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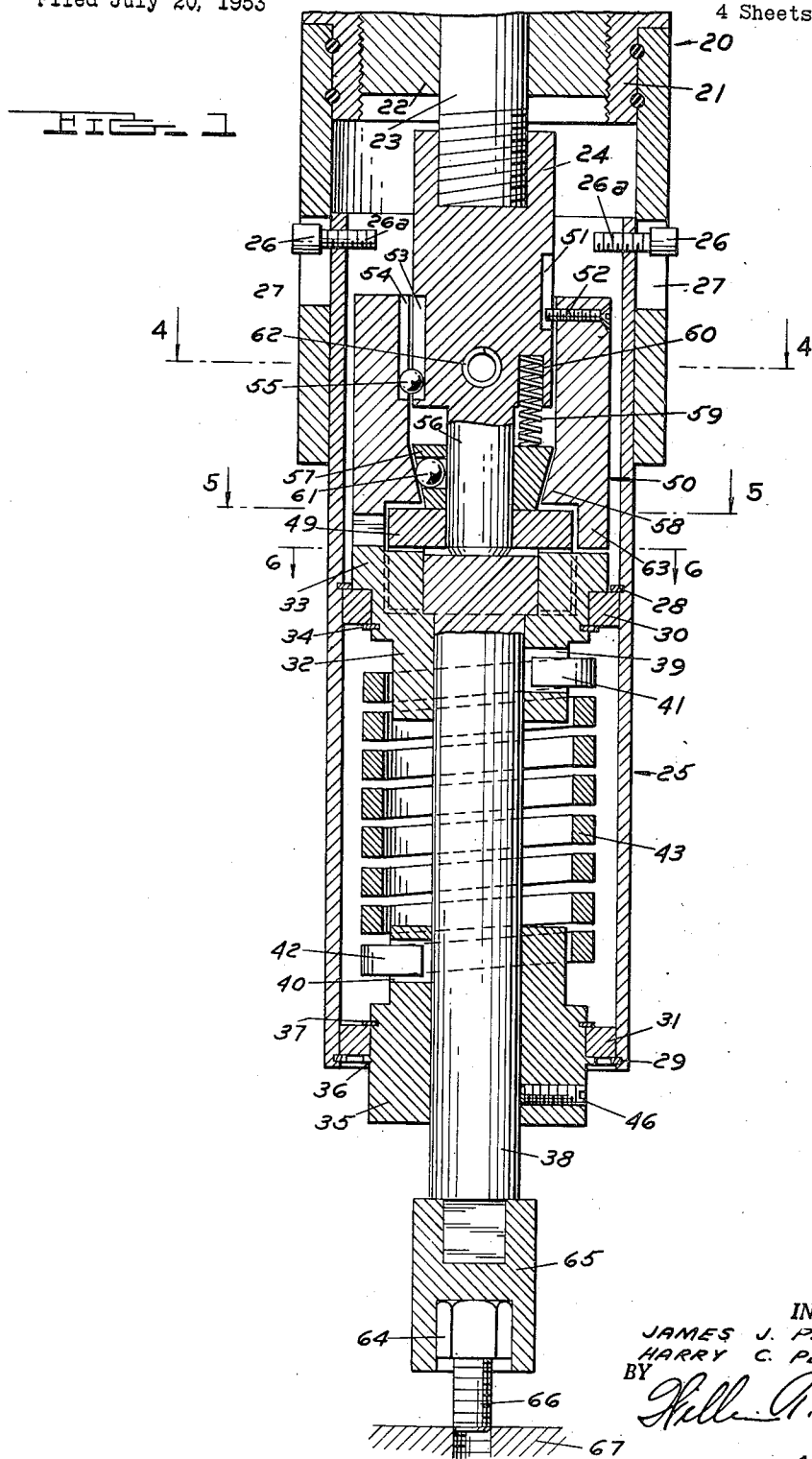
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2,765,890

TORQUE WRENCH

Filed July 20, 1953

4 Sheets-Sheet 1



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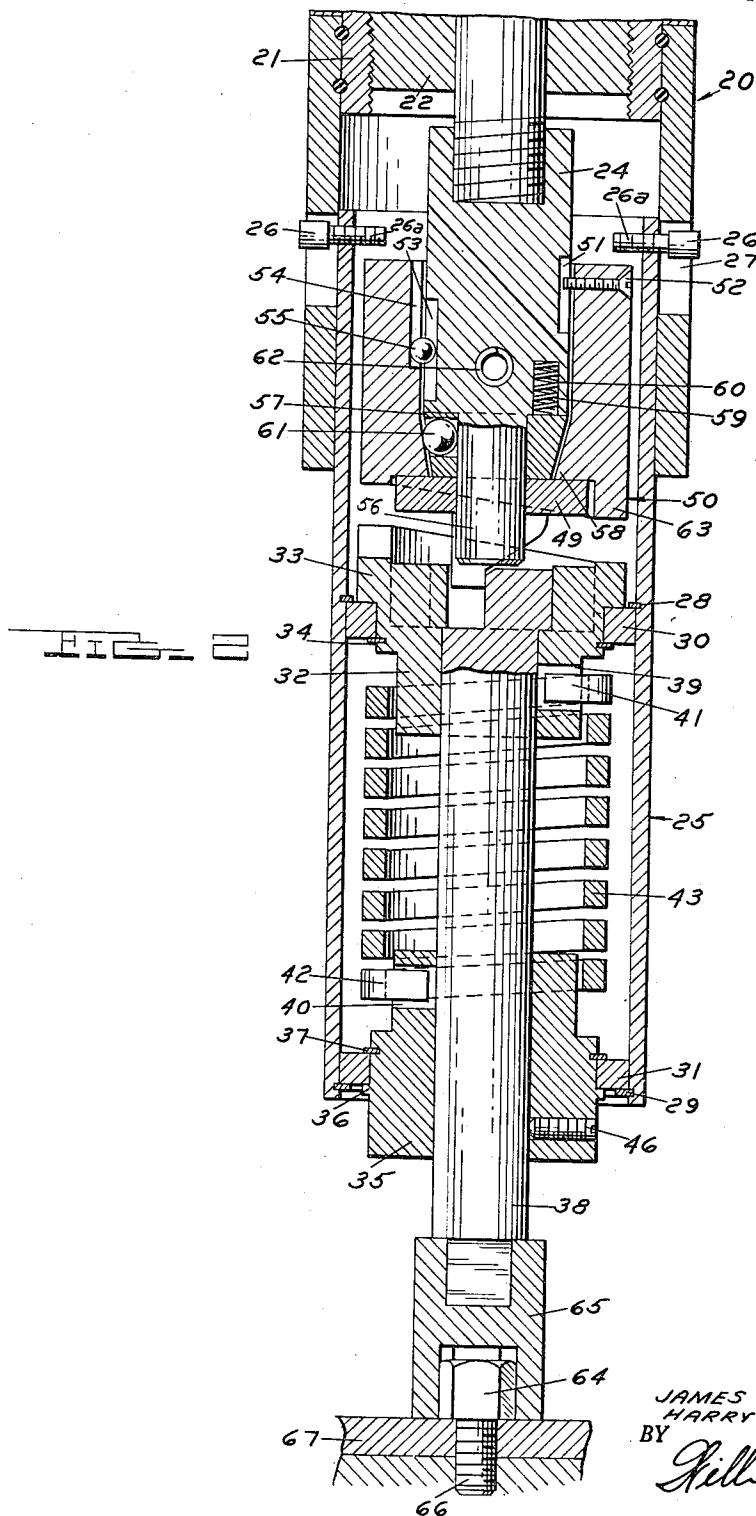
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TORQUE WRENCH

