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NOTICE OF ENTITLEMENT

We, FISKARS OY AB of PO Box 235, Mannerheimintie 14A, 00101 Helsinki 10, Finland,
being the applicant in respect of Application No 36553/93 state the following:-

The person(s) nominated for the grant of the patent:

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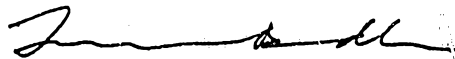
The person(s) nominated for the grant of the patent:

is/are the applicant(s) of the applications listed in the declaration under Article 8 of
the PCT

The basic application(s) listed in the declaration made under Article 8 of the PCT

is/are the first application(s) made in a Convention country in respect of the invention

DATED: 28 December 1995



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- (56) Prior Art Documents
US 4794692
US 4502220
US 4238862
- (57) Claim

1. A tool with retractable jaws capable of being moved into an exposed operating position by a single hand, said tool comprising:

first and second jaws, each including a working portion and a tang interconnected by a bearing portion, said jaws being pivotally connected at said bearing portions;

first and second handles;

means for slidably coupling said tangs to said handles for selective movement relative to said handles between extended and retracted positions, said jaws being of sufficient weight to facilitate forward sliding movement of said tangs; and

means for exposing and locking said jaws in said extended position by imparting an inertial force to the jaws by the application of a sudden movement to the tool sufficient to cause sliding movement of the jaws to the extended position without the application of a manual force to the jaws.

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3. A tool with retractable jaws capable of being moved into an exposed operating position by a single hand imparting an inertial force to the jaws by sudden movement of the tool without the application of a manual force to the jaws, said tool comprising:

first and second jaws, each including a working portion and a tang interconnected by a bearing portion, said jaws being pivotally connected at said bearing portions;

first and second handles, each including an internal channel therein;

means for slidably coupling said tangs to said handles for selective movement within said handle channels by means of said inertial force between

a retracted position in which said working portions are at least partially contained within said handle channels such that said working portions are prevented from substantial pivotal motion relative to each other, and said handles are prevented from substantially diverging; and

an extended position in which said jaw working portions are disposed forward of said handles and are capable of pivotal movement with respect to each other in response to divergence and convergence of said handles.

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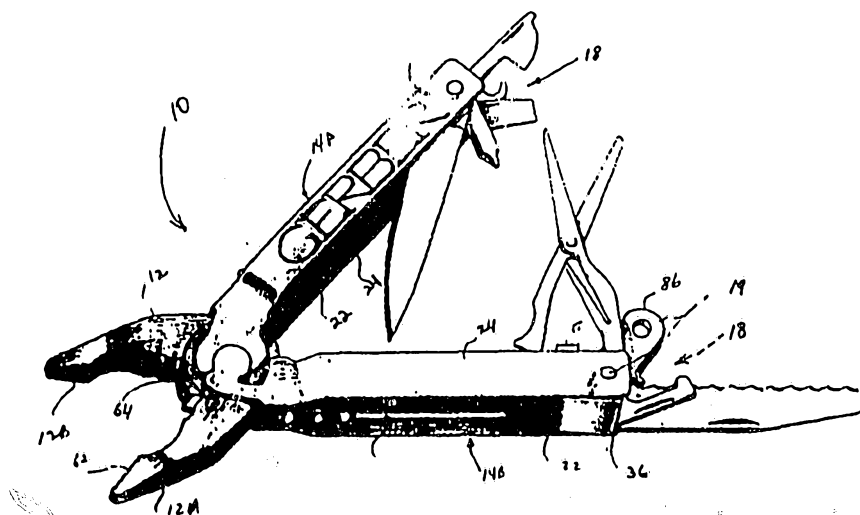


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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/US92/01708 (22) International Filing Date: 5 MAR 5.03.92 12 May 1992 (12.05.92) Fiskars Oy AB (71) Applicant: FISKARS INC. (FI/US), Wayne G. Fethke, 401 4th Street, Wausau, WI 54401 (US). (72) Inventors: SESSIONS, George, C. ; 5706 S.E. Thiessen Road, Milwaukee, OR 97267 (US). MILLS, Chuck, D. ; 14817 S.E. Johnson Road, Milwaukee, OR 97267 (US). PARRISH, Bradford, J. ; 19860 S. White Lane, Oregon City, OR 97045 (US). HUTCHENS, Douglas, C. ; 5904 S.W. Fernbrook Way, Lake Oswego, OR 97035 (US). (74) Agents: O'SHAUGHNESSY, James, P. et al.; Foley & Lardner, 777 East Wisconsin Avenue, Milwaukee, WI 53202-5367 (US). (31) 666 367 8 March 1991 US		(81) Designated States: AU, CA, FI, NO, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LU, MC, NL, SE). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> 66 73 46 AUSTRALIAN INDUSTRIAL 13 DEC 1993 PROPERTY ORGANISATION

(54) Title: POCKET TOOL WITH RETRACTABLE JAWS



(57) Abstract

The present invention is a combination tool (10) that includes a pair of retractable jaws (12) capable of being moved into an exposed operating position by inertial force using a single hand. Tool (10) includes a single compact unit with, on one end of handles (14), pivoted jaws (12) sliding into and out of handles (14) and, at the distal end of handles (14), a selected group of pivotally attached tools (18) that perform various functions. Each of pivotally attached tools (18) is housed within one of the handles (14) when not in use.

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Pocket Tool With Retractable JawsFIELD OF THE INVENTION

5 The present invention relates to a pocket tool with retractable pliers capable of being moved into an exposed operating position by inertial, e.g., centrifugal, force using a single hand. More particularly, the present invention relates to a multi-function pocket tool which includes, in a single, compact unit, jaws and various other selected tools.

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BACKGROUND OF THE INVENTION

In general, multi-function tools, including in a single instrument, pliers, and other selected tools, such as screwdrivers, knife blades, files, scissors and the like are well known. The prior art tools typically
15 include a crossjaw pliers with channel-shaped handles pivotally connected to the shanks (tang) of the respective plier jaws. The handles fold over the pliers so that the pliers are received in the handle channels. Respective tools, channel-shaped handle extensions, or
20 both, are pivotally mounted to each handle at the distal end, adapted to fall into the handle channel or nest within the handle, respectively, for storage. Examples of such multiple tools are described in U.S. Patents 4,238,862, 4,744,272, and 4,888,869, issued on December
25 16, 1980, May 17, 1988, and December 26, 1989, respectively, to Timothy S. Leatherman.

Such tools are disadvantageous in that the use of both hands is required to unfold the handles from the nested storage position to expose the plier jaws. Likewise, both hands are required to return the plier jaws



to the nested storage position. This tends to limit the utility of the tool in some circumstances.

In addition, when the handles are unfolded from the pliers, the open channel in which the pliers are received when in a folded position face outwardly. Thus, unless special provisions are made, typically involving the additional step of unfolding or pivoting a handle extension or sleeve, the open edges of the channel sides address the user's hand. This makes the pliers particularly uncomfortable to use.

Mechanisms for locking the handles of such tools in a particular position are also known. An example of such a locking mechanism is disclosed in the aforementioned U.S. Patent 4,238,862 to Leatherman. However, such mechanisms typically must be specifically released before the handles can be further opened and, thus, are not particularly suitable for maintaining the handles in a closed position when the pliers are stored or an ancillary tool is in use.



