(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
28 February 2013 (28.02.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/028147 Al

(51) International Patent Classification:
A44B 15/00 (2006.01)

(21) International Application Number:
PCT/US201 1/001496

(22) International Filing Date:
25 August 201 1 (25.08.201 1)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant *(for all designated States except US):* **INTERDESIGN, INC.** [US/US]; 30725 Solon Industrial Parkway, Solon, OH 44139 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only):* **RUBIN, Bennett, S.** [US/US]; 32379 Pinebrook Lane, Pepper Pike, OH 44124 (US). **ADAMANY, Richard, C.** [US/US]; 7150 Fox Ledges Lane, Chagrin Falls, OH 44022 (US).

(74) Agents: **HOCHBERG, D., Peter** et al; D. Peter Hochberg Co., L.P.A., 1940 East 6th Street - 6th Floor, Cleveland, OH 441 14 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available):* AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME,

[Continued on nextpage]

(54) Title: MULTI-TOOL WITH ARTIFICIAL KEY AND LED

(57) Abstract: A faux key tool and light device has a head assembly and a faux key blade assembly. The head assembly has a head housing with a battery compartment, a lens opening and an actuating button opening. The faux key blade assembly has a pair of flat, opposing spaced walls having opposing edges with faux key teeth, and a knife blade pivotally mounted between the spaced walls.

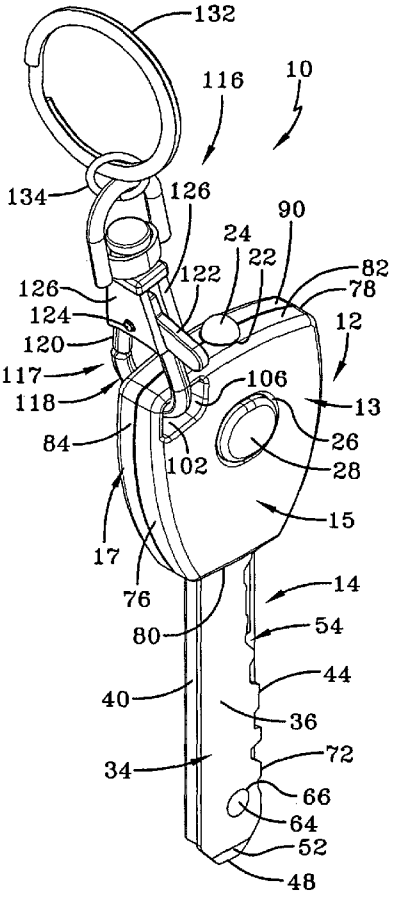

FIG-1

WO 2013/028147 A1

MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available):* ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

MULTI-TOOL WITH ARTIFICIAL KEY AND LED

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] This invention relates to miniature tool kits with an illumination device, and in particular to a faux key device incorporating a hidden but accessible knife blade with a manually operable illuminating device

Description of the Prior Art

[0002] Miniature tool kits are well known in the art. Various devices are known which can be stored in a pant's pocket or a handbag and whose utilitarian devices remain secured until they are needed and can be manually accessed for operation.

[0003] There are many descriptions of miniature tool kits which can be held in a person's pocket or in a handbag. These include U.S. Patent Nos. 6,347,875 (Painsith 2002, including among other things a pen knife), 5,809,600 (Cachot 1998, also having a pen knife), 5,887,306 (Huang 1999, screwdriver and knife), 5,996,451 (Seber et al., hand tool including pliers), 6,286,397 (Taggart et al. 2001, tool kit for use with sports equipment), 6,564,678 (Wang 2003, a plurality of tool kits), 6,574,817 (Wu 2003, a complex tool kit having two tool assemblies), 7,140,280 (Hawkins et al., tool kit with pivotable tools), 7,810,415 (Adamany et al., foldable tool kit with expandable tools), 5,491,856 (Legg 1996, a foldable multiple-function tool), U.S. D555,455 S (Chang 2007, multi-function tool), D549,542 S (Chiang 2007, tool kit), D598,266 S (Rubin et al. 2009, portable tool set), D595,106 S (Rubin et al. 2009, portable tool set), U.S. Pub. 2010/0319138 A1 (Adamany et al., a miniature tool kit with an auto-release clasp and expandable tools), 7,810,415 (Adamany et al. 2010, miniature tool kit with an auto-release clasp and expandable tools), D522,519 S (Rubin et al. 2006, miniature tool kit), D55 1,802 S (Rubin et al. 2007, miniature tool kit), 6,1 12,352 (Legg 2000, foldable tool kit) and 6,109,147 (Legg 2000, hexagonal tool bit set).

