

[54] **LEAD SCREW**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 97,086, Dec. 11, 1970, which is a continuation-in-part of Ser. No. 77,980, Oct. 5, 1970.

[52] U.S. Cl. **74/424.8 R**, 269/185

[51] Int. Cl. **F16h 1/18, B25b 1/02**

[58] Field of Search.....269/172, 184, 185, 186, 187; 74/424.8 R; 81/159, 160, 162

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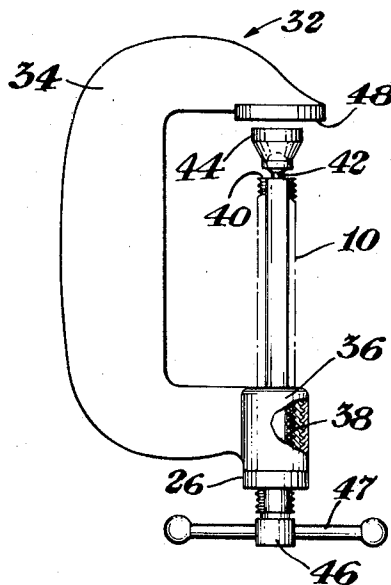
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[57] **ABSTRACT**

The present invention is to a lead screw for use in a variety of tools, for example, clamps, portable vises, set up tools, set up jacks and other machine or hand tool and/or fastening or securing assemblies in which the threads provide for quick and easy adjustment and sure, rapid locking when in a predetermined position.