Tools capable of manual activation from a retractable position to an extended position have been proposed in U.S. Patents 4502220 and 4794692. However these proposed tools have the disadvantage of only being activated by positive manual movement of their active pieces relative to the handles.

5 It is an object of the present invention to provide a tool capable of being activated by a single hand using an inertial force.

The present invention provides a tool with retractable jaws capable of being moved into an exposed operating position by a single hand, said tool comprising:

10 first and second jaws, each including a working portion and a tang interconnected by a bearing portion, said jaws being pivotally connected at said bearing portions;

first and second handles;

15 means for slidably coupling said tangs to said handles for selective movement relative to said handles between extended and retracted positions, said jaws being of sufficient weight to facilitate forward sliding movement of said tangs; and

means for exposing and locking said jaws in said extended position by imparting an inertial force to the jaws by the application of a sudden movement to the tool sufficient to cause sliding movement of the jaws to the extended position without the application of a manual force to the jaws.

20 The invention also provides a tool with retractable jaws capable of being moved into an exposed operating position by a single hand imparting an inertial force to the jaws by sudden movement of the tool without the application of a manual force to the jaws, said tool comprising:

25 first and second jaws, each including a working portion and a tang interconnected by a bearing portion, said jaws being pivotally connected at said bearing portions;

first and second handles, each including an internal channel therein;

means for slidably coupling said tangs to said handles for selective movement within said handle channels by means of said inertial force between

30 a retracted position in which said working portions are at least partially



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contained within said handle channels such that said working portions are prevented from substantial pivotal motion relative to each other, and said handles are prevented from substantially diverging; and

an extended position in which said jaw working portions are disposed forward
5 of said handles and are capable of pivotal movement with respect to each other in response to divergence and convergence of said handles.

The tool preferably includes releasable biasing or locking means for preventing said jaws from sliding with respect to said handles when said jaws are in said extended position.



BRIEF DESCRIPTION OF THE DRAWING

A preferred exemplary embodiment of the present invention will hereinafter be described in conjunction with the appended drawing, wherein like designations
5 denote like elements, and:

Figure 1 is a pictorial illustration of a first embodiment of tool in accordance with the present invention, with jaws exposed, handles open, and with ancillary tools exposed for viewing;

10 Figure 2 is a schematic top view of a second embodiment tool in accordance with the present invention, with jaws exposed;

Figure 3 is a schematic side view of the tool of Figure 2;

15 Figure 4 is a schematic side view of the tool of Figure 3, with jaws retracted;

Figure 5 is a top view of a suitable pliers jaw;

Figure 6 is a schematic side view of the pliers jaw of Figure 5, with the locking mechanism shown in exploded view;

20 Figure 7 is a side view of a suitable stop/lanyard eye; and

Figure 8 is a schematic side view of the tool of Figures 2-4 with a knife blade and lanyard receiver exposed.

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DETAILED DESCRIPTION OF A PREFERRED EXEMPLARY EMBODIMENT

Referring to Figures 1-4, a tool 10 in accordance with the present invention suitably includes a pair of jaws 12, respective channel-shaped handles 14A and 14B (generally referred to as handle 14) and, if desired, one or more selected tools, generally indicated as 18. As will hereinafter be explained, jaws 12 are adapted to selectively retract into handles 14 when closed; jaws 12

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selectively assume a fully extended (active) position (Figures 1-3) or a retracted position (Figure 4). In the extended position jaws 12 are capable of pivotal movement with respect to each other in response to divergence and convergence of handles 14. In the retracted position handles 14 are prevented from opening. Ancillary tools 18 are suitably pivotally mounted to the distal ends of handles 14.

Handles 14A and 14B are preferably substantially identical, and will be described in terms of generically denominated components. Where reference is made to a component associated with a particular one of handles 14A and 14B, an "A" or "B" suffix, respectively, will be used. Handles 14 are channel-shaped; a web 20 connects respective side panels 22 and 24. The interior wall of web 20 defines the transverse dimension of the handle channel. Web 20 is generally flat, and includes a substantially straight forward edge 21, and a longitudinally disposed slot 26. Slot 26 is of predetermined length, having a radiused forward terminus 27 and a radiused rear terminus 29. Forward terminus 27 is disposed a predetermined distance from forward edge 21. Web 20, and hence the channel between sides 22 and 24, is suitably narrowed in the vicinity and forward of slot 26 to approximately the width of jaws 12. The interior surfaces of side panels 22 and 24, and preferably web 20, are highly polished to present a smooth, corrosion-resistant surface to facilitate sliding movement of jaws 12. If desired, a spring 36 may be integrally formed at the distal end. Spring 36 would cooperate with cams in the base (tang) of ancillary tools 18. Handles 14 are suitably formed of a corrosion resistant, temperable material such as stainless steel, manifesting appropriate resiliency at spring 36.

Side panels 22 and 24 are generally planar, but conform to the configuration of web 20, i.e., are transversely stepped in the vicinity of slot forward terminus 27. Respective arms 28 and 30 extend side panels 22 and 24, respectively, forwardly of web forward edge 21



by a predetermined distance. Arms 28 and 30 each suitably terminate in a respective portion of a pivot connection, e.g., an aperture to receive a pivot pin (Figures 2-4) or a component of a flattened ball and socket mechanism (Figure 1). Arms 28 and 30 suitably dispose the pivot axis at a predetermined distance D_x (Fig. 4) e.g., approximately .312 inch longitudinally forward of web forward edge 21, and a predetermined distance D_y (Fig. 4) e.g., approximately .506 inch, vertically offset from the interior surface of web 20 to align the handle pivot axis with that of jaws 12 when jaws 12 are in the extended position. Predetermined distance D_x is chosen to ensure that web forward edge 21 does not interfere with or limit the pivotal travel of jaws 12 with the jaws in the fully extended position. Arms 28 and 30 suitably extend at an angle θ (Fig. 4), e.g., 30° , with respect to the longitudinal axis of handle 14.

In assembly, handles 14 are disposed with their respective open channels facing and, preferably pivotally connected: side panel 22A is disposed substantially in the same plane as side panel 24B; side panel 24A is disposed in substantially the same plane as side panel 22B; and separate but axially aligned pivotal connections 32 and 34, respectively, are effected between arm 28A and arm 30B and between arm 30A and arm 28B. Pivotal connections 32 and 34 can be effected in any conventional manner, such as, for example, employing a flattened ball and socket mechanism (Figure 1), or employing a pin, e.g., rivet (Figures 2-4). To facilitate use of a rivet, or other fastener, arm 28 can be disposed further from the longitudinal axis of the handle than extension 30, by a distance approximating the thickness of the arms. Thus, in assembly, in the embodiment of Figures 2-4, extensions 28 are offset from extensions 30, with extensions 30 disposed interiorly of extensions 28.

If desired, arms 28 and 30, or pivotal connections 32 and 34 therebetween, can be omitted. However, the inclusion of arms 28 and 30 and pivotally connecting handles 14, tends to maintain handles 14 in



position while jaws 12 are sliding between a fully retracted and fully extended cushion, and to aid in locking handles 14 in the closed position when jaws 12 are retracted, as will be explained. Arms 28 and 30 also
5 provide support against torsional forces on jaws 12 which may be generated during use of jaws 12.

