United States Patent [19]

Grabovac

[11] **3,772,942**

[45] **Nov. 20, 1973**

[54] **ADJUSTABLE TORQUE WRENCH**

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[22] Filed: **July 27, 1972**

[21] Appl. No.: **275,628**

[52] **U.S. Cl.** **81/52.5**
[51] **Int. Cl.** **B25b**
[58] **Field of Search** .... 81/52.4 R, 52.5

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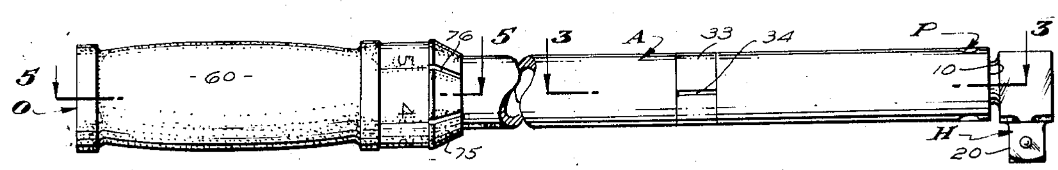
[57] **ABSTRACT**

In a click-type torque wrench comprising an elongate tubular lever, a work engaging head pivotally mounted at the front end of the lever and having a lever arm projecting freely and rearwardly in the lever, spring loaded cam and link means within the lever rearward of the lever arm to normally yieldingly hold the lever arm and head against pivotal movement relative to the lever, said spring loaded cam and link means comprising a link with a flat rearward disposed cam seat pivotally connected with and projecting rearwardly from the lever arm, axially adjustable pivotal bearing means between the ends of the lever, a slide block with a flat, forwardly disposed cam seat in the lever, a cam block with flat faces between and normally engaging the cam seats, spring means rearward of the slide block and normally yieldingly urging the slide block forwardly and novel, manually operable means rearward of the spring means to vary the force exerted by the spring means through the cam and link means.

10 Claims, 10 Drawing Figures



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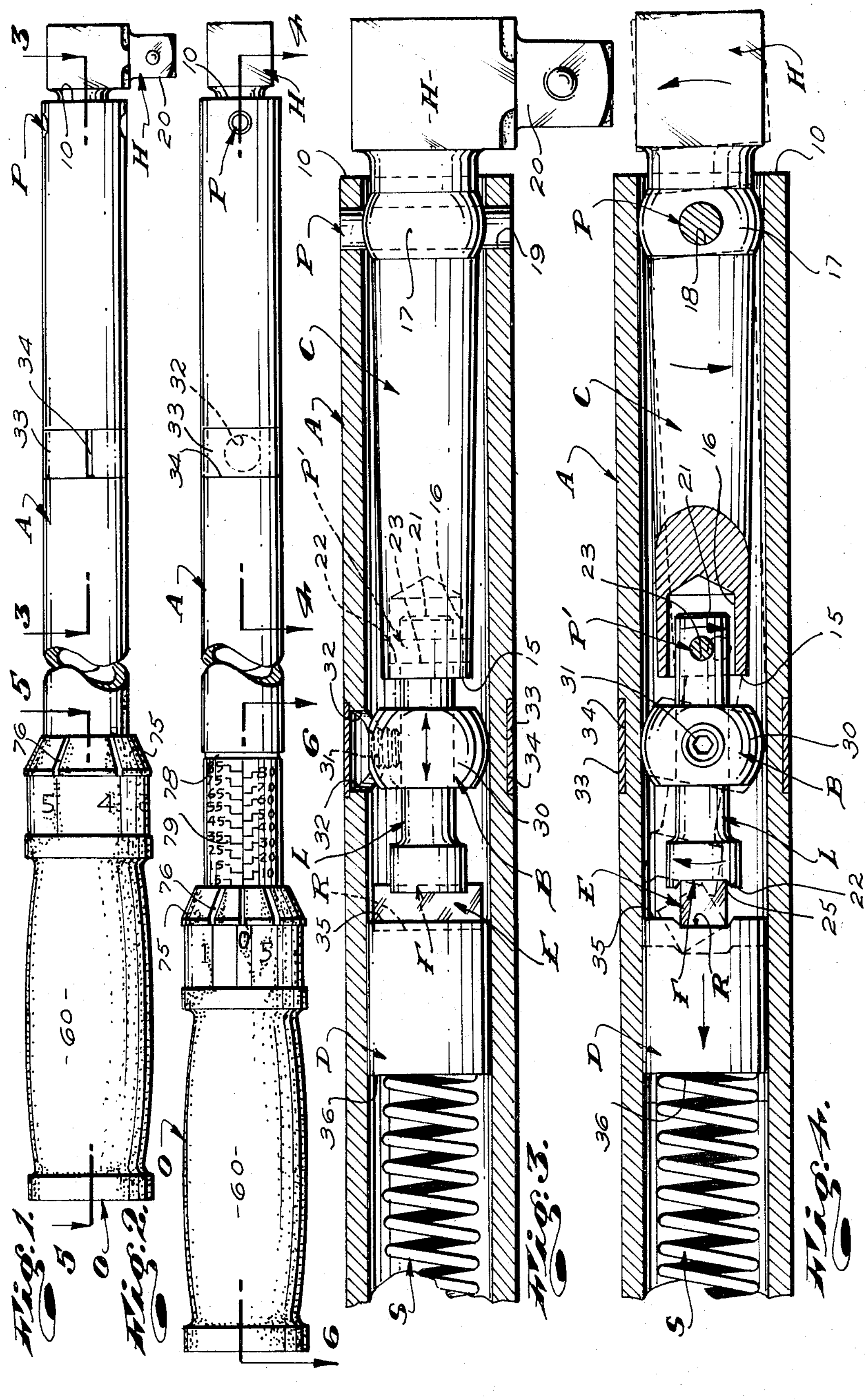

