Dec. 29, 1953 J. H. MANSFIELD ET AL 2,664,126

RATCHET SPIRAL SCREW DRIVER

Filed May 15, 1950

2 Sheets-Sheet 1

Fig. 1

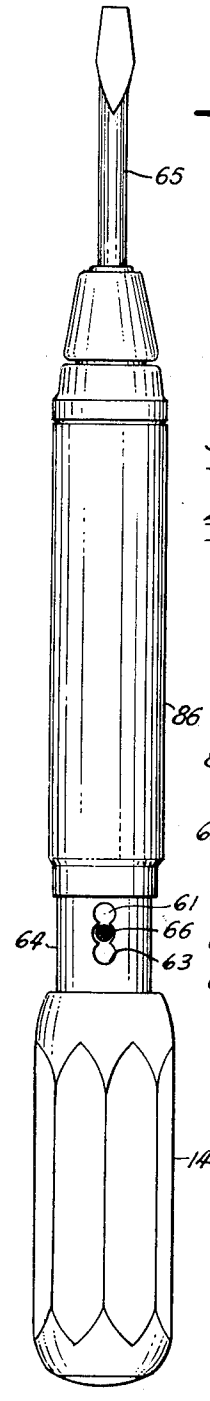


Fig. 2

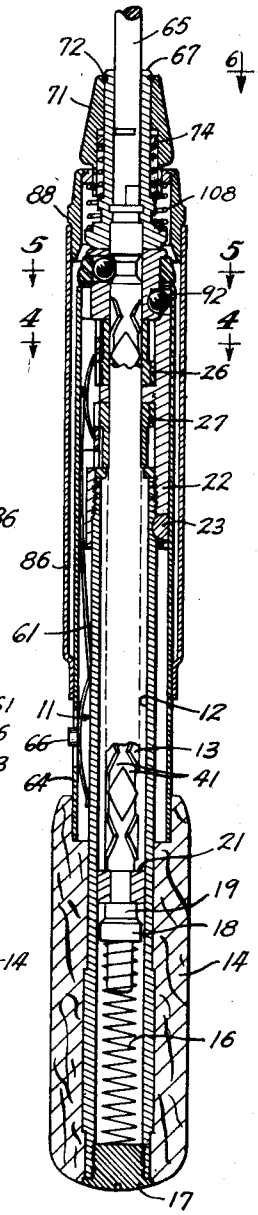


Fig. 3

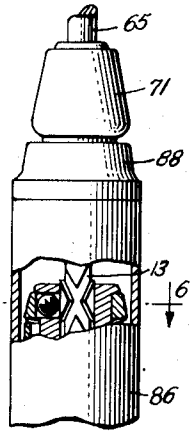


Fig. 4

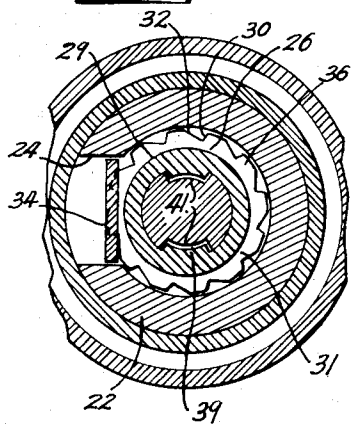


Fig. 5

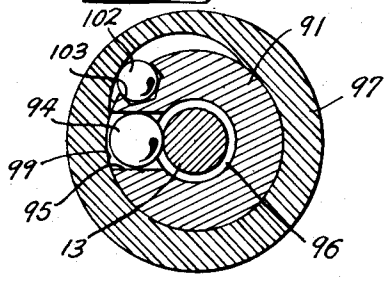
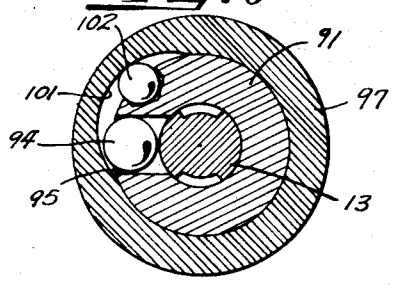


Fig. 6



Inventors

Judson H. Mansfield

Edwin C. Swanson

By McCanna and Morsbach

Attys.

