

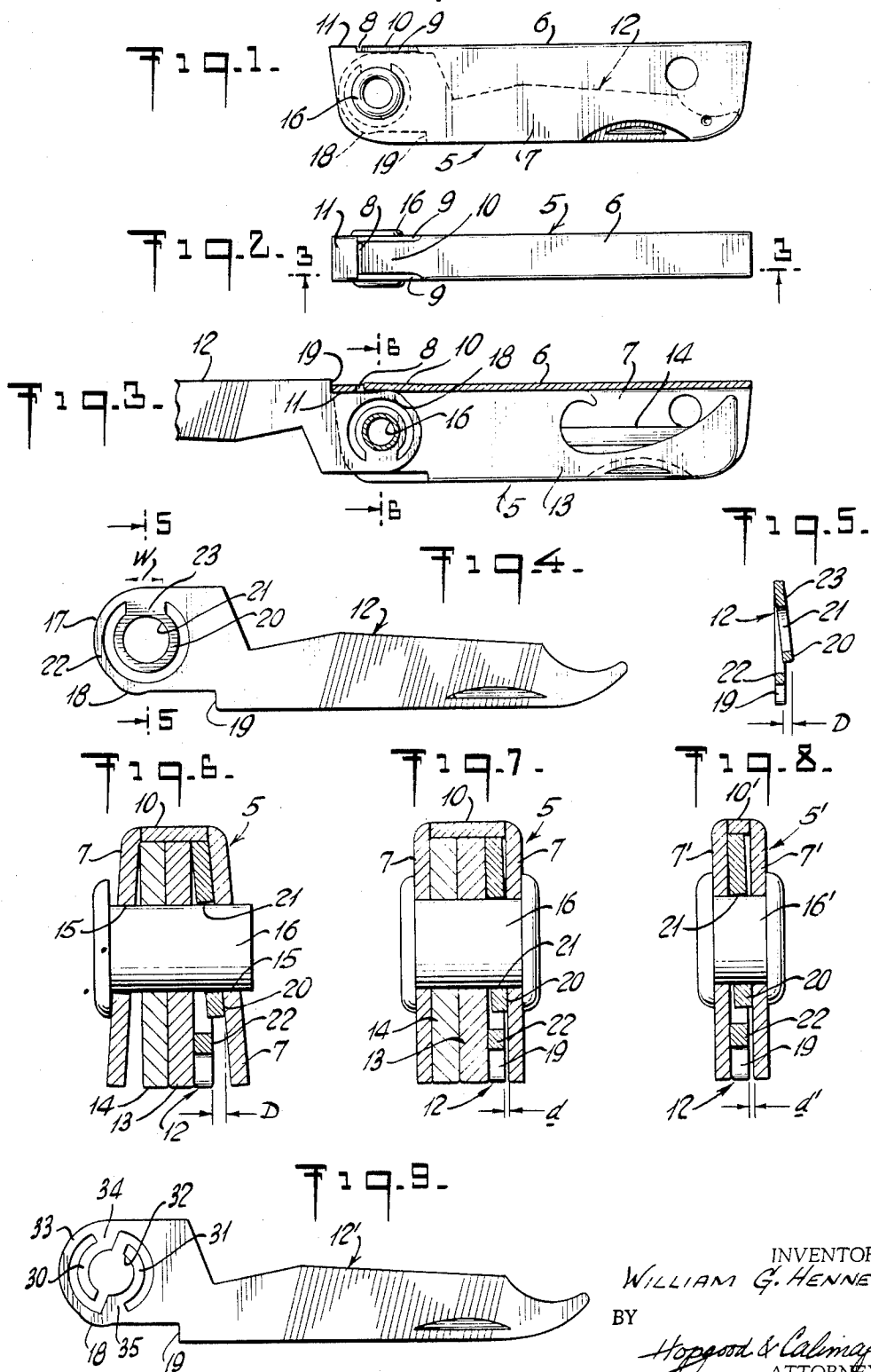
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POCKET KNIFE WITH PIVOTED BLADE

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## POCKET KNIFE WITH PIVOTED BLADE

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This invention relates to a tool having one or more blades, such as a knife blade, a bottle-opener blade, and a file blade. The blade or blades are carried in a handle and may be moved to open or closed position, as will be understood. Tools which may incorporate the present invention are shown and described in Pocoski et al. Patent No. 2,779,098.