Jaws 12 comprise respective suitably configured pivotally connected individual members (jaws) 12A and 12B, each including a tang disposed rearwardly of the pivotal
10 connection, and a working portion for, e.g., gripping or cutting, disposed forwardly of the pivotal connection. The pivotal connection of jaws 12 is at least slidably disengagable, and preferably separate, from the pivotal connection of handles 14. Jaws 12 are suitably made of a
15 corrosion resistant material such as stainless steel, with side surfaces, and, preferably the outer exterior top and bottom highly polished to facilitate sliding relative to handles 14, and are of a weight sufficient to facilitate forward sliding movement of jaws 12 in response to
20 inertial force, without creating excessive stopping inertia.

Jaws 12 are slidably connected to handles 14 preferably configured to slidably engage handles 14 with a slip fit at all adjacent surfaces, top, bottom and sides
25 irrespective of the position of jaws 12 relative to handles 14, i.e., in the fully extended, fully retracted and all intermediate positions.

Jaws 12 may comprise, for example, gripping (pliers) jaws, cutting jaws, scissor blades, or the like.
30 Referring now to Figures 3, 5 and 6, suitable jaws 12A and 12B in the form of pliers will be described in terms of generically denominated components. When reference is made to a component associated with a particular one of jaws 12A and 12B, an "A" or "B" suffix, respectively, will
35 be used. Jaws 12 are suitably of unitary construction including an elongate working portion, e.g., in the case of pliers, gripping portion 38, a generally circular recessed pivot bearing portion 40, and a handle stub (tang) 42. A first generally flat side 44 is formed by



corresponding surfaces of gripping portion 38, bearing portion 40, and tang 42. A second generally flat opposing side 46 is defined by the opposing surfaces of gripping portion 38 and tang 42. Bearing portion 40, however, is only approximately one-half of the thickness of gripping portion 38 and tang 42 and is recessed with respect to side 46. A central axial bore 48 is provided in bearing portion 40, with a counterbore 50 formed in side 44.

Gripping portion 38 suitably includes an intermediate portion 52 proximate bearing portion 40, and a nose 54. Nose 54 may be of any desired configuration that, in assembly, is amenable to a sliding fit within the handle channel and may include, for example, wire cutters. The outer extremities (height) of jaw 12, however, are preferably a flat outer surface 56 of intermediate portion 52 and a flat outer transverse surface 58 of tang 42, respectively, disposed in opposing planes and approximately tangential to the outer surface of bearing portion 40 at the perpendicular to the longitudinal center of bore 48.

In assembly, jaws 12A and 12B are pivotally connected. The interior surfaces of bearing portions 40 are disposed adjacent one another with bores 48 in registry. Sides 44A and 46B and sides 44B and 46A are substantially coplanar. The upper and lower extremities of the assembly, when closed, are established by gripping portion transverse surfaces 56 and tang outer transverse surfaces 58; outer transverse surfaces 56A of gripping portion 38A and 58B of tang 42B, and outer transverse surfaces 56B and 58A are substantially coplanar. The pivotal interconnection is effected by, e.g., a bolt 60 and a nut 62 or a rivet flush mounted within counterbores 50 (Figure 2).

Jaws 12 are adapted to be moved relative to handles 14 between an extended position, and a retracted position. In the extended position jaw gripping portions 38 are disposed forward of handles 14 and are capable of pivotal movement with respect to each other in response to divergence and convergence of handles 14, i.e., open and



close in response to operation of handles 14. In their retracted position gripping portions 38 are at least partially, and preferably substantially, contained within the channels of handles 14, and handles 14 are, in effect, locked in a closed position. Referring now to Figures 3, 4, and 6, tangs 42 are slidably coupled to handles 14, disposed within handle channels, with exterior transverse walls 58 adjacent the interior surfaces of webs 20 and side walls 44 and 46 adjacent parallel side panels 22 and 24. Respective threaded holes 60 and 62 are formed in tang 42 extending inwardly from outward surface 58. Tangs 42 are slidably affixed within handles 14 by respective fastening pins, e.g., shoulder bolts 64 and 66, disposed in slot 26 and threadedly received in holes 60 and 62. Jaws 12, when closed, may thus slide relative to handles 14 within the limits defined by slots 26.

The relative position of jaws 12 and handles 14 with the jaws in the extended (active) position, is suitably established by slot forward terminus 27. Terminus 27 is preferably disposed at a predetermined distance from forward edge 21 of web 20 slightly less than the distance from the outer diameter of the shoulder of screw 64 to the juncture of tang surface 58 with bearing portion 40. With the tangs disposed with screw 64 at forward terminus 27 of slot 26, jaws 12 are in the fully extended position: Gripping portion 38, and preferably bearing portions 40, are fully exposed, with bearing portions 40 located just forward of edge 21 of web 20; and the axis of pliers jaw pivot 48 is in registry with the axis of handle pivots 32 and 34. Since, in the extended position, and, preferably, the transverse surface of bearing portions 40, and outer transverse surfaces 56 of gripping portions 38 are exposed, and the axes of jaw pivot 48 and handle pivots 32 and 34 are aligned, movement of surface 56 beyond the planes of tang transverse surfaces 58 (i.e. the plane of handles 14) is unobstructed. Relative pivotal motion of jaws 12 can therefore be effected by urging handles 14 away from and toward each other.



As previously noted, the channel between sides 22 and 24 is narrowed in the vicinity and forward of terminus 27 of slot 26 to approximately the width of jaws 12, i.e., side panels 22 and 24 are stepped. Arms 28 and 30 are thus closely adjacent to sides 44 and 46 of jaws 12, and provide support against torsional forces, after encountered in the use of jaws 12. Handles 14 are wider to the rear of forward slot terminus 27 to make the handles more comfortable in use, and to accommodate disposition of ancillary tools 18 between the interior surfaces of sides 22 and 24 of handle 14 and sides 44 and 46 of jaws 12, when the jaws are retracted.

Retracting jaws 12 effectively locks handles 14 in a closed position. The length of slot 26 is chosen such that with the shoulder of screw 66 against the rear terminus 29 of slot 26, at least a portion of transverse surface 56 underlies web 20, i.e., is rearward of edge 21, and preferably, such that jaws 12 are substantially contained between side panels 22 and 24, and arms 28 and 30. With jaws 12 retracted, web 20 precludes pivotal movement of transverse surfaces 56 beyond the plane of the corresponding tang transverse surface 58. Jaws 12 are thus prevented from opening. This, in turn, prevents tangs 42, and hence handles 14, from diverging. In addition, with jaws 12 withdrawn from the extended position, the axes of jaw pivot 48 and handle pivots 32 and 34 are misaligned. This, too, tends to prevent opening of handles 14. Thus, retracting jaws 12 effectively locks handles 14 together in a closed position.

A mechanism is also provided to releasably lock jaws 12 in the fully extended position. Referring to Figures 3-6, a bore 68 and counterbore 70 are formed in tang 42 extending inwardly from surface 58 between threaded holes 60 and 62. An aperture 67 (Figure 2) having a diameter greater than the width of slot 26 but less than the diameter of counterbore 70 is formed communicating and preferably concentrically slot 26.



