April 15, 1930. W. D. BUSS 1,754,978

MACHINE FOR SETTING THREADED DEVICES

Filed Sept. 7, 1926 4 Sheets-Sheet 1

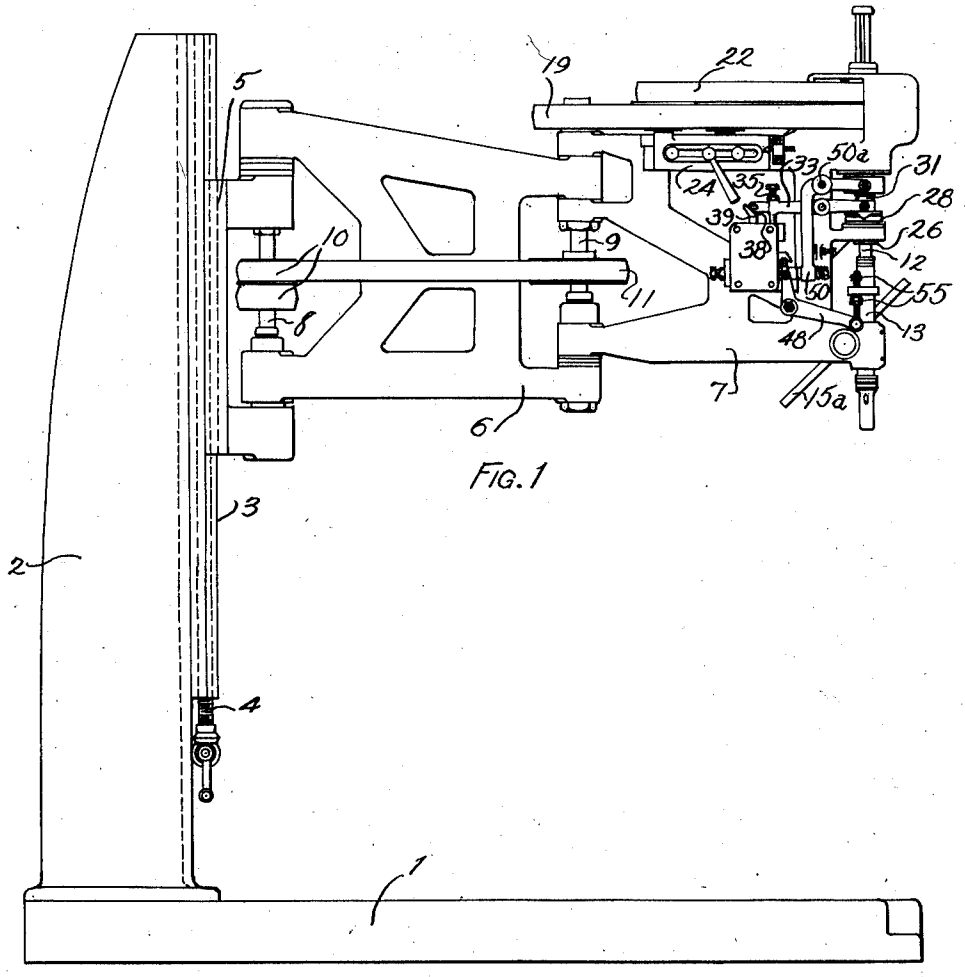


FIG. 1

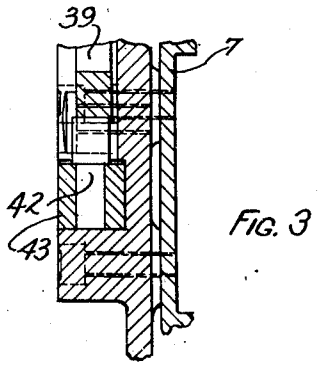


FIG. 3

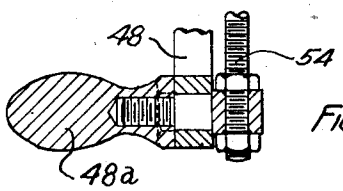


FIG 2

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MACHINE FOR SETTING THREADED DEVICES