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4 Sheets-Sheet 2



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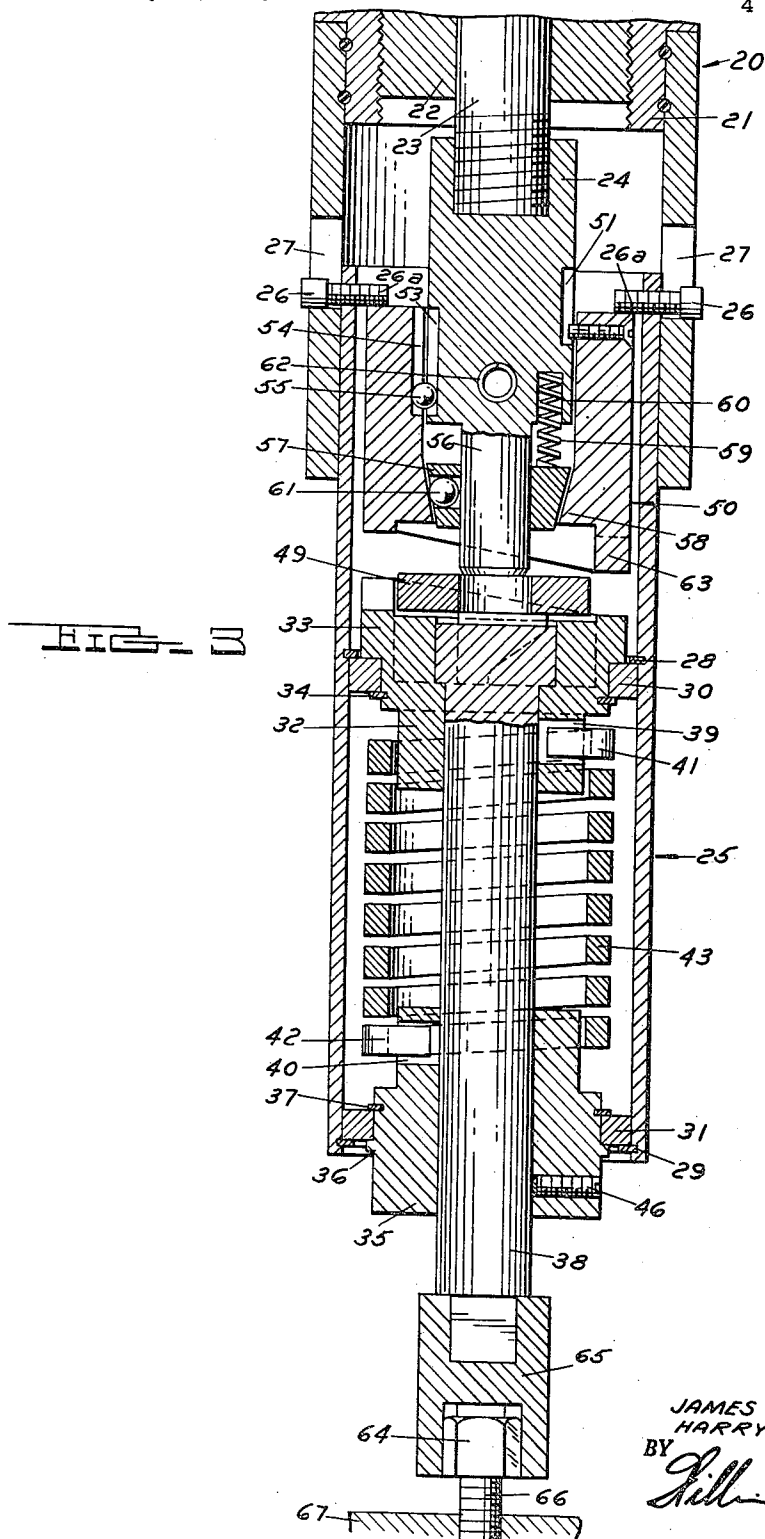
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TORQUE WRENCH

