Dec. 24, 1968 E. R. SHINN 3,417,641

POWER WRENCH FOR TIGHTENING STUDS IN ENGINE BLOCKS AND THE LIKE

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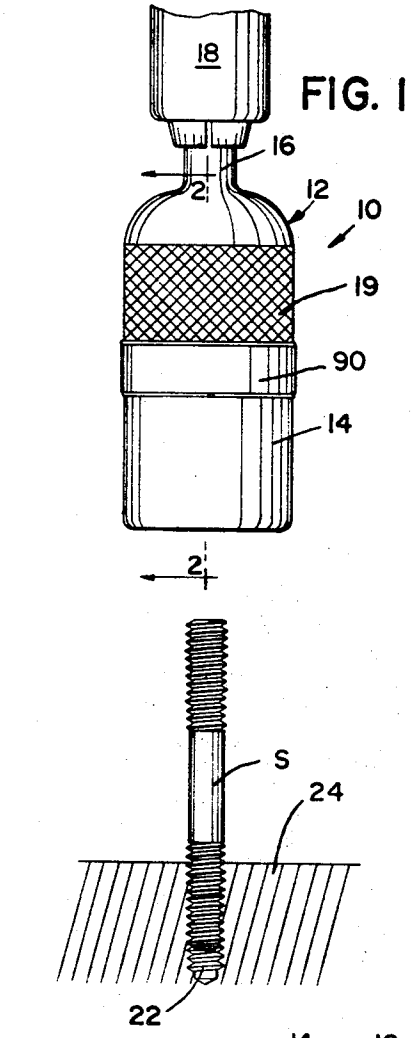