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Fig. 7

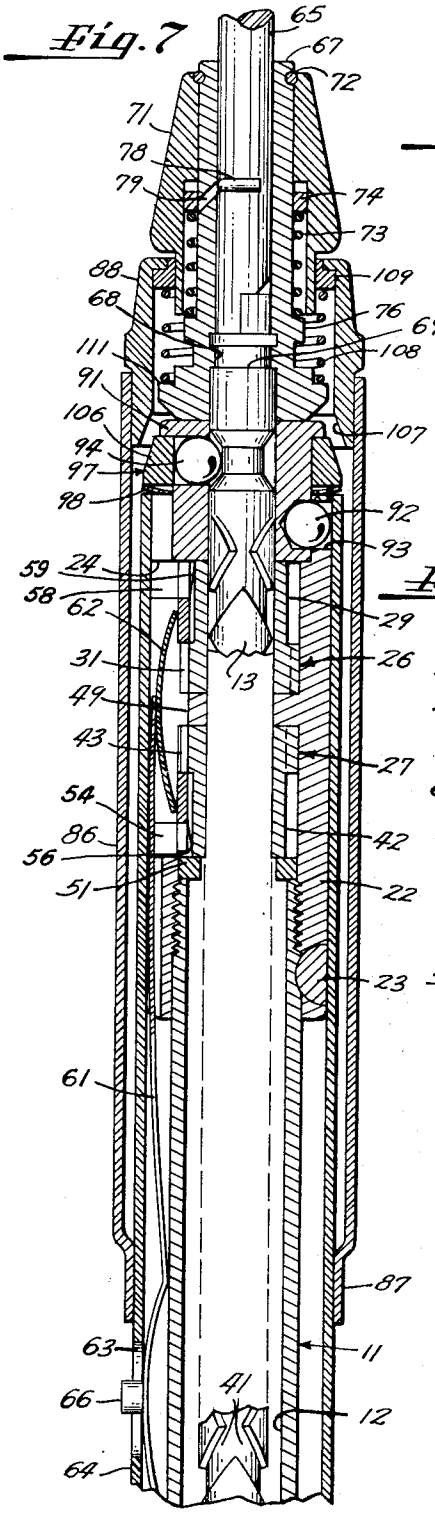


Fig. 8

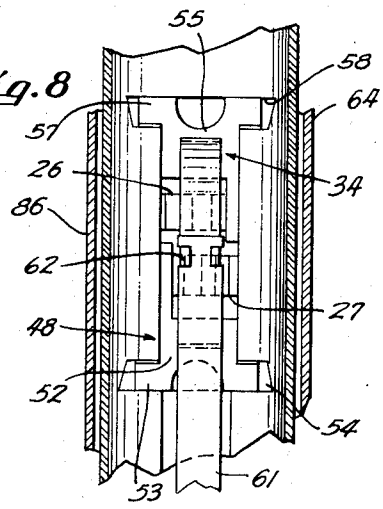


Fig. 9

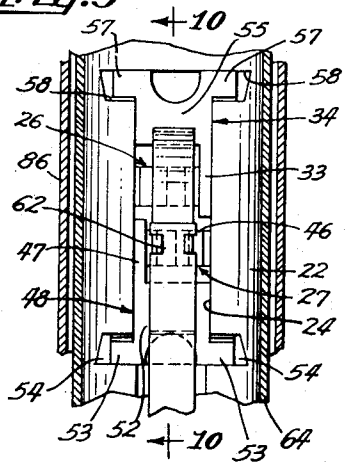
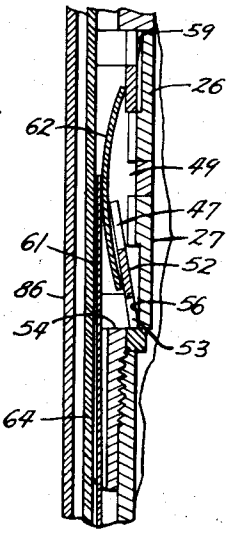


Fig. 10



Inventors
Judson H. Mansfield
Edwin C. Swanson

By
McCanna and Morsbach
Attys.

