Nov. 24, 1925. 1,562,862

C. BODMER

RATCHET SCREW DRIVER

Filed Jan. 19, 1924

Fig. 1.

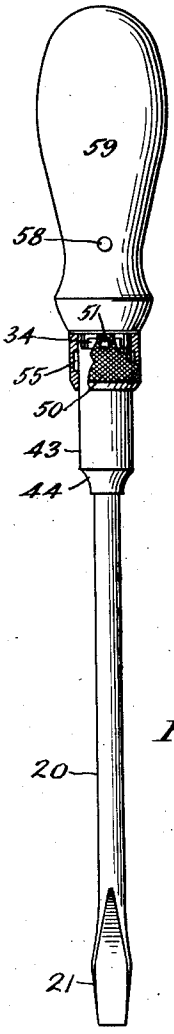


Fig. 2.

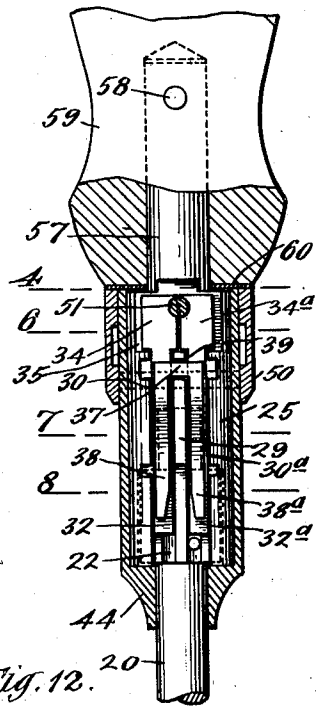


Fig. 3.

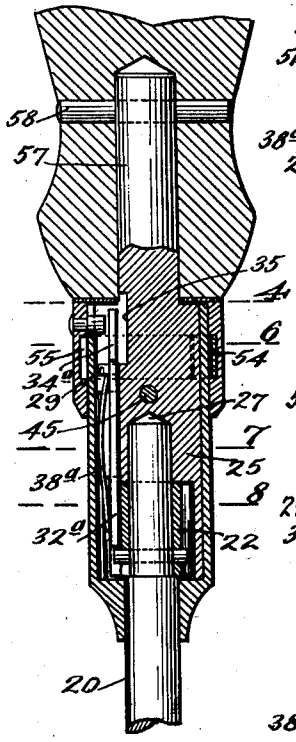


Fig. 4.

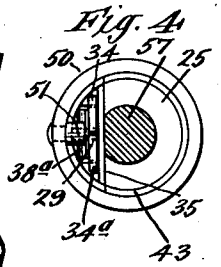


Fig. 5.

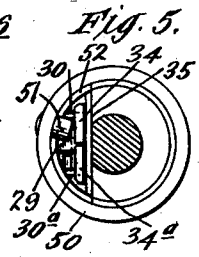


Fig. 6.

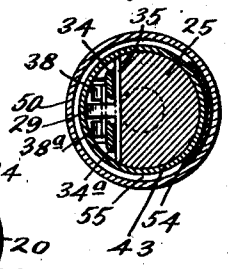


Fig. 12.

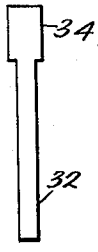


Fig. 7.

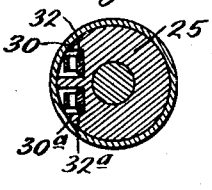


Fig. 8.

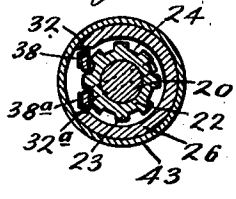


Fig. 13.

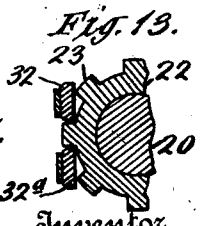


Fig. 9.

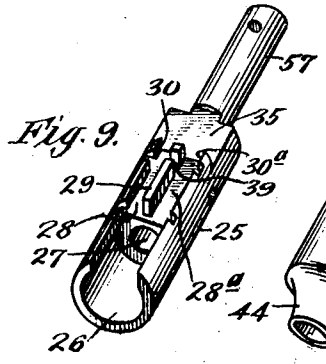


Fig. 10.

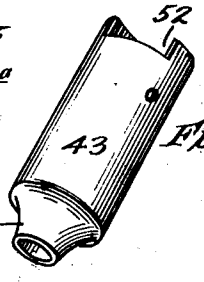
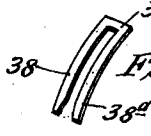


Fig. 11.