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4 Sheets-Sheet 3



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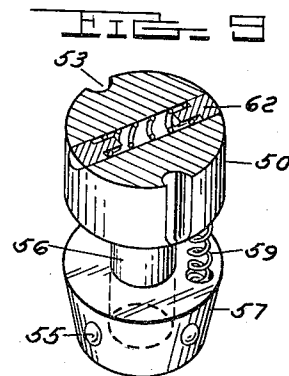
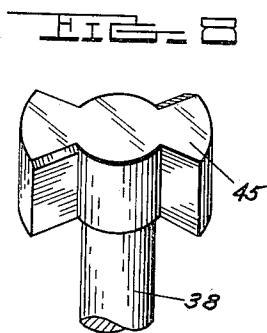
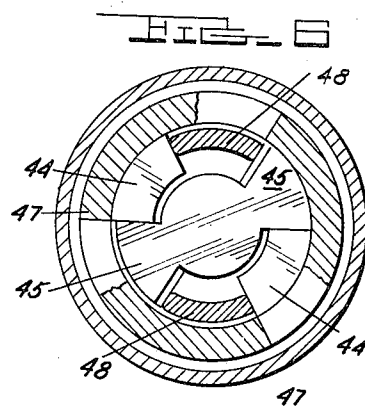
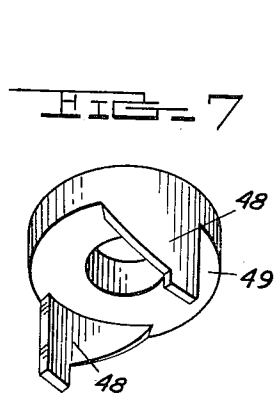
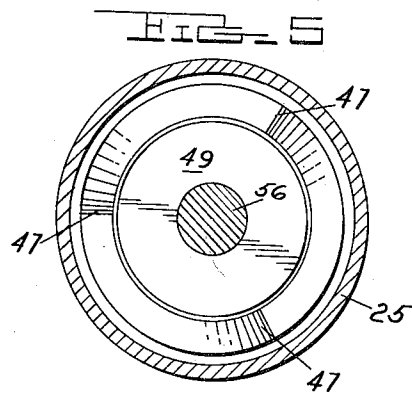
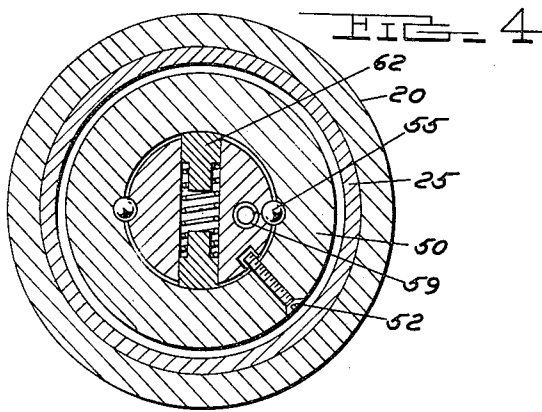
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TORQUE WRENCH

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4 Sheets-Sheet 4



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TORQUE WRENCH

Harry C. Pedersen and James J. Pedersen, Lake Orion, Mich.; said Harry C. Pedersen, guardian of said James J. Pedersen, minor, assignors to Harold L. Cox, Raymond A. Chabot, and/or Berkley Machine Products, Redford, Mich., a partnership, as tenants in common

Application July 20, 1953, Serial No. 369,155

16 Claims. (Cl. 192—56)

This invention relates to a torque wrench for rapidly running and tightening bolts and nuts with a predetermined amount of torque being applied and more particularly relates to a motor driven nut, screw, and stud running torque wrench which is inherently capable of permitting the operator to adjust the desired amount of torque desired to be applied to the nut, screw, or stud by adjusting the amount of torsion loaded into the torsion spring so that when the amount of torque applied to the nut equals the amount of torsion previously loaded into the spring, the spring anchors move whereby cam means are operated to separate the jaw clutches thereby disconnecting the motor drive from the driven nut, screw, or stud.

The utility and economy of motor driven torque wrenches are well established as these wrenches save the operator much valuable time and render his work easier so that not only can he tighten more nuts per day but also he can work longer hours before encountering muscular fatigue in his hands and arms. The utility of the motor driven torque wrench is occasioned by the fact that the wrench automatically disconnects from the drive when the desired amount of torque is imparted to the nut being driven thereby incorporating in the wrench itself the attributes of a torque gauge and thereby eliminating the necessity for testing the drive on each nut or spot checking with a gauge. With the instant motor driven torque wrench the operator merely places the wrench on the nut and allows the motor drive to impart the necessary turning to the nut whereupon when the motor overruns, he takes the wrench off the nut and drives the next nut in like manner. In other words, an operator can run nuts on bolts with a known desired torque as fast as he can load the nuts and move the wrench from bolt-to-bolt as the nut running time consumed is very small due to the speed of the device.

It is pertinent to here note that a great many torque wrenches and miscellaneous powered devices have been developed and patented for running nuts with a certain amount of torque and it is important to note that the several devices of the prior art do not fulfill all the demands required of them in that they become inaccurate in the torque applied and are subject to many breakdowns and failures whereby the use of the device is lost over long periods of time and in some instances the torque wrenches require more time to repair than they are available for running.

With the foregoing in view, the primary object of the invention is to provide a power driven torque wrench which is simple in design and construction, inexpensive to manufacture, easy to use, and which eliminates the necessity of constant repair due to the unique coaction of the various parts and which, if repairs are required, is easy and conducive to quick and complete repair.

An object of the invention is to provide a motor driven torque wrench having a torsion spring which carries the desired amount of torsion or torque desired to be imparted to the nuts to be run and tightened.

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An object of the invention is to provide simple means for adjusting the amount of torsion in the spring to any desired requirement.

An object of the invention is to provide jaw clutches for connecting and disconnecting the drive portion from the nut running portion.