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RATCHET SPIRAL SCREW DRIVER

Judson H. Mansfield and Edwin C. Swanson, Rockford, Ill., assignors to Greenlee Bros. & Co., Rockford, Ill., a corporation of Illinois

Application May 15, 1950, Serial No. 161,946

5 Claims. (Cl. 145—54)

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This invention relates to ratchet tools and more particularly to ratchet screw drivers and press drills.

An object of the invention is the provision in a spiral ratchet screw driver of the above character having telescoping enclosure members of novel locking means operable through manipulation of said members for locking the spindle in a retracted position.

Another object of the invention is the provision of a spiral ratchet screw driver having a light weight construction yet which is relatively strong and can withstand hard service.

Another object of the invention is the provision of a spiral ratchet screw driver of the above character in which plating of components of the screw driver is not necessary.

Another object of the invention is the provision in a spiral ratchet screw driver of a ratchet wheel construction that is relatively strong, rugged and is so shaped and designed that the amount of play is greatly reduced as compared with conventional constructions.

Another object of the invention is to provide a spiral ratchet screw driver of the above character having telescoping enclosure members wherein the members are so shaped that a relatively large indentation caused by dropping the screw driver or accidental contact with other tools will not interfere with the normal operation of the ratchet mechanism.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which—

Figure 1 is an elevational view of a spiral ratchet screw driver embodying the present invention;

Fig. 2 is a longitudinal sectional view of the screw driver shown in Figure 1;

Fig. 3 is a fragmentary elevational view with portions cut away to show the locking mechanism;

Figs. 4, 5 and 6 are sectional views taken substantially along the section lines 4—4 and 5—5 of Fig. 2 and the section line 6—6 of Fig. 3;

Fig. 7 is an enlarged fragmentary view similar to Fig. 2;

Fig. 8 is a fragmentary sectional view showing the details of construction of the ratchet wheel lock mechanism;

Fig. 9 is a view similar to Fig. 8 with the ratchet shifter in position to lock one of the ratchet wheels against rotation and permit rotation of the other, and

Fig. 10 is a section view taken substantially along the line 10—10 of Fig. 9.

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In general the screw driver comprises a tubular body 11 having a passageway 12 for receiving a spindle 13 adapted to be moved axially into and out of the body. A handle 14 is fixedly secured to one end of the tubular body 11 for manipulating the screw driver. The drive spindle 13 is normally urged to an extended position by a compression spring 16 (see Fig. 2) disposed at the rear end of the passageway 12 between a screw 17 threaded into the end of the passageway and a thrust bearing member 18 engageable with the rear end 19 of the drive spindle 13. A guide member 21 mounted on the rear end of the drive spindle 13 is snugly received in the passageway 12 and serves to guide the spindle 13 in the passageway as the spindle moves into and out of the body. A ratchet cage 22 is mounted on the body 11 to extend forwardly therefrom and in effect form a continuation thereof. To insure a tight connection between the ratchet cage 22 and the body 11 the cage 22 is threaded onto the end of the body 11 and a key 23 extends through a slot formed in the ratchet cage 22 to be received in a recess formed in the body 11, in registry with the slot in the cage 22, so that the cage 22 and body are positively held against relative rotational movement.

Ratchet wheels 26 and 27 are mounted on the spindle 13 in the cage 22 to be accessible through an elongated opening 24 on the cage. The ratchet wheel 26 is formed from bronze alloy material and, as shown in Figs. 2, 4 and 7, comprises a substantially smooth sleeve-like hub portion 29 and an annular radial flange portion 31 at one end of the hub portion having twelve radially extending annularly spaced teeth 36 formed on its periphery. The outer edges of the teeth are relatively wide as seen in Fig. 4 and one face 30 of each tooth is sharply inclined from the outer edge to the base of the adjacent tooth and is shaped to define a shoulder engageable with the side of the pawl 34 so that when the pawl engages the shoulder the ratchet wheel 26 is prevented from rotating. The opposite face 32 of each tooth inclines gradually from the outer edge of the tooth to the base of the adjacent tooth to effect maximum tooth strength. This configuration of the teeth permits a maximum number of teeth about the flange 31 consistent with maximum tooth strength and a minimum of play between the pawl and the teeth. Helical projections 39 formed on the ratchet wheel 26 as shown in Fig. 4 engage helical grooves 41 formed on and extending lengthwise of the drive spindle 13 in a conventional manner. As best seen in Figs. 2 and 7 two grooves 41 are formed on the spindle, one

