

Oct. 19, 1937.

J. AKINS

2,096,022

LIFTING JACK

Filed June 20, 1934

2 Sheets-Sheet 1

FIG. 1.

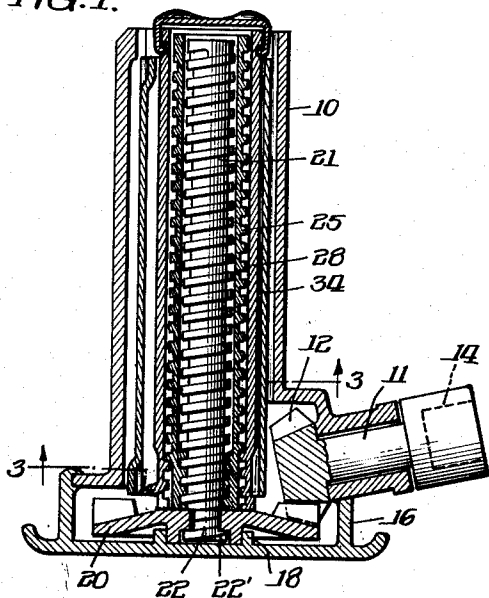


FIG. 2.

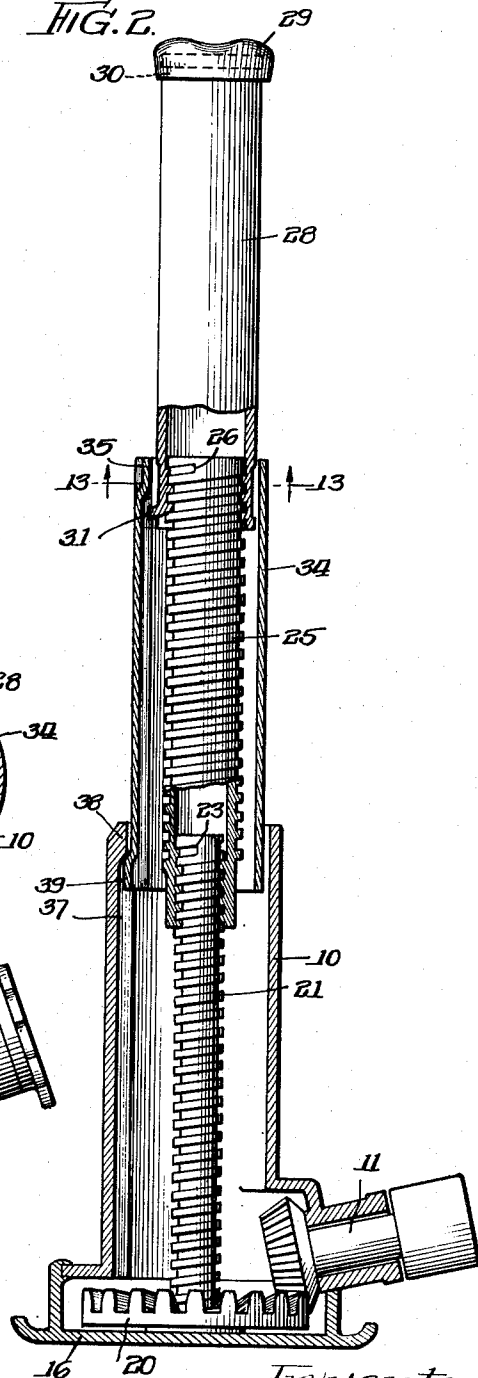


FIG. 3.

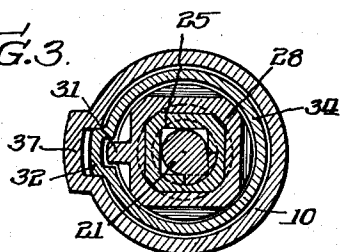
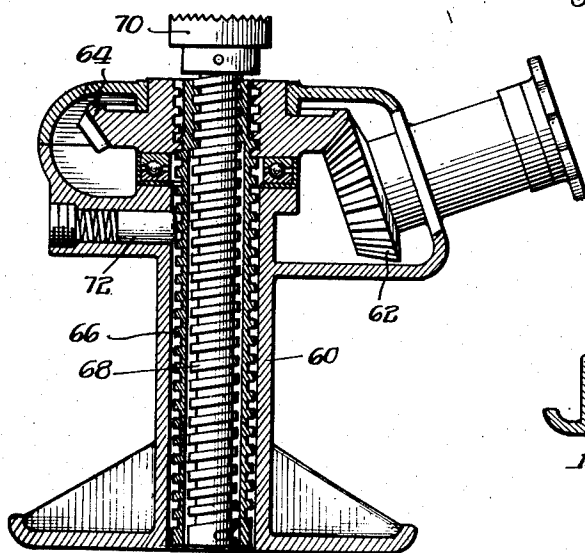