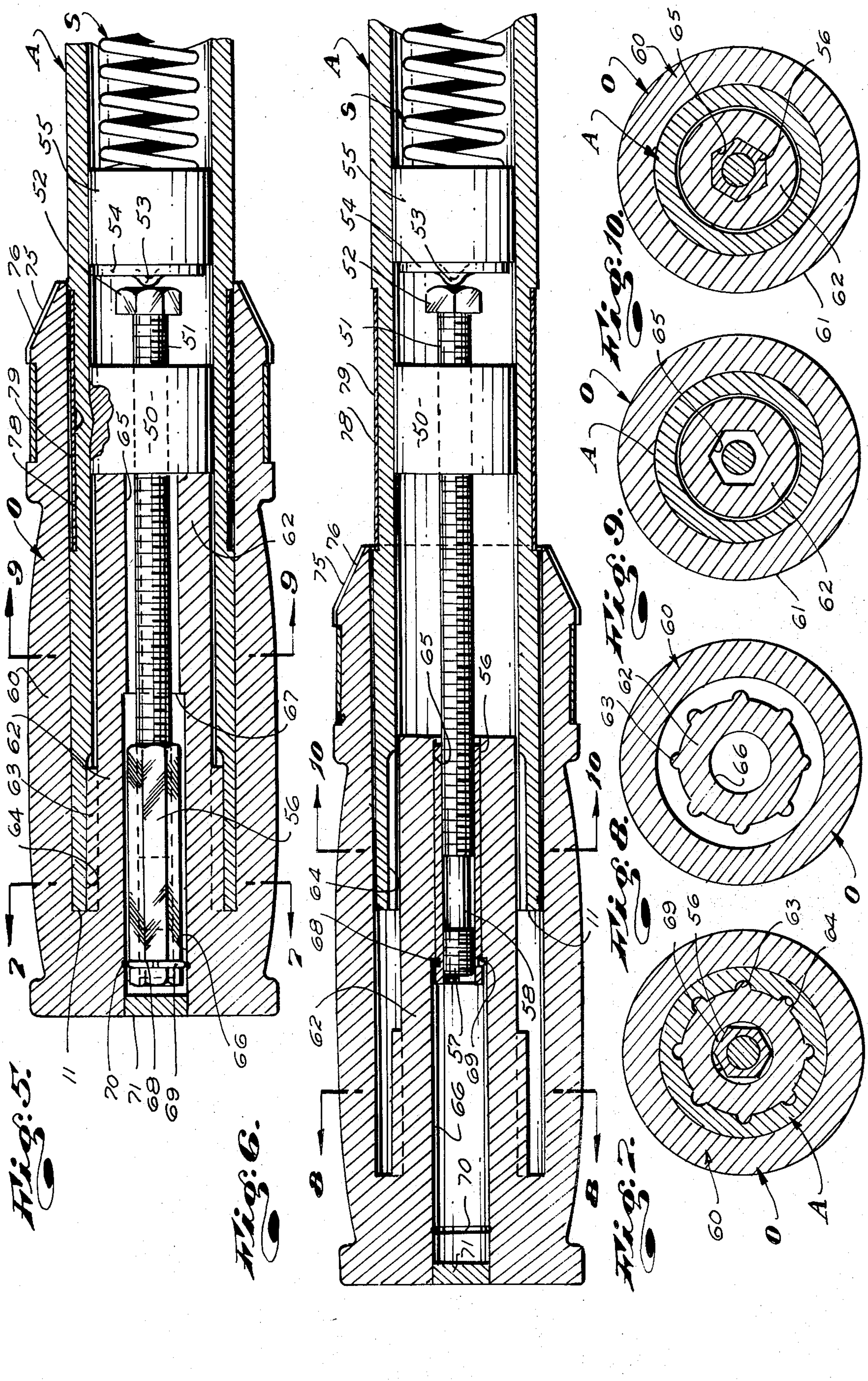
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9.
Fig. 10.