of which progresses in a clockwise direction about the spindle and the other of which progresses in a counterclockwise direction about the spindle. The ratchet wheel 27 is of identical construction to that of the ratchet wheel 26 and includes a hub portion 42 and a flange portion 43 having teeth 46 (see Fig. 9) shaped to be engageable with a tongue 47 of a pawl 48 in the manner described hereinbefore. As best seen in Fig. 2 the ratchet wheels are disposed so that the flange portions 31 and 43 are disposed on opposite sides of a rib 49 formed intermediate the ends of the ratchet cage. A thrust bearing 51 supported in the ratchet cage 22 engages the axial face of the hub portion 42 of the ratchet wheel 27. The thrust bearing 51 also is positioned to be engaged by the guide member 21 to limit outward movement of the spindle 13 from the body and define the forward-most position of the drive spindle.

Provision is made for mounting the pawls 34 and 48 so that the latter may be selectively or simultaneously brought into engagement with the teeth of the associated ratchet wheels. To this end the pawl 48 as best seen in Figs. 8, 9 and 10 is formed with a body portion 52 shaped to be received in the left end of the elongated opening 24 as seen in Fig. 9 and is formed with a pair of laterally extending arms 53 shaped to be received in transversely extending slots 54 in the sidewalls of the ratchet cage 22 and in communication with the opening 24. The bottoms 56 of the slots 54 are inclined as best seen in Fig. 7. With this construction the arms and slots in effect define a pivotal connection or axis about which the pawl 48 may be pivoted so that the tongue 47 is movable between a position in which the tongue is normally received in the space between teeth 46 on the ratchet wheel 27 and a position in which the pawl is inclined relative to the axis of the ratchet wheel so that the tongue is free of the teeth and the ratchet wheel is free to rotate.

The pawl 34 is of similar construction and includes a body portion 55 shaped to be received in the right hand end of the slot 24 as seen in Fig. 9 and laterally extending arms 57 shaped to be received in transversely extending slots 58 to define pivotal connections as described for the pawl 48. The bottoms 59 of the slots 58 are inclined so that the pawl 34 may be moved from its normal position locking the ratchet wheel 26 against movement to an inclined position in which the wheel 26 is free to rotate.

The position of the pawls 34 and 48 is controlled by a ratchet shift member 61 having an arcuate spring member 62 attached to one end so that the ends of the member 62 normally engage the body portions, respectively, of the pawls. The opposite end of the ratchet shift member 61 is accessible through an opening 63 in a tubular housing 64, enclosing the body 11, the pawls 34 and 48 and the ratchet wheel assembly, for moving the pawls between their respective control positions. To facilitate movement of the shift member a small button 66 is attached to the shift member 61 to provide an abutment extending outwardly from the housing 64 to which a force may be applied for moving the member 62 between its three positions of operation. In its rearward position, shown in Fig. 10, the spring member 62 moves to cause the pawl 48 to tilt as shown and to positively lock the tongue 33 of the pawl 34 in engagement with the ratchet wheel 26. Under these conditions the ratchet wheel 27 is free to rotate so as to cause the drive spindle 13 to rotate in one direction of rotation upon application of an axial pressure to the handle 14. In its central position shown in Figs. 7 and 9 the spring 62 engages both pawls 34 and 48 to lock the tongue 33 and the tongue 47 in engagement with the ratchet wheels 26 and 27 respectively to prevent rotation of the ratchet wheels. Under these conditions the spindle 13 is held against rotation and the screw driver can be used as a conventional screw driver. In its forward position, not shown, the spring member 62 locks the tongue 47 in engagement with the ratchet wheel 27 and tilts the pawl 34 so that the tongue 33 is free of the ratchet wheel 26. Under these conditions the ratchet wheel 27 is held against rotation and the ratchet wheel 26 is free to rotate. The direction of rotation of the ratchet wheel 26 is opposite to that of the ratchet wheel 27 so that when the ratchet wheel 26 rotates the spindle 13 rotates in a direction opposite to that when the ratchet wheel 27 is free to rotate.