Aperture 67 is disposed to overlie bore 68 when jaws 12 are in a fully extended position.

5 A stepped diameter pin 72 is received within bore 68 and slot 26. Pin 72 includes a first (small diameter) portion 74 of a diameter slightly less than the width of slot 26, a second (intermediary diameter) portion 76 of a diameter greater than the width of slot 26, but slightly less than the diameter of slot aperture 67, a third (large diameter) portion 78 of a diameter
10 corresponding to that of counterbore 70 (greater than the diameter of slot aperture 67), and a fourth portion 80 of a diameter corresponding to that of bore 68. The combined thickness of portions 76 and 78 of pin 72 are no more than the depth of counterbore 70. An axial bore 82 is formed
15 in pin 72, extending inwardly through portion 80, to partially receive a biasing spring 84. It is desirable that pin 72 and, in particular, portions 76 and 78 be of relatively large diameter for strength. In this regard, the diameter of portion 78, and of counterbore 70, may be
20 greater than the width of tangs 42.

In assembly, spring 84 and portion 80 of pin 72 are received within bore 68, and large diameter portion 78 within counterbore 70. When jaws 12 are in a fully extended position, and bore 68 underlies slot aperture 67,
25 intermediate diameter portion 76 of pin 72 is received in slot aperture 67, with the ledge of large diameter portion 78 biased against the interior surface of web 20 by spring 84. When intermediate diameter portion 76 is received within slot aperture 67, jaws 12 are unable to slide
30 relative to handle 14.

To retract jaws 12, portion 74 of pin 72 is depressed, overcoming the bias of spring 84, to cause intermediate diameter portion 76 to recede into tang counterbore 70. Plier jaws 12 can then be retracted, with
35 small diameter portion 74 of pin 72 slidably received within slot 26, and the ledge of intermediate diameter portion 76 biased by spring 84 against the underside of web 20. Only one hand is needed to retract jaws 12 into handles 14; the user depresses small diameter portions 74



with, for example, thumb and forefinger, and slides jaws 12 relative to handles 14 to a retracted position.

Friction is normally sufficient to maintain jaws 12 in a retracted position, as against casual forces typically encountered in the transport of tool 10. However, if desired, an additional aperture 69, similar to aperture 67, can be provided toward the rear of slot 26 for locking jaws 12 in the retracted position.

Jaws 12 can be exposed using only one hand by holding side panels 22 and 24 in the fingers and generating sufficient inertial or centrifugal force by the application of a sudden movement to the tool, for example, as generated by a flick of the wrist, causing jaws 12 to slide forward relative to handles 14. As previously noted, jaws 12 are of sufficient weight to facilitate movement by inertial force, while at the same time not so great as to cause excessive inertial stopping force that might damage shoulder bolts 64 and 66. In addition, sides 44 and 46 of jaws 12 and, preferably, transverse surfaces 56 and 58, as well as the interior surfaces of panels 22 and 24 and, preferably, web 20 of handles 14, are highly polished to facilitate sliding.

Alternatively, handles 14 can be held in the palm of the hand and one of screws 64, or 66, or actuator pin small diameter portion 74, pushed forward with, e.g. the thumb, to move jaws 12 into the extended position.

Ancillary tools 18 are suitably pivotally mounted to the distal ends of handles 14. Tools 18 are suitably formed of a corrosion resistant, temperable material such as stainless steel having sufficient carbon content to provide edge retention properties, as well as wear resistance in the vicinity of the tang. The tangs (bases) of each of the individual tools 18 are suitably cammed to co-operate with spring 36. When folded into handle 14, the tool resides either rearward of tangs 42 with pliers 12 in a fully retracted position, or in a space between sides 44 and 46 of jaws 12 and side walls 22 and 24. The particular selection of ancillary tools 18 is arbitrary. However, the tool selection would typically be



in accordance with the intended use of tool 10, i.e., tools typically used by an outdoorsman, electrician, hunter, etc.

It is desirable that a stop mechanism be provided at the distal end of handles 14, to establish a nominal minimum separation between the distal ends of handles, i.e., to ensure that handles 14 are not squeezed together to the extent that sliding movement of jaws 12 is restricted. It is also desirable that the stop mechanism be resilient and subject to override by application of sufficient force to ensure tight closure of jaws 12. Such a stop mechanism suitably comprises one or more ancillary tools 18 which extend upwardly beyond the inner edge of side panels 22 and 24 disposed to abut against either a cooperating stop, or other ancillary tools 18 disposed in the opposing handle 14. Referring to Figures 1 and 7, such a stop, 86 may be provided by a lanyard receiver 86.

Lanyard receiver 86 is generally planar, of constant transverse width, and as best seen in Figure 7, comprises a tang 88, an arm 90, and an eye 92. Tang 88 includes an interior through bore 100, and preferably, is cammed. Three primary dispositions are established, (nested (stop); opening bias; and exposed) employing respective peripheral transverse surface cam flats 94, 96 and 98, interconnected by curved peripheral transverse portions 102 and 104. Curved portions 102 and 104 are concentric with bore 100 and of predetermined radii, e.g., 0.200 inch and 0.224 inch, respectively.

Flat 94 resides adjacent to spring 36 when receiver 86 is in the nested (closed) position, disposed outwardly from the center of bore 102 by a predetermined height D_1 , e.g., 0.190 inch. Distance D_1 corresponds to the distance from the center of post 19 to the inner surface of spring 36 (Figure 1) with spring 36 relaxed. Flat 94 extends longitudinally a predetermined distance D_2 , e.g., 0.3 inch, forward of the center of bore 102. Distance D_2 is chosen to dispose the forward end of flat 94 a predetermined distance from the end of spring 36



corresponding to a desired spring bias against receiver 86 in response to outward pressure on eye 92.

Flat 96 resides adjacent to spring 36 when receiver 86 is in the opening bias position, suitably disposed at approximately 90° relative to flat 94, coupled to flat 94 by curved portion 102. Flat 96 is disposed at a predetermined longitudinal distance D_1 , e.g., 0.194 inch, slightly greater than distance D_1 , from the center of bore 102.

Flat 98 resides adjacent to spring 36 when receiver 86 is in the exposed position, disposed at a predetermined angle, e.g., 45°, relative to a line parallel to flat 94, coupled to flat 96 by curved portion 104. Flat 98 is also disposed at distance D_2 along a perpendicular radially from the center of bore 102.

Undercut 99 provides clearance for the end of spring 36 during pivoting of receiver 86 into and out of the exposed position. Undercut 99 suitably comprises an additional flat extending at a predetermined angle from flat 98, e.g., 30° (75° from flat 94.)

Arm 90 couples eye 92 to tang 88, and is disposed at a predetermined angle, preferably 90°, with respect to flat 98. First and second transverse surfaces 106 and 108, extend forwardly from the ends of flat 94 and undercut portion 99, respectively. When receiver 86 is in the exposed position surface 108 abuts the end of spring 36. The length and angle of arm 90 are chosen in accordance with the desired positions of eye 92 when receiver 86 is in its various positions.