FIG. 1

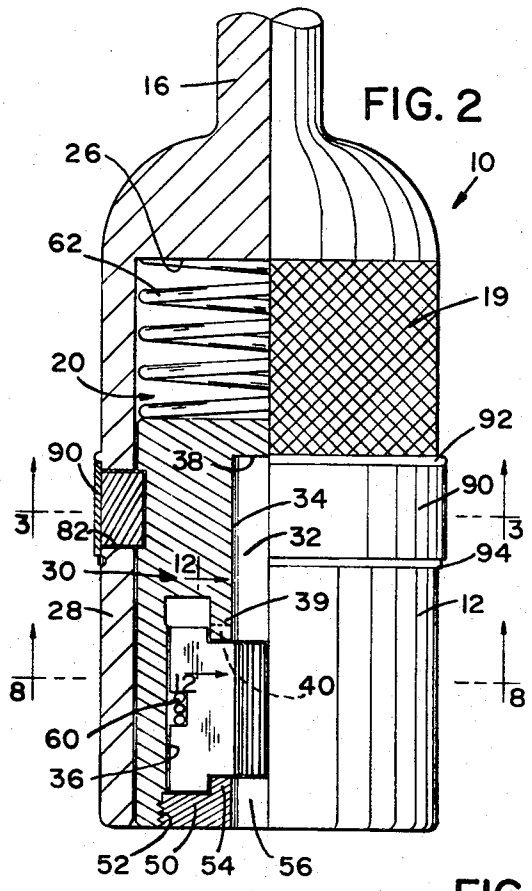


FIG. 2

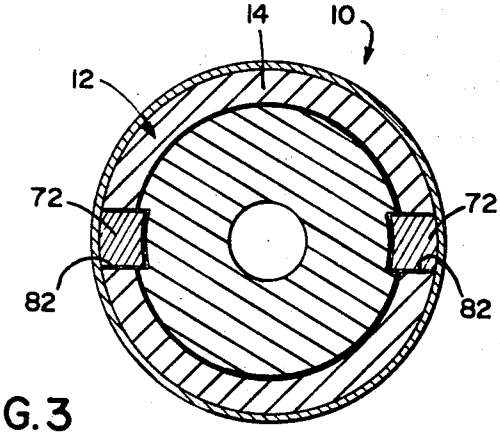


FIG. 3

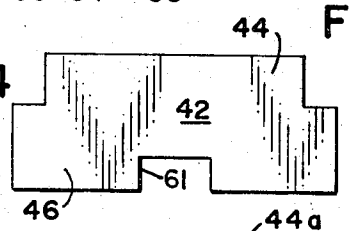


FIG. 4

FIG. 5

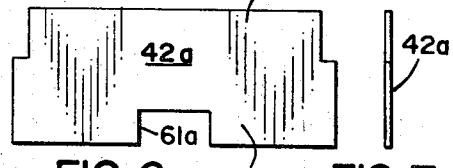


FIG. 6

FIG. 7

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FIG. 8

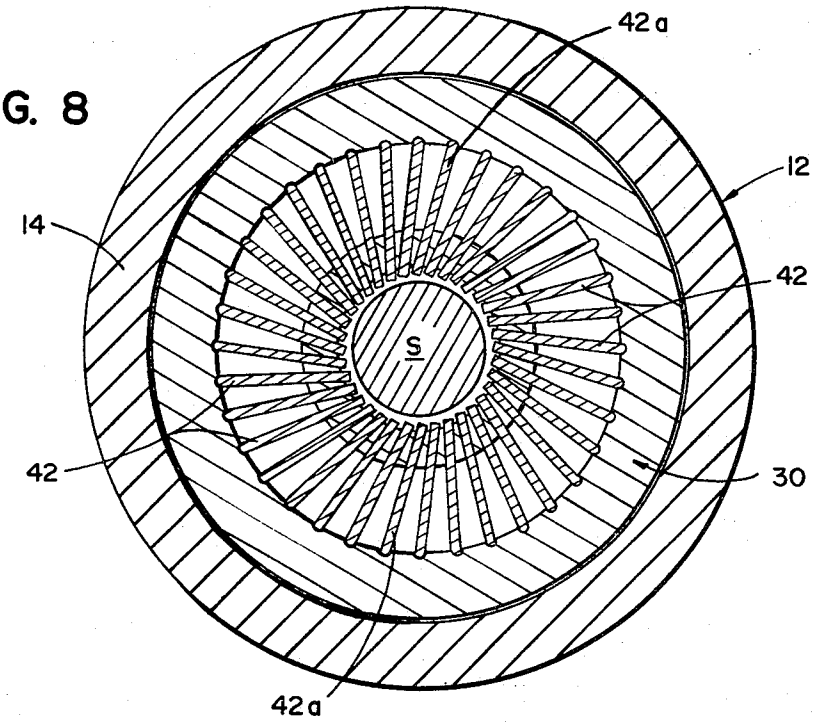
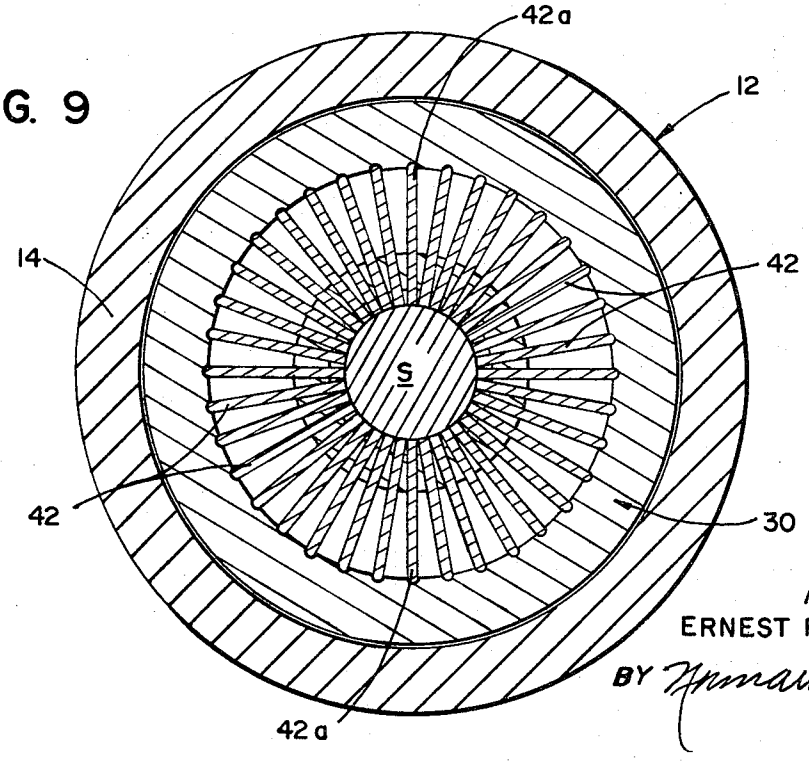


FIG. 9



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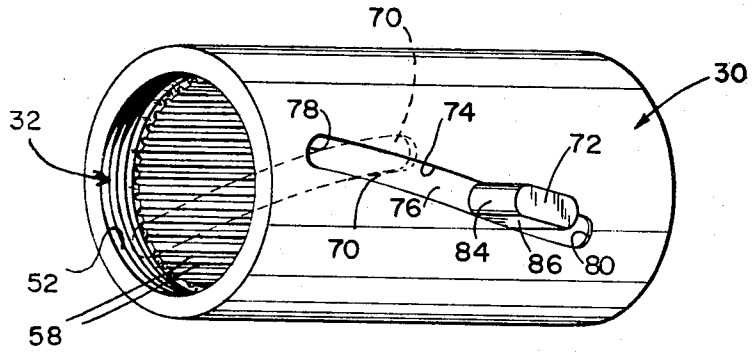