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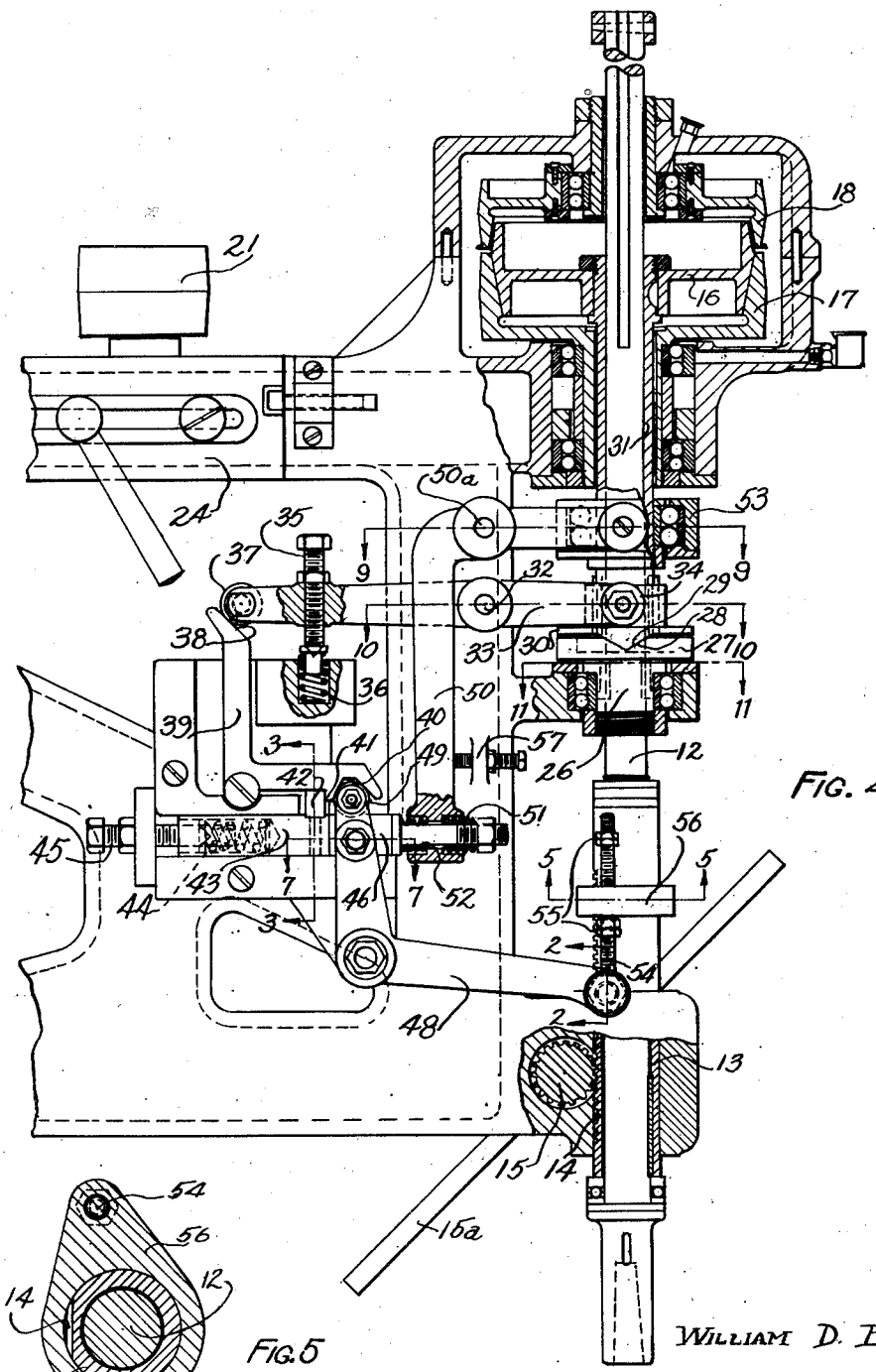


FIG. 4

FIG. 5

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MACHINE FOR SETTING THREADED DEVICES