FIG. 4.



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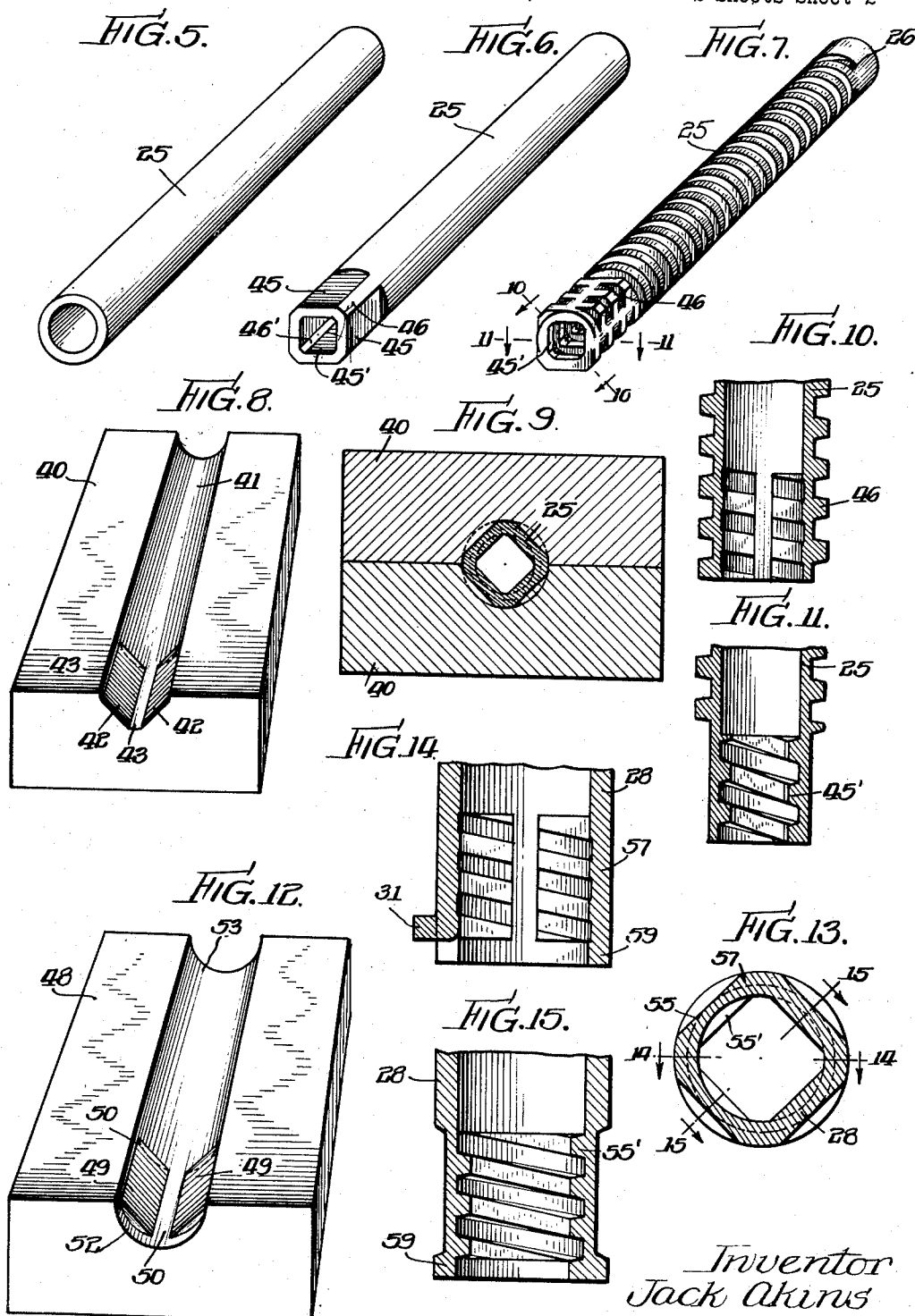
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UNITED STATES PATENT OFFICE