FIG. 10

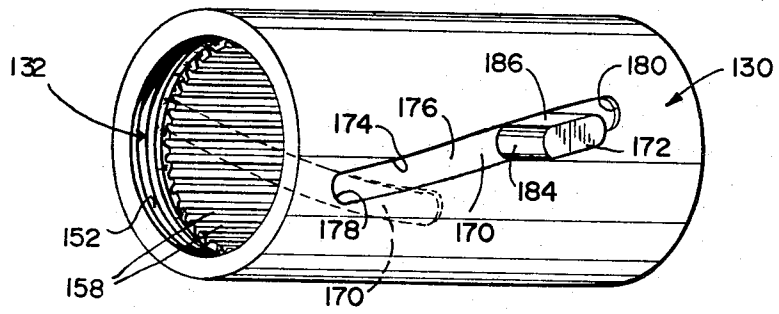


FIG. 11

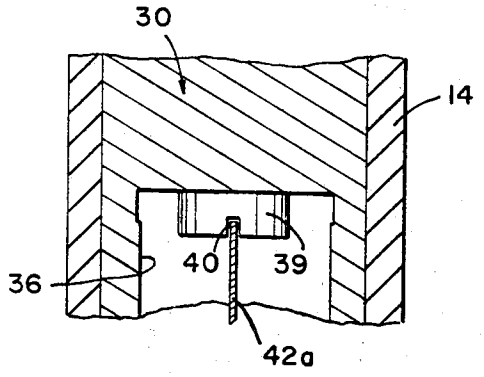


FIG. 12

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3,417,641

POWER WRENCH FOR TIGHTENING STUDS IN ENGINE BLOCKS AND THE LIKE

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Filed July 19, 1967, Ser. No. 654,666
7 Claims. (Cl. 81—53)

ABSTRACT OF THE DISCLOSURE

A power wrench for driving and tightening studs in engine blocks and the like. The wrench body has a shank suitable for mounting in a drill press chuck and a socket for telescopic reception over the stud to be tightened. As the stud bottoms in the socket of the continuously rotating wrench body, a series of wedge elements are caused to move into wedging engagement with the stud and, thereafter, the rotational movement of the wrench body causes the wedge elements to become self-energized against the stud with increased wedging action so that the stud is turned in a tightening direction. Withdrawal of the wrench from the stud deenergizes the wedge elements so that they release the stud.

The present invention relates to a power wrench for driving and tightening studs in the threaded holes or sockets which are provided for them in an engine block or the like.

Heretofore, it has been common practice in assembly line operation, as well as in automobile repair shops, to effect the installation of the various studs which project vertically upwardly from the engine block of an internal combustion engine for an automotive vehicle initially to thread the studs manually a slight distance into the threaded holes in the engine block and thereafter to tighten the studs with a Stillson type wrench. This procedure is very awkward inasmuch as the large multiplicity of closely arranged studs affords little freedom of wrench movement. The procedure also is time consuming not only by reason of such lack of working space but also by reason of the fact that to insure equality of stud height in the completed engine block repeated measurement of stud height during the stud-tightening operation must be resorted to. Stud removal or extraction operations are likewise hampered by close stud proximity. Still further, application of a self-energizing jaw type wrench to the studs may damage the latter to such an extent that difficulty is subsequently encountered in installing the cylinder head on the engine block to which the studs have been applied.

The present invention is designed to overcome the above-noted difficulties that are attendant upon the current method of stud installation, and toward this end, it contemplates the provision of a novel power wrench in the form of a normally vertically extending, thimble-like casing having at the upper end thereof a shank portion by means of which it may be secured in or connected to the rotary chuck of a conventional or standard drill press stand. The aforesaid casing of the improved wrench presents a socket for telescopic reception over a given stud to be tightened and is possessed of certain internal moving parts including a multiple jaw clutch, the latter consisting of a relatively large number of generally radially disposed wedge plates, each of which establishes or constitutes a clutch jaw. Normally, the wedge plates are maintained out of clutching engagement with the stud undergoing tightening but they are capable of being initially moved into engagement with the stud at the time the stud enters the stud-receiving socket in the wrench casing. Because the wrench is continuously rotated, as soon as the wedge plates move into clutching engagement with the stud

undergoing tightening, continued rotation of the wrench effects a self-energizing or binding action on the part of the wedge plates so that the stud is firmly gripped by the numerous surrounding wedge plates and rotated in a tightening direction. A gauge on the drill press stand indicates the proper depth of stud penetration into the engine block or other work piece, and when this depth has been attained, the drill press chuck, and consequently, the wrench, is raised so that the stud becomes withdrawn from the socket. Initial raising of the wrench terminates the self-energizing or binding action of the wedge plates so that clutch disengagement and consequent stud release is effected.