ADJUSTABLE TORQUE WRENCH

This invention has to do with an improved torque wrench, that is, with that class of wrench which includes means for limiting or indicating to the operator of the wrench when a set of predetermined force is transmitted by the wrench onto a related piece of work, such as a screw fastener, or the like. More particularly, this invention relates to an improved, adjustable click-type torque wrench, that is, that particular type or class of torque wrench which is such that when a predetermined, set force is transmitted by the wrench onto a related piece of work, certain parts within the wrench structure move rapidly from a normal position to an actuated, stopped, position and in such a manner that a slight movement, impact and audibly "click-like" sound is transmitted by the wrench, to signal the operator that the desired, set torque has been reached and applied to the work.

The ordinary torque wrenches of the specific type or class here concerned with involve an elongate tubular lever arms with front and rear ends, hand grip means at the rear end of the arms and work engaging heads adjacent the front ends of the arms. The heads have elongate pivot arms or cranks projecting rearwardly and freely into and through the forward portions of the lever arms. The forward portions of the pivot arms or cranks are pivotally mounted to the forward ends of the lever arms and have flat rearwardly disposed seats at their rear ends. Within the lever arms, rearward of the cranks are longitudinally shiftable slide blocks with flat forwardly disposed seats. Cam blocks with flat front and rear faces are engaged with and between the seats on the cranks and blocks. Within the lever arms, rearward of the blocks, elongate compression springs are arranged to engage the blocks and normally yieldingly urging the blocks forwardly toward the cranks, with the flat cam faces in flat pressure engagement with the crank and block seats. Within the rear end portion of the lever arms and engageable at the exterior thereof, manually operable setting means are provided which means engage the springs and are operable to vary the amount of force exerted by the springs onto and through the blocks.

In operation, when a sufficient, actuating force is exerted between the lever arms and the heads, as by manually applied force on the lever arms, when the heads are in stopped engagement with related pieces of work, the rear ends of the cranks pivot laterally in the lever arms and strike the inner adjacent sides of the lever arms to transmit audible clicking sounds. When the cranks swing laterally, the cam blocks must turn or rock between their related seats. Such rocking of the cam blocks urges the pressure blocks rearwardly against the resistance of the springs.

The flat front and rear faces of the cam blocks have straight edges on planes parallel with the pivotal axis of the cranks and the seats with which said faces are related have shoulders against which the noted straight edges of the cam blocks stop and are pivotally supported.

The lateral extent of the cam faces and the axial or longitudinal extent of the cam blocks determine the stability of the cam blocks between their related seats. The dimensions of the cam blocks and their resulting stability in established wrench structures is not subject to change or variation.

It will be apparent that the magnitude of the actuating force in wrenches of the character described above is determined by the length of and mechanical advantage afforded by the cranks, the stability of the cam blocks (both of which factors are fixed) and the pressure exerted by the springs. By adjusting the pressure of the springs, the actuating forces can be varied and sets (within a limited range of forces) as desired.

While the above noted basic and old wrench construction has proven to be quite satisfactory, it has been found to be wanting in a number of ways. Due to the inherent limitations of space within the lever arms of such wrenches, the effective length of the cranks is limited and the size or dimensions of the cam blocks and their resulting stability is restricted or limited. There are anumber of other limiting and restricting features in such wrenches which become apparent from a study of such structures, but which need not be specifically considered at this time.

As a result of the above noted fixed, invariables in such wrenches, the spring pressure must be considerable in those wrenches provided for each range of forces that such wrenches are commonly provided for. As a result of the high spring forces encountered, the adjusting means provided to adjust and vary spring pressure are subjected to high forces which makes them hard or difficult to operate and which subjects them to undesirable rapid wear and early fatigue. Also, the noted high spring pressures subject the cam blocks and their related seats to exceptionally high forces which result in undesirable rapid deformation and wear of those parts, which wear and/or deformation upsets and alters the operating characteristics of the wrenches and renders them inaccurate and undependable.

In the wrenches provided by the prior art, as described above, when the cam block and/or the cam block seats become worn and/or when the springs change in character due to fatigue, there is no means for adjusting and effectively recalibrating such wrenches and the wrenches must be disposed of or their worn and/or fatigued parts must be replaced.

