Jan. 3, 1956 J. HOPTA 2,728,984

TOOL ELEMENT LOCKING MEANS FOR FOLDABLE TOOLS

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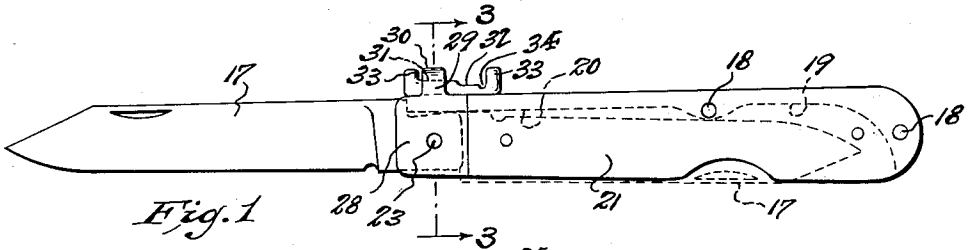

Fig. 1

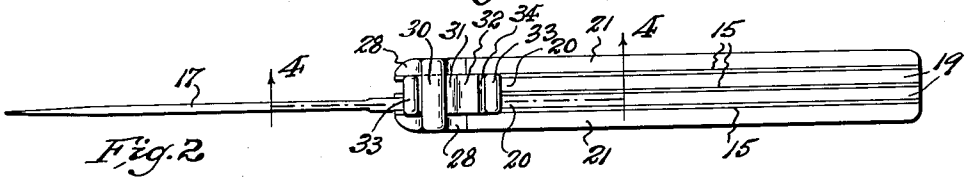

Fig. 2

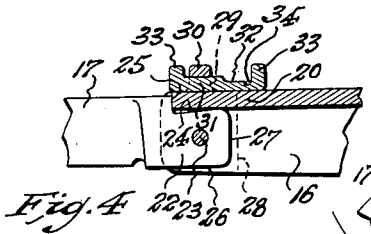

Fig. 4

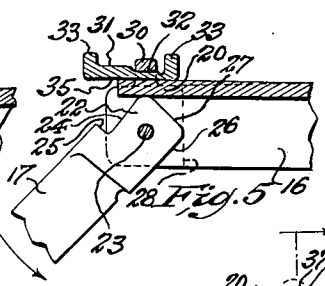

Fig. 5

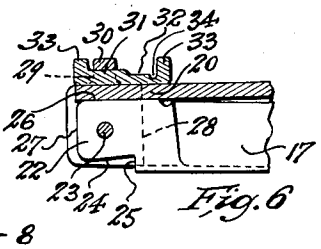

Fig. 6

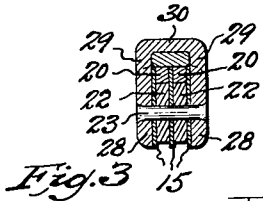

Fig. 3

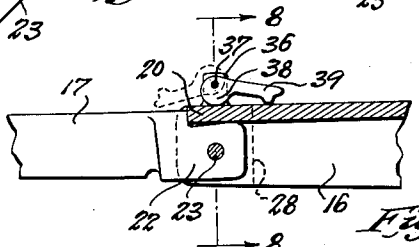

Fig. 7

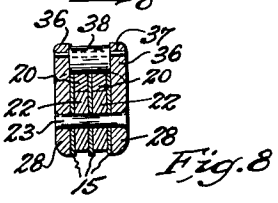

Fig. 8

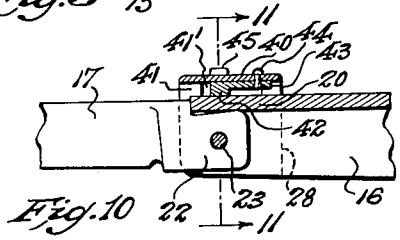

Fig. 10

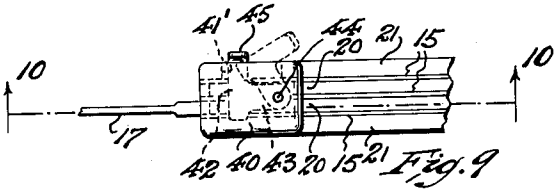

Fig. 9

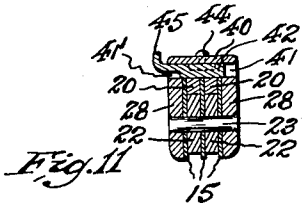

Fig. 11

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TOOL ELEMENT LOCKING MEANS FOR FOLDABLE TOOLS

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3 Claims. (Cl. 30—161)

This invention relates to improvements in tools of the kind having a handle to which one or more tool elements are pivotally connected so as to be optionally infolded thereinto in out of service position or out-swung therefrom to a position for use; and this invention has reference, more particularly, to improved manipulatable means for locking the tool element or elements in either in-folded or out-swung position, and especially against collapse or accidental displacement from the latter position when in use.