Since the wrench supporting chuck is continuously rotated, and since it is associated with a conventional drill press stand, it is merely necessary to index the engine block or other work piece to bring the various studs successively into vertical register with the wrench, whereupon, as each stud is moved beneath the wrench, the operating handle of the drill press stand is manipulated to lower the rotating chuck, and consequently, the wrench, upon the stud so that automatic stud tightening will take place. Upon raising of the chuck and wrench, the tightened stud is released and the engine block is indexed to bring the next stud into position for stud-tightening purposes.

The provision of a stud-tightening wrench of the character briefly outlined above and possessing the stated advantages constitutes the principal object of the present invention.

The provision of a stud-tightening wrench which is extremely simple in its construction; a wrench which is possessed of operative mechanical parts in the form of sheet metal stampings and, therefore, may be manufactured at a low cost; a wrench which is rugged and durable and, therefore, will withstand rough usage; a wrench in which the various parts are easily assembled and dismantled for purposes of inspection of parts, replacement or repair thereof; a wrench which requires no adjustment to accommodate studs of varying height or diameter within certain predetermined limits; a wrench which will not deface or damage the studs to which it is applied; a wrench which will positively grip the studs securely even when they are made of hardened steel; and a wrench which otherwise is well-adapted to perform the services required of it, are further desirable features which have been borne in mind in the production and development of the present invention.

Other objects and advantages of the invention not at this time enumerated will readily become apparent as the nature of the invention is better understood from a consideration of the following detailed description.

In the accompanying three sheets of drawings forming a part of this specification, one illustrative embodiment of the invention is shown.

In these drawings:

FIG. 1 is a fragmentary side elevational view showing a stud-tightening wrench embodying the invention operatively installed in the rotary chuck of a drill press stand and in position over a stud preparatory to tightening of the latter;

FIG. 2 is an enlarged partial sectional view taken vertically and centrally through the wrench and on the line 2—2 of FIG. 1;

FIG. 3 is a horizontal or transverse sectional view taken on the line 3—3 of FIG. 2;

FIG. 4 is a plan view of one of numerous clutch wedge plates which are employed in connection with the present invention;

FIG. 5 is an edge view of the clutch wedge plate of FIG. 4;

FIG. 6 is a plan view of one of two torque reaction

clutch wedge plates which are employed in connection with the invention;

FIG. 7 is an edge view of the clutch wedge plate of FIG. 6;

FIG. 8 is an enlarged horizontal or transverse sectional view taken on the line 8—8 of FIG. 2 and showing the clutch mechanism disengaged;

FIG. 9 is an enlarged sectional view similar to FIG. 8 but showing the clutch mechanism engaged on a stud to be tightened;

FIG. 10 is a perspective view of the slide member and a pair of associated drive elements which are employed in connection with the present invention, such view showing the positional relationship between said slide member and associated drive elements;

FIG. 11 is a perspective view, similar to FIG. 10 but showing a substitute slide member which, when incorporated in the wrench, will adapt the wrench for stud-removal operations; and

FIG. 12 is a horizontal or transverse sectional view taken on the line 12—12 of FIG. 2 and, in the interest of clarity, showing the clutch wedge plates removed.

Referring now to the drawings in detail and in particular to FIG. 1, a stud-tightening wrench embodying the principles of the present invention is designed in its entirety by the reference numeral **10**, such figure being a side elevational view so that only the outer wrench casing **12** is visible. The casing **12** is generally of cylindrical configuration and includes an enlarged body portion **14** from which there projects axially a shank portion **16**. The latter is located at the upper end of casing **12** and is adapted for retention in a suitable chuck such as the rotatable chuck **18** which forms a part of a conventional or standard drill press stand (not shown). The casing **12** is provided with a knurled upper section **19**. The casing **12** also is provided with a deep axially extending clutch-enclosing socket **20** (see FIG. 2) for telescopic reception over the upper end of a stud S. The latter is shown in the drawings as being loosely threaded socket **22** in the upper portion of an automotive engine block **24**. Preferably, in a commercially feasible installation, the drill press stand will be stationary while the engine block **24** will be suitably mounted on a bed plate (not shown) which is capable of being indexed to bring the various upstanding studs into successive vertical register with the stud-tightening wrench **10** so that, upon descent of the latter, the stud S will enter the socket **20** for stud-tightening purposes. It will be understood that the chuck **18** is continuously rotated and that, upon each descent thereof, the rotating wrench will operatively engage the stud S to be tightened and effect the tightening operation automatically with no manipulative procedure on the part of the operator being required other than his manipulation of the usual drill press lever (not shown) or other operating instrumentality such as a foot pedal or the like (also not shown).