[0004] A number of these miniature tool kits have illuminating devices such as flashlights, flashers and LEDs. This group includes U.S. 2007/0182572 A1 (Rubin et al. 2007, emergency device with-a-flashlight and-emergency-flasher);-US-2006/00755-70- Al-(Gelfand-2006-,-a handheld multi-functional knife assembly with a compartment for holding foldable tools), 7,306,366 (Camenzind et al. 2007, a folding knife with a flashlight that can be powered by a battery or a solar cell), 7,008,076 (Zirk et al. 2006, a folding knife with a light that can be powered by conventional batteries, a solar-powered series of cells or a solar-charged battery), 7,810,415 (Adamany et al. 2010, a portable tool kit having electrically powered lamps), US 2006/0164826 A1 (Ackermann et al. 2006, a pocket lamp having a rechargeable energy-

storage unit), and 6,460,698 (Wang 2002, a planer tool casing that can be held in a pocket and having one or more lights). There are also U.S. design patents that can be stored in a pocket and have an illumination device including D593,693 S (Adamany et al. 2009, a combined flashlight and docking station), D564,387 S (Rubin et al. 2008, a handheld emergency tool), D552,276 S (Shaljian 2007, a cellular phone light), D544,388 S (Chisholm 2007, an emergency light), D543,297 S (Oslecki et al. 2007, a lighting device), D525,247 S (Rubin et al. 2006, a micro-pro flash drive), D522,519 S (Rubin et al. 2006, a micro-pro flash drive), D514,063 S (Rubin et al. 2006, a micro-flashlight docking station).

[0005] There are also known in the prior art many key ring devices having different key ring assemblies and other apparatuses combined with the key rings. These include US 2003/01337833 A1 (Hsu 2003, a mini-flashlight incorporated on a key ring), 7,810,415 (Adamany et al., an expandable tool kit on a key ring), 7,146,667 (Eisner 2006, a pocket tool including knife blades incorporated on a key ring), 6,332,345 (Huang 2001, a key ring structure having a disc for holding a number of key rings), 6,006,562 (Wolter 1999, a collective holder having a number of slidable runners each of which include a key ring), 6,487,941 (Ping 2002, a foldable hand tool for being mounted on a key ring), 6,460,698 (Wang 2002, a planer tool casing mounted on a keychain, 6,418,628 (Steingass 2002, a car window breaker mounted on a keychain loop), 5,491,856 (Legg 1996, a foldable multiple-function tool which can be mounted on a key ring), 5,279,021 (Edgin 1994, an article retaining apparatus for being mounted on a key ring), 5,077,850 (Brubaker 1992, a utility device for a key ring), 4,324,121 (Richter 1982, a ring having a removable metal ring for the insertion and removal of keys where the ring is rotatable in a handle portion), 2,558,265 (Mosch 1951, a pocket utensil holder having pivotally-mounted keys), 2,412,056 (Mosch 1946, a utensil holder having pivulally-iuuuuted -keys), 2,371,308 (Mosch 1945, a pocket utensil holder having pivotally mounted keys), 1,561,262 (Martin 1925, a pocket implement mounted on a key ring), US 2010/0319138 A1 (Adamany et al. 2010, a portable tool kit mounted on a clasp), 7,557,720 (Rubin et al. 2009, a personal emergency device mounted on a key ring), 5,491,856 (Legg 1996, a foldable multi-function tool mountable on a key ring). There are also a number of U.S. design patents disclosing various devices mountable on a key ring or incorporating a key ring, including D593,693 S (Adamany et al. 2009, a combined flashlight and docking station), D575,182 S (Rubin et al. 2008, a handheld emergency tool mountable on a key ring), D522,519 S (Rubin et al. 2006, a micro-pro flash drive mountable on a key ring), D543,297 S (Oslecki et al. 2007, a lighting device incorporating a key ring) and D622,955 S (Mudrick et al. 2010, a solar-powered key ring).