The invention has for an object to provide in combination with a foldable tool, such e. g. as a pocket knife, wherein the handle thereof is provided with spring means to bear upon the tang of a pivoted tool element so as to yieldably retain said element in open or closed position, manipulatable locking means cooperative with the spring means whereby to prevent the latter from yielding to pivotal movement of a tool element engaged thereby, especially when said element is extended from the handle for use, and thus to prevent collapse of the tool element when in use with risk of injury to the user.

The above stated and other objects of this invention will become apparent from a reading of the following description of the invention in connection with the accompanying drawings, in which:

Fig. 1 is a side elevational view of a pocket knife form of tool embodying this invention and showing, by full lines, a knife blade thereof as extended from the handle and secured by the novel locking means in position for use, and, by broken lines, in-folded and secured within the handle in out of service position; Fig. 2 is a top edge elevational view of the same; and Fig. 3 is a cross-sectional view, taken on line 3—3 in Fig. 1.

Fig. 4 is a fragmentary longitudinal sectional view, taken on line 4—4 in Fig. 2; Fig. 5 is a similar view, but showing the locking means released, and the knife blade in the course of its in-swinging movement to closed position within the handle; and Fig. 6 is also a similar view, showing the blade in closed position within the handle, and the locking means disposed to lock the same therein.

Fig. 7 is a fragmentary longitudinal sectional view, similar to that of Fig. 5, but showing a modified form of locking means according to this invention; and Fig. 8 is a cross-sectional view, taken on line 8—8 in Fig. 7.

Fig. 9 is a fragmentary top edge elevational view, similar to that of Fig. 2, but showing another modified form of locking means according to this invention; Fig. 10 is a longitudinal sectional view through the same, taken on line 10—10 in Fig. 9; and Fig. 11 is a cross-sectional view, taken on line 11—11 in Fig. 10.

Similar characters of reference are employed in the several views, to indicate corresponding parts.

The tool according to this invention comprises a handle of the type formed by laterally spaced apart scale or frame plates 15 which provide intermediate space 16 for reception of a tool element, such e. g. as a knife blade 17. Affixed by transverse rivets 18 to and between scale or frame plates 15, so as to be anchored within

the outer end portion of the handle in extension within and along the back of a space 16, is a spring member 19 having a yieldable spring arm 20 which extends forwardly to the inner end of the handle. Secured to the external faces of outer scale or frame plates 15 are the face plates 21 of the handle, the inner ends of which abut external bolster means with which the inner end of the handle is furnished. The tang 22 of a knife blade 17 is lodged within the inner end of a space 16 between opposed scale or frame plates 15, and is pivotally supported by a transverse pivoting rivet 23 which extends through the inner end portion of the handle, and which also serves to affix the bolster means to the handle structure. The tang 22 is formed to provide a longitudinal back edge 24 terminated at its inner end by a stop shoulder 25 angular thereto, and is also formed to provide a longitudinal front edge 26. When the knife blade 17 is out-swung to extend from the handle in position of use, the cooperating spring arm 20 tensionally bears upon the back edge 24 of tang 22, with the stop shoulder 25 of the tang abutting the end of said spring arm, whereby the knife blade is yieldably held in such extended position. When the knife blade 17 is folded into a space 16 within the handle, and thereby disposed in a closed, out of service position within the handle, the co-operating spring arm 20 tensionally bears upon the front edge 26 of the tang 22, whereby the knife blade is yieldably held in such closed position. When the knife blade 17 is swung about the pivoting rivet 23 to either extended open or to closed position, the rear end 27 of the tang 22 is thrustingly moved against the cooperating spring arm 20, and by its thrust causes the latter to flex outwardly so as to yield to the swinging movement of the knife blade.

The handle may be equipped with one or more tool elements, and although a tool element in the form of a knife blade 17 is shown for purposes of illustration, it will be understood other kinds of tool elements may be furnished, such e. g. as a screw-driver blade, a can-opener blade, a file, a hair comb, a button-hook, or other selected form or forms of tools.

According to this invention, the tool element locking means is supported by the bolster means of the handle structure so as to overlie the outer part of the free end portion of a spring arm 20 for releasable engagement therewith.