Inventor

Christian Bodmer

By his Attorneys

Philipp Lawyer Lie Kenney

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UNITED STATES PATENT OFFICE.

CHRISTIAN BODMER, OF NEW BRITAIN, CONNECTICUT, ASSIGNOR TO THE STANLEY WORKS, OF NEW BRITAIN, CONNECTICUT, A CORPORATION OF CONNECTICUT.

RATCHET SCREW DRIVER.

Application filed January 19, 1924. Serial No. 687,222.

To all whom it may concern:

Be it known that I, CHRISTIAN BODMER, a citizen of the United States, residing at New Britain, county of Hartford, and State of Connecticut, have invented certain new and useful Improvements in Ratchet Screw Drivers, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to ratchet screw drivers and like tools.

It is the principal object of the invention to provide an improved ratchet screw driver or similar tool that is strong and durable and that is economical to manufacture.

With this general object in view the invention consists in the features, combinations, details of construction and arrangements of parts which will first be described in connection with the accompanying drawing and then more particularly pointed out.

In the drawing—

Fig. 1 is a face view of a screw driver constructed in accordance with the invention, parts being shown broken away and in section;

Fig. 2 is an enlarged view showing part of the screw driver in longitudinal section;

Fig. 3 is a similar view, the section being taken at right angles to that of Fig. 2;

Fig. 4 is a sectional view taken on the line 4—4 of Figs. 2 and 3;

Fig. 5 is a similar view showing a different position of the parts;

Figs. 6–8 are sectional views taken on lines 6—6 to 8—8 of Figs. 2 and 3;

Fig. 9 is a perspective view of the pawl carrier removed;

Fig. 10 is a perspective view of the pawl housing removed;

Fig. 11 is a similar view of the pawl spring removed;

Fig. 12 is a plan view of one of the pawls; and,

Fig. 13 is an enlarged view of part of Fig. 8.

Referring to the drawing, in which the invention is illustrated as embodied in a ratchet screw driver, there is provided a blade, or part to be operated, having a rachet thereon. In the embodiment illustrated, a blade 20 is formed from round stock and is suitably shaped at its outer end, as indicated at 21 (Fig. 1). Adjacent, but short of, the inner end of the blade is pinned or otherwise secured, a ratchet 22. This ratchet has alternate teeth 23 and grooves 24 paralleling the axis of the blade, the ratchet having a form somewhat like a spur gear (Figs. 3 and 8).

Cooperating with the ratchet are two reversely acting selective pawls, either one of which may be thrown out of action, and in structures embodying the invention to what is now considered the best advantage, the pawls are freely positioned in open grooves in a carrier, the grooves being located side by side in a plane. Although capable of various constructions in that here shown as an example, a carrier 25 is formed from a cylindrical block and is provided with two open parallel grooves 28, 28ª, located side by side, and having flat bottoms lying in the same plane. These grooves, as shown, are separated by a dividing wall 29 and are bounded by side abutment walls 30, 30ª, which are substantially perpendicular to the groove bottoms. These grooves may be formed by suitable cutters as hereinafter described. Forward of the grooves the block forming the carrier is hollowed out to provide a recess 26 for receiving the ratchet. This recess is enclosed by a sleeve like part of the block which houses the ratchet 22 with a close guiding fit, the recess having substantially the same length as the ratchet. The sleeve like part of the block is cut away (Fig. 9) adjacent the grooves 28, 28ª, to give access to the ratchet for the pawls. As shown, the walls defining the cut away portion are continuations of the walls 30, 30ª. The block forming the carrier, in the present embodiment, is bored, as at 27, at the inner end of the ratchet receiving recess, to provide a bearing for the inner end of the blade 20, the face of the block surrounding this bore 27 serving as an abutment for the inner face of the ratchet, as later referred to.

Freely positioned in the grooves 28, 28ª, are the pawls 32, 32ª. These pawls, as here exemplified, comprise long flat bars of a width to fit within the grooves and of a length to project forwardly a substantial distance over the ratchet. Normally the pawls are seated on the groove bottoms. In this position the forward ends of the pawls lie in a plane that cuts the circumference of the ratchet (Fig. 8), the pawl 32 being

located between a ratchet tooth and the side wall 30 and the pawl 32ª being located between the opposite side of the same ratchet tooth and the side wall 30ª. In this connection, it is noted that the pawls are wider than the ratchet grooves and so cannot drop into the latter, thereby jamming the ratchet mechanism. As illustrated in Fig. 8, when the pawl is forced against the ratchet the bite of the pawl is substantially at the root of the ratchet tooth.