[0006] Significant patents issued on a device known as a Utili-Key® key ring tool, namely U.S. Patent Nos. 6,1 12,352 and D405,953 issued to Larry K. Legg on September 5, 2000. The latter device incorporated an artificial key, having a pivot point in a pair of opposed head portions of two integral parts that were pivotally mounted to the pivot point. One integral portion had a head portion with an extending flat screwdriver head on one side of the pivot and an elongated portion with a serrated knife blade and an adjacent straight knife blade. The latter blades were only exposed when the second part of the key ring tool was pivoted to an open position about the pivot point. The other portion had a Phillips screwdriver defining a free end of the second integral portion to which was mounted a bottle opener. Also on the second portion was a micro eyeglass screwdriver. The latter device was similar to that of the present invention, at least as to the extent that they both incorporated an artificial or faux key, but the respective constructions are quite different.

SUMMARY OF THE INVENTION

[0007] An object of the present invention is to provide a tool and light device which is compact, rugged and easy to use in operation.

[0008] Another object of the present invention is to provide a compact tool and light device which can be held on a key ring, the device having a closed condition to protect its surroundings and the device, and an open condition for use.

[0009] Still another object of the present invention is to provide a faux key tool and light device which can be held on a key ring and give the appearance of being a key, yet functioning as a cutting tool and as a source of illumination.

[0010] It is yet an additional object of the present invention to provide a faux key tool and light device having an easily accessible actuating button for the light source and an easily accessible battery compartment for providing batteries to a circuit board to which the illumination device is connected.

[0011] It is yet still another object of the present invention to provide a faux key tool and light device where the tool is a knife blade which can be pivoted to extend the length of the knife blade to provide better torque for its operation and render it easier to use in many applications.

[0012] It is still an additional object of the present invention to provide a faux key tool and light device having an appropriate covering on the head of the faux key to both make the faux key easier to handle and to provide it with greater similarity to modern keys.

[0013] Another object of the present invention is to provide a faux key tool and light device where the like device is an LED which provides illumination from an easy-to-aim position at

an end edge of the faux key.

[0014] Another object of the present invention is to provide a faux key tool and light device having a quick-disconnect key ring assembly.

[0015] A general object of the present invention is to provide a faux key tool and light device which is inexpensive to manufacture, rugged in construction and easy to use.

[0016] Other objects will be apparent from the description to follow and from the appended claims.

[0017] The foregoing objects are achieved according to the preferred embodiment of the invention by a faux key tool and light device which comprises a head assembly and a faux key blade assembly. The head assembly includes a head housing having a battery compartment and a lens opening for a lens and an actuating button opening for rendering an actuating button accessible. The faux key blade assembly includes a faux key blade housing having a pair of opposing, generally flat elongated walls extending from the head housing in a side-by-side relationship and defining a space between them. A knife blade is pivotally mounted for movement between the elongated walls between an open position in which the cutting edge portion is exposed and a closed position in which the cutting edge portion is unexposed. An actuating button is accessible on one of opposing faces of the head housing, and a battery compartment having a cover is on the other face of the head housing. The knife blade is preferably pivotally mounted at the free end of the elongated walls. An illumination device in the form of an LED is disposed at an end of the head housing which is opposite from the elongated walls. The head is preferably covered with a polycarbonate/acrylonitrile butadiene styrene which is a moldable plastic that is hard, does not undergo chemical change when heated, and is used on many keys, such as those used with automobiles and other motor vehicles.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Fig. 1 is a perspective view of the faux key tool and light device according to a preferred embodiment of the invention with a knife blade in the closed position.

[0019] Fig. 2 is a perspective view of the device shown in Fig. 1 taken from the other side of the device.

[0020] Fig. 3 is a perspective view of the device shown in Figs. 1 and 2 with the knife blade in an open position.

[0021] Fig. 4 is top view of the device shown in Figs. 1-3, with the knife blade in the open position.

[0022] Fig. 5 is a side view of the device shown in Fig. 4.

[0023] Fig. 6 is a perspective view of the device shown in Fig. 4 with part of the head housing removed.

[0024] Fig. 7 is a top view of the device shown in Fig. 6.