In one embodiment of the locking means, as shown in Figs. 1 to 6 inclusive, the bolster means comprises bolster plates 28 respectively mounted on external faces of the outer scale or frame plates 15 at the inner end of the handle structure. Formed integrally with said bolster plates, in connection with the back edges thereof, are outwardly projecting arms 29 between which extends a stationary transverse bridge bar 30. Said bridge bar 30 overhangs the underlying free end portion of a spring arm or arms 20 with which the handle is equipped, whereby to be suitably outwardly spaced or offset relative to the latter. Longitudinally slidable between said stationary bridge bar 30 and the underlying spring arm or arms 20 is a locking member in the form of a slide bolt having an outer body portion 31 corresponding in thickness to the height of the space between said bridge bar and said underlying spring arm or arms 20, and an inner body portion 32 of substantially reduced thickness. The respective ends of the slide bolt are provided with upstanding finger pieces 33, which also serve, by abutment against the bridge bar 30, as stop means to limit in and out sliding movement of the slide bolt. The outer end of the inner portion 32 of the slide bolt is preferably further reduced in thickness by a transverse groove or channel 34, whereby the adjacent extremity of the slide bolt is rendered somewhat yieldable. The under face 35 of the

slide bolt is preferably formed to be somewhat concave from end to end, whereby, when in locking position, the slide bolt is tensionally flexed and stressed to effect strong frictional engagement with the bridge bar 30, and thus caused to be firmly held against accidental outward shift from its locking position.

When a tool element, e. g. the knife blade 17, is out-swung in extended relation to the handle structure, and thus positioned for use, in which position the cooperating spring arm 20 bears tensionally upon the back edge 24 of the tang 22, to lock the knife blade against accidental in-folding collapse, and thus to guard the user against risk of injury, the slide bolt is pushed inwardly, thereby to insert its outer body portion 31 beneath the bridge bar 30 so as to wedge between the latter and the underlying cooperative spring arm 20 (see Figs. 1, 2, 3 and 4). When thus positioned, the slide bolt obstructs outward flexing movement of said spring arm in response to turning movement of the tang 22, and consequently positively locks the knife blade 17 against in-swinging movement and collapse. When it is desired, after use, to fold and close the knife blade into the handle, the slide bolt is drawn outward, thereby disposing its relatively thin inner body portion 32 intermediate the bridge bar 30 and the cooperating spring arm 20. Under these circumstances, the slide bolt is free to move toward the bridge bar, since the reduced thickness of the inner body portion 32 thereof does not fill the space between said spring arm 20 and said bridge bar. After the slide bolt is thus out drawn, when the knife blade 17 is in-swung so that the rear end of its tang 22 thrusts against the cooperating spring arm 20, the latter is free to yield and flex outwardly so as to allow the tang 22 to traverse the same during the in-folding movement of the knife blade into the handle (see Fig. 5). After the knife blade has been closed into the handle and the cooperating spring arm 20 engages the front edge of the tang 22, the slide bolt can be inwardly slid back to its locking position, thereby preventing outward flexing of said spring arm 20, and thus positively locking the knife blade against outward displacement from its closed position within the handle (see Fig. 6).

Referring to Figs 7 and 8, these figures illustrate a modified embodiment of locking means according to this invention. In this embodiment, the bolster plates 28 are respectively provided with bearing posts 36 upstanding in the planes thereof from their back edges, and relatively disposed in transverse alignment. Supported by and between said bearing posts 36 is a transverse pivot pin 37, and pivotally supported by said pivot pin 37 between the bearing posts 36 is a rotatable eccentric locking member or cam 38. Integral with said locking member or cam 38, to extend radially therefrom, is a lever arm 39, by which said locking member or cam can be actuated. The tool element, e. g. the knife blade 17, as disposed in either its out-swung position for use or its in-swung closed position relative to the handle, can be positively locked against displacement therefrom, by rotating the locking member or cam 38 in clockwise direction. Such rotation of the locking member or cam forces its section of major radius against the outer face of a spring arm 20, thus obstructing outward flexing of the latter in response to turning movement of the tang 22 of the knife blade (see full line showing of Fig. 7). The lever arm 39 is so related to the locking member or cam 38 that, when in-swung to the limit of its movement by abutment against the back of the handle, the section of major radius of the locking member or cam is carried somewhat past dead center, whereby reverse releasing rotation of the locking member of cam, under upward pressure exerted through the spring arm 20 is prevented. To release locking member or cam 38, the same is rotated in counterclockwise direction, thus opposing its section of minor radius to and outwardly spaced from the spring arm 20 (see broken line showing of Fig. 7), whereby the latter can yield to the thrust of the knife blade tang 22, when the knife blade is out-swung or in-swung relative to the handle, as the case may. be.