An object of the invention is to provide cam means to disconnect the jaw clutches when the amount of torsion pre-set in the spring is equal in the amount of torsion or torque applied to the nut.

An object of the invention is to provide a ball lock to hold the upper jaw clutch out of engagement during the non-engageable neutral position such as during the period when moving the wrench from nut-to-nut.

An object of the invention is to provide an outer sleeve for attaching the wrench to a motor.

An object of the invention is to provide a sleeve telescoped with and axially slidable relative to the outer sleeve so as to move the upper jaw clutch from a non-engageable neutral position to an engageable neutral position when moved in one axial direction.

An object of the invention is to provide an inner sleeve telescoped within and axially slidable within the outer sleeve so as to engage the jaw clutches when moved in the opposite direction as set forth in the preceding object.

An object of the invention is to provide an axial abutting relationship between the primary drive shaft and the final drive shaft so that axial thrust imposed on either member is directly transferred to the other member thereby eliminating the transfer of axial thrust through associated members.

These and other objects of the invention will become apparent by reference to the following description of a motor driven spring loaded cam operated torque wrench embodying the invention taken in connection with the accompanying drawings, in which:

Fig. 1 is a longitudinal cross-sectional view of the inventive wrench showing all the elements in the drive position;

Fig. 2 is a view similar to Fig. 1 showing the component parts in nonengageable neutral condition;

Fig. 3 is a view similar to Fig. 1 and 2 showing the component parts in engageable neutral condition;

Fig. 4 is a cross-sectional view of Fig. 1 taken on the line 4—4 thereof;

Fig. 5 is a cross-sectional view of Fig. 1 taken on the line 5—5 thereof;

Fig. 6 is a cross-sectional view of Fig. 1 taken on the line 6—6 thereof.

Fig. 7 is a perspective view of the cams and cam carrier;

Fig. 8 is a perspective view of the top portion of the final drive shaft showing the arms; and

Fig. 9 is a perspective view, partly in cross-section, of the primary drive shaft and ball-lock assembly.

Referring now to the drawings wherein like numerals refer to like and corresponding parts throughout the several views, the torque wrench embodiment disclosed therein to illustrate the invention comprises an outer sleeve 20 having an internally threaded reinforcement 21 welded thereto which is threaded on the motor housing 22 in fixed axial relationship. The motor armature drive shaft 23 extends beyond the housing 22 and the wrench primary drive shaft 24 is threaded thereon. At this point it is important to note that the motor housing 22 and the motor armature drive shaft 23 are fixedly connected relative to the outer sleeve 20 and the stub shaft 24 respectively so that the wrench outer sleeve 20 and primary drive shaft 24 are fixed against axial movement relative to the motor.

The inner sleeve 25 is axially slidably telescoped within the outer sleeve 20 and carries pins 26 disposed in the

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slots 27 of the outer sleeve whereby axial movement of the inner sleeve 25 is limited relative to the outer sleeve by the radially outer ends of the pins and it is to be noted that the radially inner ends 26A of the pins 26 project radially inwardly of the inner sleeve 25, the purpose of which will be hereinafter explained.

The inner sleeve 25 carries an upper internal ring 28 and a lower internal ring 29 against which are positioned the annular bearings 30 and 31 respectively. The driven clutch element or upper spring boss 32 is equipped with an annular shoulder 33 riding on the bearing 30 and also carries a ring 34 located below the bearing 30 so that the upper clutch element-spring boss 32 is not only rotatably positioned but also axially fixedly located relative to the inner sleeve 25. The lower spring boss 35 is equipped with a shoulder 36 which engages one side of the annular bearing 31 and carries a ring 37 engaging the other side of the bearing so that the lower spring boss 35 is not only rotatably positioned but also axially fixedly disposed relative to the inner sleeve 25.

The spring bosses 32 and 35 are equipped with bores which house the final drive shaft 38 and are equipped with radial channels 39 and 40 which receive the upper tab 41 and lower tab 42 of the torsion spring 43 which lies concentric to the secondary drive shaft 38 within the inner sleeve 25.

The upper spring boss-clutch element 32 is provided with internal dogs 44 (Fig. 6) and the final drive shaft 38 is provided with arms 45 in the area of the dogs 44 so as to engage the dogs 44 in angular movement as seen in Fig. 6 for holding the upper end of the spring 43 relative to the lower end of the spring 43 via the final drive shaft 38. More particularly in this connection, the desired amount of preloaded torque is imparted to the spring 43 by holding the element 32 or the secondary drive shaft 38 and turning the lower spring boss 35 to wind the spring so that the force travels from the lower spring boss 35 through the spring 43 through the upper spring boss 32 to the upper spring boss dogs 44 at which point it is transferred back to the final drive shaft 38 via the arms 45 thereon which abut the spring boss dogs 44. When the desired amount of wind or torque is loaded in the spring 43, the set-screw 46 is tightened against the shaft 38 thereby holding the assembly in the desired torque-wise preloaded condition. The upper spring boss-clutch element 32 carries the lower jaw clutch teeth 47 and it is now to be particularly noted that the upper spring boss-clutch element 32, and lower spring boss 35, and all the parts associated therewith are axially fixedly located relative to the inner sleeve 25 and move axially therewith at all times.

Referring now to Figs. 1 and 6, the dogs 44 occupy approximately one third of the area of the upper spring boss internal annular opening. The final drive shaft arms 45 occupy approximately a third of this opening and paired cams 48 are disposed between the disassociated sides of the respective dogs 44 and arms 45 and that the paired cams 48 are attached to the annular cam carrier 49, and, it is to be noted that the cam carrier 49 as seen in Fig. 1 lies within the tooth 47 area whereas in Fig. 2 illustrating the cams 47 in their activating position, that the cam carrier 49 is elevated well above the teeth 47 area. It is also to be noted that primary drive shaft 24 and the final drive shaft 38 abut each other in the driving relationship so that axial thrust imposed on either shaft is directly transferred to the other shaft.