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LIFTING JACK

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Application June 20, 1934, Serial No. 731,410

14 Claims. (Cl. 254-102)

This invention relates to lifting jacks and has particular reference to the several lifting screws, and to improved methods for producing them.

It is an object of the invention to provide an economical and readily operable method for forming the lifting screws of a lifting jack.

It is a further object of the invention to provide a method for forming a screw sleeve which may be carried out while the metal is cold, which does not destroy the tensile strength of the metal, and which does not produce imperfections in the metal wall.

It is a further object of the invention to provide a means for in effect uniformly thickening the wall of a screw sleeve by cold forging the sleeve into polygonal shape by a single die operation.

It is a further object of the invention to provide an improved means for terminating the thread of a lifting screw by merely withdrawing the thread cutting tool.

It is a further object of the invention to provide a screw sleeve having a uniform tensile strength, and a uniform thickened wall portion having no imperfections therein and which provides a good bearing surface.

It is a further object of the invention to provide a screw having interrupted threads thereon which will effectively cut dirt and facilitate lubrication of the thread.

It is a still further object of the invention to provide a lifting screw having a stop at the end of the thread which is strong, which will not jam the parts, which does not project from the outer cylindrical surface of the screw, and which leaves a good bearing surface at the end of the screw.

Other objects and advantages of the invention will appear from the following description, taken in connection with the accompanying drawings, wherein there are described certain preferred embodiments of the invention, and certain preferred method steps of manufacture.

In the drawings, wherein like reference numerals refer to like parts throughout,

Fig. 1 is a sectional side view of a bottom drive jack embodying the lifting screws of the invention, the screws being in collapsed position.

Fig. 2 is a view similar to Fig. 1, but showing the lifting screws in extended condition.

Fig. 3 is a sectional view through the assembly of Fig. 1 on an enlarged scale, taken on the line 3-3 of Fig. 1.

Fig. 4 is a side sectional view of a top drive jack embodying the screws of the invention.

Figures 5, 6 and 7 are views showing the steps

of the method by which the intermediate screw sleeve is formed from a piece of cylindrical tubing.

Figures 8 and 9 are perspective and end views respectively of the die blocks for forming the squared end portion on the sleeve, as shown in Fig. 6.

Fig. 10 is a longitudinal sectional view through the screw sleeve of Fig. 7, taken substantially along the line 10-10 thereof.

Fig. 11 is a longitudinal sectional view of the sleeve of Fig. 7, taken along the line 11-11 thereof.

Fig. 12 is a perspective view of the die block for forming the outer or large screw sleeve of the jack.

Fig. 13 is a sectional view through the outer screw sleeve as taken along the line 13-13 in Fig. 2, and

Figs. 14 and 15 are longitudinal sectional views through the outer screw sleeve taken along the lines 14-14 and 15-15, respectively, of Fig. 13.

While the invention is shown for purposes of illustration applied to an extensible lifting jack of the type commonly used for raising automotive vehicles, it is to be understood that the invention is equally applicable to equivalent devices.

In Fig. 1 there is shown an extensible bottom drive lifting jack of the general type disclosed in the patent to Millard B. Lucker, Reissue Patent No. 17,527, dated December 17, 1929. As shown, a generally cylindrical elongated casting 10 has formed in the bottom portion thereof a bearing for receiving a rotatable shaft 11 to which there is secured at the inner end and within the casting, a driving pinion 12. To the other end of the shaft 11 there is secured a member having a squared socket 14 adapted to receive a suitable handle by which the shaft and the pinion 12 may be rotated to extend the jack. Secured to the bottom of the casting 10 in a suitable manner, is a support casting 16. The horizontal base portion of the support casting is formed with an annular flange 18, within which is journaled a co-operating annular portion on a rotatable gear 20, which engages with and may be driven by pinion 12.

