

Jan. 15, 1957

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2,777,484

POWER OPERATED SCREW DRIVING ARRANGEMENT

Filed Oct. 10, 1955

3 Sheets-Sheet 1

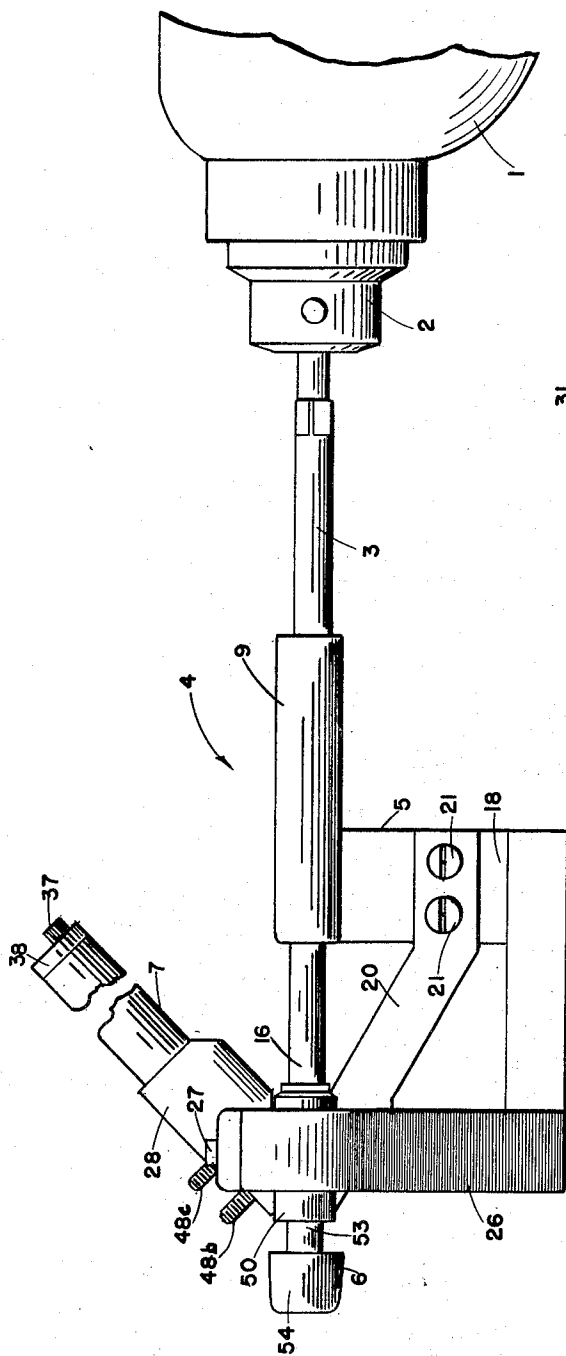


FIG. 1

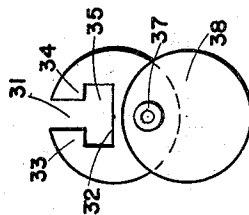


FIG. 5

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3 Sheets-Sheet 2

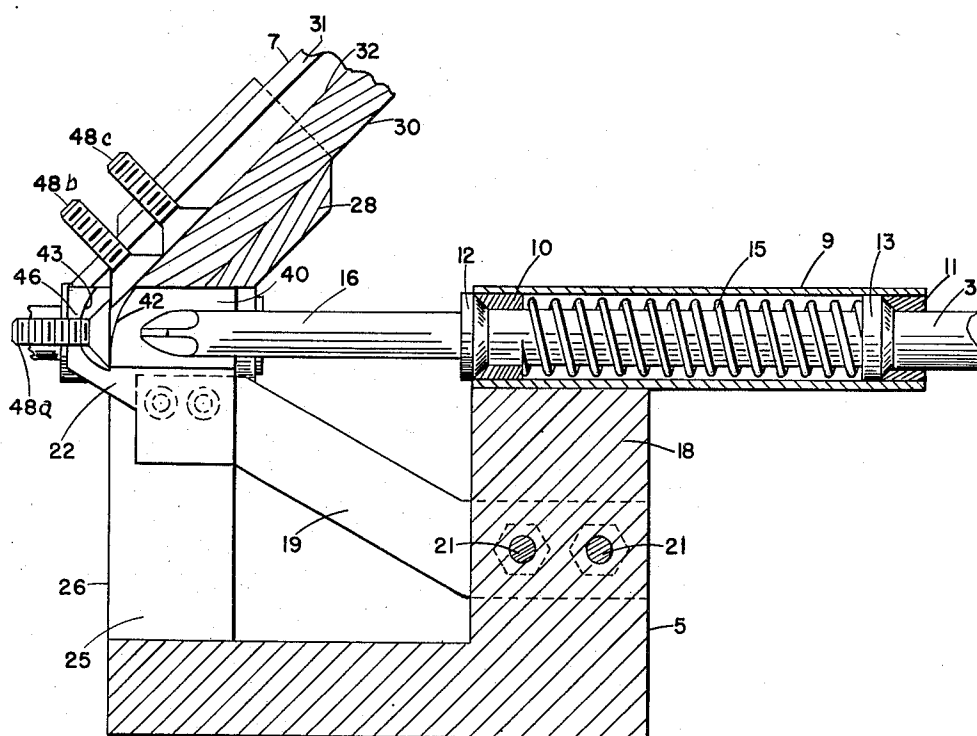


FIG. 3

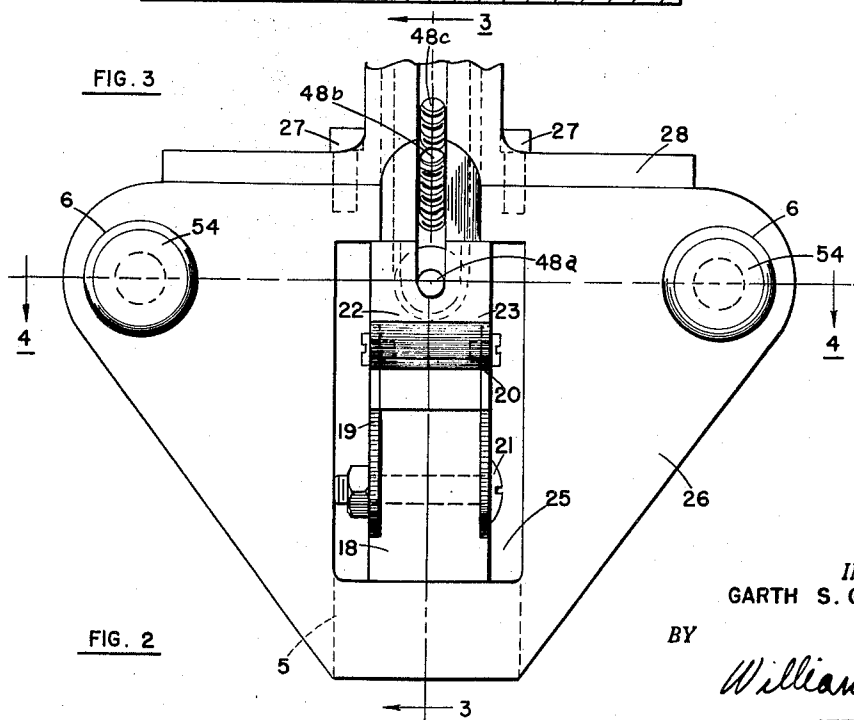


FIG. 2

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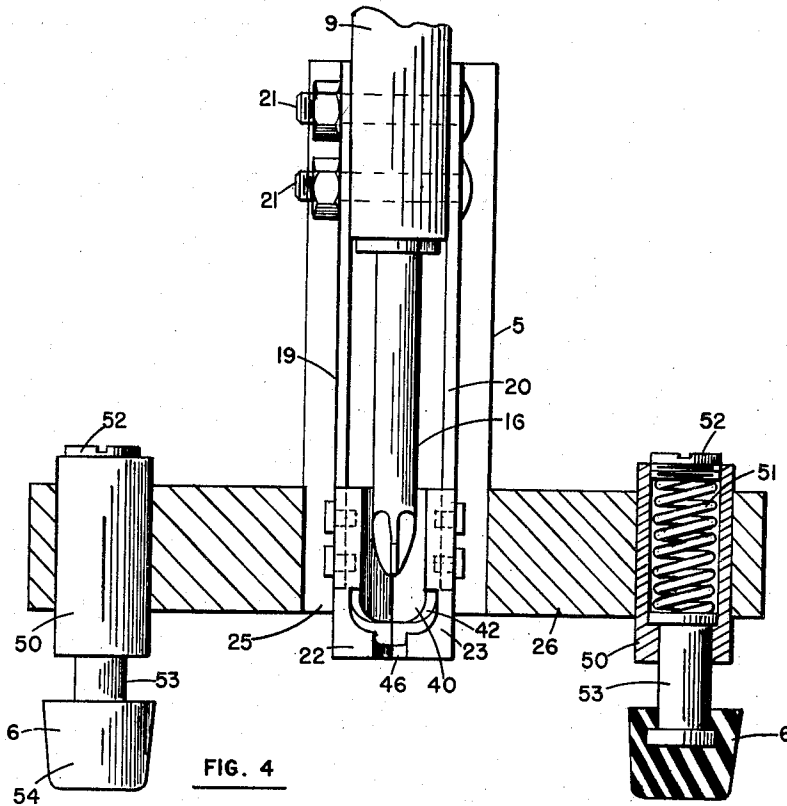


FIG. 4

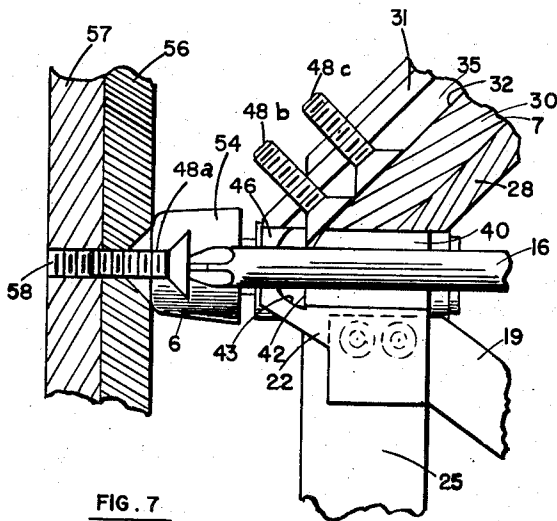


FIG. 7

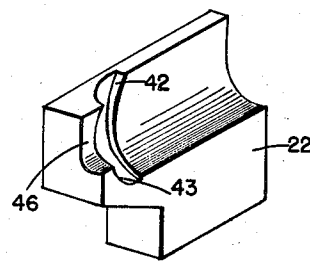


FIG. 6

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1

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POWER OPERATED SCREW DRIVING ARRANGEMENT

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Application October 10, 1955, Serial No. 539,402

6 Claims. (Cl. 144—32)