Keeping in mind that the first described outer sleeve 20 and primary drive shaft 24 are axially fixedly connected to the motor and that the next previously described inner sleeve 25 and its associated parts are interconnected for axial movement as a unit relative to the outer sleeve 20 and associated parts, it is now to be understood that the upper jaw-clutch collar 50 surrounds the primary drive shaft 24 and is capable of relative axial movement not only to the outer sleeve 20 and associated parts but

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also relative to the inner sleeve 25 and associated parts and that the primary drive shaft 24 is equipped with a slot 51 which receives the end of the key 52 carried by the collar 50 limiting the axial movement of the collar 50 relative to the primary drive shaft 24 and outer sleeve 20 and that the primary drive shaft 24 is equipped with a key slot 53 and that the clutch collar 50 is equipped with a mating key slot 54 and that the ball key 55 lies in both slots 53 and 54 keying the primary drive shaft 24 and the clutch collar 50 for rotation together and permitting axial movement of the clutch collar 50 relative to the primary drive shaft 24. The primary drive shaft 24 is equipped with a reduced pilot portion 56 which is surrounded by the conical ball lock assembly 57 which coacts with the conical lower interior face 58 of the clutch collar 50. The spring 59 chambered in the cavity 60 of the primary drive shaft 24 bears against the conical ball lock assembly 57 urging the balls 61 into locking engagement between the clutch collar conical face 58 and the primary drive shaft pilot portion 56 locking the clutch collar 50 relative to the primary drive shaft 24, and the primary drive shaft 24 is equipped with a radial channel which houses the spring pressed plungers 62 which bear against the clutch collar 50 for frictionally holding the clutch collar 50 in an elevated position as seen in Fig. 3. Since the ball lock is operable to lock the clutch collar only against upward movement relative to the primary drive shaft 24, the clutch collar 50 is equipped with teeth 63 which are adapted to drivingly engage the teeth 47 on the upper spring boss-clutch element 32.

In operation, the device is shown in the nut running and driving relationship in Fig. 1 where the drive is transmitted from the motor armature drive shaft 23 to the nut 64 via the primary drive shaft 24, balls 55, clutch collar 50, upper spring boss-clutch element 32, spring 43, the lower spring boss 35, the final drive shaft 38, and the adaptor 65 to drive the nut 64 on to the bolt 66. It is to be understood that when the preloaded torsion of the spring 43 is overcome by the nut 64 contacting the base 67 with sufficient force that the secondary drive shaft 38 tends to stop relative to the upper spring boss-clutch element 32, the upper spring boss 32 further torsions the spring 43 so as to move the dogs 44 relative to the arms 45 so that the cams 48 are forced by the dogs 44 into engagement with the arms 45 causing the carrier 49 to rise from the position shown in Fig. 1 to the position shown in Fig. 2, during which movement the carrier 49 first contacts the bottom of the spring lock assembly 57 moving the ball 61 out of locking engagement between the pilot 56 and the cone 58, leaving the clutch collar 59 free to move axially upwardly as seen in the figures, and, upon further movement of the cam carrier 49 the cam carrier 49 engages the bottom portion of the clutch collar 50 elevating it from the position seen in Fig. 1 to the position seen in Fig. 2, which movement disengages the teeth 63 on the clutch collar 50 from the teeth 47 on the upper spring boss clutch element 32 allowing the motor drive to overrun the final drive shaft 38 and associated parts, thereby disconnecting the drive from the nut and leaving the device in non-engageable neutral condition.

When this occurs the operator knows that the nut has been driven with the preloaded force. The device is now in the non-engageable neutral condition illustrated in Fig. 2 with the clutch teeth disassociated with the friction plungers 62 holding the clutch collar 50 in the elevated position on the stub shaft 24.

The operator now lifts the device by the motor and when this occurs the motor and parts fixed thereto, namely the outer sleeve 20 and stub shaft 24 move initially upwardly relative to the inner sleeve 25 so that the inner ends 26a of the pins 26 stand still during the first portion of the movement when the stub shaft 24 moves upwardly with the motor and as the clutch collar 50 is in the position of Fig. 2 at this time, the pins 26 contact the

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top of the clutch collar 50 and hold the clutch collar 50 down as the primary drive shaft 24 moves up re-locating the clutch collar 50 on the primary drive shaft 24 as seen in Fig. 3 but at a relative position above the spring boss-clutch element teeth 47 and disengaged therewith, and, it is to be noted that the pins 26 limit the upward movement of the outer sleeve 20 relative to the inner sleeve 25 so that when the primary drive shaft 24 moves upwardly via the motor, the pins 26A hold the clutch collar 50 downwardly so as to properly relocate the clutch collar on the primary drive shaft for again engaging the teeth when the sleeve 25 moves into the sleeve 20. The clutch collar 50 is then in the position seen in Fig. 3 and is locked in this position by the balls 61 being jammed between the conical face 58 and the pilot 56 so that the clutch collar 50 is locked against upward movement until the ball lock assembly 57 is first moved up elevating the balls 61 out of jamming relationship as previously described.

The operator now places the adaptor 65 on the next nut to be run, Fig. 3, and drops the weight of the motor thereon which is resisted by the associated parts so that the inner sleeve 25 and the upper spring boss-clutch element 32 and the teeth 47 are axially stationary when the motor moves axially downwardly moving the primary drive shaft 24 and clutch collar 50 locked thereon downwardly so as to engage the clutch collar teeth 63 with the spring boss-clutch element teeth 47 as seen in Fig. 1 whereupon the engagement of the teeth 63 with the teeth 47 again rotates the final drive shaft 38 via the spring 43 to run the nut now engaged in the same manner as previously described relative to the previously run nut and it is to be noted that the primary drive shaft pilot portion 56 rests directly on the final drive shaft 38 not only transferring the incident axial thrust but also spacing the ball lock mechanism 57 above the cam carrier 49 thereby preventing its release so that the clutch element 50 is locked against upward movement thereby forcing the teeth 47 and 63 into engagement until the cams 48 raise the carrier 49 to release the ball lock mechanism 57.