To enable either pawl to be thrown out of action, provision is made for permitting tilting of the pawls into an inactive position. To this end, as here shown as an example, the grooves 28, 28ª and their walls terminate, at the inner end, at a flat surface 35 the plane of which is stepped down from the plane of the pawl grooves (Fig. 3). The rear ends of the pawls are suspended over the surface 35 and can be tilted over the ledge formed between this surface and the groove bottoms.

The pawls of the present embodiment are constructed to enable them to be anchored against forward movement and so as to be interchangeable duplicates. To this end, the pawls are roughly T-shaped, the widened ends 34, 34ª being suspended over the surface 35 as above described. When the pawl 32 is in position, the shoulders formed by the widened portion 34 are hooked around the ends of the side wall 30 and the dividing wall 29. Similarly the shoulders of pawl 32ª are hooked around the ends of the side wall 30ª and the wall 29. This relation of the parts aids in locating the pawls during assembly and anchors them against any forward dislodgment.

The pawls are conveniently formed by a simple stamping operation and as they are interchangeable duplicates only one set of stamping tools is required. Moreover, the pawls are interchangeable without reversal of the direction of facing because of the T-shape with symmetrical shoulders. In punching articles from sheet metal, the face of the stamping opposed to the female die ordinarily has slightly rounded edges while the other face has sharp edges. It is considered desirable to assemble the pawls with the sharp edge faced toward the ratchet (Fig. 13). With pawls constructed as described the pawls may always have this face toward the ratchet and at the same time are interchangeable duplicates.

There is provided spring means for normally holding the pawls in ratchet engaging position, and in structures embodying the invention to what is now considered the best advantage, there is a one-piece spring element common to the two pawls and freely positioned on top of the latter. Although capable of various constructions, as here shown as an example, the spring element is roughly U-shaped and comprises a cross bar 37 and two bent spring arms 38, 38ª (Fig. 11). The spring is freely positioned on the pawls with the cross bar 38 seated on both pawls and the forward end of each arm seated on its corresponding pawl (Figs. 2 and 3). In the present embodiment, the dividing wall 29 is formed with a notch 39 which receives the cross bar 37 of the spring. This notch aids in locating the spring and anchors it against longitudinal movement. The spring element described may conveniently be formed by a simple stamping operation.

There is provided an abutment for the convex spring arms 38, 38ª. This may be conveniently accomplished by means of an element which serves as a retaining housing for the spring and pawls and provides a bearing for the blade and an anchoring abutment for the ratchet. Although capable of various constructions, in the present embodiment, embracing the pawl carrier 25 with slip fit is a cylindrical housing 43 of a length to house the carrier. The parts are so arranged that the inner wall of the housing serves as an abutment for the spring arms 38, 38ª and the housing serves as a retaining housing for the freely positioned pawls and spring element. At its forward end the housing has a solid, contracted portion 44, bored to provide a bearing for the blade outside the ratchet. The inner face of this portion 44 provides an abutment for the forward face of the ratchet. The housing may be secured to the carrier in any suitable manner such, for example, as a cross pin 45 which passes through a hole bored in the body of the carrier and alining holes in the housing.

With the construction described, not only does the element 43 serve as a housing and as an abutment for the bent bar spring element, but its solid portion 44 in connection with the end of the solid portion of the carrier confines the ratchet and thus firmly anchors the blade against longitudinal play. Moreover, the housing and carrier together provide bearings for the blade on both sides of the ratchet, thus giving a strong, rugged construction.

There is provided selective means for placing one pawl or the other into an inactive position. Although capable of various constructions, as here shown as an example, rotatably mounted on the housing 43, at its rear or inner end, is a knurled collar 50. Extending radially inwardly from the collar 50 is a pin or lug 51 located over the rear ends of the pawls, the housing having a cut-away notch 52 to provide access to the pawls. The lug 51 is of such length that when it is located between the pawls (Figs. 2–4) it is clear of both of them. When, however, the sleeve is rotated slightly

to the right of this neutral position, the lug presses down the rear end of one pawl and thus tilts the forward end upwardly away from the ratchet, the pawl tilting over the ledge formed by the junction of the groove and the stepped surface 35. By turning the collar to the other side of the neutral position, its lug 51 similarly tilts the other pawl into an inactive position.