The inner or small solid screw 21 of the jack is carried upon the gear 20 and is constrained for rotation therewith by means of generally rectangular cutaway end portion 22, which extends through a similarly shaped opening in the central part of the gear. Extension 22 is headed over, as indicated at 22', to secure the parts in

non-separable relation. The screw 21 is threaded throughout its length to the point 23 near its upper end, where the thread terminates abruptly.

The threads of screw 21 engage threads formed internally on the lower end of an intermediate screw sleeve 25. The screw sleeve 25 is threaded externally throughout its length to the point 26 adjacent the upper end thereof, where the thread abruptly terminates. The external thread on screw sleeve 25 co-operates with a thread formed internally on the lower end of an outer or large threaded sleeve member 28. At the upper end of sleeve 28 is secured the cap member 29, which is adapted to engage the object to be lifted. The cap member 29 may be suitably secured to sleeve 28 by heading over a flange on the cap into an annular recess 30, formed in the upper end of sleeve 28. Sleeve 28 is not externally threaded. It has, however, at its lower extremity, an extending projection 31, which as will be seen by reference to Fig. 3, slides within an elongated channel 32 formed substantially throughout the length of a non-threaded sleeve member 34, which embraces sleeve 28. Channel 32 is struck inwardly at its upper end, as indicated at 35, Fig. 2, to prevent the withdrawal of projection 31 from the channel. Channel 32 is adapted to slide longitudinally within a cooperating channel 37, formed substantially throughout the length of casting member 10. Channel 37 is formed at its upper end with an inwardly projecting portion 38, which co-operates with an outwardly struck portion 39, formed at the lower end of channel 32 to prevent withdrawal of sleeve member 34 upwardly from casting 10.

The present invention relates particularly to the screws 21, 25 and 28, and to the method of forming these parts.

Screw 21 may be formed from a piece of cylindrical metal bar stock. The bar is placed in a lathe and threaded throughout its length to the point 23, where the thread-cutting tool is rapidly or abruptly withdrawn. Withdrawal of the tool produces a sharp or abrupt termination in the thread at the point 23. After the bar has been threaded, the rectangular portion 22 may be formed thereon at the end opposite the thread stop 23, in any suitable fashion, as by cutting or the like.

The manner of forming intermediate screw sleeve 25 may be best described by reference to Figs. 5, 6 and 7. As indicated in Fig. 5, a tube of metal stock is first cut into an appropriate length. The tube is then placed between suitable dies, and has formed thereon a squared end portion, as shown in Fig. 6. As best seen by reference to Figs. 8 and 9, each of the die blocks 40 which co-operate to form the squared end portion, has flat surfaces 42 arranged in V-shaped arrangement in one end of the semi-cylindrical groove running the length of the block. The flat portions 42 do not quite meet, thereby leaving a portion 43 between them, which is a continuation of the semi-cylindrical die surface. When the tube 25 is placed between the die blocks and the blocks brought together, as indicated in Fig. 9, a squared end portion will be formed on the tube by a single operation. The operation may be performed without heating the tube. As shown in Fig. 6, the squared end portion has flat surfaces 45 arranged thereon, and between each flat portion 45 is a portion 46 which is a continuation of the original cylindrical surface of the tube. The external flat surfaces 45 are struck inwardly from the original outer cylindrical surface of the tube,

producing corresponding inner flat portions 45', which are struck inwardly of the original inner cylindrical tube surface. Between flat surfaces 45' are portions 46', corresponding to outer portions 46, which form continuations of the original inner tube cylindrical surface. Although in the embodiment shown the end of the tube is formed into a square formation, it is obvious that the tube end could be formed into any polygonal shape by merely arranging the flat portions 42 of the die members in the desired polygonal arrangement.

This squaring operation forms what is in effect a thickened portion on the end of the tube into which may be cut both external and internal threads, the original external surface of the tubes having been preserved along the portions 46, and a new internal surface of reduced diameter having been secured on the inside of the tube at the portions 45'. The equivalent of a thickened tube wall has thus been secured. The effectively thickened wall is uniform and without cracks or other imperfections, which results are difficult if not impossible to produce by ordinary upsetting or thickening operations. Moreover, the forging operation of the present invention can be readily performed with a cold tube. This reduces the cost of the operation as heating equipment is not necessary, and further, by avoiding heating the tensile strength of the tube is not impaired. The tube end is effectively thickened by a single blow of the dies, producing a very economical and yet effective method.