It is an object of the invention to provide an improved tool of the character indicated which has a simple spring arrangement for enhancing the action of blade movement and retention.

More specifically, it is an object to provide a tool of the character indicated wherein one of the blades is provided with an integral axially-acting spring.

It is also an object to provide an improved tool construction of the character indicated, without changing external appearance or adding to the number of parts, but at the same time rendering the construction more readily adaptable to mass-production, within less stringent manufacturing tolerances and yet achieving action and service life which equals or exceeds those of prior constructions.

Other objects and various further features of novelty and invention will be pointed out or will occur to those skilled in the art from a reading of the following specification in conjunction with the accompanying drawings. In said drawings, which show, for illustrative purposes only, preferred forms of the invention:

FIG. 1 is a view in side elevation of a tool embodying the invention;

FIG. 2 is a back edge or plan view of the tool of FIG. 1;

FIG. 3 is a sectional view, taken substantially in the plane 3-3 of FIG. 2;

FIG. 4 is an enlarged view of an unassembled blade element of the tool of FIG. 1;

FIG. 5 is a sectional view in the plane 5-5 of FIG. 4;

FIG. 6 is a sectional view in the plane 6-6 of FIG. 3, just prior to final assembly of the parts;

FIG. 7 is a view similar to FIG. 6, following final assembly of the parts;

FIG. 8 is a view similar to FIG. 7, illustrating a single-bladed, rather than a multiple-blade, tool; and

FIG. 9 is a view similar to FIG. 4 to illustrate a modified blade construction.

The invention will be described as embodied in a combined tool involving a knife blade, a bottle-opener blade, and a manicuring-file blade, but it is to be understood that a single blade may be employed or different combinations of blades may be used, the particular tool feature of a particular blade being unimportant to the invention.

Briefly stated, the invention contemplates formation of an integral axial spring action in one blade member so that when the blade members are permanently secured by the pivot between side walls of the handle, the axial spring is compressionally loaded. Thus it is assured that for a fairly wide range of tolerance in regard to initial clearance between blades and side walls, or in regard to the permanent set of the pivot, the blades will always be subject to more uniform, easier acting torsional-friction resistance, whatever the selected blade, and whatever the angle at which it may be positioned.

In the tool illustrated in FIGS. 1 to 7, there is a handle member 5 of sheet material, preferably sheet steel, which may be heat-treated to provide added stiffness. The handle member 5 is bent up into the form of a channel

including a base 6 and spaced-apart side walls 7. As shown, the base 6 is slitted transversely at 8 and lanced longitudinally at spaced locations 9 extending from slit 8, thereby defining an integral tongue or spring 10 in the base 6. The spring tongue 10 terminates short of one end of the channel, thus defining an integral bridge connection 11 between side walls 7 at said end; this bridge connection serves as an abutment for blade reference when a selected blade is in its extended position (see FIG. 3).

Plural blades 12, 13 and 14, preferably of sheet steel and heat-treated, are received and retained between side walls 7, which in turn are pierced with registering pivot openings 15. Openings 15 register with openings in each blade. A pivot member, which may be an eyelet or rivet 16, passes through all registering openings and is riveted or beaded over so as to permanently pivotally secure all blades to the handle member 5.

Each blade 12-13-14 is essentially flat at its hub or pivoted end and is similarly contoured for coaction with the integral spring 10. Thus, each hub may have an arcuate contour 17, and a localized detent or projection 18 coacts with spring 10 to hold the selected blade in its extended position, with a notch or shoulder 19 of the blade referencing against the bridge or abutment 11.

In accordance with the invention, one of the blade members, as for example the file blade 12 (FIGS. 4 and 5), is pierced and formed in the pivot region with a combined integral axial spring and thrust bearing, which, when assembled with the rest of the tool structure, makes for better and more uniform blade action, not only for blade 12 but also for the other blades 13-14 in the tool, even though the other blades have no spring feature in their hubs.