10 Claims, 8 Drawing Figures



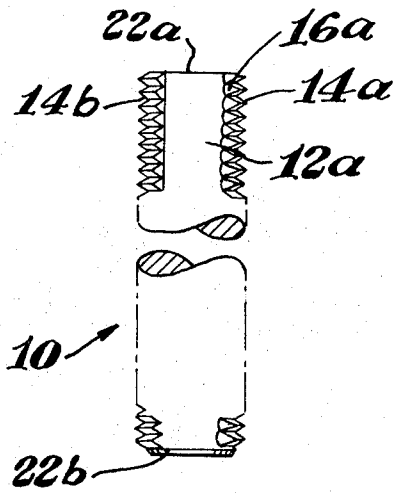


Fig. 1

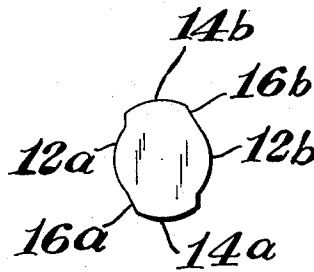


Fig. 2

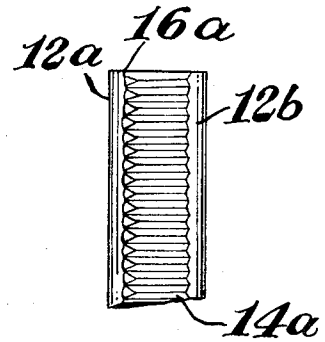


Fig. 3

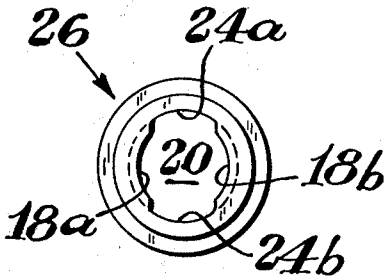


Fig. 4

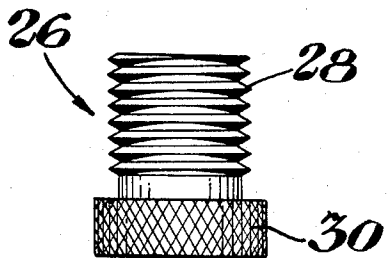


Fig. 5

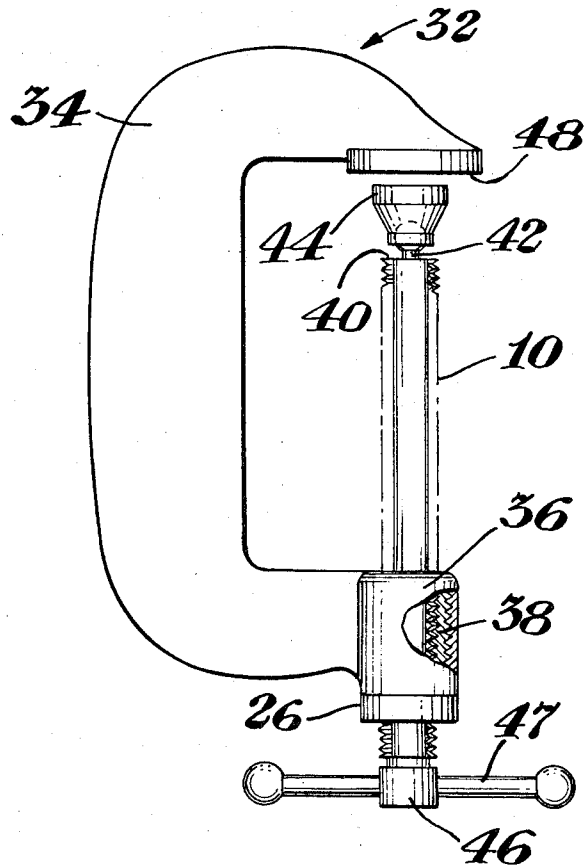
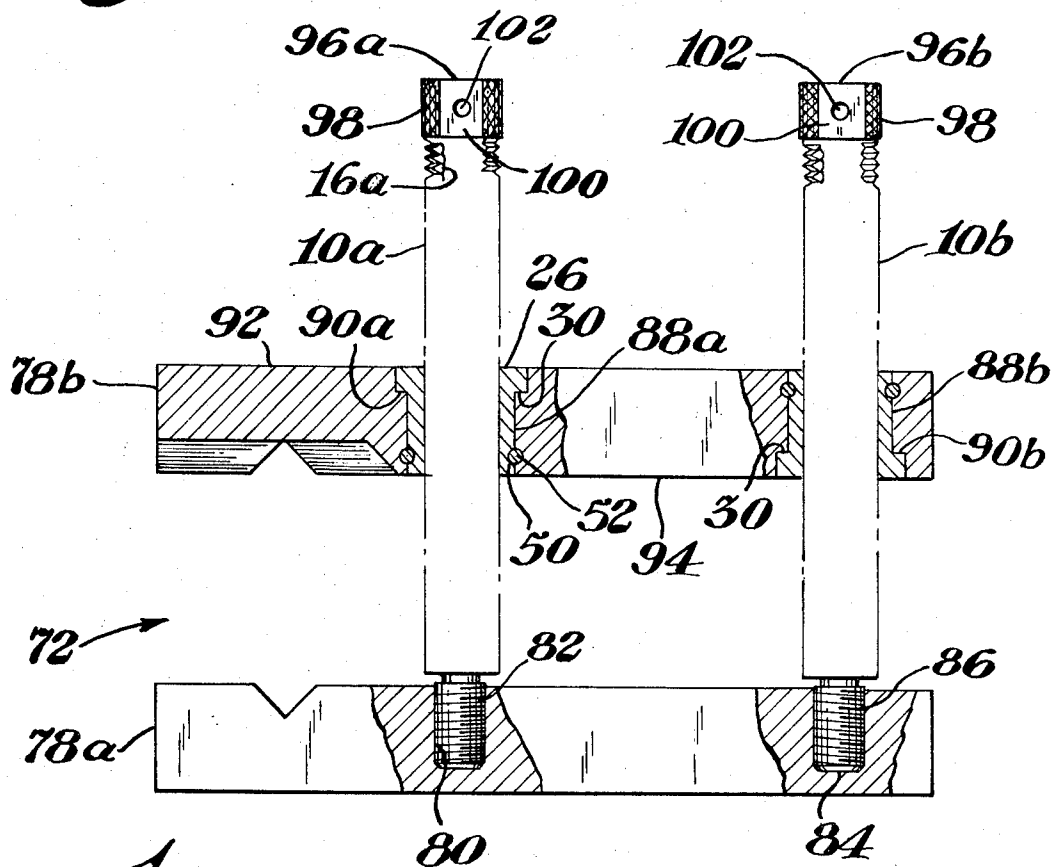
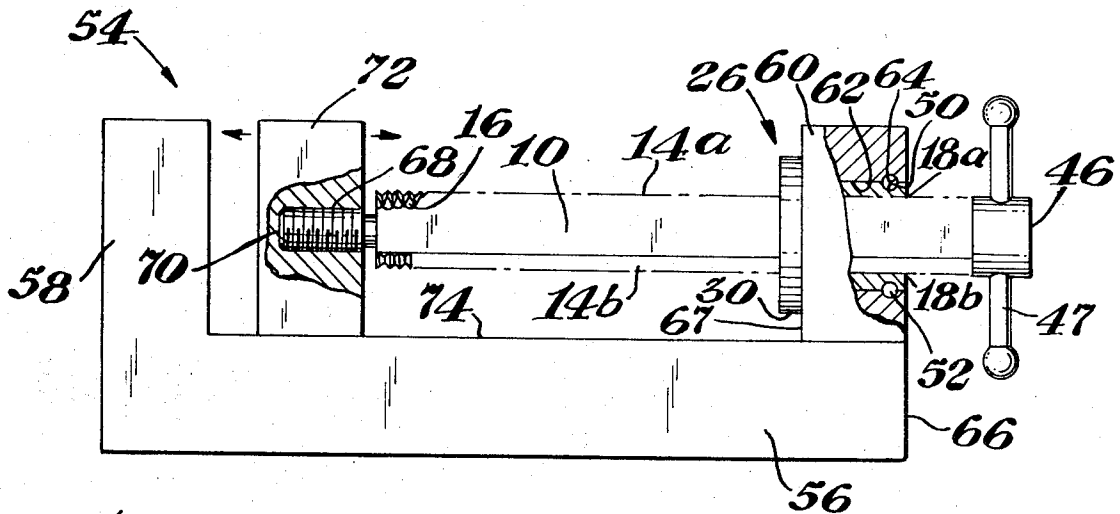