A chuck assembly is mounted on the outer end of the drive spindle 13 for supporting a screw driver bit, drill bit, or similar tool 65. In general, the chuck assembly includes a chuck body 67 positively secured on the end of the spindle shaft 13 as by an annular shoulder 68 received in a groove 69 formed on the outer end of the drive spindle 13. A chuck casing 71 is mounted on the chuck body 67 and is retained in position by a chuck retaining clip 72 acting between the chuck body and the casing 71 to prevent outward axial movement of the casing 71 relative to the body. A coil spring 73 mounted on the chuck body 67 acts between a bit retainer washer 74 and an annular shoulder 76 formed on the chuck body 67 to urge the chuck casing 71 to the position shown in Figs. 2 and 7 against the clip 72. A bit retainer 78 is disposed in an inclined passageway 79 formed in the body 67 and shaped to interfit with a notch formed in a shank of the screw driver bit in a conventional manner to retain the bit in the chuck assembly.

As best seen in Figs. 2 and 7 the screw driver is provided with a tubular member 86 interconnected with the chuck assembly and arranged to telescope over the tubular member 64 so as to provide an enclosure for the spindle 13 as it moves into and out of the body. In tools of this type the telescoping members are sometimes damaged so badly when the screw driver is accidentally dropped that indentations formed in the sidewalls of the tubular member interfere with the operation of the tool. In this embodiment of the invention the telescoping tubular housing 86 is so constructed that it will stand considerable abuse and deformation without impairing the operation of the tool. For this purpose the inner end 87 of the tubular housing 86 is formed to define an opening of substantially the same diameter as the outer diameter of the tubular housing 64 and in effect forms a guide for guiding the tubular housing 86 with respect to the tubular member 64 as the latter telescopes relative to the tubular housing 64 during the spindle movement in a screw driving operation. At its outer end the tubular housing 86 is interconnected with the chuck assembly through a lock sleeve 88 which in effect forms a continuation of the tubular housing 86. The intermediate portion of the tubular housing 86 is formed with a diameter larger than the outside diameter of the housing 64 so that the sidewalls of the tubular housing 86 are normally spaced from the sidewalls of the tubular housing 64. With this construction the tubular housing

86 is positively guided as it telescopes and the outer tubular housing can withstand considerable abuse and deformation before interference between the parts occurs.

Locking means is provided for locking the spindle in its retracted position such as shown in Figs. 2, 5, 6 and 7. In this embodiment of the invention the locking means comprises a lock body 91 fixed to the outer end of the ratchet cage 22. For this purpose a portion of the lock body is press fitted into an axially facing recess formed on the ratchet cage 22. A ball 92 received in a radially extending recess 93 in the ratchet cage and the lock body 91 and held in position by the tubular housing 64 also serves to prevent relative rotation between the cage 22 and body 91. A radially extending passageway 95 (see Figs. 5 and 6) for receiving a locking ball 94 is formed in the lock body 91 and is located so that when the spindle 13 is in the position shown in Fig. 7 the ball 94 may be received in an annular groove 96 formed on the spindle 13. Mounted on the lock body 91 is a lock collar 97 disposed between an upturned outer flange on the lock body 91 and the end of the ratchet cage 22. A lock collar spring 98 disposed between the lock collar 97 and the ratchet cage 22 serves to aid in holding the lock collar 97 in a desired adjusted position. When the lock collar 97 is in its locking position shown in Fig. 5 the inner circular surface 99 of the lock collar 97 overlies the passageway 95 and urges the ball 94 into the annular groove 96 on the drive spindle 13. When the lock collar 97 is in its release position as shown in Fig. 6 an arcuate recess 101 formed on the lock collar receives the ball 94 so that the spindle 13 is free to move into and out of the body 11. A ball 102 disposed in a radially extending recess 103, adjacent the passageway 95 on the periphery of the lock collar body, engages opposite ends of the dwell as shown in Figs. 5 and 6 to limit movement of the lock collar between its spindle locking and release positions.