After the tube has been squared at its end, it is internally threaded at the squared end portion and externally threaded throughout its length to the point 26, as indicated in Figs. 7 and 2. Either threading operation may be performed first. As shown in Figs. 7 and 10, the portions 46 of the external tube surface carry a fully formed thread for cooperation with internally threaded sleeve 28, and as seen in Figs. 7 and 11, the inwardly struck portions 45' on the inner surface of the tube carry full threads for co-operation with threaded screw 21. The exterior thread is terminated at the point 26 by abrupt withdrawal of the thread-cutting tool, as in the case of the thread termination on the inner screw 21.

The outer sleeve member 28 is squared adjacent its lower end portion for the reception of internal threads in a manner substantially similar to that employed in squaring the lower end of intermediate threaded sleeve 25, the only essential difference being that in the case of outer sleeve 28 the effective thickening or squaring is performed near but not at the lower end of the sleeve, leaving a bearing portion at the extreme end of the sleeve in its original cylindrical contour.

One block 48 of the die for forming or squaring the lower end portion of sleeve 28 is shown in Fig. 12. The die block 48 has flattened portions 49 and intermediate cylindrical portions 50 similar to flattened portions 42 and cylindrical portions 43, respectively, of die block 40. In die block 48, however, the flat portions 49 are spaced inwardly from the extreme end of the die leaving an end portion 52 of semi-cylindrical contour, an extension of semi-cylindrical recess 53 running throughout the major length of the die block. As in the case of sleeve 25, sleeve 28 could be formed into an end having any desired polygonal shape by suitably increasing the number of flat spots 49 upon the dies. Sleeve 28 is formed into its squared or effectively thickened end portions by a single blow of the dies, which operation may be performed while the piece is cold.

The squared lower end portion of sleeve 28, which is formed by the operation, is best shown by reference to Figs. 13, 14 and 15. It will be seen that the sleeve has flat spots 55' struck inwardly from the original cylindrical inner surface of the sleeve, for the reception of the internal threads, and cylindrical portions 57 on the outer surface between outer flat spots 55. The extreme end of the sleeve is not deformed, leaving a cylindrical bearing portion 59 thereon, which is a continuation of portions 57 and the main cylindrical body of the sleeve.

After the squared end or effectively thickened portion has been formed on sleeve 28, the projection 31 is struck outwardly from the lower end thereof in any suitable manner, and the annular groove 30, which receives cap 29, is formed at the opposite or upper end of the sleeve.

In assembling the parts inner solid screw 21 is first threaded into intermediate screw sleeve 25 in a manner best understood by reference to Fig. 2. In this operation screw 21 is brought downwardly through sleeve 25, the lower end 22 of the screw being first inserted within the sleeve into upper end thereof. Screw 21 may then be threaded through the sleeve 25 to the position shown in Fig. 2. If the cutaway end portion 22 of screw 21 is formed in some manner which would not mutilate the threads on the screw, portion 22 may be formed prior to the insertion of screw 21 within screw sleeve 25. However, if there is danger of mutilating the threads during the operation of forming end portion 22, screw 21 must be inserted within sleeve 25 prior to the formation of the end portion.

Assembled parts 21 and 25 are then brought downwardly, end 22 of screw 21 being first inserted through the upper end of outer screw sleeve 28 and screwed to a position such as shown in Fig. 2. Non-threaded sleeve 34 may then be dropped into position over the upper end of sleeve 28, after which cap 29 may be placed in position upon the upper end of sleeve 28. Gear 20 is then secured to end 22 of the screw 21 by heading over the portion 22 at 22', as indicated. The entire assembly may then be inserted upwardly through casting 10, after which the lower support casting 16 may be placed in position.