In establishing wrenches, as set forth above, the effective range of forces attainable by a single spring is limited, with the result that special springs of predetermined strength must be provided for each range of forces and, as a result, special wrenches, which differ only in the special nature of the springs employed and, in some cases, in the calibrations provided for setting the wrenches, must be provided for each desired range of forces.

An object of feature of this invention is to provide a click-type torque wrench having novel actuating means whereby the spring forces, or strength of the spring employed can be materially less than in wrenches of the same class provided by the prior art.

It is an object and feature of my invention to provide a wrench structure of the character referred to above which is such that the cam block and its related seats are subjected to materially less wearing forces and the spring adjusting means is subjected to materially less forces than in wrenches provided by the prior art whereby my new wrench structure is materially easier to operate and has a materially longer life expectancy than do wrenches provided by the prior art.

Another object and feature of the instant invention is to provide a wrench structure of the character referred to having novel adjusting means whereby a single wrench structure can be adjusted and set to operate throughout any desired operating range, without the provision and use of special springs and a means whereby the wrench structure can be effectibely adjusted to compensate for wear and fatigue without requiring the replacement of parts and/or reconstruction of the wrench.

Still further, it is an object and feature of this invention to provide a wrench of the character referred to including an intermediate link between the crank and the cam block which link is pivotally connected with the crank and pivotally supported in the lever arm; said link affording a mechanical advantage for the spring and the cam means whereby the spring and its attending forcing throughout the construction can be materially lessened.

It is yet another object and feature of my invention to provide a means of the character referred to above wherein the pivotal support between the link and the lever arm is adjustable longitudinally of the link and said lever arm to afford adjustment of the construction.

Finally, it is an object and feature of my invention to provide improved adjusting means for the spring.

The foregoing and other objects and features of my invention will be apparent and understood from the following detailed description of a typical preferred form and application of my invention, throughout which description reference is made to the accompanying drawings, in which:

FIG. **1** is a side elevational view of my wrench with parts shown in one position;

FIG. **2** is a top plane view of my wrench with parts shown in another position;

FIG. **3** is an enlarged detailed sectional view taken as indicated by line **3—3** on FIG. **1**;

FIG. **4** is an enlarged detailed sectional view taken as indicated by line **4—4** on FIG. **2**;

FIG. **5** is an enlarged detailed sectional view taken as indicated by line **5—5** on FIG. **1**;

FIG. **6** is an enlarged detailed sectional view taken as indicated by line **6—6** on FIG. **2**;

FIG. **7** is a sectional view taken as indicated by line **7—7** on FIG. **5**;

FIG. **8** is a sectional view taken as indicated by line **8—8** on FIG. **6**;

FIG. **9** is a sectional view taken as indicated by line **9—9** on FIG. **5**; and

FIG. **10** is a sectional view taken as indicated by line **10—10** on FIG. **6**.

It is to be understood that the drawings here provided and referred to are for the purpose of illustrating the basic structure provided by my invention and that certain liberty has been exercised in the proportioning of parts for the purpose of better illustrating the invention.

The wrench here provided includes an elongate, cylindrical, tubular, lever A with front and rear ends **10** and **11**, a work engaging head H adjacent the forward end of the lever A and having a rearwardly projecting lever arm **12** or limited longitudinal extent projecting into the lever A; a crank pin P pivotally connecting the lever arm **12** in and to the front portion of the lever A, (for the purpose of this disclosure, the lever will be described as being disposed or extending horizontally and the axis of the crank pin P being on a vertical axis intersecting the central, horizontal, longitudinal axis of the lever and/or the wrench structure). The construction next includes an elongate crank C formed integrally with the lever arm **12**, projecting rearwardly in the lever A from the pin P. The crank is preferably tapered rearwardly and normally projects freely in and through the lever A, concentric with the axis thereof and has a flat rear end **15** with a rearwardly opening central socket **16**.

The rear end of the lever arm **12** and front end of the crank C are joined at the axis of the pin P by a semi-spherical enlargement **17** which establishes substantial free universal bearing support in the bore of the lever and which is provided with a vertical bearing opening **18** through which the pin P extends. The opposite ends of the pin P are engaged and held in openings **19** in the lever, as clearly illustrated in FIGS. **1, 2** and **3** of the drawings.

The head H can be of any desired form and style and is shown as a substantially square, block-like member with a polygonal work-engaging projection **20** depending therefrom, on a vertical axis intersecting the central longitudinal axis of the structure.