Eye 92 includes an interior through bore 110, a concentric curved peripheral portion 112, and a flattened peripheral portion 114. Flat 114 is generally parallel to, and at a predetermined distance D_3 from, tang flat 94, e.g., 0.545 inch. Distance D_3 is greater than the height of handle sides 22 and 24 by an amount in accordance with the desired minimum separation. The center of eye bore 110 is offset, both longitudinally and in height, from the center of tang bore 100 by predetermined distances, e.g., 0.562 and 0.155 inch, respectively.



In assembly, post 19 is journaled through tang bore 100 to pivotally mount lanyard receiver 86 in the distal end of, e.g., handle 14B. In the nested position, flat 94 is disposed adjacent to, and bearing against, the inner surface of spring 36B. Eye flat 114 abuts against an opposing stop, or against one or more ancillary tools 18 in opposing handle 14A. Thus a nominal minimum handle separation is established. However, when jaws 12 are in the extended position, it may be desirable in some instances to force handles 14 closer together than the nominal minimum to, for example, close jaws 12 tightly on a thin object. Such instances are accommodated by receiver 86. Converging force on handles 14 tends to rotate receiver 86 counter-clockwise about post 19, causing the juncture of flat 94 and arm surface 106 against spring 36. If sufficient force is exerted on handles 14 to overcome the bias of spring 36, moving it outwardly, handles 14 are permitted to move closer than the nominal minimum.

Receiver 86 can also be used to provide an opening bias for jaws 12. With receiver 86 pivoted into the opening bias position, with flat 96 adjacent spring 36, the rounded portion 112 of eye 92 is suitably disposed underlying a rounded bearing surface disposed on the distal end of the opposing handle 14, such as the rounded portion (e.g., corresponding to portion 104 of lanyard receiver 86) of the tang of an ancillary tool 18 in the opposing handle 14A. As handles 14 are forced together beyond the point of contact between eye rounded portion 112 and the rounded portion of the tang of the opposing tool, rounded portion 112 rides on the bearing surface, causing receiver 86 to pivot in a clockwise direction. This moves flat 96 off of spring 36 and rounded portion 104 bears against spring 36, moving it outward. If sufficient converging force is not present to overcome the bias of spring 36, i.e., the user ceases to squeeze the handles together, spring 36 causes receiver 86 to rotate in the counterclockwise direction. This causes rounded surface 112 to push up on the bearing surface of opposing handle 14A and open jaws 12 by a small amount.



When receiver 86 is rotated in a clockwise direction into the exposed position (flat 98 adjacent spring 36), eye 92 is disposed to receive a lanyard without interfering with the operation of other ancillary tools. Referring now to Figure 8, when flat 98 is adjacent spring 36, arm 90 is disposed at approximately 90° with respect to the longitudinal axis of handles 14. Eye 92 is thus disposed exteriorly of web 20. Thus, the lanyard may be routed through eye bore 110, without interfering with the opening or closing of other ancillary tools 18 disposed transversely adjacent to receiver 86 such as, for example, a knife blade 116.

In the exposed position, lanyard receiver 86 also serves as a quillon with respect to blade 116 and eye flat 114 provides a particularly comfortable brace for a user's thumb, when exerting cutting pressure on blade 116.

It will be understood that the above description is of preferred exemplary embodiments of the present invention, and that the invention is not limited to the specific forms shown. For example, in the preferred embodiment the pivotal connection of jaws 12 is separate from the pivotal connection of handles 14. Alternatively, jaws 12 and handles 14, may share a common pivotal connection when jaws 12 are in the extended position, from which one or the other disengages to facilitate retraction. In this regard, jaws pivot pin 60 may be extended transversely outward from jaw sides 44 and 46, and cooperating slots provided in arms 28 and 30; the pivot aperture in arms 28 and 30 would be open, forming a partial, e.g. half, circle opening to the rear. The projecting ends of extended pin 60 would engage the slots in arms 28 and 30 when in a fully extended position. By way of another example, slots 26 could be disposed in one of side panels 22 or 24, rather than web 20. In such case, shoulder screws 64 and 66 could, if desired, be eliminated. Alternative mechanisms for slidably affixing tangs 42 to handles 14 may also be employed. Likewise, while it is advantageous and preferred, to provide locking mechanisms in both handles 14, if desired, the locking



mechanism, can be omitted altogether, locking pin 72 employed only in one of handles 14, or some alternative form of locking mechanism employed. These and other modifications may be made in the design and arrangement of the elements within the scope of the invention, as expressed in the claims.



The claims defining the invention are as follows:

1. A tool with retractable jaws capable of being moved into an exposed operating position by a single hand, said tool comprising:

first and second jaws, each including a working portion and a tang interconnected by a bearing portion, said jaws being pivotally connected at said bearing portions;

first and second handles;

means for slidably coupling said tangs to said handles for selective movement relative to said handles between extended and retracted positions, said jaws being of sufficient weight to facilitate forward sliding movement of said tangs; and

means for exposing and locking said jaws in said extended position by imparting an inertial force to the jaws by the application of a sudden movement to the tool sufficient to cause sliding movement of the jaws to the extended position without the application of a manual force to the jaws.

2. The tool of claim 1, further comprising means for effecting a pivotal connection between said handles, said connection between said handles having a pivotal axis aligned with the axis of the pivotal connection between said jaws when the jaws are in said extended position.

3. A tool with retractable jaws capable of being moved into an exposed operating position by a single hand imparting an inertial force to the jaws by sudden movement of the tool without the application of a manual force to the jaws, said tool comprising:

first and second jaws, each including a working portion and a tang interconnected by a bearing portion, said jaws being pivotally connected at said bearing portions;

first and second handles, each including an internal channel therein;

means for slidably coupling said tangs to said handles for selective movement within said handle channels by means of said inertial force between

a retracted position in which said working portions are at least partially contained within said handle channels such that said working portions are prevented



from substantial pivotal motion relative to each other, and said handles are prevented from substantially diverging; and

an extended position in which said jaw working portions are disposed forward of said handles and are capable of pivotal movement with respect to each other in response to divergence and convergence of said handles.

4. The tool of claim 1, 2 or 3 further comprising releasable biasing or locking means for preventing said jaws from sliding with respect to said handles when said jaws are in said extended position.

5. The tool of claim 1, 2 or 4, when appended to claim 1 or 2, wherein said handles each include an internal channel in which said tangs are slidably coupled.

6. The tool of claim 4 or 5, wherein said means for slidably coupling comprises at least one longitudinal slot of predetermined width formed in one of said handles, and a fastener coupled to the tang disposed in the handle channel, said fastener including a portion extending through said slot, disposed for sliding movement therein.

7. The tool of claim 6, wherein said handle includes a web and respective side panels, said web interconnecting said side panels to define said handle channel, and said slot is formed in said handle web.

8. The tool of claim 4 or any one of claims 5 to 7 when appended to claim 4, wherein said releasable biasing or locking means comprises:

an aperture of a first predetermined diameter greater than the width of said slot, disposed in communication with said slot;

a pin coupled to said tang, including a first portion of a diameter less than the width of said slot, disposed to be slidably received within said slot when said jaws are in other than an extended position, and a second portion of a diameter greater than the width of said slot, but less than said first predetermined diameter disposed to be received in said aperture when said jaws are in said extended position; and means for biasing said pin toward said slot.

9. The tool of claim 8, further comprising a second aperture of said first predetermined diameter, disposed in communication with said slot to receive said pin



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when said jaws are in said retracted position.