In the form shown, a first or inner ring portion or thrust bearing 20 of limited radial extent circumferentially surrounds and defines the pivot opening 21. A second or outer ring 22 is radially spaced from the inner portion 20 and circumferentially surrounds the same. These ring portions 20-22 are integrally and resiliently connected by a bridge or tongue 23 of limited arcuate extent W, and the thrust bearing defined by the inner ring portion 20 is axially offset at 23 (to an initial undeformed extent D) from the plane of the remainder of the blade member 12 and its hub. Preferably, the dimension W substantially exceeds the blade thickness and the radial extent of thrust bearing 20, as shown.

FIG. 6 illustrates the parts just prior to the final assembly step of riveting the eyelet 16, and the outward flare of side walls 7 will be understood to show with some exaggeration that there is, at this juncture, no compression of any resilient parts. Upon fastening the eyelet, as shown in FIG. 7, the opposed beaded ends of the eyelet 16 will be seen to not only hold the side walls 7 compressed against the blade members 12-13-14, but also to compress thrust bearing 20 toward the plane of hub 22 and against the stiff compliance of the offset or bridge 23. The then-reduced offset of these parts is identified d in FIG. 7, and the displacement D-d will be understood to assure axially resilient loading of any selected blade, for a considerable tolerance range with regard to the stressed offset d.

FIG. 8 illustrates the principles of the invention in application to a tool having but a single blade 12 between side walls 7'-7', and compressed by eyelet 16' to a stressed reduced thrust-bearing offset d'. Parts similar to those of the described multiple-blade structure have been given the same reference numbers, with primed notation.

FIG. 9 illustrates a modification of the integral thrust-bearing and spring feature in a single blade 12'. The inner ring portion is there defined by two like diametrically opposed semi-circular parts 30-31, defining the pivot opening 32, and integrally connected at opposed corresponding

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ends to the surrounding hub structure 33. These connections 34-35 are of limited arcuate extent and will be understood to provide similar axial offsets for the thrust-bearing parts 30-31. Since both thrust-bearing parts 30-31 are similarly offset, there is greater symmetry of axially resilient action (as compared with the FIG. 4 arrangement), but this is achieved at a sacrifice of the strength and ease of manufacture which characterize FIG. 4, the latter having been found to be highly satisfactory in use.

Although the invention has been described in detail for the preferred forms shown, it will be understood that modifications may be made within the scope of the invention as defined in the claims which follow.

What is claimed is:

1. In a tool of the character indicated, a handle comprising a single-piece sheet-metal channel having a base and upstanding side walls, said side walls having opposed aligned openings defining a pivot axis spaced from said base near one longitudinal end thereof, an elongated blade member retained between said side walls, said blade member being of stiffly compliant material and including a substantially flat body with a hub having a pivot opening near one end thereof, said hub comprising a radially inner portion of limited radial extent circumferentially defining the pivot opening and a radially outer portion of limited radial extent circumferentially continuously encompassing said inner portion, said inner and outer portions being axially offset with respect to each other and having an integral compliant interconnection of limited arcuate extent, and pivot-pin means extending through all said openings and retaining said side walls in compressionally loaded relation with said inner and outer portions against the axially compliant reaction of said interconnection.

2. In a tool of the character indicated, a handle comprising a single-piece sheet-metal channel having a base and upstanding side walls, said side walls having opposed

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aligned openings defining a pivot axis spaced from said base near one longitudinal end thereof, a plurality of elongated blade members retained between said side walls, each of said blade members having at one end thereof an opening for pivotal suspension, one of said blade members being of stiffly compliant material and including a substantially flat body with a hub having a pivot opening near one end thereof, said hub comprising a radially inner portion of limited radial extent circumferentially defining the pivot opening and a radially outer portion of limited radial extent circumferentially continuously encompassing said inner portion, said inner and outer portions being axially offset with respect to each other and having an integral compliant interconnection of limited arcuate extent, and pivot-pin means extending through all said openings and retaining said side walls in compressionally loaded relation with all blade members and against the axially compliant reaction of the interconnection between said inner and outer portions.

3. A tool according to claim 1, in which said radially inner portion is circumferentially continuous.

4. A tool according to claim 1, in which said radially inner portion comprises diametrically opposed segments of substantially semi-circular circumferential extent, there being a separate integral compliant interconnection from each of said segments to diametrically opposed parts of said radially outer portion.

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