The construction here provided next includes an elongate, preferably cylindrical, link L, with front and rear ends **21** and **22** arranged in the lever, rearward of the crank C and normally arranged with its axis concentric with the axes of the crank and the lever.

The forward end portion of the link L project freely into the socket **16** in the rear end of the crank and is pivotally connected with the crank by a pivot pin P′ engaged in registering openings **22** and **23** in the crank and the link. The axis of the pin P′ is vertical, normally intersects the central axis of the construction and is parallel with the axis of the pin P and the projection **20** on the head H.

The rear end **22** of the link is shown as being slightly enlarged and is characterized by a flat rearwardly disposed front seat F, which seat establishes an element or part of a cam means M, which will hereinafter be described. The flat rearwardly disposed seat F is defined by a vertically extending channel in the rear end of the link L and is characterized by laterally spaced, laterally inwardly and rearwardly disposed, vertical shoulders **25**. The shoulders **25** are parallel with the axes of the pins P and P′ and are spaced a predetermined distance laterally from the central axis of the link.

The construction that I provide next includes axially shiftably longitudinally adjustable central bearing support means B between the link L and lever A. The means B can vary considerably in form or construction. In the preferred carrying out of my invention, and as illustrated in the drawings, the means B includes a semispherical support ring **30** slidably engaged on and about the link L and establishing semi-universal, sliding, bearing engagement in and with the bore of the lever. The support ring **30** is provided with or carries a set screw **31** to releasably secure the ring longitudinally of the link. The screw **31** can be an Allen head screw, is accessible at the exterior of the ring and is accessible through a radial access opening **32** provided in the wall of the lever A. The opening **32** is normally closed by a closure band **33** releasably engaged in an annular recess **34** formed in the exterior of the lever, as illustrated in the drawings.

With the structure thus far described, it will be apparent that the link L is pivotally connected with the crank C and is slidably, pivotally supported between its ends in the lever A. It will be further apparent that by and through the means of the set screw **31**, the axial or longitudinal positioning of the bearing ring **30** on the link L and the resulting central pivotal axis of the link can be easily and conveniently varied and adjusted, as desired and as circumstances require.

In practice, since it is an object of the link L and its related bearing support means B to afford a mechanical advantage for the cam means and a related spring means, to be later described, it should be presently noted that the bearing means B for the link L is preferably spaced a predetermined, desired distance forward of the central radial plane of the link, whereby the lever arm portion of the link, rearward of the central pivotal axis of the link is longer than the lever arm portion of the link forward of said axis.

The instant invention next includes a cylindrical slide block D with flat front and rear ends **35** and **36** slidably engaged in the bore in the lever in spaced relationship from the rear end **21** of the link. The front end **35** of the block D has a flat, forwardly disposed rear cam seat R, which seat opposes the front seat F on the link. The seat R is similar to the seat F, being formed or defined in the same or similar manner as the seat F is, and, like the seat F, is chaacterized by laterally spaced, vertical shoulder **25'**, which shoulders are disposed forwardly and laterally inwardly.

The present invention next includes a cubical cam block E, between the seats F and R. The block E has front and rear faces **40** and **41** corresponding in size with the seats F and R and normally in flat bearing engagement on and with said seats. The block E has opposite vertical sides which join with the faces **40** and **41** to define vertical edges on the block, at the opposite sides of the faces thereof, which edges establish pivotal engagement in the vertical corners established by the seats and their vertical side shoulders.

With the above structure, which establishes the previously referred to cam means M, it will be apparent that when the slide block D is urged forwardly and axial pressure is exerted upon the cam block E, the faces **40** and **41** establish and are maintained in stable, flat bearing engagement with their opposing seats.

It will further be noted that when the rear end of the link L is urged and caused to move laterally in the lever A, by the application of forces on and through the head H and the crank C, the cam block E is caused to turn or rock, out of seated engagement with the seats F and R, in the manner illustrated in dotted lines in FIG. **4** of the drawings. When the cam means is caused to shift from its normal position to its actuated position, as described above, the vertical edges or corners of the cam block E pivotally seat and bear in the corners established by the seats and their related shoulders.

When the structure is actuated, as above set forth, the rear end of the link engages, strikes and is stopped by the bore of the lever A before the cam block E is rotated an extent to cause it to shift over or about its center and so that when the forces which caused the rear end of the link to move laterally are released or removed, any slight forwardly applied force on the slide block D will urge the cam block E back to its normal position, which movement will in turn, urge the link L, crank C and head H, back to their normal positions.

When the construction is urged from its normal to its actuated position, as set forth above, and as the cam block is caused to rock or turn, slide block D is urged and caused to move and shift rearwardly in the lever, against forwardly directed force applied thereto.