In operation pinion 12 is rotated to effect the extension of the jack, operation of pinion 12 rotates gear 20 meshing therewith, and operation of gear 20 rotates screw 21. Sleeve 28 is held from rotation by virtue of the engagement of its extension 31 with channel 32 in sleeve 34, and by virtue of the engagement of this channel 32 with the larger channel 37 formed in casting 10. Screw 21 is in threaded engagement with sleeve 25, and sleeve 25 is in turn in threaded engagement with sleeve 28. As screw 21 is rotated therefore, and sleeve 28 held from rotation, it will be seen that, due to the threaded engagement of the parts, sleeves 25 and 28 will be extended from screw 21 from the Fig. 1 to the Fig. 2 position of the parts. During this operation sleeve 25 may at times rotate with screw 21 and at times be held non-rotatable with sleeve 28. Ultimately, however, the parts will reach their Fig. 2 position.

The thread stops 23 and 26 on screws 21 and 25 limit the upward movement of the parts. Due to the relatively sharp termination of the thread, the stop which is formed will not jam into locked position with the co-operating thread, and the parts therefore can be readily reversed from extreme extended position to bring them back to

original position. The stop formed by the thread termination is exceedingly strong and will not break down in use. These features of strength and non-jamming are essential to the successful operation of a jack. The stops formed by terminating the thread leave good cylindrical bearing surfaces unimpaired at the end of the screws which aid in holding the parts firmly in upright position; and, further, there is nothing projecting from the cylindrical surface of the screw, as might be the case if a pin or the like were used as a stop, which can scratch or cut the encircling cylindrical member with which the screw co-operates. The squared lower end portions of screw sleeves 25 and 28 have unimpaired outer bearing surfaces thereon, as has been previously described. This is particularly important in the case of sleeve 28 as when the parts are extended, as shown in Fig. 2, the bearing contact between the lower end of sleeve 28 and sleeve 34 must be relied upon to give rigidity to the structure. A further important feature resides in the squared end portions, in that the interrupted threads act as scrapers or cutters to clean dirt and the like from the cooperating threads, and also aid in the distribution of grease or lubricant. These features are important for lifting jacks which, though frequently called upon for heavy duty, are generally not well cleaned or lubricated by their users.

In Fig. 4 the invention has been shown applied by way of illustration to a top drive jack of the type disclosed in the patent to Millard B. Lucker, No. 1,864,603, dated June 28, 1932, which is operated and which is constructed in a manner generally similar to the bottom drive jack described.

The top drive jack of Fig. 4 has a two-part casting 60, housing a driving pinion 62 and a gear 64 meshing with the pinion. In threaded engagement with gear 64 is a threaded sleeve 66, which is formed with the squared or effectively thickened end portion at its top and with the thread termination stop at its lower end. Threaded into sleeve 66 is a screw 68, formed at its lower end with the thread stop. The upper end of screw 68 carries the lifting platform 70 of the jack. A friction plunger 72 tends to hold sleeve 66 normally from rotation.

In assembling the parts screw 68 is first threaded upwardly into sleeve 66. Sleeve 66 is then threaded upwardly into gear 64. Platform 70 may then be secured to screw 68, after which the parts can be dropped into place into the casting.

In operation, as gear 64 is rotated, sleeve 66 is threaded upwardly by reason of the fact it is held from rotation by friction plunger 72. As it reaches its uppermost position the thread stop formed at its lower end engages a thread on gear 64. Continued rotation of gear 64 therefore now rotates sleeve 66, overcoming the drag of friction piece 72, and, due to the fact that screw 68 is held from rotation by engagement of the lifting platform 70 with the object being lifted, screw 68 will be threaded upwardly with respect to screw sleeve 66 until the thread stop formed at its lower end engages the internally formed threads on sleeve 66.

It is obvious that various changes may be made in the constructions and methods which I have set out for purposes of illustration. My invention, however, contemplates the use of equivalents throughout, and I therefore do not wish to be limited to the precise constructions and meth-

od steps shown and described, but only as indicated in the following claims.

I claim:

1. In a lifting jack, a screw, a screw sleeve comprising an elongated cylindrical body formed at one end to provide wall portions having polygonal cross-sectional configuration, internal screw threads formed on said wall portions and having threaded engagement with said screw, a screw thread formed externally on said cylindrical sleeve, and a second cylindrical sleeve encircling the first sleeve and having inwardly offset wall portions formed at one end to provide the sleeve with polygonal cross-sectional configuration, internal screw threads formed in the offset portions of said second sleeve and having threaded engagement with the external screw thread of the first sleeve.

