of the surface onto which scale 24 is pressed, so that it will not be necessary to force the scale 24 along the housing 1 for any distance greater than is necessary to force it onto its seating surface or area.

Surrounding the polygonal portion 16 of driven shaft 15 is a group of non-rotatable driven disks 26 that have a shaft receiving opening 27 that conforms to the flat sides of the polygonal portion 16 and the outer diameter of driven disks 26 is such that they will freely rotate within the innermost diameter of the ribs 7.

Drive disks 28 which are of greater diameter than the driven disks 26 are provided with projections 29 that are complementary to, and extend into, the flutes 6 to thereby make a non-rotatable connection with and between the disks 28 and the housing 1. The disks 28 are provided with relatively large axial openings 30 to accommodate the portion 16 of shaft 15 and avoid contact therewith.

The drive disks 28 are preferably provided on each side with a fused metal strip 31, that is preferably a self lubricating friction material, or similar metal. However, the drive disks 28 may be made entirely of such a self-lubricating friction material.

The driven disks 26 slidably fit over the bearing portion 17 of drive shaft 15 and have sliding, but non-rotatable, fit with the polygonal portion 16 of shaft 15 and thereby establish operable connection between the shaft 15 and disks 26.

The projections 29 of drive disks 28 have sliding fit in the flutes 6 and thereby establish driving connection between such disks 28 and the housing 1, but are not in direct contact with driven shaft 15.

It will thus be seen that the disks 26 and 28 in the chamber 3 may move longitudinally along the polygonal portion 16 of the shaft 15, and within the chamber 3.

In assembly, I have found that a fused metal strip 31 should preferably contact the inner flat face of the block 10, and a driven disk 26 is then interposed between each alternate drive disk 28, and that a drive disk 28 should complete the group of disks so that a fused metal strip 31 will contact the inner face 32 of the closure member 19. This enables adjustment of the member 19 on the housing 1 to vary the torque with the highest degree of accuracy; and further makes for a more solid or fixed connection between the housing, closure member 19 and the driven elements therein, and reduces to a minimum likelihood of varying the exact amount of torque to which the device is adjusted.

The various parts and combinations of parts are assembled as shown in Figure 2 and above described. The closure member 19 is threaded onto housing 1 until the disks will be held against each other under the tension of the flat spring members 5 that are contacted at their central portion by the raised center portion of the abutment block 10. Member 19 is tightened until slippage between the driven disks 26 and drive disks 28 occurs at the proper torque reading to which the attachment is to be set.

When such torque has been obtained the calibration scale 24 is forced onto its seat with the proper graduation 33 opposite the pointer 34 which protrudes from the free edge of member 19, and a stop pin 35 is then placed in position to secure the scale 24 in proper radial position on the housing 1 and to prevent the closure member 19 from being retracted on the housing. The stop pin 35 extending upwardly and being contacted by pointer 34 prevents such retraction. However, advancement of the closure member on the housing will increase the pressure on springs 5, and such increase of torque will at once be indicated by the relation of the pointer 34 to the graduations 36 on the scale 24.

The use of the device will be apparent to those skilled in the art. However, the driven shank portion 18 is connected to a socket, and a socket wrench handle (either ratchet or straight) used in conjunction with socket wrenches, is connected to be associated with the connecting means 2.

It will be obvious that when the driven shaft 15 is operated the housing 1 and socket wrench connected thereto will move in unison until the nut is tightened against the work to a certain degree, and then slippage will occur between the driven disks 26 and the drive disks 28, so that further turning of the drive disks will not be transmitted to the socket or member that may be connected to the shank portion 18, and overtightness of the nut against the work is avoided. Further, the pressure against all nuts (with the same adjustment of the attachment) will be uniform on all.

While I have shown and described in the foregoing, a preferred embodiment of my invention, it is to be understood that changes in the details of construction, combination and arrangement of parts may be made without departing from the spirit and scope of the invention as hereinafter claimed.

I claim:

1. An adjustable drive clutch comprising a housing provided with a chamber tapered at its bottom and open at one end of said housing; means at the other end of said housing to receive a driving member; said housing having an externally threaded portion; a cup-shaped closure member having an internally threaded portion to receive the externally threaded portion of said housing; a spring member in said chamber and having its peripheral edge supported at the bottom of said chamber; an abutment member slidable in said chamber and being in contact with said spring member only at its central portion; a driven shaft journalled in and extending through said closure member and also being journalled in said abutment member, and provided with an implement connection exteriorly of said closure member; a set of driven disks in said chamber and being slidably and non-rotatably mounted on said shaft, and of smaller diameter than said chamber; and a set of drive disks interposed between the driven disks and being slidably but non-rotatably mounted in said chamber, and each drive disk having an axial bore therein rotatably receiving said shaft; said closure member and housing being threadedly adjustable relative to each other to positively urge said drive and driven disks into engagement with each other and against said abutment and under tension of said spring member.

2. An adjustable drive clutch comprising a housing provided with a chamber open at one end of said housing; means at the other end of said housing to receive a driving member; said housing having an externally threaded portion; a cup-shaped closure member having an internally threaded portion to receive the externally threaded portion of said housing; a plurality of spring members supported at their peripheral edges in said chamber; an abutment member slidable in said chamber and being in contact only at its central portion with an adjacent spring member; a driven shaft journalled in and extending through said closure member and also being journalled in said abutment member, and provided with an implement connection exteriorly of said closure member; a set of driven disks in said chamber and being slidably and non-rotatably mounted on said shaft, and of smaller diameter than said chamber; and a set of drive disks interposed between the driven disks and being slidably but non-rotatably mounted in said chamber, and each drive disk having an axial bore therein rotatably receiving said shaft; said drive disks having a face of self-lubricating friction material on each side of said drive disks that engages with a driven disk; said closure member and housing being threadedly adjustable relative to each other to positively urge said drive and driven disks into engagement with each other and against said abutment and under tension of said spring members.

3. An adjustable drive clutch as defined in claim 1,

and in which a drive disk is in engagement with said abutment member, and another drive disk is in engagement with said closure member.

4. An adjustable drive clutch as defined in claim 2, and in which a face of self-lubricating friction material of one drive disk is in engagement with said abutment member, and a face of self-lubricating friction material of another drive disk is in engagement with said closure member.

5. An adjustable drive clutch as set forth in claim 1, and in addition including: a graduation scale on the exterior of the housing; and a pointer on, and projecting from, the free edge of said cup-shaped closure member and cooperating with said scale.

6. An adjustable drive clutch as set forth in claim 1, and in addition including: a graduation scale on the exterior of the housing; a pointer on, and projecting from, the free edge of said cup-shaped closure member and cooperating with said scale; and said closure member being enlarged on its inner surface at the free edge thereof to receive and overlie an edge of said scale.

References Cited in the file of this patent

UNITED STATES PATENTS

2,606,431 Elgin ---------- Aug. 12, 1952