There is provided means for releasably holding the selective means in shifted position. This may be accomplished, for example, by a friction spring, and in structures embodying the invention to the best advantage, the spring is of a type easy to assemble. As here shown as an example, a bent bar spring 54 is located between the collar 50 and the housing 43. This spring seats in a shallow circumferential groove 55 formed on the interior of the collar 50. When the parts are assembled the spring is bent into substantially the arc of the collar and by its pressure between collar and housing, it releasably holds the collar in shifted position. To assemble the parts the spring is placed in the groove and bent to its arc, by pliers or any suitable tool, until the sleeve is slipped over the housing. The ends of the notch 52 act, if necessary, as stop means for the movements of the lug 51. The collar and housing may be given any suitable markings to indicate neutral position. In the embodiment here illustrated the collar 50 extends forwardly beyond pin 45 and so serves to retain the latter in position.

A handle is provided and in structures embodying the invention to the best advantage the handle serves as an end retaining wall for the pawl carrier and its associated parts. As here illustrated as an example, integral with the carrier block 25 is a rearwardly extending stem 57. Secured to this stem by means of a pin 58 is a solid wooden handle 59 having a flat end face bored to receive the stem. As shown in Figs. 2 and 3, the pawl carrier 25, the housing 43 and the collar 50 are substantially conterminous. When the handle is in place, its flat end face is in close proximity to the parts just mentioned and serves as an end retaining or stop wall. In the present embodiment, a metal washer 60 is located between the end of the handle and the pawl carrier and associated parts. This washer serves, in effect, as a metal facing for the end of the wooden handle.

The pawl carrier above described makes possible a desirable type of pawl and ratchet mechanism and at the same time it is relatively economical to manufacture. The carrier illustrated may conveniently be made as follows: From rod stock a cylindrical block and stem of the desired dimensions are formed. By means of screw machine operations the ratchet receiving recess 26 and the bore 27 are formed. The transverse hole for pin 45 is then bored in the block. By means of a milling machine the longitudinal slots 28, 28ª are cut by two cutters. This operation cuts slots in that part of the block defining the cut away portion of the receiving recess 26, the dividing wall 29 extending forwardly over said recess. The block is next placed in a milling machine having three suitable transverse cutters. One forms the flat surface 35, the second cuts notch 39 for anchoring the spring element; the third cuts off the dividing wall 29 at the end of the grooves and thus completes the formation of the cut away portion of the block at the recess 26. These cross cutting operations form notches in the side walls 30, 30ª, as appears in Fig. 9 but these notches do not interfere with the function of the walls. During these milling operations the blocks are conveniently located in the jigs by means of the transverse pin hole. Sets of cutters in a gang for milling several blocks simultaneously may, of course, be used.

In operation, assuming the selective collar 50 to be shifted to the right (looking from the handle down the blade), the lug 51 engages the right hand pawl 32 and tilts the same into an inactive position. The screw driver is now arranged for right hand, i. e., clockwise, operation. As the handle and carrier 25, which are secured together to move as a unit, are turned to the right, the ratchet is moved with them. This results in a like rotation of the operated part, e. g., the blade 20, for driving a screw due to the pawl 32ª being forced by the carrier against a ratchet tooth. Following each driving stroke the handle may be given an idle reverse rotation. During such idle stroke the blade remains stationary as the carrier moves around the ratchet, the pawl sliding over the ratchet teeth. At the end of the reverse stroke of the handle the pawl drops into position behind another ratchet tooth because of spring arm 38ª and the driving stroke may be repeated.

For a left hand, or counter clockwise drive, the collar 50 is shifted over to the left. This releases pawl 32, which is moved back to active position by its spring arm 38, and lug 51 tilts the other pawl 32ª into inactive position. The relative movements are now reversed. Upon a left hand turn being given the handle, pawl 32 is forced by the carrier against a ratchet tooth and the ratchet and blade are rotated to the left with the handle. The handle may make an idle reverse stroke to the right, the pawl sliding over the ratchet teeth in the manner described.

Should it be desired to use the screw driver as one of the non-ratchet type, the collar 50 is turned to neutral position. In this position (Figs. 4 and 8) the lug 51 is located

between the two pawls, engaging neither, and both pawls are in active or locked position. Consequently, in whichever direction the handle is turned, handle and blade turn as a unit.

With the construction described the parts are easily and economically assembled; the construction is such that any applied force is transmitted to the blade, short of a force sufficient to crush the pawls; and the tool as a whole is strong and durable and is economical to manufacture.

What I claim is:

1. A pawl carrier for a ratchet screw driver or like tool comprising a block having a ratchet receiving recess, two pawl-receiving open parallel grooves located side by side in a plane, a flat surface at which the dividing wall and outer walls of the grooves terminate and which lies in a plane lower than that of the grooves, the wall of the ratchet-receiving recess being cut away adjacent the grooves, with the walls defining the cut away portion being continuations of the outer walls of the grooves.