Fig. 6

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LEAD SCREW

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of my copending application Ser. No. 97,086, for "Set Up Jack," filed on or about Dec. 11, 1970, (Docket No. A-8), which in turn is a continuation-in-part of my application Ser. No. 77,980, filed Oct. 5, 1970 for "Machine Tools."

GENERAL SUMMARY OF THE INVENTION

In general, the lead screw of the present invention for use in a variety of tools comprises a threaded stud having a plurality of cut down sections extending along its length at spaced apart intervals around the periphery and threaded sections in between the cut down sections. The trailing edge of each threaded section is deformed so as to provide a stop.

In use, the lead screw is employed with a connector member comprising a mating through passage of a tool member, such as for example, a coupling as shown in FIGS. 4 or 5, or in the tool assemblies of FIGS. 7 and 8, or such a passage formed directly in a securing or holding clamp member or other machine or hand tool.

As employed, the screw member is slid to a predetermined position with the through passage and turned therein to achieve mating of the threads. As the screw member is rotated therein the deformed section at the trailing edge of each threaded section assures that the lead screw cannot be turned past a locked position.

The lead screw can be used in any of a variety of devices where rapid adjustment and easy but sure securing is required such as for example C-clamps, parallel clamps, quick adjust vises, as a riser post in set up jacks as disclosed in one of the parents of the present application, the stud member of set up tools as disclosed in application Ser. No. 77980 (also a parent of this application), and other clamping, machine and hand tool, and holding members.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side elevation of one embodiment of the lead screw of the present invention.

FIG. 2 is a top view of the lead screw of FIG. 1 on an enlarged scale and turned about 90° from the view of FIG. 1.

FIG. 3 is a fragmentary side elevation of the lead screw of FIG. 1 looking at a threaded portion.

FIG. 4 is a top view of one embodiment of a coupling for use with the lead screw embodiment of FIG. 1.

FIG. 5 is a side elevation of the coupling of FIG. 4.

FIG. 6 is a side elevation, partly cut away, of a C-clamp employing the lead screw of the present invention and coupling of FIGS. 4 and 5.

FIG. 7 is a side elevation, partly in section, of a quick adjust vise employing the lead screw of the present invention and another embodiment of a coupling member.

FIG. 8 is a sectional view of parallel clamp employing the lead screw of the present invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

A preferred embodiment of the lead screw 10 of the present invention has two diametrically opposed cut

down sections 12a-12b extending along its length. These sections generally are cut down to the body of the screw 10. The remaining sections of screw 10 consist of threads 14a-14b. The trailing edge 16a-16b of each section of threads 14a-14b is flattened or otherwise deformed so as to provide a barrier or stop such that the screw 10 cannot be turned in a mating passage freely more than about 90° during a locking or securing operation.

As shown in the various Figures, the trailing edges 16a-16b of the threads 14a-14b can simply be flattened down on themselves, see particularly FIG. 3. Alternatively, the V-section between threads 14a-14b can be filled in at this trailing edge to make the stop. Other means for providing the stop, as readily can be understood by one skilled in the art, can be employed. It is only essential that this trailing edge, i.e., stop 16a-16b of the corresponding threaded section 14a-14b be of a configuration such that when the members 16a-16b reach the threads 18a-18b of a passage 20 in a member employed in combination with the lead screw 10 the screw cannot be turned any further.