The present invention next includes spring means S in the lever, rearward of and engaging the rear end **36** of the slide block D and normally yieldingly urging the slide block forward in the lever A with limited or controlled predetermined force. The means S is shown as including an elongate helical compression spring in the lever A, with a front and seated on the rear end of the block D and its rear end, stopped in the rear end of the lever A by a spring stop member or means.

In practice, the spring stop member or means can be fixed or can, as shown in the drawings, include a suitable manually operable adjusting means O, which means is operable to vary the axial pressure normally exerted onto the spring S and to thereby vary the pressure of the block D and transmitted to and through the cam means M.

The manually operable spring pressure adjusting means O provided by this invention and illustrated in FIGS. **1**, **2** and **5** through **10** of the drawings includes a carrier block **50** fixed in the lever in spaced relationship rearward of the spring S, an elongate axially shiftable adjusting screw **51** threaded in and through the carrier block **50** to project forwardly and rearwardly from the block **50**, concentrically and freely in the lever A. The screw **51** is shown in the form of an elongate threaded bolt, with a head **52** at its forward end. The head **52** of the screw **51** is engaged by a rearwardly projecting teat **53** on an anti-friction washer **54** in the lever A, which washer can engage and seat with the rear end of the spring S or can, as shown, engage a cylindrical spacer **55** arranged between the washer **54** and the spring S.

The rear end portion of the screw **51** carries an elongate polygonal drive sleeve or nut **56** which nut projects freely from the rear end of the screw and is shiftable longitudinally of the screw for adjusting purposes and is secured in locked, fixed position on the screw by a lock screw **57** engaged in the nut from the open rear end thereof and either engages the rear end of the screw directly or, as shown, engages a binding pin **58** arranged between the two noted screws.

The means O next includes an elongate manually engageable driver **60** axially and rotatably engaged in and about the rear end portion of the lever A and axially shiftable about the drive nut **56**, from a normal, forward, locked position, where it is locked against rotation relative to the lever A and is out of driving engagement with the nut **56**, to a rear, operating position, where it is out of locked engagement with the lever A and in driving engagement with the nut.

The driver **60** is preferably a unitary cast or molded part of durable plastic or the like and is characterized by an outer cylindrical, manually engageable outside sleeve portion **61**, rotatably and slidably engaged about the rear portion of the lever A, in bearing support therewith, and a central core portion **62** projecting concentrically in the sleeve portion **61** and into the rear portion of the lever A. The rear end of the driver **60** normally projects a short distance from the rear end of the lever A and the portions **61** and **62** thereof join at said rear portions. The rear end portion, for example, about the rear quarter of the core portion **62** is polygonal in exterior cross-section or is splined, as indicated at **63**. The rear portion of the bore in the lever A is polygonal or splined, as at **64** to cooperatively engage the splined portion **63** of the core when the driver **60** is in its normal forward position, as shown in FIGS. **5** and **7** of the drawings and so that the driver and the lever A are in rotary locked relationship with each other.

When the driver is moved rearwardly relative to the lever A, to its rear, actuated or operating position, the splines **63** and **64** disengage and the driver is free to be manually rotated relative to the lever.

The central core portion **62** of the driver **60** has an elongate central opening with a polygonal front portion **65** to slidably receive and establish driving engagement with the nut **56** when the driver is in its rear actuated position, as shown in FIGS. **6** and **10** of the drawings, and an enlarged, normally rearwardly opening rear portion **66** to freely accommodate the nut **56** when the driver is in its forward normal position, as clearly shown in FIG. **5** and FIG. **7** of the drawings.

The inner forward end of the rear portion **66** of the opening in the core portion defines a rearwardly disposed stop shoulder **67**. The rear end portion of the nut **56** is provided with an annular, radially outwardly opening groove **68** in which a snap-ring type stop ring **69** is releasably engaged. The stop ring **69** normally establishes sliding friction engagement in the rear cylindrical portion **66** of the central opening in the driver, to prevent it from shifting freely axially. The stop ring further engages the shoulder **67** when the driver is shifted to its rear actuated position, to prevent undesired disengagement of the driver from the remainder of the construction.

In practice, the rear portion **66** of the central opening in the driver **60** can be provided with an orienting groove **70** in which the stop ring yieldingly seats when the driver is in its forward normal position.

The rear end of the central opening in the driver is preferably normally closed by a removable plug **71**.