Referring now to FIG. 2 the casing **12** embodies a circular top wall **26** and a cylindrical side wall **28**, and these walls together define the socket **20**. Slidably mounted and capable of limited rotational turning movement in either direction within the socket **20** is a clutch actuator in the form of a generally cylindrical slide member **30** which has formed therein a stud-receiving socket **32**. This last-mentioned socket is in the form of a bore **34** in the upper region of the slide member **30**, and a counterbore **36** in the lower region of said slide member. The latter embodies a circular top wall **38** which defines the upper extremity or end of the bore **34**. The juncture region between the bore **34** and the counterbore **36** presents a downwardly projecting annular flange **39** having formed therein a pair of diametrically opposite reaction slots **40** (see FIG. 12), the function of which will be made clear presently.

Positioned loosely within the counterbore **36** of the socket **32** in the slide member **30** is an annular series

of substantially radially disposed wedge plates **42**, thirty-six such plates being illustrated herein for exemplary purposes although a greater or lesser number of such plates may be employed if desired. As best illustrated in FIGS. 2 and 4 to 7, inclusive, each of these wedge plates is generally of wide area T-shape design, each plate having a wide T-shank **44** and a T-head **46**. Two of the thirty-six wedge plates are of special design and they are designated by the reference character **42***a* and are of slightly modified construction in that they have somewhat wider T-shanks **44***a* than do the other thirty-four wedge plates **42**. The T-heads **46***a* of the two special wedge plates **42***a* are the same in width as the T-heads **46** of the regular wedge plates **42**. Preferably, the various wedge plates are in the form of metal stampings in order to reduce the manufacturing cost of the wrench. An annular retainer ring **50** is threadedly received as at **52** in the rim region of the socket **32** and is provided with an upwardly extending circular boss **54** and this defines a central opening **56** through the ring **50**. The various wedge plates **42** and **42***a* are arranged so that their T-heads extend vertically and their T-shanks inwardly. They are loosely held in position within the socket **32** with the outer edges of their T-heads seated within an annular series of closely spaced, longitudinally extending grooves **58** (see FIG. 10), such grooves being formed in the counterbore **36** and there being one groove **58** for each wedge plate. The upper and lower portions of the inner edges of the T-heads **46** and **46***a* are normally and respectively maintained in seated engagement or abutting relation with the outer peripheral surfaces of the annular depending flange **39** and the upwardly extending circular boss **54** by means of a vertical series of elastomeric O-rings **60** which are positioned notches **61** in the central portions of the outer edges of the T-heads **46** of the regular wedge plates **42** and notches **61***a* in the central portions of the outer edges of the T-heads **46***a* of the two special wedge plates **42***a* and function as garter-type springs to draw the various wedge plates **42** and **42***a* radially inwardly with respect to the socket **32**. The T-shanks **44** and **44***a* of the wedge plates project radially inwards through the annular space which exists between the opposed rims of the annular depending flange **39** and the upwardly extending circular boss **54** as clearly shown in FIG. 2, the radial extent of these T-shanks being but slightly greater than the radial thicknesses of said flange and boss.

As best illustrated in FIGS. 8 and 9, in the normally disengaged condition of the multiple jaw clutch of the wrench **10**, the various wedge plates **42** and **42***a* do not extend in truly radial directions but, instead, they deviate slightly from true vertically extending, radial planes with the inner end edges of the T-shanks **44** and **44***a* in substantial contiguity. When a stud S which is to be tightened is projected into the socket **32** through the central opening **56** in the retaining ring **50**, the radial inclination of the wedge plates is such that the inner end edges of their T-shanks lie in close proximity to, but do not touch, the stud as shown in FIG. 8. When the multiple jaw clutch of the wrench **10** is engaged upon the stud as shown in FIG. 9 by reason of a slight counterclockwise rotation of the slide member **30** with respect to the casing **14**, the various wedge plates **42** and **42***a* assume substantially radial positions and the inner end edges of their T-heads securely engage the stud S with a self-energizing action under the influence of the continous rotational movement of the power-actuated wrench as a whole, all in a manner that will become clear presently.

The aforementioned slight rotational movement of the slide member **30** which is necessary to effect clutch engagement is automatically attained by projection of the stud S into the socket **32**, it being understood that this projection of the stud is a relative one which takes place when the rotating wrench is lowered upon the fixed stud which projects upwardly from the engine block **24**.