Usually each stop 16a-16b is relatively thin and is at the terminus of the trailing edge of the threaded portions 14a-14b of screw 10. This assures that in a securing operation, the maximum of threaded engagement is realized. However, if desired, the stops 16a-16b can be extended over a longer distance of the threads 14a-14b. Generally, at a maximum the stops 16a-16b extend up to about 45° along the arc of the threads from each trailing edge.

Usually, the cut down sections 12a-12b of screw 10 each cover an arc of about 90° to about 100° and each threaded section 14a-14b covers an arc of about 80° to about 90°. For ease in fabrication and use, the cut down sections 12a-12b preferably define equal arcs and threaded sections 14a-14b also are equal.

As shown, in the depicted embodiments, the screw 10 contains two diametrically opposed cut down sections 12a-12b and two threaded portions 14a-14b. It is to be understood that the screw 10 can contain more than two each of these sections, it is only essential that the passage 20 corresponds in its configuration. In use, I have found that the depicted embodiment is very satisfactory and fabricated with a minimum of machining.

Further, when each set of the diametrically opposed sections 12a-12b and 14a-14b are equal in the length of the arcs, there is no need to be concerned with the placement of the screw 10 in a passage 20 as both sides of each set are the same.

The two ends 22a-22b of lead screw 10 can be formed into a variety of configurations. Either one or both can have a knurled shoulder to facilitate movement and rotation. When used as a riser post in set up tools or a set up jack assembly of the parent applications, the lead screw 10 can have its end sections 22a-22 finished in any of the shapes as disclosed therein. Other functional configurations for specific tool and clamping units can be used on the ends 22a-22 of the screw 10. See, for example, the set up and jack tools of the parent application, the C-clamp of FIG. 6, the right hand and left hand threaded end portions on the quick adjust vise of FIG. 7 and parallel clamps of FIG. 8, and the hand or other gripping por-

tions at the end of the screw 10 in the tools of the FIGURES. These illustrative tool embodiments will be discussed in more detail hereinafter.

As indicated hereinbefore the lead screw 10 is employed in combination with at least one member having a through passage 20. The passage 20 is generally circular in shape but elongated at two opposite positions 24a-24. Threads 18a-18b fill the circular portion, the elongated sections 24a-24b being non-threaded. The passage 20 is of a size to permit the screw 10 to be freely slid up and down therein when sections 24a-24b are adjacent threads 14a-14b, but wherein threads 14a-14 mate with those, 18a-18b, in passage 20 when the screw 10 is rotated within passage 20.

The passage 20 can be in a member which is any of a variety of configurations. Conveniently, this member can be a collar 26 having an internal bore, i.e., passage 20, of design as described hereinbefore and having either a smooth external surface or threads 28 along most of its length as shown in FIG. 5. Ordinarily, the collar 26 has an enlarged shoulder 30 at its lower end for ease in gripping. Preferably, this shoulder 30 is knurled, as shown, but this is not critical or essential.

When the member with passage 20 is the collar 26 as described directly hereinbefore, this in turn can be used with clamp members, e.g., a C-clamp, parallel clamps, strap clamps of set up tools or other units which employ a lead screw. Certain assemblies employing this configuration will be described more fully hereinafter.

Alternatively, if desired, in many assemblies the passage 20 with its threads 18a-18b and elongated sections 24a-24b can be formed directly in the unit in which the present lead screw is employed. For example, passage 20 can be formed directly in the base of a C-clamp, or strap clamp of a set up tool assembly as disclosed in parent application Ser. No. 77,980.

As shown in FIGS. 7 and 8, the collar 26 has a smooth external surface but contains a groove 50 fitted with a metal, rubber, plastic or other type material flexible O-ring or other configuration frictional engaging snap ring member 52 which also mates with a corresponding groove in the tool member in which the lead screw 10 and coupling 26 is being used.

The diameter of the lead screw 10 will vary depending upon the nature and type of device or assembly in which it is being used. The same can be said for its length. For most operations, the screw 10 will range from about one-half inch to about 2 inches in diameter; in many operations I have found that when the screw 10 is fabricated from tool steel, it exhibits excellent holding strength when employed in diameters of from one-half inch to about 1 inch.