This invention pertains to a screw driving arrangement and more particularly to a device incorporating an automatic screw feeding arrangement with a power-operated driving member.

It has been customary when driving screws, even when employing a power-operated driver, to start each screw in its hole by hand. This obviously requires considerable time, is an expensive procedure, and slows down production. Subsequent rotation of the screws to their fully driven position by means of a power-operated bit will not overcome the bottleneck provided by the initial starting of the screws by hand. Various devices have been proposed for automatically starting the screws in their openings, but these have been complex in design and unsatisfactory in operation.

According to the provisions of this invention, a releasable jaw arrangement is incorporated with a power-operated driving member. A chute is included which accommodates a plurality of screws individually feeding them to the jaw members. Guide means in the jaw members advance each screw in an axial direction as it is received and position it in alignment with the driver. The following screw is caused to be in engagement with the screw which is so aligned but is disposed slightly rearwardly thereof. Movement of the bit of the power-operated driver in an axial direction releases the jaws and threads the screw in the hole. When the driving bit is retracted, the jaws again close, another screw is fed thereto, and the cycle may be repeated.

Accordingly, it is an object of this invention to provide individual and successive automatic driving of a plurality of screws.

Another object of this invention is to provide an automatic screw driving arrangement incorporating jaws releasable upon axial movement of the driving bit.

A further object of this invention is to provide an automatic screw driving means which is of simplified and portable design.