Accordingly, the slide member **30**, which, as previously pointed out, constitutes the clutch actuator for the wrench **10**, is axially shiftable within the socket **20** in the body portion **14** of the casing **12** between a lowered advanced position in which it is shown in full lines in FIG. 2 and an upper or retracted position in which it is shown in dotted outline in FIG. 2. Normally, the slide member **30** is maintained in its lowered advanced position by means of a helical compression spring **62** which is disposed within the upper region of the socket **20** in the body portion of the wrench casing and bears at its upper end against the circular top wall **26** and at its lower end against the top wall **38** of the slide member. Upon projection of a stud S into the socket **32**, the upper end of the stud will engage said top wall **38** of the slide member **30** and as the rotating casing **12** continues to descend over the stud, the consequent relative movement between the casing and the slide member will cause the latter to be moved to its retracted dotted line position against the action of the spring **62**.

The relative movement between the body portion **14** of the wrench casing and the slide member **30** just described is accompanied by a slight rotational movement of the slide member in a counterclockwise direction as viewed in FIGS. 8 and 9 under the influence of two shallow helical cam grooves **70** (see FIG. 10) which are formed in the outer cylindrical surface of the side wall of the slide member **30** and cooperate respectively with a pair of diametrically opposite drive elements **72**. The latter are carried by the casing body portion **14** and project into the cam grooves.

Reference to FIGS. 3 and 10 will reveal the fact that the portion of the slide member side wall which surrounds the bore **34** is of appreciable thickness and that the portion of said side wall which surrounds the counterbore **36** likewise is thick although of less thickness than the said first mentioned side wall portion. Both side wall portions are of sufficient thickness to accommodate the provision of the two shallow grooves **70** at diametrically disposed regions of the slide member. While these two grooves **70** have been referred to herein as being "helical" grooves, they are helical only in that the side edges **74** follow the cylindrical curvature of the cylindrical side wall in which they are formed. Due to the extremely long pitch of the involved helix, the bottoms **76** of these two grooves **70** may be made planar or flat without cutting through the slide wall of the slide member **30**. The ends of the grooves **70** are curved or rounded and establish the extent which the slide member is capable of sliding within the socket **20** in the casing body portion **14**, the upper ends **78** (see FIG. 10) of the cam grooves being engageable with the drive elements **72** to limit the lowered advanced position of the slide member and the lower ends **80** of the grooves similarly limiting the upper retracted position of the slide member. These drive elements are loosely disposed in slots **82** (see FIGS. 2 and 3) in the cylindrical side wall of the casing body portion **14** and they project radially inwardly of the slots, extend into the helical cam grooves **70** and ride on the flat bottoms **76** thereof. The drive elements **72** are in the form of block-like structures having curved ends **84** and flat sides **86**, the former cooperating with the curved ends **78** and **80** of the helical cam grooves **70** to limit the stroke of the slide member **30**, and the latter making camming contact with the side edges **74** of the grooves **70** so that, upon relative sliding movement between the slide member **30** and the casing body portion **14** between their two extreme relative positions, a slight angular turning movement of the slide member within the casing **12** in opposite directions will take place. This turning movement of the slide member within the casing body portion **14** is relied upon to effect clutch engagement and disengagement in a manner that will subsequently be set forth in detail. The two drive members **72** are maintained in their operative positions within the slots **82** by means of an encompassing retainer ring **90** which is held against longitudinal shifting movement on the casing body portion **14** by a rib **92** on the top side thereof and a split snap ring **94** on its bottom side.

Before entering into a description of the operation of the herein described power wrench **10**, it is deemed pertinent to set forth the manner in which the various parts of the wrench may be assembled at the factory. Initially, the spring **62** is inserted from below into the upper end portion of the socket **20** and, thereafter, the slide member **30** is installed in said bore in its proper position wherein it directly underlies the spring. With the slide member **30** thus in place, the various wedge plates **42** and **42*a*** are individually slid into position with the outer side edges of the T-heads within the longitudinal grooves **58** which, as heretofore stated, are formed in the counterbore **36**. However, before the wedge plates are projected fully into position, the garter-type O-rings **60** are installed in the notches **61** and **61*a***. When the O-rings have thus been installed, the entire series of radially extending wedge plates **42** and **42*a*** is pushed fully into the counterbore **36** of the socket **32** so that the upper end portions of the T-heads **46** and **46*a*** encompass the downwardy projecting annular flange **39** and, thereafter, in order to complete the assembly of the wrench **10**, the retainer ring **50** is screwed into position within the threaded portion **52** of the rim region of the socket **32**. During installation of the various wedge plates **42** and **42*a***, it is essential that the two special wedge plates **42*a*** be installed in the two diametrically disposed grooves **58** which are in longitudinal register with the two reaction slots **40** to the end that when the series of wedge plates is finally pushed fully into the counterbore **36** of the socket **32**, the upper end portions of the wide T-shanks **44*a*** (see FIG. 6 of the two special wedge plates) will enter these slots and prevent circumferential shifting of said series of wedge plates within the slide member **30**. The present power wrench **10** is thus capable of relative ease of assembly and, similarly, by a reversal of the assembly process just described, the wrench is easily dismantled for purposes of inspection, replacement or repair of parts. Additionally, and as will be set forth presently, such dismantlement may readily be effected for the purpose of substitution of a special slide member such as that which is illustrated in FIG. 12 at **130** and by means of which the wrench may be converted to use as a stud removal wrench.