The forward end portion of the outer sleeve portion **61** of the driver **60** is forwardly and inwardly tapered as at **75** and is provided with suitable circumferentially spaced calibrating reference marks or lines **76**. That rear portion of the lever A, which is normally covered by the driver **60** when it is in its normal forward position and which is and/or can be exposed and/or uncovered when the driver is in its rear, actuated position is provided with and carries longitudinally spaced calibrating reference marks or lines **77** with appropriate symbols and with which the calibrating marks **76** on the driver are adapted to be related.

In the preferred carrying out of my invention and as illustrated, the portion of the lever A with which the marks **77** are related is recessed as at **78** and the marks are applied to a band **79**, as by printing, which band is arranged and fixed in the recess **78**.

The calibration and/or marks **76** and **77** can vary widely in practice and are, for example, such that when certain of the marks **76** are registered with certain of the marks **77**, as by axial and rotary movement of the driver relative to the lever A, the registered marks indicate that force at which the wrench construction will operate to indicate or signal the operator and thereby advise him that desired, predetermined force has been exerted, through the wrench onto a related piece of work.

In operation, when it is desired to adjust and set the wrench to operate at a particular applied force, the driver is moved from its normal, locked, forward position to its rear, unlocked, driving, actuated position. When so positioned, the driver is rotated relative to the lever A, rotating the nut **56** and screw **51** to advance the screw **51** forwardly or rearwardly and to thereby increase or decrease the axial compression of the spring S and increase or decrease the force exerted by the spring onto and through the cam means proportionately. As the nut and screw assembly is moved axially relative to the lever A in the manner set forth above, the axial position of the driver relative to the lever, when the driver is in its rear actuated or operating position is varied proportionately and the calibration of the above described calibrating means is, also, varying proportionately.

In and during operation and use of my new wrench construction after the adjusting means O has been adjusted and set to effect operation of the wrench at a desired, predetermined force, when the head H of the wrench is engaged with a related piece of work and the desired force is applied onto the work, by manually applied force on and through the hand grip portion of the driver **60** and the lever, the crank C is caused to swing laterally in the lever, left or right, depending upon the direction of applied force. As the crank swings laterally about the axis of the pin P, it drives and swings the forward end of the link L laterally in the same direction and the rear end of the link in the other or opposite direction about the central pivotal axis of the link, established by the bearing support means B of the link. As the link is pivoted in the above manner, the central pivotal axis of the link must and is free to shift axially forwardly in the lever, a short but necessary distance. As the rear end of the link is urged and moved laterally in the above manner, the cam means M is operated and the slide block is urged rearwardly against the resistance of the spring S, as previously described.

Since, as previously noted, the rear portion of the link is longer than the forward portion of the link, that is, since the rear lever arm portion of the link, rearward of its central pivotal axis is longer than its forward lever arm portion, the force applied to the forward end of the link by the crank must be greater than the force afforded by the spring S and cam means M, which resists lateral shifting of the rear end of the link. As a result, the force of the spring, acting upon and through the cam means can be and is materially less than the spring force that would be required if the link L was not provided and the front cam seat F was at the rear end of the crank, as is common practice in the prior art.

It will be further apparent that by manually adjusting the longitudinal position of the central pivotal axis of the link L, as by shifting the ring **30** of the means B, the differential of the front and rear movement or lever arms of the link can be adjusted. Such adjustment of the link L and/or means B can be exercised to fine adjust the wrench structure when new, to fine adjust said structure to compensate for wear and the like, after it is used and can be exercised to adjust the construction to operate in and throughout different ranges of forces, which the spring S and/or the adjusting means O therefor could not otherwise handle or be employed for.

By virtue of the lighter spring force required in carrying out my invention, as compared with such forces required in the wrenches provided by the prior art, it will be apparent that the cam means M and all other parts and means of my construction rearward of the cam means are subjected to materially less spring applied, internal forces, that the construction is therefore easier to operate, will not wear or fatigue so rapidly and can be expected to have a noticeably longer period of usefulness.

Having described only one preferred form and carrying out of my invention, I do not wish to be limited to the specific details herein set forth, but wish to reserve to myself any modifications and/or variations which appear to those skilled in the art and which fall within the scope of the following claims:

Having described my invention, I claim:

1. A click-type torque wrench comprising an elongate horizontal lever with front and rear ends, a work-engaging head with a vertical axis adjacent the front end of the lever, a lever arm projecting rearwardly from the head, a crank pin on a vertical axis connecting the rear end of the lever arm at the front end of the lever, an elongate crank pivotally supported by and projecting rearwardly from the crank pin, an elongate link with a front end pivotally connected with the rear end of the crank and projecting rearwardly therefrom, bearing means between the ends of the link and pivotally supporting the link on a vertical axis shiftable longitudinally of the lever, a slide block carried by the lever for free longitudinal shifting relative thereto and spaced rearward from the rear end of the link, spring means carried by the lever rearward of the slide block and normally yieldingly urging the slide block forwardly, cam means between the link and the slide block including flat front and rear seats with laterally spaced vertical shoulders at opposite sides thereof and defining laterally spaced vertical corners on the link and the slide block respectively and a cam block with flat front and rear faces between and normally in flat bearing engagement with the front and rear seats and having laterally spaced vertical edges in pivotal engagement in said corners and means on the lever in spaced relationship from the opposite sides of the rear ends of the crank and the link to be engaged by the end of the link upon lateral shifting of the crank and the link and to limit lateral shifting of the rear end of the link and rocking of the cam block between said seats resulting from the application of sufficient torsional force applied to the head on the vertical axis thereof, through the lever arm, crank and link to turn said cam block between said seats against the force of the spring means.

2. A structure as set forth in claim **1** wherein said bearing means is selectively shiftable longitudinally of the link whereby the relative longitudinal extent and mechanical advantage of the portions of the link extending forwardly and rearwardly from the pivotal axis of said bearing means can be selectively varied to adjust the operation of the wrench.

3. A structure as set forth in claim **2** wherein the lever is an elongate tubular member with a central longitudinal bore, said crank and link normally extending longitudinally and freely through and substantially concentric with the bore, said bearing means including a part on the link pivotally and slidably engaged in the bore, said slide block is slidably engaged in the bore for free longitudinal shifting therein, and said means to be engaged by and to stop the link being defined by the portions of the bore at the opposite sides of said link.

4. A structure as set forth in claim **2** wherein the lever is an elongate tubular member with a central longitudinal bore, said crank and link normally extending longitudinally and freely through and substantially concentric with the bore, said bearing means including a part on the link pivotally and slidably engaged in the bore, said slide block is slidably engaged in the bore for free longitudinal shifting therein, and said means to be engaged by and to stop the link being defined by the portions of the bore at the opposite sides of said link and crank, said bearing means is selectively shiftable longitudinally of the link whereby the relative longitudinal extent and mechanical advantage of the portions of the link extending forwardly and rearwardly from the pivotal axis of said bearing means can be selectively varied to adjust the operation of the wrench.

5. A structure as set forth in claim **1**, wherein said spring means includes an elongate helical compression spring with a front end engaging the slide block and extending rearwardly therefrom, and adjusting means to vary the compression of and force exerted by the spring onto the slide block and including a carrier block carried by the lever rearward of the spring, an elongate longitudinally extending screw thread in and through the carrier block and having means at its forward end to engage the rear end of the spring, and drive means including a manually engageable driver engaged with and between the rear ends of the screw and the lever and shiftable longitudinally from a normal forward position where it is in rotary locked engagement with the lever and rotary unlocked engagement with the screw to an actuated rear position where it is in rotary unlocked engagement with the lever and rotary locked engagement with the screw.

6. A structure as set forth in claim **5** wherein the lever is an elongate tubular member with a central longitudinal bore, said crank, link and spring normally extend longitudinally and freely through and substantially concentric with the bore, said bearing means includes a part on the link pivotally and slidably engaged in the bore, said slide block is slidably engaged in the bore, said means to be engaged by and to stop the link being defined by the bore at the opposite sides of said link.

7. A structure as set forth in claim **5** wherein the carrier block is fixed in the bore, said screw is concentric in and extending freely longitudinally of the bore, said driver including an outer sleeve portion engaged about the exterior of the rear portion of the lever, a central core portion projecting from the rear end of the sleeve portion into the bore and having a central opening with a cylindrical rear portion and polygonal front portion freely receiving the rear portion of the screw, said operating means further including an elongate polygonal drive part on the rear end of the screw freely engageable in the rear portion of said central opening when the driver is in its forward position and establishing driving engagement in the forward portion of said opening when the driver is in its rear position.

8. A structure as set forth in claim **7** wherein said bore has splines in its rear portion and said core has splines on its rear portion, said splines on the core engaging the splines in the bore only when the driver is in its forward position.

9. A structure as set forth in claim **8** wherein the forward end of the rear portion of the opening defines a rearwardly disposed shoulder and said polygonal part carries a radially outwardly projecting stop part about its rear portion to engage said shoulder and to limit rearward movement of the driver relative to the said polygonal part and the lever.

10. A structure as set forth in claim **9** which includes circumferentially spaced calibrating marks at the forward end of the sleeve portion of the driver and said lever has axially spaced calibrating marks to occur adjacent the forward end of the sleeve portion when the driver is in its rear position and with which the marks on the sleeve portion are cooperatively related to indicate set operating forces of the wrench.

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