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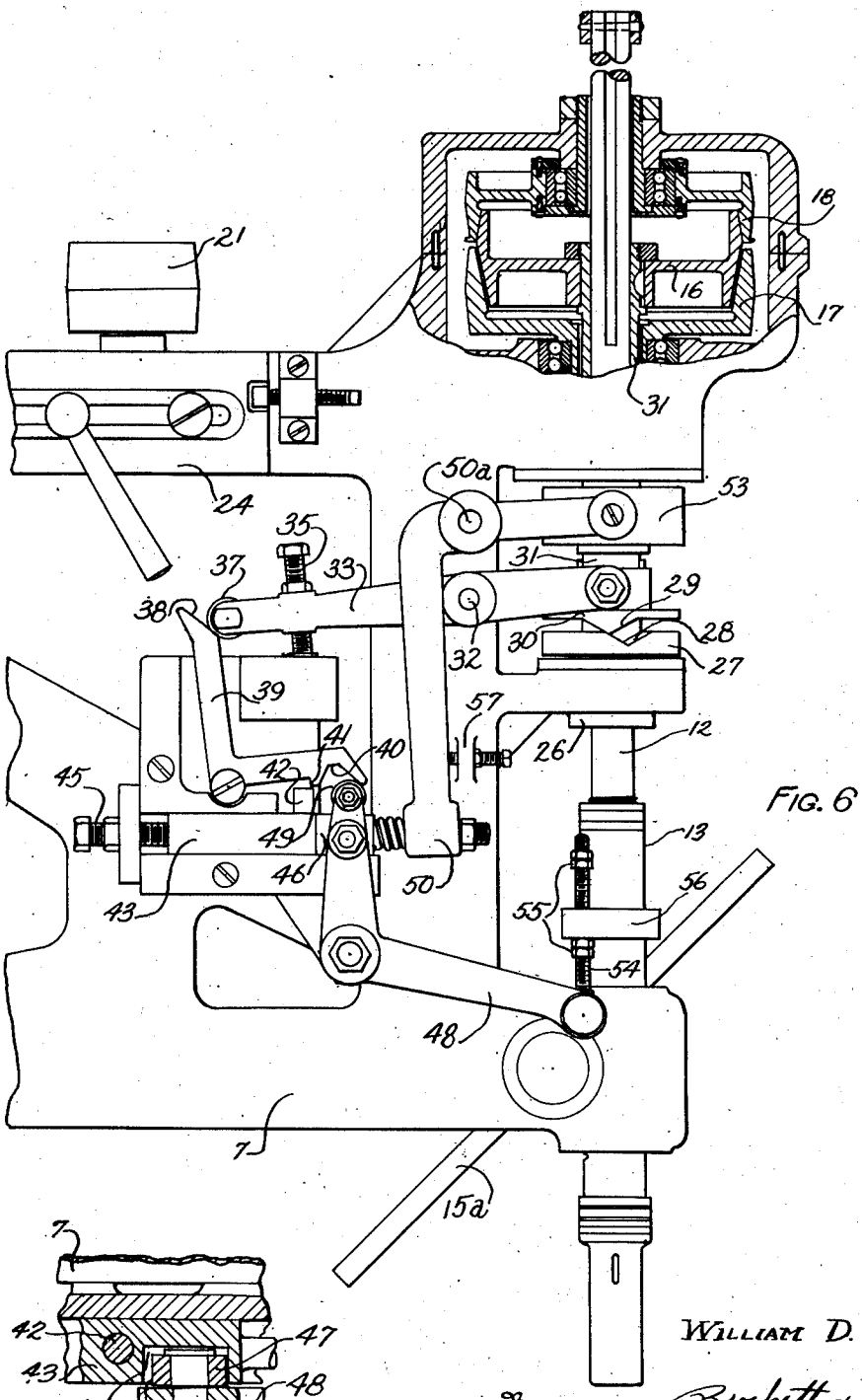


FIG. 6

FIG. 7

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MACHINE FOR SETTING THREADED DEVICES

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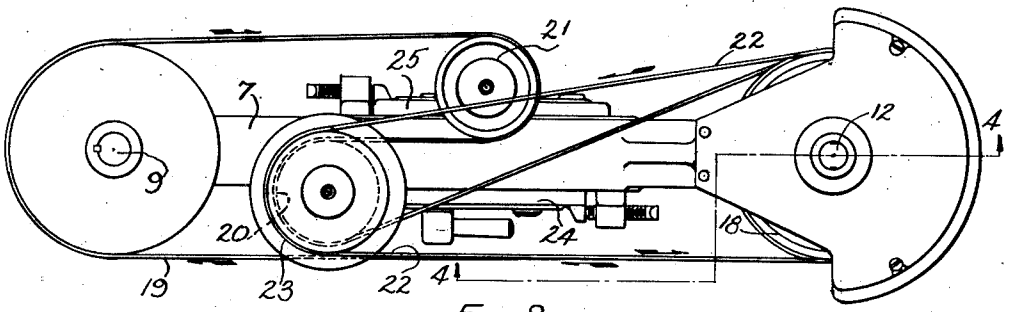