For most operations, tool steel or other high strength ferrous based metals are used. However, in those assemblies where relatively high strength and low weight are desired the screw 10 and its mating members can be fabricated from magnesium or aluminum alloys or other non-ferrous metals.

A demonstration of the operability of the present lead screw 10 is depicted in the C-clamp 32 of FIG. 6. In this clamp 32, a conventional C-arm member 34 has its base 36 fitted with threads 38 to accommodate a collar 26. Lead screw 10 has its upper end 40 formed into a ball shaped support member 42 onto which is

rotatably and swivably fastened a support pad 44. The lower portion of screw 10 is fitted with a head 46 having an elongated sliding rod-like grip 47 passing therethrough as conventionally employed in such clamps.

In operation, the pad 48 in the upper arm of the C-member 34 and support pad 44 are positioned on opposite sides of an article or articles to be clamped together, lead screw 10 being slid along within collar 26 a predetermined distance as required. Once in position, the lead screw 10 is turned to engage threaded sections 14a-14b and 18a-18b. As the screw 10 is rotated and trailing edges 16a-16b come in contact with threads 18a-18, the screw stops and cannot rotate any further such that the threaded sections 14a-14b of screw 10 are in line with the non-threaded portions 24a-24b of the collar 26. Once the threads 14a-14b are locked in place in collar 26 the collar 26 itself rotates in base 36 as threads 28 turn in threads 38. This permits the final securing and tightening of the clamp.

To release the clamp, the screw 10 is rotated in a reverse direction until the two sets of threads 14a-14b and 18a-18b are disengaged. A big advantage of the present screw 10 is that because of the deformed sections of threads 14a-14b at the trailing edges 16a-16b, the screw does not become re-engaged during this disassembly. The screw 10 can then easily be slid down along passage 20 of collar 26 for ready ease in positioning and securing material and articles of different sizes.

This is an advantage over conventional lead screws with a continuous thread which must be screwed in and out in a laborious and time consuming manner.

Alternatively, if desired the base 36 of the C-arm member 34 can be fitted with a through passage 20 of a configuration to mate with a lead screw 10; i.e., this passage 20 can be of the same shape as the internal bore 20 of collar 26 described herein. Also, the base 36 can be designed to accommodate a collar 26 having a smooth external surface and fitted with a groove 50 around its outer periphery near the end opposite shoulder 30. This collar 26, which serves as a coupler nut, accommodates a snap ring fastener 52, mating with a groove in the base 36 of the C-clamp 32.

With this type of a coupler, the shoulder 30 of coupler 26 is positioned to rest on the top edge of base 36 of the clamp 32; i.e., just the reverse as shown for the collar depicted in FIG. 6. This collar thus serves as a thrust bearing surface to assure that the clamp becomes tightened. Also, the end of the screw 10 can be attached to pad 44 by means of a left-handed threaded portion which further aids in tightening the pad 44 against a work piece as the screw 10 is locked in position during a securing operation.

The quick adjust vise 54 of FIG. 7 illustrates another use of the lead screw of the present invention. The vise 54 comprises a conventional -shaped base 56, one upright arm of which is a stop 58, and the other upright end arm 60 which serves as a support for the lead screw 10.

The arm 60 contains a through passage 62 having a circumferential groove 64 near its outer wall 66. This passage 62 accommodates a collar 26 having a groove 50 which accommodates a snap ring 52. The snap ring 52 fits into grooves 50 and 64 when collar 26 is positioned into passage 62. These are formed into the mem-

bers such that they mate when shoulder 30 is adjacent the inner wall 67 of arm 60. A lead screw 10 with right hand threads and of a thread configuration as described fully hereinbefore is fitted into the mating passage of collar 26. The end of the lead screw 10 in the illustrated embodiment which extends outside of arm 60 is in the same general shape as described for that of the C-clamp 32. It has a head 46 with an elongated sliding rod-like arm 47 passing therethrough.

The other end of the lead screw 10 terminates in a left-handed threaded portion 68 of smaller diameter. This fits into a mating threaded blind passage 70 in the movable jaw 72 which slides along a track in the horizontal elongated bottom arm 74 of the base 56.

In use a work piece to be held in the vise is placed between stop 58 and movable jaw 72. The movable jaw 72 is slid along the base to a predetermined position so as to loosely hold the work piece. The lead screw 10 is turned to the right to engage the threads 14a-14b with the mating threads of the collar 26 thereby to secure the lead screw and cause the collar 26 to rotate. Simultaneously, the left-handed threaded portion 68 forces the jaw 72 firmly against the work piece. To disengage the work piece from the vise, the lead screw 10 is turned to the left to disengage threads 14a-14b from the mating threads 18a-18b in the collar 26 which permits the lead jaw 72 to be freely slid along base 56 as the lead screw 10 is moved freely within collar 26.