The description of the movement of the various parts relative to one another must be considered in view of the phase or condition of the device at the time. While one part may be described as moving in one axial direction, it must be recognized that the other part or parts may be moving in the opposite direction thereby effecting the relative movement and such variations are considered within the scope of the invention.

Although but a single embodiment of the invention has been shown and described in detail, it is obvious that many changes may be made in the size, shape, detail, and arrangement of the various elements of the invention within the scope of the appended claims. For example, the telescoping of the sleeves can be reversed or equivalent mechanical means substituted for the sleeves themselves; the driving and driven clutches can be reversed so that the driving element includes the torsion spring; on various types of cams, lock mechanisms and clutches can be employed within the purview of the invention.

We claim:

1. A limited torque imparting device comprising a driving first clutch element, a driven second clutch element adapted to be rotated by said first clutch element, said clutch elements being adapted to be engaged and disengaged; cam means adapted to disengage said clutch elements; a final drive shaft, a spring boss on said final drive shaft, a torsion spring connected at one of its ends to said spring boss at one end thereof, a dog on said second clutch element, an arm on said shaft adapted to abut said dog, said spring being connected at its other end to said second clutch element, said arm on said shaft being adapted to abut said dog on said second clutch element to hold said second clutch element against rotational

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movement on said shaft to permit preloading said spring with the desired amount of torque by turning said spring boss on said shaft and then securing said boss relative to said shaft; said arm being adapted to abut said dog until the preloaded torque of the spring is exceeded by resistance on said shaft and to then move away from said dog to operate said cam means to disengage said clutch elements.

2. A limited torque imparting device comprising a driving spring boss, a dog on said spring boss, a final drive shaft journaled in said spring boss, an arm on said shaft adapted to abut said dog to furnish a reaction point between said shaft and driving boss in an angular direction opposite to the direction of drive, a driven spring boss fixed on said shaft, a torsion spring having one of its ends connected to said driving spring boss and its other end connected to said driven spring boss and torque-wise preloaded against the drive direction of said driving spring boss so as to urge said arm against said dog at the reaction point so that said spring transmits the drive, and a cam disposed between said dog and said arm operable to disconnect the power from said driving spring boss when the preloaded torque of said spring is exceeded by causing said arm to move off said dog against said cam.

3. A three position clutch drive including a non-engageable neutral position, an engageable neutral position, and a driving position, comprising an axially fixed primary drive shaft, a first axially fixed sleeve surrounding said primary drive shaft in spaced relation thereto, a second axially movable sleeve telescoping with said first sleeve, a driven clutch portion disposed in said second sleeve adapted to move axially therewith, a driving clutch portion drivingly keyed to said primary drive shaft adapted to move axially in relation thereto and relative to said second sleeve, said non-engageable neutral position being achieved when said driving clutch element is axially retracted relative to said primary drive shaft, said engageable neutral position being achieved when said second sleeve is located axially outwardly of said first sleeve and said driving clutch element is axially extended relative to said primary drive shaft; and said driving position being achieved when said driving clutch element is axially extended relative to said shaft and said second sleeve is advanced axially into said first sleeve.

4. A three position clutch drive including a non-engageable neutral position, an engageable neutral position, and a driving position comprising an axially fixed primary drive shaft, a first axially fixed sleeve surrounding said primary drive shaft in spaced relation thereto, a second axially movable sleeve telescoping with said first sleeve, a driven clutch portion bearing in said second sleeve adapted to move axially therewith, a driving clutch portion drivingly keyed to said primary drive shaft adapted to move axially in relation thereto and relative to said second sleeve, said non-engageable neutral position being achieved when said driving clutch element is axially retracted relative to said primary drive shaft; said engageable neutral position being achieved when said second sleeve is located axially outwardly of said first sleeve and said driving clutch element is axially extended relative to said primary drive shaft; and said driving position being achieved when said driving clutch element is axially extended relative to said shaft and said second sleeve is advanced axially into said first sleeve; an internal conical face on said driving clutch portion, a pilot extension on said shaft lying within said conical face, and a ball lock assembly disposed between said conical face and said pilot non-retractably locking said first clutch element relative to said shaft in its extended position; said ball lock body being movable to allow axial retraction of said clutch element.

5. A clutch position lock and torque sensitive release combination comprising an axially relatively fixed primary drive shaft, an axially extending pilot portion on said drive shaft, a driving clutch portion axially movably disposed on said drive shaft and slidably keyed thereto

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for rotation therewith having an internal conical face in the area of said drive shaft pilot portion, a ball lock body having at least one locking ball disposed between said shaft pilot portion and said driving clutch portion, a spring urging said lock body balls into locking engagement with said clutch portion conical face and said portion so as to lock said clutch portion against movement up said shaft until said body first is moved in that direction out of locked condition, an axially movable part adapted to contact said lock body under certain conditions of torque to move said lock body out of plunger wedging relationship to release drive, and torque sensitive means adapted to urge said part against said lock body to release drive when a predetermined amount of torque is developed.

6. A clutch position releasable lock and torque sensitive release combination comprising a drive shaft, a lock body having plungers surrounding a portion of said shaft, a clutch portion keyed to said shaft for rotation therewith and axial movement relative thereto having a conical face portion in the area of said lock body adapted to wedge the plungers of said lock body between itself and said shaft, a spring urging said lock body into plunger wedging relationship to said face and said shaft so that said lock body is releasable for axial movement by thrust in one direction and said clutch portion is releasable for axial movement by thrust in the opposite direction, an axially movable part adapted to contact said lock body under certain conditions of torque to move said lock body out of plunger wedging relationship to release drive, and torque sensitive means adapted to urge said part against said lock body to release drive when a predetermined amount of torque is developed.