2. In a lifting jack, a screw having an external thread and a cylindrical sleeve encircling said screw, said sleeve having inwardly offset portions providing polygonal cross-sectional configuration in the sleeve adjacent one end and internal threads in said offset portions having engagement with the thread of said screw.

3. In a lifting jack, a threaded screw, a cylindrical sleeve having inwardly offset portions providing polygonal cross-sectional configuration at one end of said sleeve and internal threads cut in said offset portions and having threaded engagement with the threads of said screw and said sleeve being exteriorly threaded on its cylindrical portions and opposite said offset portions.

4. A screw sleeve for a lifting jack comprising an elongated body having a cylindrical portion and inwardly offset portions providing polygonal cross-sectional configuration, said cylindrical and offset portions being arranged in longitudinal alignment, internal screw threads in said sleeve at said offset portions and external threads on said sleeve extending in said cylindrical portions and opposite said offset portions.

5. A screw sleeve for a lifting jack comprising an elongated body having a cylindrical portion and inwardly offset portions providing polygonal cross-sectional configuration in the sleeve, a continuous screw thread formed on the cylindrical portion and extending opposite the offset portions and a discontinuous or mutilated screw thread formed only on the offset portions.

6. A screw sleeve for a lifting jack comprising an elongated cylindrical body having a plurality of circumferentially arranged portions offset inwardly of said cylindrical body, said offset portions being spaced apart circumferentially of the sleeve to leave normal cylindrical body portions therebetween, screw threads formed externally on said cylindrical body and on said cylindrical body portions, and additional screw threads formed on said inwardly offset portions.

7. A screw sleeve comprising an elongated cylindrical body having a plurality of circumferentially arranged, substantially flat portions offset inwardly from the body, screw threads on said cylindrical body, and screw threads on said offset portions.

8. A screw sleeve comprising an elongated cylindrical body having a plurality of circumferentially arranged, substantially flat portions offset inwardly from the body, screw threads on said cylindrical body and extending opposite said offset portions.

9. A lifting element for a lifting jack comprising a cylindrical metal sleeve provided with external threads along a portion of its length, inwardly extending cold forged areas over a portion of the length of said sleeve to provide spaced apart thickened portions over said sleeve, said thickened portions being threaded to provide an internal discontinuous thread for said sleeve, the portions of said sleeve between said spaced apart inwardly projecting portions being cylindrical.

10. A metallic extension member for a lifting jack comprising a metal sleeve having cylindrical outer and inner surfaces, a continuous thread on said outer surface, a portion of the length of said sleeve being formed with inwardly extending forged spaced apart thickened portions with intermediate cylindrical portions on the outer surface of said sleeve, said intermediate cylindrical portions being threaded to provide a discontinuous thread which is a continuation of the outer cylindrical thread of said sleeve, said inwardly extending thickened portions being spaced apart internally of said sleeve and provided with threads to provide an internal broken thread for said sleeve, the internal portions of said sleeve between said thickened portions being cylindrical to correspond with the remaining inner cylindrical surfaces of said sleeve.

11. In a lifting jack, a sleeve comprising a tube of generally uniform cross-section having over a portion of the length thereof, longitudinally extending, inwardly deformed areas separated by intermediate non-deformed areas, forming interior shoulders, the said shoulders being provided with an interior thread, the exterior of the tube having threads thereon.

12. In a lifting jack, a screw sleeve comprising a substantially cylindrical tube having over a portion of the length thereof longitudinally extending, inwardly deformed areas separated by intermediate non-deformed areas, forming interior shoulders, the said shoulders being provided with an interior thread, the exterior of the tube having a thread thereon extending over said intermediate non-deformed areas.

13. In a lifting jack, a sleeve comprising a hollow tube of substantially uniform cross section having over a portion of the length thereof longitudinally extending, inwardly deformed areas separated by intermediate non-deformed areas, forming interior shoulders, the said shoulders being provided with an interior thread.

14. A screw sleeve for a lifting jack comprising a cylindrical tube having a wall with concentric inner and outer surfaces, portions of the wall along a part of the axial length of the tube being inwardly offset and having internal threads on said offset portions.

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