Referring now to Figs. 9 to 11 inclusive, there is shown thereby another modified form of locking means comprehended by the principles of this invention. In this modified embodiment, the bolster plates 28 are bridged by a back plate 40, which extends horizontally between the back edges thereof, and, preferably, so as to form an integral part of the bolster means. Said back plate 40 is outwardly spaced or offset relative to an underlying spring arm 20 of the handle structure, so as to provide an intermediate chamber 41. At least one of the bolster plates 28 is pierced adjacent to and beneath the back plate 40, whereby to provide a lateral gateway or passage 41' which communicates with said chamber 41. Pivoted by the back plate 40 for lateral swinging movement, in the horizontal plane thereof, into and out of said chamber 41 is a manipulatable locking means. This locking means comprises a transverse lock bolt 42, which corresponds in thickness to the height of the chamber 41. Connected with the lock bolt 42 to extend angularly thereto contiguous to the underside of the back plate 40, is its supporting arm 43 which is of substantially reduced thickness, the same being pivotally connected with said back plate by a pivot pin 44. An exterior end of the lock bolt 42 is provided with an upstanding finger piece 45, by which the same can be manipulated. The tool element, e. g. the knife blade 17, as disposed in either its out-swung position for use or its in-swung closed position relative to the handle, can be positively locked against displacement therefrom, by swinging the lock bolt 42 into the chamber 41 so as to engage between the outer face of a spring arm 20 and the back plate 40 (see Figs. 10 and 11), thus obstructing outward flexing of said spring arm in response to turning movement of the tang 22 of the knife blade. To release the lock bolt 42, the same is out-swung through the gateway or passage 41', thus withdrawing the same from its interposed locking position between a spring arm 20 and the back plate 40, whereby said spring arm is free to yield to the thrust of the knife blade tang 22, when the knife blade is out-swung or in-swung relative to the handle, as the case may be.

It will be understood that various detail modifications of the above described constructions may be made without departing from the principles of this invention as defined in the appended claims. For example, although I have shown bolster plates 28, which carry external means to support a movable locking member, as independent part or parts of the handle structure separate from the face plates 21 of said handle, it will be obvious that the bolster means and the locking member support carried thereby may, if desired be formed as integral part or parts of the handle side plates 21. It will also be obvious that, in tool structures wherein the handle is provided with tool elements pivotally connected with opposite ends thereof, the locking means and supports therefor may be provided at both ends of the handle respectively for cooperation with the tool elements pivoted to said respective handle ends. It will be further understood that, with respect to locking means comprising slide bolts 31—32, said slide bolts may be arranged to lock either upon inward or outward sliding movement thereof.

It will be observed that, with respect to all forms of the disclosed locking means, the locking means is disposed or mounted exteriorly of the handle structure, whereby not only to be readily accessible for convenient manipulation, but, by such disposition, requiring, for its incorporation with the handle structure, no alteration of the internal construction of the latter or of the means for pivotally connecting tool elements to the same, and therefore requiring no radical departure from conventional handle design.

Having now described my invention, I claim:

1. A foldable tool comprising a handle, a tool element having a tang pivoted in an end of the handle for swinging

movement into and out of the handle, spring means mounted in the handle along and normally flush with the back thereof and adapted to flex outwardly from the back thereof, the flexible end portion of said spring means being disposed to yieldably bear upon the tang of said tool element in all position of said tang, a bridge bar supported from external sides of the handle for transverse extension across the back of said handle adjacent to an end of the handle to which said tool element is pivoted and in outwardly spaced offset relation to the exposed back surface of said flexible end portion of the spring means, and a slide bolt releasably movable betwen said bridge bar and said flexible end portion of the spring means, whereby to obstruct outward flexing movement of the latter under turning thrust of the tang of the tool element and thereby to lock said tool element against accidental displacement from either out-swung position for use or in-swung closed position relative to the handle.

2. A foldable tool comprising a handle, a tool element having a tang pivoted in an end of the handle for swinging movement into and out of the handle, spring means mounted in the handle along and normally flush with the back thereof and adapted to flex outwardly from the back thereof, the flexible end portion of said spring means being disposed to yieldably bear upon the tang of said tool element in all positions of said tang, a bridge bar supported from external sides of the handle for transverse extension across the back of said handle adjacent to an end of the handle to which said tool element is pivoted and in outwardly spaced offset relation to the exposed back surface of said flexible end portion of the spring means, and a slide bolt longitudinally movable beneath said bridge bar, said slide bolt having at one end a portion of maximum thickness to engage, on longitudinal movement of the slide bolt in one direction, between the bridge bar and flexible end portion of spring means, whereby to obstruct outward flexing movement of the latter under turning thrust of the tang of the tool element and thereby to lock said tool element against accidental displacement from either outswung position for use or in-swung closed position relative to the handle, and said slide bolt having at its opposite end a portion of reduced thickness which, on longitudinal movement of the slide bolt in the opposite direction, is disposed beneath the bridge bar to provide clearance permitting outward flexing of the spring means under turning thrust of the tang of the tool element and thereby allowing outswinging or in-swinging movement of the tool element relative to the handle.

3. A foldable tool according to claim 2, wherein the slide bolt is provided at its respective ends with upstanding portions adapted, by abutment against the bridge bar, to serve as stops to limit longitudinal movements of the slide bar and also to serve as finger pieces for manipulating said slide bar.

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