The parallel clamp 72 depicted in FIG. 8 shows another tool use for the lead screw of the present invention. The arm 78a is fitted with a blind passage 80 having right hand threads which mate with those in the end portion 82 of lead screw 10a. Arm 78a has a second blind passage 84 near its back end having left hand threads which mate with those in the end portion 86 of a second lead screw 10b.

The second arm 78b of clamp 72 is fitted with passages 88a and 88b designed to accommodate a collar 26 of the type described for the vise of FIG. 7. Passage 88a has an indented shoulder 90a at its exit with the outer face 92 of arm 78b. This shoulder 90a mates with shoulder 30 of collar 26. Passage 88b near the rear end of arm 78b has a similar shoulder 90b except this is at the inner face 94 of arm 78b. The heads 96a-96 of the two lead screws 10a-10b are designed to have knurled section 98 for hand gripping and flat sections 100 for gripping with a wrench. Also the heads 96a-96 have a through passage 102 into which a pin can be inserted, if desired, for tightening or loosening the lead screws.

The gripping jaws of the clamp arms 78a-78b can be flat, or as shown can be grooved to hold round or irregularly shaped stock. It is to be understood that these jaws can also be in any of a variety of other designs.

As is readily apparent, the operation of the lead screws is as disclosed hereinbefore. However, ready ease of adjustment and the optimum in gripping action is realized because of the right-handed threaded portion 82 on the front screw 10a and left-handed threaded portion 86 of the back screw 10b. This enables the two screws to exert opposing forces as screws 10a-10 are tightened and the clamping arms 78a-78b are secured onto a work piece. In effect, the forward screw 10a with the right hand threaded portion 82 is pulling the jaws of the arms 78a-78b together as the

lead screw 10a is rotated to the right causing the lead screw 10a to become locked with collar 26 allowing thread 82 to tighten the clamp.

The rear screw 10b, meanwhile because of the left-handed threaded portion 86, as the lead screw 10b is turned to the right to a locking position, serves to push the arms 78a-78b apart thereby providing an extra securing action not realized with parallel clamps employing conventional lead screws.

I claim:

1. In a lead screw for tools which comprises a threaded stud having a plurality of cut down sections extending along its length at spaced apart intervals around its periphery and threaded sections in between said cut down sections, the improvement which comprises the trailing edge of each threaded section being deformed so as to provide a stop.

2. The improved lead screw as defined in Claim 1 and having in combination therewith a connector, said connector having a mating through passage, said through passage providing for ready sliding of said screw therein and having threaded sections mating with those of said lead screw.

3. The improved lead screw as defined in claim 1 which has two diametrically opposed cut down sections and two threaded sections in between said cut down sections and wherein the improvement comprises the trailing edge of each section of said threads being flattened at its trailing edge so as to provide a stop.

4. The improved lead screw as defined in claim 3 wherein each of said cut down sections extend for an arc of from about 90° to about 100° and each of said threaded sections extends for an arc of from about 80° to about 90° around the periphery of said lead screw.

5. The improved lead screw as defined in claim 3 and having in combination therewith a connector, said connector defining a through passage, said through passage being generally circular in shape but elongated at two opposite positions, said threaded sections having threads mating with those of said lead screw, the elongated sections being non-threaded, said passage being of a size to permit the lead screw to be freely slid up and down therein when the threaded sections of said lead screw are adjacent said non-threaded sections of said passage but wherein the threads of said lead screw and said passage mate when said screw is rotated within said passage.

6. The improved lead screw and connector as defined in claim 5 wherein said connector is a collar, the external surface of which mates with a passage in a tool member.

7. The improved lead screw and connector as defined in claim 5 wherein the connector is a through passage in a tool member employed with said lead screw.

8. The improved lead screw and connector as defined in claim 6 wherein the collar has external threads, said threads mating with threads in a passage of a tool member.

9. The improved lead screw and connector as defined in claim 6 wherein the collar has a smooth external surface.

10. The improved lead screw as defined in claim 1 and having a second threaded portion on one end, said second threaded portion being of opposite handed

threads than that of the stop containing threaded section in between said cut down sections of the stud.

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