These and other objects will become apparent from the following detailed description taken in connection with the accompanying drawings in which:

Fig. 1 is a side elevational view of the screw driving arrangement of this invention;

Fig. 2 is an enlarged front elevational view of the arrangement of Fig. 1;

Fig. 3 is a sectional view taken along line 3—3 of Fig. 2;

Fig. 4 is a sectional view taken along line 4—4 of Fig. 2, but with the screws removed;

Fig. 5 is a plan view of the cap arrangement of the feed chute, with the cap in an open position;

Fig. 6 is a perspective view of one of the jaws; and,

Fig. 7 is a fragmentary sectional view showing the screw feeding and driving operations.

The overall arrangement of the screw driving system of this invention may be seen by reference to Fig. 1. A suitable power-operated driving member 1 of the type well-known in the art, such as a pneumatically-operated

2

motor, is provided with a chuck 2 and an elongated drive shaft 3. The screw feeding and holding device, indicated generally at 4, rotatably receives the drive shaft of the power-operated device. Included with the screw feeding arrangement is a base or body portion 5, work-engaging bumpers 6 projecting therefrom, and a screw supply chute 7 attached to the upper portion thereof.

The construction of the screw feeding portion of the device may be seen by reference to Figs. 2 through 4. As best shown in Fig. 3, drive shaft 3 is received within a cylindrical element 9 and rotatable therein on bearing elements 10 and 11. Shaft 3 is provided with annular collars 12 and 13 which are adapted to engage the ends of elements 10 and 11, respectively, which thereby provides a stop means limiting movement of shaft 3 to the right of the position illustrated in Fig. 3. The shaft is normally maintained in this right-hand retracted position by means of helical spring 15 which engages element 10 and collar 13 thereby loading shaft 3 to retract the same. The free outer end of shaft 3 is provided with a screw driver bit 16 which may be of the well-known cross-slot type illustrated or any other desired type of screw driving slot.

Rear portion 18 of body 5 supports not only cylindrical element 9, but also a pair of leaf springs 19 and 20 which are secured thereto by bolts 21. The opposite ends of these spring elements carry a pair of jaws 22 and 23 yieldably holding the jaws together. This positions the jaws within cutout area 25 of forward vertical portion 26 of the body. This portion of the body, by means of screws 27, carries a support 28 which mounts screw supply chute 7.

The chute may be of any suitable design, in the preferred embodiment comprising a cylindrical element 30 having an open elongated slot 31 extending the length thereof (see Fig. 5). The bottom of the slot provides a flat upper face 32 cooperating with overhanging lip portions 33 and 34 to define a screw-receiving channel 35. This channel receives the screws in the manner shown in Fig. 3 with the heads received within the channel and the shanks of the screws extending through slot 31 in the tube. The slot is of course dimensioned to freely pass the screw shanks while not permitting the heads of the screws to pass therethrough, thereby retaining the screws in the slot. The screw feed chute may be any desired length so as to hold a number of screws. The top portion of the chute mounts by means of screw 37 a cap 38, which is pivotal from the position of Fig. 1 to a position where the end of the feed chute is open as in Fig. 5 so that the chute may be filled with screws.

The two jaws, when held together by the springs, define a substantially U-shaped slot 40 which receives the driving bit of the screw driving member. The forward portion of slot 40, that is the portion remote from the screw driving bit, is provided with inclined surfaces 42 and 43. Surface 42 provides a guide means communicating with channel 35 of the screw supply chute. Surface 46 defines a more narrow and shallow portion of the slot which cooperates with inclined surfaces 42 and 43 to provide a means for receiving a screw from the feed chute. Therefore, when a screw slides down channel 35 of the chute it will be directed forwardly by inclined surface 42 into a position where it is supported in axial alignment with driving bit 16. The head of the screw rests at the bottom of surface 43 adjacent the shoulder formed by surface 42, while the shank of the screw engages surface 46. Screw 48a, as shown in Fig. 3, is in this position. The next screw 48b will slide down channel 35 to a position of engagement with the head of screw 48a. It should be noted, however, that screw 48b is displaced rearwardly of screw 48a by reason of the inclined guide portion of the jaws and the location of the feed chute

3

communicating with this part of the jaws. Screw 48c engages the periphery of the head of screw 48b.