10. The tool of any preceding claim further comprising means for effecting a pivotal connection between said handles, said connection between said handles having a pivotal axis aligned with the axis of the pivotal connection between said



jaws when the jaws are in said extended position.

11. The tool of claim 7 or 8, or claim 9 when appended to claim 7 or 8, wherein:
said handle includes a second aperture of said first predetermined diameter;
said second aperture being disposed to receive said pin when said jaws are in
5 said retracted position.

12. The tool of claim 4, or any one of claims 5 to 11 when appended to claim 4,
wherein:

at least one of said handles includes an aperture of a first predetermined
diameter;

- 10 the tang within said handle includes a bore disposed to underlie said aperture
when said jaws are in said extended position; and

said releasable biasing or locking means comprises:

- a pin disposed in said tang bore, said pin including a portion of a diameter
but less than said first predetermined diameter disposed to be received in said
15 aperture when said jaws are in said extended position; and
means for biasing said pin toward said aperture.

13. The tool of any preceding claim, wherein said jaws include:

first and second generally flat opposing side surfaces;

- said working portion of each of said jaws includes a generally flat transverse
20 outer portion proximate said bearing portion; and

said tang includes a generally flat outer transverse surface, said tang outer
transverse surface and said working portion outer transverse surface being
substantially coplanar.

14. The tool of any one of claims 1 to 6 or any one of claims 8 to 13 when
25 appended to any claim other than claim 7, wherein:

each said handle includes a web and respective side panels, said web
interconnecting said side panels to define said handle channel;

said side panels each include an arm extending forwardly of said web by a
predetermined distance;

- 30 said handles are disposed with their respective open channels facing; and



said means for effecting a pivotal connection between said handles comprises means for effecting separate but axially aligned pivotal connections between respective pairs of said arms.

15. The tool of any preceding claim, wherein:

5 said first and second jaws are substantially identical; and
 said first and second handles are substantially identical.

16. The tool of any preceding claim, wherein said jaws comprise pliers.

17. The tool of any preceding claim, further including at least one ancillary tool pivotally mounted to the distal end of said first handle.

10 18. The tool of claim 17, wherein said first handle includes a spring at said distal end thereof, and said ancillary tool comprises:

 a tang and an arm;

 said ancillary tool being pivotally mounted to said first handle at said tang;

 said tang including at least a first flattened portion disposed to reside adjacent

15 to said spring when said ancillary tool is in a nested position within said first handle;

 said arm extending transversely to said flattened portion at a first predetermined angle and including a portion projecting outwardly of said first handle channel toward said second handle by a predetermined distance when said ancillary tool is in said nested position;

20 said arm projecting portion abutting against a surface on said second handle when said first and second handles converge to a predetermined separation.

19. The tool of claim 18, including a juncture of said first flattened portion and said arm disposed in predetermined relation to said spring, such that convergence of said handles closer than said predetermined separation pivots said juncture against

25 the bias of said spring.

20. The tool of claim 18 or 19, wherein:

 said tang includes a second flattened portion;

 said arm projecting portion includes a curved peripheral portion; and

 said tool includes a curved bearing surface at the distal end of said second

30 handle;



said arm curved portion and said second handle bearing surface being configured such that upon convergence of said handles closer than said predetermined distance

5 said bearing surface tends to be forced against said arm curved portion, such that said arm curved portion rides on said bearing surface to pivot said ancillary tool from said flattened portion against the bias of said spring; and

the bias of said spring tends to pivot said ancillary tool to force said arm curved portion against said bearing surface such that said bearing surface rides on said arm curved portion to cause said handles to diverge and thereby open said jaws.

10 24. The tool of any preceding claim, further comprising a stop for establishing a nominal minimum separation between the distal ends of said handles.

25. The tool of claim 24, wherein said stop comprises a portion of an ancillary tool pivotally mounted in the distal end of said first handle.

15 26. The tool of claim 25, wherein ancillary tool comprises a tang and an arm extending at an angle therefrom, and said first handle includes a spring at said distal end thereof disposed to cooperate with said tang.

27. A tool substantially as described with reference to Figure 1 or Figure 2 or Figure 2 as modified by any one or more of Figures 3 to 8 of the accompanying drawings.