FIG. 8

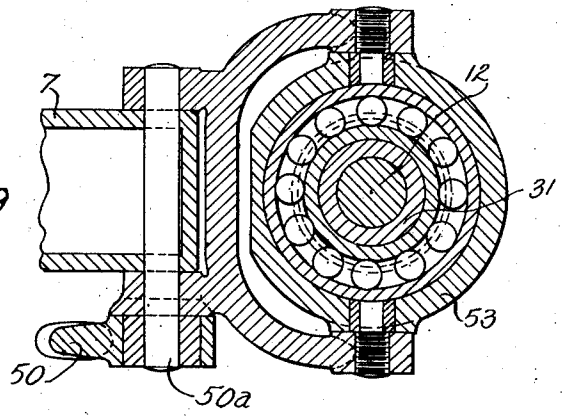


FIG. 9

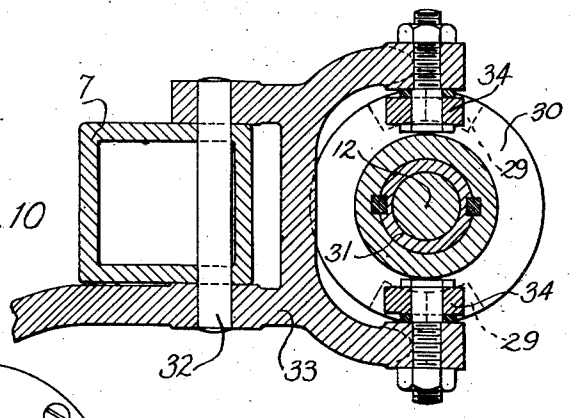


FIG. 10

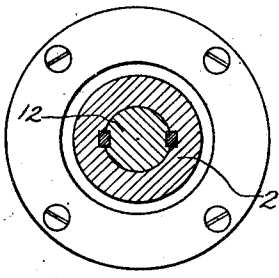


FIG. 11

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UNITED STATES PATENT OFFICE

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MACHINE FOR SETTING THREADED DEVICES

Application filed September 7, 1926. Serial No. 134,101.

This invention relates to a machine for setting up or operating threaded devices such as for screwing home threaded studs, bolts, or nuts, or for operating taps or like tools, or devices.

The object of the invention is to provide improved mechanism of this kind which automatically stops or reverses the spindle, according to pre-setting of the mechanism by the operator, when the tap or like tool has completed its work, or when the stud, bolt or the like, has been fully screwed home, or in case an obstruction is encountered in the operation or driving of either a threaded bolt, stud, or the like, all without special attention of the operator; and, therefore, a machine of this class, which is certain in operation, is easy to adjust and is capable of use in connection with a wide variety of work.

Further objects of the invention are in part obvious and in part will appear more in detail hereinafter.

In the drawings, which represent one suitable embodiment of the invention, Fig. 1 is a side elevation; Fig. 2 is a detail sectional elevation on the line 2—2, Fig. 4; Fig. 3 is a detail sectional elevation on the line 3—3, Fig. 4; Fig. 4 is in part a side elevation and in part a sectional elevation on the line 4—4, Fig. 8, showing the parts driving the spindle in the forward direction; Fig. 5 is an inverted sectional plan view on the line 5—5, Fig. 4; Fig. 6 is a view corresponding for the most part to Fig. 4, but showing the parts at the conclusion of an operation; Fig. 7 is a detail sectional plan view on the line 7—7, Fig. 4; Fig. 8 is a top plan view; and Figs. 9 and 10 and 11 are sectional plan views on the lines 9—9, 10—10 and 11—11, Fig. 4.

The machine shown in the drawings comprises a suitable frame including a base 1, adapted to rest upon the floor or other suitable support, and from which rises a standard or pillar 2, provided with vertical guideways 3 along which is suitably adjustable, such as by the screw mechanism 4, the slide 5 carrying the two-part jointed arm including members 6 and 7.

The pivot shafts 8, 9 are provided with belt pulleys 10, 11 for driving the mechanism, it being understood that shaft 8 is connected to any suitable source of power and for this purpose may be directly connected to the shaft of an electric motor, or the like. The double swinging arm arrangement enables the tool spindle to be shifted in a horizontal plane to any position above the work.