In the operation of the power wrench **10** for stud-tightening purposes, the engine block **24** will be mounted on a suitable indexing table which is capable of being shifted so as successively to bring the various studs S into vertical alignment with the chuck-supported rotating wrench **10**. As soon as this alignment has been attained, the rotating wrench is lowered upon the subjacent stud so that the upper threaded end of the stud passes through the central opening **56** of the retainer ring **50**, enters the socket **32** and engages the top wall **38** of the slide member **30**. Engagement of the stud S with the top wall **38** will arrest further downward movement of the slide member **30** while the rotating wrench casing **12** continues to descend. During such descent, the helical compression spring **62** will become compressed as the upper end of the slide member **30** moves deeper into the socket **20**. The relative sliding movement thus established between the slide member **30** and the body portion **14** of the casing **12** will cause the two drive elements **72** to traverse the longitudinal extent of the shallow helical grooves **70**, and in so traversing the grooves, a slight turning movement of the slide member **30** within the surrounding casing body portion **14** will take place in a counterclockwise direction as viewed in FIG. 8.

The axial distance between the top wall **38** of the slide member **30** and the various wedge plates **42** and **42*a*** is such that, at the time the upper end of the stud S engages said top wall, the T-shanks **44** and **44*a*** of the wedge plates will be in radial register with the smooth unthreaded portion of the stud S. Not only will such radial register obtain,

but additionally, the radial extent of the wedge plates and the dimensions of the other associated elements of the wrench are so designed that at the time the stud S initially enters the socket **32**, the inner edges of the T-shanks **42** and **42***a* will frictionally engage the stud S as shown in FIG. 8, thus slightly displacing all of the wedge plates radially outwardly so that the garter O-rings **60** maintain them in frictional engagement with the stud. The two slots **40** (see FIG. 11) are provided for the purpose of preventing collapse of the entire annular series of wedge plates so that the inner edges of the T-shanks **44** and **44***a* which are disposed in substantial contiguity in a circumferential direction will be at all times maintained in such contiguity.

As soon as the aforementioned relative turning movement of the slide member **30** and the body portion **14** of the casing **12** takes place, the various longitudinal grooves **58** in the counterbore **36** tend to impart a collective counterclockwise shifting movement of the outer edges of the T-heads **46** and **46***a* of all of the wedge plates, while the inner edges of the T-shanks **44** and **44***a* are frictionally restrained. In this manner, a self-energizing action of all of the wedge plates takes place tending to straighten them out into a radial position, thus exerting a powerful binding action on the stud S by the rotating wrench **10**. The stud S is thus firmly engaged by the multiple clutch jaws which are formed by the wedge members and it is rotated in a stud-tightening direction.

As soon as the stud S has been thus driven into the socket **22** (see FIG. 1) in the engine block **24** to the desired depth as evidenced by the reading of a depth gauge in associated relation with the drill press stand, continued lowering of the wrench will be terminated and the wrench will then be immediately raised. During such raising of the wrench, the spring **62** will maintain the top wall **38** of the slide member **30** in contact with the upper end of the stud S while the rotating casing **12** will move upwardly with respect to the slide member **30**. The net effect of this relative motion between the slide member and the casing of the wrench will be to effect reverse relative rotation between the slide member **30** and the casing **12** as the two drive elements **72** again traverse the shallow helical grooves **70**, thus tilting the various wedge plates **42** and **42***a* away from their generally radial positions and releasing the stud S. It is to be noted at this point that the width of the two slots **40** (see FIG. 11) is slightly greater than the thickness of the wedge plates **42***a* so that freedom of tilting movement of these special wedge plates is not hindered.

As soon as the drill press chuck and the wrench **10** have been restored to their uppermost position, the work supporting table which supports the engine block **24** may be indexed to bring a successive stud S to be tightened into position beneath the wrench for the next succeeding stud-tightening operation.