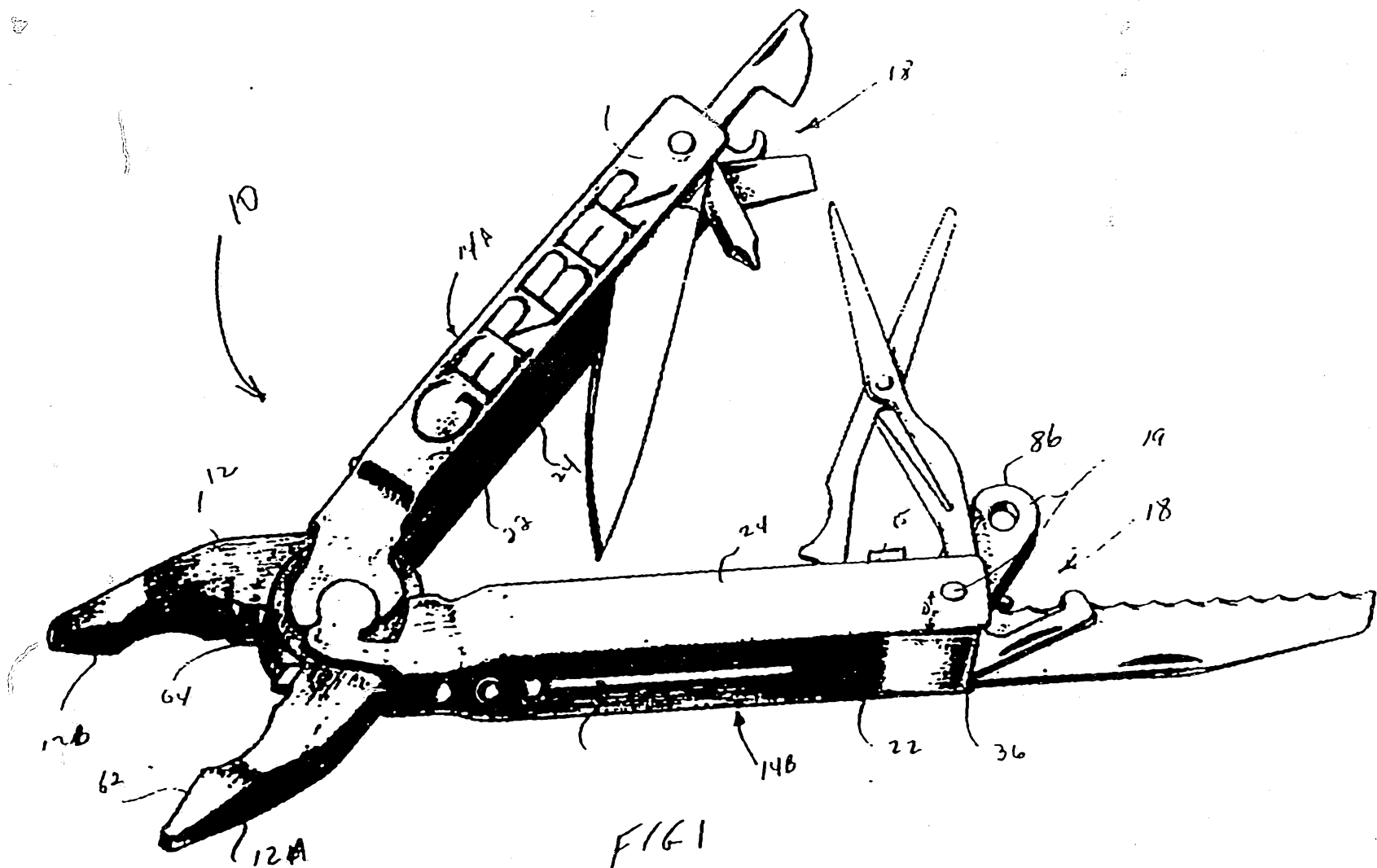
DATED: 28 December 1995

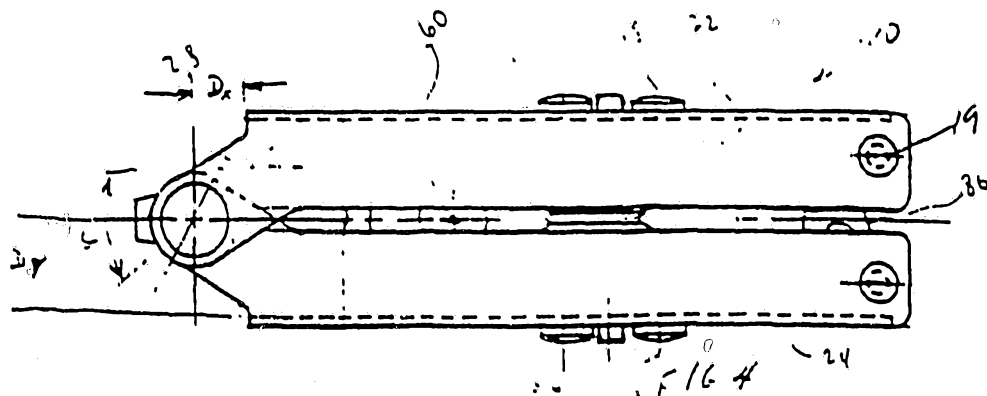
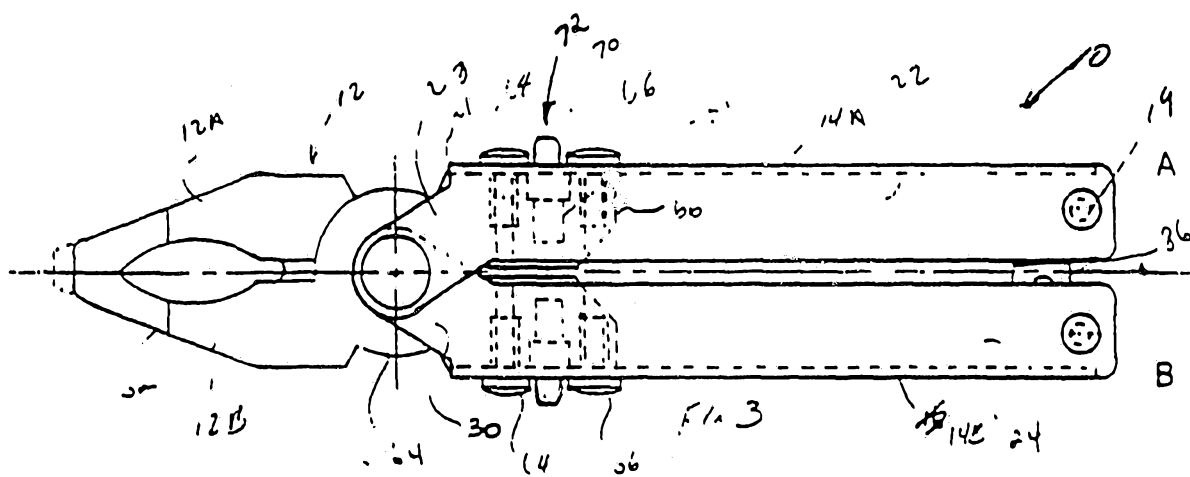
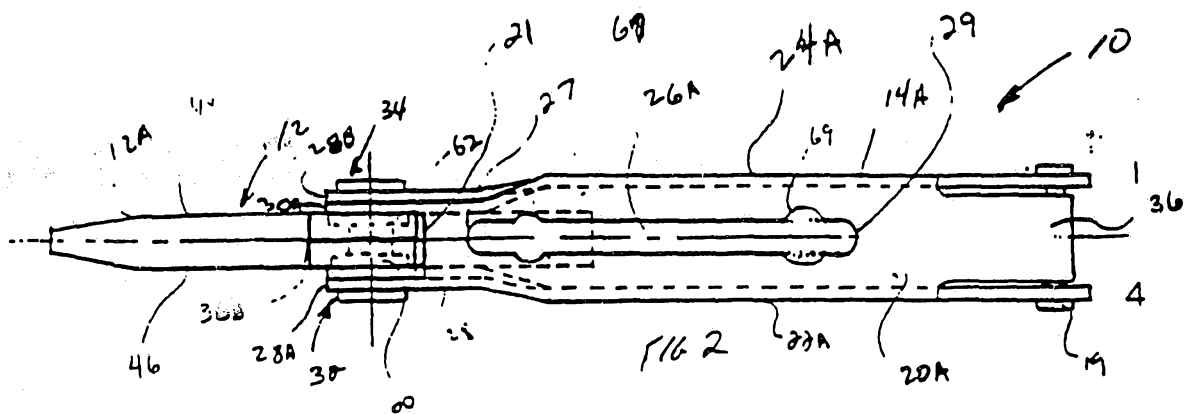
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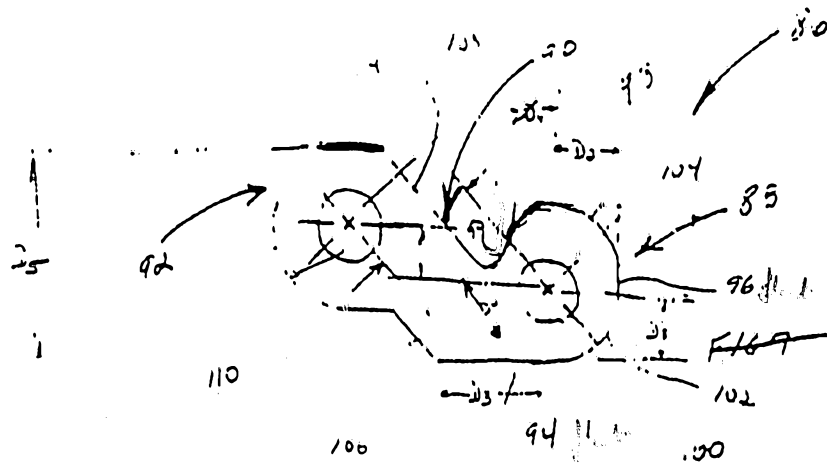
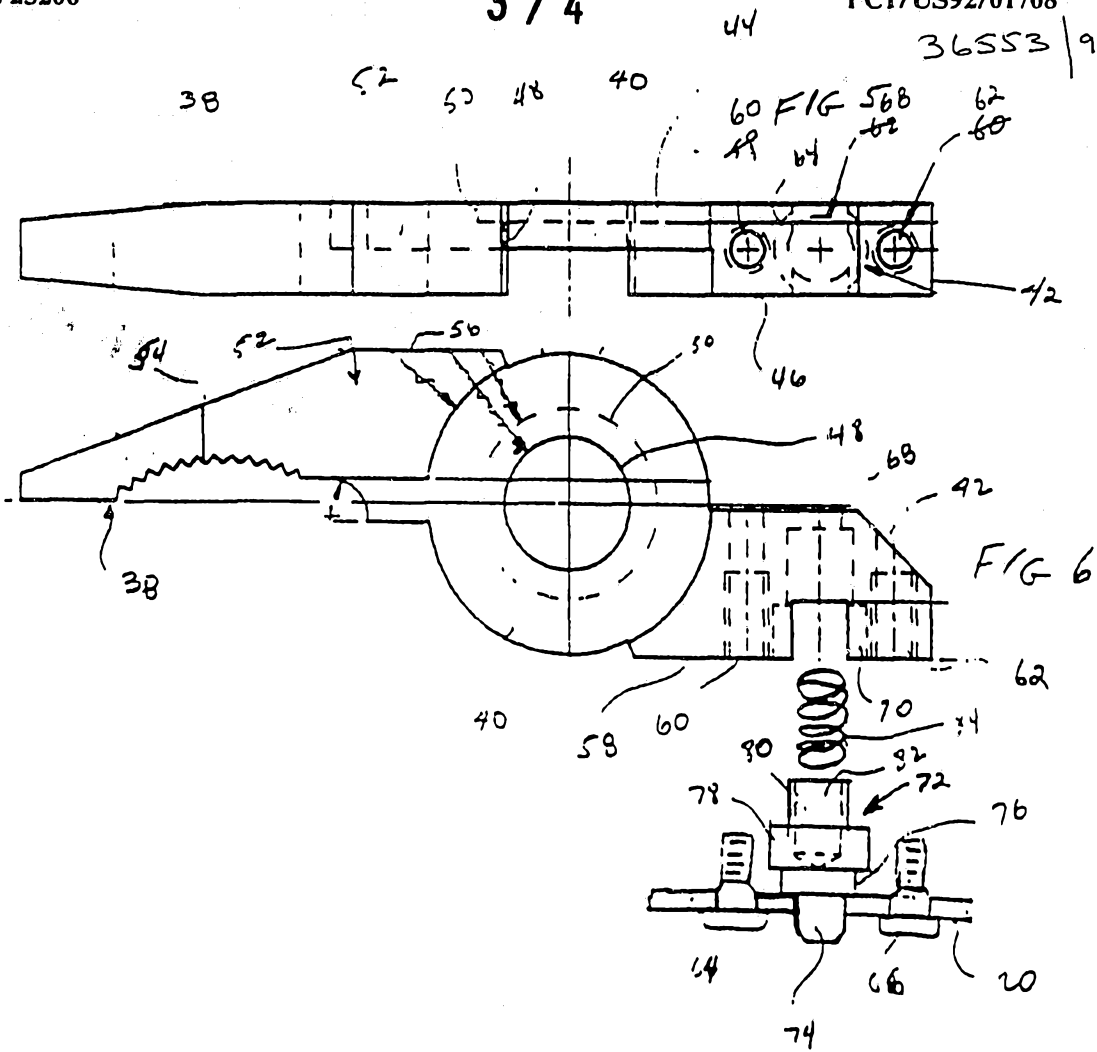
Patent Attorneys for the Applicant:

FISKARS OY AB





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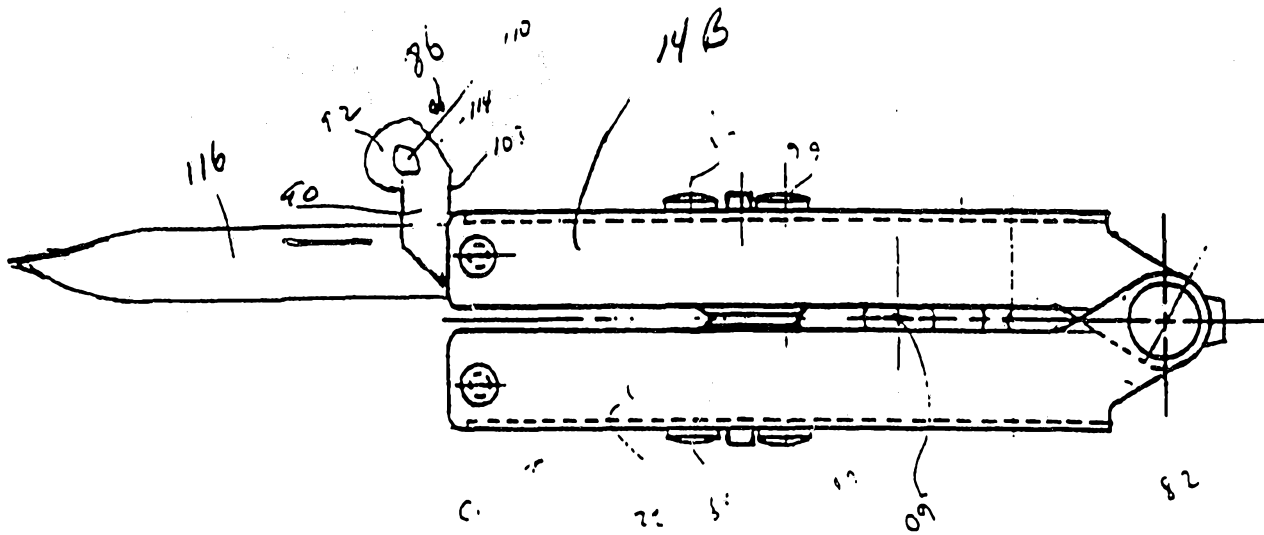


FIG 8

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 92/01708

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl.5 B 26 B 11/00	B 25 B 7/22	B 25 F 1/00 B 25 F 1/04
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
Int.Cl.5	B 25 B	B 25 F B 26 B
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	DE,U,8714293 (TAIR CHEN) 10 December 1987	1,2,4,7 8,12, 14,16- 18,31, 42,43, 46
Y	see page 8, line 16 - page 9, line 10; claim 1; figures 1-6	3,15,19 30,32- 35,4
Y	US,A,4238862 (LEATHERMAN) 16 December 1980	3,15,19 30,32- 35,41, 50
A	see abstract; figures 1-17 see column 2, line 48 - line 51 -/-	28,29, 48,49
¹⁰ Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
19-05-1993	14. 09. 93	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE		

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category °	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
X	DE,U,8623301 (EMIL LUX) 27 November 1986 see page 4, line 19 - page 7, line 13; figures 1-7 ---	1,2,7, 16-18, 27,31, 47
X	DE,C, 3140 (SCH[FER) 30 April 1878 see the whole document -----	1,31

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

US 9201708
SA 70581

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on 08/09/93
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-U- 8714293	10-12-87	FR-A- 2622139 US-A- 4794692	28-04-89 03-01-89
US-A- 4238862	16-12-80	None	
DE-U- 8623301	27-11-86	None	
DE-C- 3140		None	