In suitable bearings in member 7 is mounted the drill spindle 12, rotatable in the quill 13, which is suitably adjustable vertically for feeding purposes such as by the rack 14 and hand operated pinion 15, the upper end of the spindle extending through a clutch member 16, shown as a double-cone clutch member driven by either of the cone clutch faces within pulleys 17, 18. Pulley 17 is driven in the one diretction by the belt 19 passing over idlers 20, 21 (Fig. 8), while pulley 18 is driven directly by the belt 22 passing over a pulley 23 on the same shaft as idler 20; 24 indicates generally means for adjusting and maintaining the tension of belt 22, and 25 similar mechanism on the other side of the frame 7 for adjusting and maintaining the tension of the belt 19.

Upon the spindle 12 is mounted to rotate therewith a sleeve 26, Fig. 4, provided with a collar 27 having V-shaped radially extending recesses 28 to receive corresponding ribs 29 on a collar 30, splined on the lower end of a sleeve 31, to which the clutch member 16 is keyed. Pivoted at 32 in the frame 7 is a lever 33 provided with a front arm of yoke form carrying rollers 34 lying above and travelling on the collar 30, the rear arm of said lever carrying an adjustable abutment, such as the screw 35 for varying the tension of a compression spring 36 and on its extreme outer end a roller 37 engaging the inclined upper end portion 38 of a bell crank lever 39, the other arm of which is provided with a downwardly opening recess 40 and a latch abutment having an abutment 41 co-operating with a latching projection 42 extending upwardly from a slide 43. Said slide is continually urged forwardly by suitable means such as by the compression spring 44 adjustable by the abutment screw 45, said slide having a recess 46 into which extends a roller 47 on one arm of a bell crank lever 48, said lever

arm also carrying a roller 49 co-operating with the recess 40. The front end of the slide 43 has a reduced extension passing through an opening in one arm of a bell crank lever 50, adjustable compression springs 51, 52 being interposed between said lever arm and the slide extension, of which spring 52 is relatively weaker than spring 51.

Lever 50 is pivoted at 50^a in the frame member 7 and its other arm is provided with a yoke, the arms of which are pivotally connected to a collar 53 surrounding the sleeve 31, ball bearings being interposed between said collar and sleeve and the arrangement being such that the sleeve rotates within the collar, but is compelled to move in either direction vertically therewith. The forward arm of bell crank lever 48 is jointed as shown in Fig. 2 to an upwardly extending threaded rod 54 provided with upper and lower abutments such as the nuts 55 thereon, said abutments lying one above and the other below a collar 56 on the quill 13 and the rod 54 passing loosely, or with a sloppy fit, through an opening in said collar. On the frame 7 in front of the lever 50 is an adjustable abutment screw 57 forming a stop for a purpose to be described.

The machine may be used either for driving or operating taps, or for screwing or setting up threaded studs, bolts, nuts, or the like. Its operation will be first described in the driving of a stud or of a tap intended to be fed through or into the work for a definite distance and therefore requiring a predetermined amount of forward feed of the tool spindle before said spindle is reversed to withdraw the tool from the work. The abutments 55 above and below the collar 56 are first set with proper spacing between them and with reference to collar 56, according to the required duty. Assuming the parts in the position shown in Fig. 4, the pinion 15 is rotated by its handle 15^a to engage the tap with the work and as soon as engagement is effected, the tool becomes self-feeding as is usual. Compression spring 36 holds the rollers 34 down against collar 30 and the forward drive from clutch member 16 and sleeve 31 is transmitted to the spindle through the collar 30 splined on the sleeve, and, thence to the sleeve 26 splined to the spindle. The slide 43 is held retracted by the latch members 41, 42, and clutch members 16, 17 are held in engagement by the preponderating effect of the heavier spring 51. As the tapping operation proceeds the spindle moves downwardly carrying with it collar 56, which finally engages the lower abutment 55, which has been adjusted so that such contact is effected when the tap duty is nearly concluded. Thereupon further slight downward motion of the spindle turns lever 48 in the clock-wise direction, Fig. 4, moving roller 49 to the right and by its effect on the inclined wall of recess 40 turning lever 39 in the counter-clockwise direction and raising latching abutment 41 above the projection 42, thus releasing slide 43 to the effect of its compression spring 44. Said spring thereupon extends over to the right and turns lever 50 in the counter-clockwise direction, it being understood that stop 57 is adjusted to permit sufficient motion of said lever to raise the sleeve 31 and clutch member 16 until the latter is engaged with the reversing driver 18. The tap is thereupon promptly rotated in the reverse direction and withdrawn from the work, and when disengaged therefrom the operator further raises the quill 13 by operation of pinion 15 until collar 56 engages the upper abutment 55 and oscillates lever 48 in the counter-clockwise direction to push back the slide 43 until it reaches the latching position shown in Fig. 4 in which the forward driving clutch parts are re-engaged and the machine is ready for another tapping operation.