2. A pawl carrier for a ratchet screw driver or like tool comprising a block having a ratchet-receiving recess, two pawl-receiving open parallel grooves located side by side in a plane, a surface at which the dividing wall and outer walls of the grooves terminate and which lies in a plane lower than that of the grooves, the dividing wall between the grooves having a cross notch for receiving a spring element, and the block having a transverse hole for receiving a pin.

3. A screw driver or like tool comprising a cylindrical block having a recess for a ratchet and two grooves for pawls, the portion of the block defining said recess being cut away to form abutment walls in continuation of the outer walls of said grooves, a blade having a ratchet thereon with its teeth and grooves paralleling the axis of the blade, the ratchet being located in said recess, two reversely acting pawls freely positioned in said grooves and having their ends extending over said ratchet, a spring element freely mounted on said pawls, the block being cut away to the rear of said grooves to provide a ledge over which the pawls may tilt, a cylindrical housing closely fitting said block and providing an abutment for said spring element and having a ratchet-anchoring portion at its forward end, and selective means for engaging one pawl or the other to tilt the same into inactive position with relation to the ratchet.

4. A screw driver or like tool comprising a cylindrical block having at one end a stem for receiving a handle and at the other end a ratchet-receiving recess and having two grooves for pawls, the portion of the block defining said recess being cut away to form abutment walls in continuation of the outer walls of said grooves, a blade having a ratchet thereon with its teeth and grooves paralleling the axis of the blade, the ratchet being located in said recess, two reversely acting pawls freely positioned in said grooves and having their ends extending over said ratchet, a spring element freely mounted on said pawls, the block being cut away to the rear of said grooves to provide a ledge over which the pawls may tilt, a cylindrical housing closely fitting said block and providing an abutment for said spring element and having a ratchet-anchoring portion at its forward end, a collar rotatably mounted on the housing, a pawl engaging element on said collar for engaging one pawl or the other to tilt the same into inactive position with respect to the ratchet, the housing being cut away to give said element access to the rear ends of the pawls, and a handle on said stem.

5. A screw driver or like tool comprising a cylindrical block having a recess for a ratchet and being cut away to form seats and oppositely disposed abutment walls for pawls, the portion of the block defining said recess being cut away to form continuations of said abutment walls, a blade having a ratchet thereon located in said recess, two reversely acting pawls freely positioned on said seats and between said walls and having their ends extending over said ratchet, a spring element freely mounted on said pawls, the block being formed to permit tilting of the pawls, a cylindrical housing closely fitting said block and providing an abutment for said spring element, and selective means for tilting one pawl or the other into inactive position with respect to the ratchet.

6. A screw driver or like tool comprising a blade having a ratchet thereon, a cylindrical block formed with a ratchet-receiving recess and two pawl-receiving open parallel grooves located side by side in a plane, the block having a surface at which the dividing wall and outer walls of the grooves terminate and which lies in a plane lower than that of the grooves and having a cross notch, two reversely acting pawls located in said grooves and having their ends extending over the ratchet and over said surface, a spring element comprising two leaf springs and a cross bar freely mounted on said pawls with its cross bar located in said notch, a cylindrical housing enclosing said block and serving as an abutment for the springs, and selective means for tilting one pawl or the other over the shoulder formed between the grooves and said surface.

7. A screw driver or like tool comprising a blade having a ratchet thereon short of the end thereof, a cylindrical block formed with a recess for receiving said ratchet and having an axial bore or recess for receiving the inner end of the blade, said block having

grooves for pawls, the portion of the block defining said ratchet-receiving recess being cut away to form abutment walls in continuation of the outer walls of said grooves, two reversely acting pawls freely seated in said grooves and having their ends extending over said ratchet, a spring element freely mounted on said pawls, the block being formed to permit tilting of the pawls, a cylindrical housing closely fitting said block and serving as an abutment for said spring element and having a ratchet-anchoring portion, and selective means for tilting one pawl or the other into inactive position.

8. A pawl carrier for a ratchet screw driver or like tool comprising a block having a ratchet-receiving recess, two pawl-receiving, open parallel grooves located side by side in a plane, a surface at which the dividing wall and outer walls of the grooves terminate and which lies in a plane lower than that of the grooves, the dividing wall between the grooves having a cross notch for receiving a spring element.

9. A pawl carrier for a ratchet screw driver or like tool comprising a block having a ratchet-receiving recess, the block being formed with flat axial surfaces, for receiving pawls, and opposing abutment walls, the portion of the block defining the recess being cut away to form continuations of said walls, and the block being cut down at the end of said surfaces to form shoulders therewith over which pawls may be tilted.

In testimony whereof, I have hereunto set my hand.

CHRISTIAN BODMER.