The bumper elements 6 carried by forward portion 26 of the body are adapted to engage a workpiece and provide a means for positioning the unit. Each bumper element includes a cylindrical portion 50 containing a spring 51 retained by cap 52. The spring engages a plunger 53 carrying a rubber pad 54 from the outer end thereof. Spring 51 is a relatively stiff spring allowing movement of plunger 53 but requiring considerable force for appreciable axial movement. This plunger arrangement permits the driving bit to be axially aligned with an aperture in a workpiece regardless of a curvature or angularity of the surface of the workpiece with respect to the axis of the aperture.

The operation of the device may be seen by reference to Fig. 7. The unit is positioned with the bumpers engaging a workpiece 56 which is to be attached to workpiece 57 by means of a threaded aperture 58 in the latter member. The driving bit 16 is axially aligned with the apertures in these members by the operator of the device. At this point an axial force is exerted on driving bit 16 which may be accomplished by moving driving unit 1 toward the workpiece against the resistance of spring 15. At the same time drive shaft 3 is rotated whereby the screw 48a, in alignment with the driving bit, is picked up by the bit and urged axially forwardly. The screw, reacting against surface 43, will overcome the yieldable force exerted by leaf springs 19 and 20 thereby separating the jaws to permit the head portion of the screw to pass through the jaws. The bit thereby pushes screw 48a forwardly to a position where it enters the aperture in workpiece 56 and is threaded into aperture 58. While this is taking place, screw 48b rests on the outer diameter of bit 16 and is thereby prevented from dropping into the area left open by the separated jaws which are held open by the bit. After the driving operation is complete, the bit is withdrawn simply by releasing the axially-exerted force on the power-drive unit of the screw driver. Spring 15 will return the bit to the retracted position of Fig. 3. As the bit is withdrawn the jaws 22 and 23 are permitted to return to their normally closed position urged thereto by leaf springs 19 and 20. At the same time withdrawal of bit 16 permits screw 48b to drop into the recess in the jaws being moved forwardly by guide surface 42 as this occurs. This screw therefore assumes the position formerly occupied by screw 48a while screw 48c drops down to where screw 48b had formerly been located. Thus, the cycle may be repeated until the supply of screws within the feed chute is exhausted.

The feed chute need not be inclined upwardly at an angle relative to a vertical line but it is preferred to use such a direction so that the feed chute will not interfere with the workpiece or any surrounding structure.

It can be seen from the foregoing that I have provided a simplified automatic screw driving arrangement whereby screws may be quickly threaded into apertures as rapidly as the driving bit can be reciprocated axially. By means of the unique separable jaws, wherein the screws are advanced axially and drop within the recessed portion defined by the jaws, an individual screw feeding action is obtained without danger of jamming during the feeding operation. Furthermore, the unit is of light weight for easy manual manipulation and is simplified in design whereby construction is of low cost.

The foregoing detailed description is to be understood as given by way of illustration and example, the spirit and scope of this invention being limited only by the appended claims.

I claim:

1. An automatic screw driving arrangement comprising a body member; a bit carried by said body member with freedom for rotation and for axial reciprocation relative thereto; a pair of jaws; means yieldably holding said jaws in abutting engagement, said jaws when so positioned de-

4

fining an aperture for passing said bit therethrough in an axial direction; said jaws having a slot communicating with said aperture and further being provided with guide surfaces in said slot extending into said aperture from said side thereof, said jaws including a support portion for supporting a screw in axial alignment with said bit, said support portion being in communication with said guide surfaces and axially more remote from said bit than said guide surfaces at said one side of said jaws; and chute means for individually supplying screws to said guide surfaces of said jaws while said jaws are in such abutting engagement, said chute means including a channel communicating with said guide surfaces at said side of said jaws thereby to supply screws thereto, said jaws including surface means engageable by a screw positioned on said support portion upon axial movement of said bit for forcing said jaws apart in opposition to said yieldable means, for causing said jaws to release said screw and enabling said bit to drive the same into an aperture in a workpiece.