The present stud-tightening wrench assembly is capable of being employed for stud removal purposes by the simple expedient of substituting for the slide member **30** the different slide member **130** of FIG. 11. Said slide member **130** remains substantially the same as the slide member **30** except for the fact that the two shallow helical cam grooves **170** that are formed in the cylindrical side wall of said slide member **130** extend in a reverse direction. In view of the similarity between the two slide members **30** and **130**, and in order to avoid needless repetition of description, similar characters of reference but of a higher order have been applied to the corresponding parts of the slide member **130** as between the disclosures of FIGS. 10 and 12. It will be understood that when the slide member **130** has been substituted for the slide member **30**, the wrench **10** embodying the slide member **130** will be rotated in a reverse stud removal direction. Thus, upon descent of the wrench and consequent projection of the upper end of the stud S into the socket **32**, substantially the same clutch engagement phenomena will take place and the stud S will be gripped firmly by the inner edges of the T-shanks **44** and **44***a* of the wedge plates **42** and **42***a* due to the self-energizing action of these plates, but because the wrench is rotating in the reverse direction, the stud S will be rotated in a direction tending to unthread the same from the socket **22** in the engine block **24**. Stud removal operations are not a frequent occurrence, either in assembly line practice or in a maintenance or repair shop. Thus, for economy reasons, it may be found expedient for the owner of one of the present power stud-tightening wrenches to keep on hand one of the slide members **130** and to effect the necessary substitution when an occasional stud-removal operation is required. However, where stud-removal operations are more frequently encountered, it may be expedient for wrench owner to maintain two of the wrenches, one embodying the slide member **30** and the other embodying the slide member **130**.

The invention is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in this specification as various changes in the details of construction may be resorted to without departing from the spirit or scope of the invention. Therefore, only insofar as the invention is particularly pointed out in the accompanying claims is the same to be limited.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. A power stud-tightening wrench comprising a vertically extending, generally cylindrical casing embodying means at its upper end for connecting it to a continuously rotating chuck, and having extending axially inwardly from its lower end a socket into which a stud is adapted to be projected endwise, a generally tubular stud-encircling slide member coaxial with and axially slidable in said socket between upper and lower positions, means yieldingly biasing said slide member toward its lower position, said slide member being capable of limited turning movement within the socket bodily between first and second angular positions, interengaging cam means on said casing and slide member and effective during movement of the slide member between its lower and upper positions to effect turning movement of the slide member between its first and second angular positions, a series of substantially radially disposed wedge plates loosely mounted within said tubular slide member, having outer edges bearing against the inner wall of said slide member and having their inner edges disposed in close proximity to each other and designed for frictional engagement with a stud which has been projected into said socket, means wieldingly maintaining said wedge plates slightly displaced from truly radial positions so that upon relative turning movement of the slide member with respect to the casing from its first angular position to its second angular position a self-energizing wedging action of the plates between the wall of the casing and the stud will take place, and a shoulder formed internally of the slide member and engageable with the end of a stud during projection thereof into said socket for moving the slide member toward its upper axial position against the action of said yieldable biasing means.

2. A power stud-tightening wrench as set forth in claim **1** and wherein said interengaging cam means comprises a series of elongated helical grooves in the slide mmeber and a series of cooperating guide elements carried by the casing and projecting into said grooves.

3. A power stud-tightening wrench as set forth in claim **2** and wherein said helical grooves are two in number and are substantially diametrically disposed on opposite sides of the slide member.

4. A power stud-tightening wrench as set forth in claim **1** and wherein said biasing means comprises a compression spring interposed between the top wall of said socket in the casing and the top wall of the slide member.

5. A power stud-tightening wrench as set forth in claim **3** and wherein the opposite ends of said helical

grooves are engageable with said guide elements to determine the upper and lower positions of the slide member.

6. A power stud-tightening wrench as set forth in claim 1 and wherein the inner surface of the side wall of the slide member is provided with an annular series of longitudinally extending grooves, one for each wedge member, and in which grooves the outer edges of the wedge members are seated.

7. A power stud-tightening wrench as set forth in claim 1, wherein said slide member is provided with an axial bore and an enlarged counterbore, the juncture region between said bore and counterbore being formed with a depending annular flange, and wherein each wedge plate is generally of T-shape construction and includes a T-head and a T-shank, the upper end portion of the T-head of each wedge plate projecting into the annulus existing between said annular flange and the wall of said counterbore, the lower end of said counterbore being internally threaded said wrench including, additionally, a retaining ring threadedly received in the threaded lower

end of the counterbore, said retaining ring being formed with a centrally disposed annular boss, the lower end portion of the T-head of each wedge plate projecting into the annulus existing between said annular boss and the wall of said counterbore.

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