7. A clutch position releasable lock and torque sensitive release combination comprising a drive shaft, a lock body having plungers surrounding a portion of said shaft, a clutch portion keyed to said shaft for rotation therewith and relative axial movement relative thereto having a conical face portion in the area of said lock body adapted to wedge the plungers of said lock body between itself and said shaft, a spring urging said lock body into plunger wedging relationship to said face and said shaft so that said lock body is releasable for axial movement by thrust in one direction and said clutch portion is releasable for axial movement by thrust in the opposite direction, and friction elements disposed between said clutch element and said shaft preventing accidental movement of said clutch element in the direction of lock release, an axially movable part adapted to contact said lock body under certain conditions of torque to move said lock body out of plunger wedging relationship to release drive, and torque sensitive means adapted to urge said part against said lock body to release drive when a predetermined amount of torque is developed.

8. A limited torque imparting device comprising a driving spring boss, a dog on said spring boss, a final drive shaft journaled in said spring boss, an arm on said shaft adapted to abut said dog to furnish a reaction point between said shaft and driving boss in an angular direction opposite to the direction of drive, a driven spring boss fixed on said shaft, a torsion spring having one of its ends connected to said driving spring boss and its other end connected to said driven spring boss and torque-wise preloaded against the drive direction of said driving spring boss so as to urge said arm against said dog at the reaction point so that said spring transmits the drive, a cam disposed between said dog and said arm adapted to be activated to disconnect the power from said driving spring boss when the preloaded torque of said spring is exceeded causing said arm to move off said dog against said cam, a clutch position lock comprising an axially relatively fixed primary drive shaft, an axially extending pilot portion on said primary drive shaft, a driving clutch portion axially movably disposed on said primary drive shaft and slidably keyed thereto for rotation there-

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with having an internal conical face in the area of said primary drive shaft pilot portion, a ball lock body having at least one locking ball disposed between said shaft pilot portion and said driving clutch portion, and a spring urging said lock body balls into locking engagement with said clutch portion conical face and said portion so as to lock said clutch portion against movement up said primary shaft until said body first is moved in that direction out of locked condition.

9. A limited torque imparting device comprising a driving spring boss, a dog on said spring boss, a final drive shaft journaled in said spring boss, an arm on said shaft adapted to abut said dog to furnish a reaction point between said shaft and driving boss in an angular direction opposite to the direction of drive, a driven spring boss fixed on said shaft, a torsion spring having one of its ends connected to said driving spring boss and its other end connected to said driven spring boss and torque-wise preloaded against the drive direction of said driving spring boss so as to urge said arm against said dog at the reaction point so that said spring transmits the drive, a cam disposed between said dog and said arm adapted to be activated to disconnect the power from said driving spring boss when the preloaded torque of said spring is exceeded causing said arm to move off said dog against said cam, a clutch position releasable lock, a stub shaft, a lock body having plungers surrounding a portion of said stub shaft, a clutch portion keyed to said stub shaft for rotation therewith and axial movement relative thereto having a conical face portion in the area of said lock body adapted to wedge the plungers of said lock body between itself and said stub shaft, and a spring urging said lock body into plunger wedging relationship to said face and said stub shaft so that said lock body is releasable for axial movement by thrust in one direction and said clutch portion is releasable for axial movement by thrust in the opposite direction.

10. A three position clutch drive including a non-engageable neutral position, an engageable neutral position, and a driving position comprising an axially fixed primary drive shaft, a first axially fixed sleeve surrounding said primary drive shaft in spaced relation thereto, a second axially movable sleeve telescoping with said first sleeve, a driven clutch portion disposed in said second sleeve adapted to move axially therewith, a driving clutch portion drivingly keyed to said primary drive shaft adapted to move axially in relation thereto and relative to said second sleeve, said non-engageable neutral position being achieved when said driving clutch element is axially retracted relative to said primary drive shaft; said engageable neutral position being achieved when said second sleeve is located axially outwardly of said first sleeve and said driving clutch element is axially extended relative to said primary drive shaft; and said driving position being achieved when said driving clutch element is axially extended relative to said shaft and said second sleeve is advanced axially into said first sleeve, a driving spring boss within said first sleeve, a dog on said spring boss, a final drive shaft journaled in said spring boss, an arm on said shaft adapted to abut said dog to furnish a reaction point between said shaft and driving boss in an angular direction opposite to the direction of drive, a driven spring boss fixed on said shaft, a torsion spring having one of its ends connected to said driving spring boss and its other end connected to said driven spring boss and torque-wise preloaded against the drive direction of said driving spring boss so as to urge said arm against said dog at the reaction point so that said spring transmits the drive and a cam disposed between said dog and said arm adapted to be activated to disconnect the power from said driving spring boss when the preloaded torque of said spring is exceeded causing said arm to move off said dog against said cam.

11. A limited torque imparting device comprising a driving spring boss, a dog on said spring boss, a final

drive shaft journaled in said spring boss, an arm on said shaft adapted to abut said dog to furnish a reaction point between said shaft and driving boss in an angular direction opposite to the direction of drive, a driven spring boss fixed on said shaft, a torsion spring having one of its ends connected to said driving spring boss and its other end connected to said driven spring boss and torque-wise preloaded against the drive direction of said driving spring boss so as to urge said arm against said dog at the reaction point, a cam disposed between said dog and said arm adapted to be activated to disconnect the power from said driving spring boss when the preloaded torque of said spring is exceeded causing said arm to move off said dog against said cam, driving means for said final drive shaft comprising a primary drive shaft, a lock body having plungers surrounding a portion of said primary shaft, a clutch portion keyed to said shaft for rotation therewith and relative axial movement relative thereto having a conical face portion in the area of said lock body adapted to wedge the plungers of said lock body between itself and said shaft, and a spring urging said lock body into plunger wedging relationship to said face and said shaft so that said lock body is releasable for axial movement by thrust in one direction and said clutch portion is releasable for axial movement by thrust in the opposite direction, and friction elements disposed between said clutch element and said shaft preventing accidental movement of said clutch element in the direction of lock release.