2. A screw driving arrangement comprising a body; a bit carried by said body with freedom for rotation and axial reciprocation relative thereto; projecting means extending from said body remote from said bit for engaging a workpiece; a chute, said chute including a channel for receiving the heads of a plurality of screws and having overhanging lip portions defining a slot for freely passing the shanks of said screws projecting from said channel while retaining the heads thereof within said channel; a pair of normally closed jaws, said jaws when closed being provided with an open side in communication with said channel and being provided with guide surfaces for receiving the head of a screw received from said channel, and including support surfaces communicating with said guide surfaces to support the head and shank of such a screw in a position of axial alignment with said bit for engagement thereby upon axial movement of said bit, said guide surfaces being directed axially from said chute in a direction away from said bit whereby a screw received by said guide surfaces is advanced to a position axially more remote from said bit when directed to said support surfaces than at the location of said channel; yieldable means holding said jaws in said closed position, said jaws including surface means engageable by the head of a screw received on said supporting surfaces for urging said jaws apart upon such axial movement of said bit thereby to release the screw held thereby for permitting said bit to advance said screw and thread the same in an aperture in a workpiece engaged by said projecting portion.

3. A device for driving a plurality of screws comprising a rotatable bit movable in an axial direction; means for effecting rotation of said bit; jaw means, said jaw means including a receptacle portion for receiving a screw in axial alignment with said bit; screw supply means connected with said jaw means for individually feeding screws thereto, said jaw means when closed including an open side adjacent said screw supply means and having guide means communicating with said screw supply means and said receptacle portion for directing a screw from said screw supply means through said open side to said receptacle portion of said jaw means while advancing such a screw to a position more remote in an axial direction from said bit than said screw feed means; means for releasing said jaws upon axial movement of said bit for permitting said bit to advance a screw from said jaws to drive the same into threaded engagement with a threaded aperture; means for returning said bit to its original position following a driving operation thereby; and means for returning said jaws to their original position when said bit is returned.

4. A screw driving arrangement comprising an axially movable rotatable bit; means for causing rotation of said bit; a pair of opposed jaws; resilient means urging

5

said jaws into abutting engagement, said jaws when in such position having an open upper side and defining a receptacle for receiving a screw in axial alignment with said bit, and further defining guide means above said receptacle for directing a screw into said receptacle through said open side, said guide means including a screw-transmitting path extending downwardly from the upper portion of said jaws and to a position axially more remote from said bit at said receptacle portion than at said upper portion; chute means connected with said upper portion of said guide means for individually supplying screws thereto, said chute means including a slot having overhanging lip portions defining a channel for engaging head portions of such screws and transmitting the same to said guide means, said jaws including means operable upon axial movement of said bit against a screw in said recess for separating said jaws and releasing said screw from said recess for permitting the same to be driven by said bit into a threaded aperture; and means for returning said bit following such a driving operation.

5. A screw driving arrangement comprising a base member; a bit carried thereby with freedom for rotation and axial movement relative thereto, said base member including projecting means for engaging the surface of a work-piece adjacent a threaded aperture therein; normally closed jaw means carried by said base member, said jaw means when closed including an open side and guide means to receive a screw and conduct the same through said open side to a position in axial alignment with said bit and axially more remote from said bit than the location where said screw is received by said guide means, said screw being thereby disposed in a position for engagement by said bit upon axial advancement of the same; said jaw means including means operable upon such axial advancement of said bit relative thereto for releasing a screw held thereby to permit said bit to drive the same into threaded engagement with said threaded aperture;

6

and means for individually supplying screws to said guide means.

6. A screw driving arrangement comprising a bit member; means for effecting rotation of said bit member; a screw feed chute, said chute having a downwardly extending channel including a slot with overhanging lip portions for engaging the heads of screws with the shanks thereof projecting beyond said slot and transmitting said screws through a path defined thereby; a pair of normally closed jaws at the base of said chute, said jaws when closed including an open side and guide means for receiving a screw from said chute and conducting the same through said open side to a position of axial alignment with said bit and axially more remote from said bit than the bottom of said channel of said screw feed chute; spring means maintaining said jaws in said closed position; and support means carrying said spring means, said support means including projecting portions adapted to engage a workpiece adjacent a threaded aperture therein, said support means engaging said bit so as to permit rotational and axial movement thereof relative thereto whereby said bit is movable to a position of engagement with a screw in said jaws to advance the same to threaded engagement with said aperture, said jaws including means operable upon such movement of said bit for opening said jaws and releasing a screw received thereby.

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