The lock collar 97 may be rotated from the exterior of the screw driver through a clutch mechanism by rotation of the tubular housing 86. Thus, as best seen in Fig. 7 the forward end of the lock collar 97 is provided with a conical friction surface 106 shaped to interfit with a conical friction surface 107 formed on the lock sleeve 88. The lock sleeve 88 is normally urged to a position in which the friction surface 107 is disengaged from the lock collar by a spring 108 acting between a lock sleeve collar 109, slidably mounted in the chuck casing 71 and supporting the forward end of the lock sleeve 88, and a shoulder 111 formed on the chuck body. By applying a compressive force between the handle 14 and the lock sleeve 88 the spring 108 may be compressed so that the friction surface 107 on the lock sleeve 88 engages the friction surface 106 on the lock collar 97 whereupon rotation of the tubular housing 86 will rotate the lock collar 97 between the release and locking positions as shown in Figs. 5 and 6. Upon release of pressure between the handle 14 and the lock sleeve 88, the spring 108 acts to return the parts to the position shown in Figure 1.

The tubular housing 64 and the tubular housing 86 are preferably formed from stainless steel. This insures a relatively strong structure and one that is rust resistant. Another advantage is that no plating of the parts, which is relatively costly, is required to protect metallic surfaces as has been the case heretofore. One disadvantage of plating is that it wears off the parts during

the use of the tool and consequently the parts are no longer protected against deterioration. Also the plating frequently scales off and lodges in the ratchet wheel assembly and interferes with the functioning of these parts. Another advantage of using stainless steel enclosure members is that the body 11 and the ratchet cage 22 may be formed of light weight material such as aluminum, since the steel enclosure members provide a strong rugged enclosure for these parts. As a consequence this tool has the advantage of being a comparatively strong rugged tool as well as a light weight tool. This construction also has a simple, yet positive locking means for maintaining the chuck in its retracted position. The ratchet wheel construction insures maximum strength of the teeth, yet minimizes play between the parts. This construction is designed for long service life and can withstand considerable abuse without impairing the functioning of the tool.

We claim:

1. In a spiral screw driver, the combination of a body having an axially extending passageway, a chuck, a spindle received in said passageway and shaped to support said chuck, means for mounting said spindle to have said chuck movable between a retracted position in which the chuck is adjacent the body and a position in which the chuck is spaced axially of the body, telescoping tubular members one of which is fixed to said body and the other of which is secured to said chuck to be movable in unison therewith, locking means for said spindle having a rotatable actuating member movable between release and locking positions, said locking means when said actuating member is in the release position permitting free axial movement of the spindle and when said actuating member is in the locking position preventing axial movement of said spindle to hold said chuck in its retracted position and clutch means acting between one of said tubular members and the rotatable actuating member operable upon a preselected endwise pressure applied between the tubular members and relative rotational movement therebetween to effect movement of the actuating member between its locking and release positions.

2. In a spiral screw driver, the combination of a body having an axially extending passageway, a chuck, a spindle received in said passageway and shaped to support said chuck, means for mounting said spindle to have said chuck movable between a retracted position in which the chuck is adjacent the body and a position in which the chuck is spaced axially of the body, telescoping tubular members one of which is fixed to said body and the other of which is interconnected with said chuck to be movable in unison therewith, locking means for said spindle having a rotatable actuating member movable between release and locking positions, said locking means when said actuating member is in the release position permitting free axial movement of the spindle and when said actuating member is in the locking position preventing axial movement of said spindle to hold said chuck in its retracted position, said rotatable actuating member having a friction surface, a rotatable locking sleeve forming the connection between said other tubular member and the chuck and having a friction surface shaped to engage the friction surface on said actuating member to rotate the latter between said release and locking positions, means for mounting said locking sleeve for movement between positions in which said friction surfaces

are in spaced relation and a position in which they are engaged in response to axial pressure applied to said locking sleeve and spring means acting between said chuck and locking sleeve normally urging said locking sleeve away from said actuating member.

