FOLDING SCREW DRIVER

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My invention relates to hand tools and particularly to tools such as screwdrivers, chisels, socket wrenches and the like.

The principal object of my invention is to provide a tool of the character mentioned above which may be folded into a compact unit and by means of which, when unfolded to form a screwdriver or wrench, a very powerful turning moment may be applied to a screw or nut. Another object is to provide a tool, such as a screwdriver, in which the shank or blade may be positioned in axial alignment with the handle or in which the handle may be laterally offset from the axis of the shank or blade whereby a greater turning moment may be applied to the tool than is the case when the blade or shank is coaxial with the handle. A further object is to provide in a single unit two tools of somewhat different character and which is so designed that either of the tools may be so disposed with respect to the other tool as to form a laterally offset handle portion whereby a greater turning moment may be applied to the tool than would be the case if the handle were coaxial therewith.

I accomplish these and other objects which will be apparent as the description proceeds by means of the novel combination of elements described below and illustrated in the accompanying drawing in which—

Fig. 1 is a side elevation of my tool when folded;

Fig. 2 is a top plan view thereof;

Fig. 3 is a bottom plan view thereof;

Fig. 4 is a left hand side view of the device as shown in Fig. 1;

Fig. 5 is a vertical section through my tool with the parts thereof in one position;

Fig. 6 is a section of Fig. 5 in the plane 6—6;

Fig. 7 is an enlarged fragmentary section of Fig. 5 in the plane 7—7;

Fig. 8 is an elevation view of a bushing; and

Fig. 9 is a top plan view of the bushing shown in Fig. 8.

Referring to the drawing—

My device comprises an elongated handle 1, preferably of metal or plastic, having axial recesses 2 and 3 extending inwardly from each end thereof. Opposite sides of the handle are provided with longitudinal grooves or recesses 4 and 5 which extend from end to end thereof. At each end of the handle, there is a transversely-extending slot 6 which communicates both with the adjacent axially-extending recess in the handle and also with each of the longitudinally-extending grooves or recesses in the opposite sides of the handle.

For the purpose of explaining my invention, I have illustrated it, and shall describe it below, as applied to a screwdriver, but it is to be understood that the invention is equally applicable to other tools and particularly to rotary tools which are used to tighten or loosen elements such as nuts, screws or bolts. As illustrated, 1 represents generally the shank of an ordinary screwdriver having a blade 8, while 2 represents generally the shank of a screwdriver having blade 10 adapted to drive or loosen Phillips screws.

Each of the shanks 7 and 9 comprises three articulated sections. Thus, the shank 7 comprises a comparatively long section 11, a comparatively short section 12, and a link 13 which pivotally connects the adjacent ends of the sections 11 and 12 together, as shown at 14 and 15. Similarly, the shank 9 comprises a comparatively long section 16, a comparatively short section 17, and a link 18 which pivotally connects the adjacent ends of said sections together, as shown at 19 and 20. The shanks 7 and 9 are substantially identical except for the shape of the blades at the ends thereof. In cross section, the portions 11 and 12 of the shank 7 and the portions 16 and 17 of the shank 9 are preferably square and adapted to fit quite closely into the longitudinally-extending grooves or recesses 4 and 5 in the sides of the handle, and also in the transversely-extending slots 6 in the ends of the handle. The sides of the slots 6 closely embrace the shanks when said shanks are disposed at right angles to the handle, as shown in the upper part of Fig. 5, and thus prevent the shanks, when so disposed, from rotating about the axis of the other sections of the shanks within the handle.

In order to prevent the tool shanks from turning in the handle, bushings 21 are press-fitted into the open ends of the recesses 2 and 3. The bushings 21 are cylindrical on the outside and initially cylindrical on the inside; the inside diameter being slightly less than the diagonal of the shank sections 11 and 16. Four grooves 22 (see Fig. 9) having their sides disposed at right angles to each other are broached out of the inside of the bushings to form a running fit with the shanks 11 and 16 so that the cooperation of the bushings with the corners of the shanks prevents relative rotative movement thereof. Portions 23 of the bushings which would otherwise obstruct the slots 6 in the ends of the handle are also removed. In assembling the device, the bushings are, of course, first fitted over the
shanks and then pressed into the handle. To prevent the shanks from being withdrawn entirely from the axial recesses in the handle, pins 24 are pressed or driven into the sections 12 and 17 of the shanks near the inner ends thereof, and, by contact with the inner ends of the bushing 21, limit the distance to which the shanks may be pulled from the handle. In order to maintain the shanks substantially straight within the recesses 2 and 3, flat springs 25 are positioned within the recesses between the bottoms thereof and the inner ends of the bushings and are biased to force the shanks toward the opposite side of the recess. The length of the pins 24 is also such that, when in contact with the wall of the recess, the sections 12 and 17 are in alignment with the passages through the bushings.