12. A limited torque imparting device constituting a driving clutch element, a driven clutch element; at least one said clutch element being adapted to be moved out of engagement relative to said other clutch element; a torque-wise preloaded final drive spring connected to one said clutch element adapted to relatively immovably drive until its preloaded condition is exceeded and then to move relatively to said clutch elements, a cam adapted to be activated to disengage said clutch elements by said spring's relative movement, a three position clutch drive including a non-engageable neutral position, an engageable neutral position, and a driving position comprising an axially fixed primary drive shaft, a first axially fixed sleeve surrounding said primary drive shaft in spaced relation thereto, a second axially movable sleeve telescoping with said first sleeve, a driven clutch portion disposed in said second sleeve adapted to move axially therewith, a driving clutch portion drivably keyed to said primary drive shaft adapted to move axially in relation thereto and relative to said second sleeve, said non-engageable neutral position being achieved when said driving clutch element is axially retracted relative to said primary drive shaft; said engageable neutral position being achieved when said second sleeve is located axially outwardly of said first sleeve and said driving clutch element is axially extended relative to said primary drive shaft; and said driving position being achieved when said driving clutch element is axially extended relative to said shaft and said second sleeve is advanced axially into said first sleeve.

13. A limited torque imparting device comprising a driving clutch element, a driven clutch element; at least one said clutch element being adapted to be moved out of engagement relative to said other clutch element; a torque-wise preloaded final drive spring connected to one said clutch element adapted to relatively immovably drive until its preloaded condition is exceeded and then to move relatively to said clutch elements, and a cam adapted to be activated to disengage said clutch elements by said spring's relative movement, a three position clutch drive including a non-engageable neutral position, an engageable neutral position, and a driving position comprising an axially fixed primary drive shaft, a first axially fixed sleeve surrounding said primary drive shaft in spaced relation thereto, a second axially movable sleeve telescoping with said first sleeve, a driven clutch portion bearing in said second sleeve adapted to move axially

therewith, a driving clutch portion drivably keyed to said primary drive shaft adapted to move axially in relation thereto and relative to said second sleeve, said non-engageable neutral position being achieved when said driving clutch element is axially retracted relative to said primary drive shaft; said engageable neutral position being achieved when said second sleeve is located axially outwardly of said first sleeve and said driving clutch element is axially extended relative to said primary drive shaft; and said driving position being achieved when said driving clutch element is axially extended relative to said shaft and said second sleeve is advanced axially into said first sleeve; an internal conical face on said driving clutch portion, a pilot extension on said shaft lying within said conical face, and a ball lock assembly disposed between said conical face and said pilot non-retractably locking said first clutch element relative to said shaft in its extended position; said ball lock body being movable to release position to allow axial retraction of said clutch element.

14. A limited torque imparting device comprising a driving clutch element, a driven clutch element; at least one said clutch element being adapted to be moved out of engagement relative to said other clutch element; a torque-wise preloaded final drive spring connected to one said clutch element adapted to relatively immovably drive until its preloaded condition is exceeded and then to move relatively to said clutch elements, a cam adapted to be activated to disengage said clutch elements by said spring's relative movement, a clutch position lock comprising an axially relatively fixed primary drive shaft, an axially extending pilot portion on said drive shaft, a driving clutch portion axially movably disposed on said drive shaft and slidably keyed thereto for rotation therewith having an internal conical face in the area of said drive shaft pilot portion, a ball lock body having at least one locking ball disposed between said shaft pilot portion and said driving clutch portion, and a spring urging said lock body balls into locking engagement with said clutch portion conical face and said portion so as to lock said clutch portion against movement up said shaft until said body first is moved in that direction out of locked condition.

15. A limited torque imparting device comprising a driving clutch element, a driven clutch element; at least one said clutch element being adapted to be moved out of engagement relative to said other clutch element; a torque-wise preloaded final drive spring connected to one said clutch element adapted to relatively immovably drive until its preloaded condition is exceeded and then to move relatively to said clutch elements, a cam adapted to be activated to disengage said clutch elements by said spring's relative movement, a clutch position releasable lock comprising a drive shaft, a lock body having plungers surrounding a portion of said shaft, a clutch portion keyed to said shaft for rotation therewith and relative axial movement relative thereto having a conical face portion in the area of said lock body adapted to wedge the plungers of said lock body between itself and said shaft, and a spring urging said lock body into plunger wedging relationship to said face and said shaft so that said lock body is releasable for axial movement by thrust in one direction and said clutch portion is releasable for axial movement by thrust in the opposite direction.

16. A limited torque imparting device comprising a driving clutch element, a driven clutch element; at least one said clutch element being adapted to be moved out of engagement relative to said other clutch element; a torque-wise preloaded final drive spring connected to one said clutch element adapted to relatively immovably drive until its preloaded condition is exceeded and then to move relatively to said clutch elements, a cam adapted to be activated to disengage said clutch elements by said spring's relative movement, a clutch position releasable lock comprising a drive shaft, a lock body having plungers surrounding a portion of said shaft, a clutch portion keyed

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to said shaft for rotation therewith and relative axial movement relative thereto having a conical face portion in the area of said lock body adapted to wedge the plungers of said lock body between itself and said shaft, and a spring urging said lock body into plunger wedging relationship to said face and said shaft so that said lock body is releasable for axial movement by thrust in one direction and said clutch portion is releasable for axial movement by thrust in the opposite direction, and friction elements disposed between said clutch element and said shaft preventing accidental movement of said clutch element in the direction of lock release.

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