3. In a spiral screw driver, the combination of a body having an axially extending passageway, a chuck, a spindle received in said passageway and shaped to support said chuck, means for mounting said spindle to have said chuck movable between a retracted position in which the chuck is adjacent the body and an extended position in which the chuck is spaced axially of the body, telescoping tubular members one of which is fixed to said body and the other of which is secured to said chuck to be movable in unison therewith, spindle locking means having a rotatable actuating member movable between release and locking positions, said locking means when said actuating member is in the release position permitting axial movement of the spindle between its retracted and extended positions and when said actuating member is in the locking position holding said spindle in its retracted position, clutch means acting between one of said tubular members and the rotatable actuating member operable upon a preselected endwise pressure between the tubular members and relative rotational movement therebetween to effect movement of the actuating member between its release and locking positions, and means engageable with said rotatable member to limit rotational movement thereof between opposed positions to define said release and locking positions.

4. In a spiral screw driver, the combination of a body having an axially extending passageway, a chuck, a spindle received in said passageway and supporting said chuck, means for mounting said spindle to have said chuck movable between a retracted position in which the chuck is adjacent the body and a position in which the chuck is spaced axially of the body, telescoping tubular members one of which is fixed to said body and the other of which is interconnected with said chuck to be movable in unison therewith, locking means for said spindle having a rotatable actuating member movable between release and locking positions, said locking means when said actuating member is in the release position permitting free axial movement of the spindle and when said actuating member is in the locking position preventing axial movement of said spindle to hold said chuck in its retracted position, said rotatable actuating member having a clutch face, a rotatable locking sleeve connected to said other tubular member and having a clutch face shaped to engage said clutch face on said actuating member to rotate the latter between release and locking positions, means for mounting said locking

sleeve for axial movement between a position in which said clutch faces are in spaced relation and a position in which said clutch faces are engaged in response to axial pressure applied to said locking sleeve, and spring means normally urging said locking sleeve axially away from said actuating member.

5. In a spiral screw driver, the combination of a body having an axially extending passageway, a chuck, a spindle received in said passageway and shaped to support said chuck, said spindle having an annular groove formed adjacent said chuck, means for mounting said spindle in said body to have said chuck movable between a retracted position in which the chuck is adjacent the body and an extended position in which the chuck is spaced axially of the body, telescoping tubular members one of which is fixed to said body and the other of which is secured to said chuck to be movable in unison therewith to define an enclosure for said body and spindle for all positions of the spindle between the extended and retracted positions of the chuck, a lock sleeve mounted on said body having a radially extending passageway adapted to be in registry with said annular groove on the spindle when the chuck is in said retracted position, a ball adapted to be received in said radial extending passageway, a lock collar rotatably mounted on said lock sleeve for movement between locking and release positions and having a recess shaped to permit reception of said ball in the release position of the collar and having a surface shaped to force said ball into said annular groove on the spindle in the locking position of said collar to secure said chuck in its retracted position, means for rotating said collar between said positions operable from the exterior of said tubular housings, and a second ball received in a recess on the sleeve and engageable with opposite edges of the recess formed in the inner face of the collar to limit angular movement of the collar between its release and locking positions.

JUDSON H. MANSFIELD.
EDWIN C. SWANSON.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
593,157	Furbish	Nov. 2, 1897
632,560	Furbish	Sept. 5, 1899
902,957	Furbish	Nov. 3, 1908
1,022,311	Fegley	Apr. 2, 1912
1,401,817	Roberts	Dec. 27, 1921
1,821,194	Wilcox	Sept. 1, 1931
1,971,289	Abramson	Aug. 21, 1934

FOREIGN PATENTS

Number	Country	Date
68,476	Germany	May 9, 1893