When not in use, the tool may be folded, as illustrated in Figs. 1, 2, 3 and 4, so that it may be carried in the pocket very much like a jackknife. In order to fold the shanks, they are pulled out of the handle as far as possible or, in other words, until the pins 24 on the shank contact the inner ends of the bushing 21. When withdrawn as far as possible, the pivot 19 (see Fig. 5), for example, may be moved into the position occupied by the pivot 20 whereupon the link 18 may be folded over into the slot 6 and the section 16 of the shank folded down into the groove or recess 4. In order to use the screwdriver, it is merely necessary to straighten out the shank and push it into the handle as far as it will go as shown in the lower part of Fig. 5. Where no particularly strong force is required to be applied to the blade 8, the other shank 5 may remain in folded condition so that the tool may be used as any ordinary screwdriver having a handle and blade. However, if a stronger tightening or loosening force is required to be applied, say to the shank 7, the shank 5 may be opened up to the position shown in Fig. 5 so that it is substantially at right angles to the axis of the shaft 11 and the handle 1 whereupon the tool may be steadied by grasping the handle 1 in one hand and utilizing the offset shaft 9 with the other hand to apply a powerful turning moment to the shank 7. Instead of using the screwdriver as just described, the shank 7, as shown in Fig. 5, may be used as an extension of the handle 1 for turning the shank 5, or it may be pulled out of the handle and folded into closed position so that the shank 5 and the handle 1 will then form a less powerful offset screwdriver but by means of which a very strong turning moment can be applied to the shank 5.

While I have described my invention in its preferred embodiment, it is to be understood that the words which I have used are words of description rather than of limitation and that changes, within the purview of the appended claims, may be made without departing from the true scope and spirit of my invention in its broader aspects.

What I claim is:

1. A folding screw driver comprising an elongated handle having an axially extending recess in the end thereof and a slot extending transversely of said end and communicating with said recess; a shank comprising a comparatively short section having a blade at one end, a comparatively short section slidably mounted in said recess, and a comparatively short link hingedly connecting said sections together; said recess being of a depth at least sufficient to receive therein said short section, said link and a portion of said long section adjacent said link when said sections and said link are in axial alignment, and being provided with means cooperating with said shank to prevent relative rotation of said shank and handle; whereby to maintain said parts in fixed alignment with said handle when so received; said slot being of a width adapting the portion of said long section adjacent said link to lie therein when said long section is disposed at right angles to said handle to form an offset screw driver; and said link being of a width adapting it to lie in said slot, and of a length adapting said long section to be folded to lie substantially throughout against the outside of said handle when said link is in said slot.

2. A folding screw driver of the character described comprising an elongated handle having an axially extending recess in each end thereof, two oppositely disposed, longitudinally-extending grooves in the exterior thereof, and a transversely-extending slot in each end thereof communicating with the adjacent recess in said handle and at least one of said grooves; a pair of shanks each comprising an elongated first section adapted to lie in one of said grooves and also to be closely engaged by the sides of the slot communicating with said groove when disposed at right angles to said handle, a comparatively short second section slidably mounted in one of said recesses, and a comparatively short link pivotally connecting said sections together and adapted to lie in one of said slots when the first section of one shank is connected thereto lies in one of said grooves; each of said recesses being of a depth adapted to receive a link and a portion of the first section of the shank connected to said link when said shank sections are in alignment; at least one of said first sections having a blade at an end thereof; and means in each recess cooperating with the shank therein to prevent relative rotation of said shank and handle; whereby, when the first section of one of said shanks having a blade thereon is disposed at right angles to the handle, the other of said shanks may be positioned coaxially with and form an extension of said handle to provide increased leverage for rotating the shank at right angles thereto.

RICHARD MAROOG.

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