When the device is used for setting up or screwing up cap screws, nuts, bolts, or the like, the necessary socket or head is inserted in the tool spindle, engaged with the screw and the latter is introduced to its threaded hole in the work. In this case no advantage need be taken of the abutments 55 and the latter are adjusted to ineffective positions. The spindle is fed downwardly with forward drive by rotation of pinion 15, all parts being in the position shown in Fig. 4. As soon as the screw is turned home, or to its final seat in the hole, or in case an obstruction is encountered, rotation of the spindle is subjected to very greatly increased resistance or in other words, to a heavy over-load. The sleeve 26 and collar 27 thereupon practically stop rotating but the the drive from the forward driver 17 to clutch members 16, sleeve 31 and collar 30 continues, causing the inclined parts 29 to ride up in the recess 28 or toward the position shown in Fig. 6, thereby turning the lever 33 against the effect of spring 36 and causing roller 37 to ride down the cam face 38 and turn the lever 39 until its recessed end is raised to disengage the latch 41 from the projection 42. This operation releases the slide 43 for movement to the right as before described, causing swinging motion of lever 50 sufficient to raise the collar 53, sleeve 31 and the clutch member 16. In such use of the machine abutment stop 57 has been adjusted to permit the clutch member 16 to raise only to neutral position, or in other words, to disengage it from the forward driver 17, but without engaging it with the reverse driver 18. The spindle thereupon stops and may be disengaged from the work by upward movement, such as by rotation of the pinion 15, and by raising the forward arm of lever 48, as by means of its handle 48^a until the collar 56 engages the upper abutment 55 and thus turns lever 48, all parts

being restored to their original positions ready for another screwing operation.

During this operation of the machine, the screw, or other threaded article to be screwed home, is driven forwardly with yielding pressure controlled by the spring 36 through the medium of the clutch collars 27, 30 and their V-shaped ribs and recesses. As soon as sufficient resistance to rotation is encountered the threaded part stops, but the V-shaped ribs ride up the walls of their recess with continued torsional effect upon the threaded article giving an additional twist, as it were, and tigthening the same to the last degree.

By a light adjustment of the spring 36 and setting the mechanism otherwise as described whereby the abutments 55 and 57 are ineffective, dead ended holes may be tapped, the tap being automatically reversed and turned out upon reaching the bottom of each hole.

Under all conditions the drive of the spindle is through a yieldable clutch, to wit, collars 27, 30, with the parts so arranged that injury to the machine cannot occur since the drive is automatically interrupted although continuing up to the desired limit short of breakage of any part.

What I claim is:

1. Apparatus for performing threading operations, comprising a tool spindle, a rotatable driver, driving connections between said driver and spindle including clutch means driven thereby and a movable member yieldable upon abnormal torque resistance of the spindle to the driving effect of said clutch means, yielding means effective upon said clutch means and normally urging the same to release position, latch means for holding said yielding means retracted with the clutch means in driving relation, and an operating connection from said torque responsive member to said latching means effective upon movement of the torque responsive member, to cause release of the clutch means by said yielding means.

2. Apparatus of the class described in claim 1, including means actuated by longitudinal advance of the tool spindle for also actuating said latching means.

3. Apparatus of the class described in claim 1, including means effective upon both said latching means and said yielding means and adapted upon predetermined advance of the spindle to release said latching means and upon predetermined retraction of the spindle to retract said yielding means.

4. Apparatus of the class described in claim 1, including means for varying the yieldability of said yieldable member, and therefore the value of the torque resistance to which it is responsive.

In testimony whereof I hereby affix my signature.

WILLIAM D. BUSS.