[0025] Fig. 8 is a side view of the device shown in Fig. 7.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0026] Referring to Figs. 1-5, a faux key tool and light device 10 according to the preferred embodiment of the invention is shown. Device 10 includes a head assembly 12 and a faux key blade assembly 14. Head assembly 12 has a head housing 13, a battery compartment 16 as shown in Figs. 6-8, which is shown as having two single battery compartments 18 and 20 for holding batteries in a snug relationship, a lens opening 22 through which an LED with lens 24 extends, and an actuating button opening 26 through which an actuating button 28 is accessible. Battery compartment 16 has a selectively removable battery compartment cover 30 which can be removed by a closing device such as a Phillips head screw 32 as described below. Head housing 13 has a front head housing 15 and a rear head housing 17. Faux key blade assembly 14 includes a faux key blade housing 34 with a forward, generally flat elongated wall 36 and a rearward, generally flat elongated wall 38, and a knife blade 54 having a cutting edge portion 56. Walls 36 and 38 are connected at one edge by an edge wall 40 which can be integral with rear, generally flat elongated wall 38 from which it can advantageously having been bent during the manufacturing process. Walls 36 and 38 are separated from each other by a blade-receiving space 42 shown in Figs. 3, 5, 6 and 8. Walls 36 and 38 have opposing edges 44 and 46, respectively, and respective free ends 48 and 50. Free end 48 has a flat screwdriver head 52 thereon for enabling device 10 to act as a screwdriver.

[0027] Cutting edge portion 56 includes a straight knife blade 58 extending from a free end 60 of knife blade 54, and a serrated knife blade 62 extending from straight knife blade 58 towards the inner part of knife blade 54.

[0028] A pivot pin 64 extends through a hole 66 in front, generally flat elongated wall 36, a hole 68 in rear, generally flat elongated wall 38 and a hole 70 extending through knife blade 54. The pivot point at pivot pin 64 enables a greater torque to be applied to knife blade 54 because of the added length of elongated walls 36 and 38. It can be seen from pivot pin 64 extending through a somewhat enlarged hole 68 in elongated wall 38 that pin 64 must be compressed to fill hole 68 and prevent the disengagement of pin 64 from walls 36 and 38.

[0029] Free edges 44 and 46 of elongated walls 36 and 38 have opposing faux key teeth 72 and 74, respectively, for rendering elongated walls 36 and 38 to appear to be a key blade with millings or grooves forming the teeth.

[0030] As mentioned previously, head assembly 12 includes a front head housing 15 and a rear head housing 17. Front head housing 17 includes centrally disposed actuating button opening 26 through which actuating button 28 extends, rendering it easy to use. Rear head housing 17 includes removable battery compartment cover 30 (Fig. 2) which is easily removable for changing the batteries by means of loosening screw 32. Screw 32 can be tightened into a receptacle located in removable battery compartment cover 30, but screw 32 cannot be removed from battery compartment cover 30 since it is locked in place in a small metal liner on the interior side of battery compartment cover 30. This prevents screw 32 from become separated from cover 32 and being lost. The metal liner also completes an electrical circuit through the batteries in battery compartment 16.

[0031] Front head housing 15 has a pair of convexly curved, opposing sides 76 and 78. Front head housing 15 also has a key blade end side 80 interconnecting curved sides 76 and 78 proximal blade assembly 14, and a free end side or light-emitting side 82 opposing key blade side 80. Likewise, rear head housing 17 includes a convexly curved side 84 and an opposing convexly curved side 86. Sides 84 and 86 are opposed to and are so configured that curved sides 76 and 78 of front head housing 15 match curved sides 84 and 86 of rear head housing 17. Likewise, rear head housing 17 has a key blade side 88 and a free end side 90 which oppose and match corresponding key blade side 80 and free end side 82 of front head housing 15. Lens opening 22 is formed of two essentially semicircular openings in each of free end sides 82 and 90 of front head housing 15 and rear head housing 17.

[0032] Key blade end sides 80 and 88 of front head housing 15 and rear head housing 17, respectively, have respective shoulders 92 and 94 for holding faux key blade housing 34 in place insofar as it prevents movement of housing 34 beyond shoulders 92 and 94. However, front head housing 15 and rear head housing 17 have respective recess-defining walls 96 and 98, respectively, which oppose each other and cooperate to define a knife blade recess 100 for receiving knife blade 54 as it rotates to or from the closed position as shown in Figs. 1 and 2, to or from open position shown in Figs. 3-8.

[0033] Front head housing 15 has hole-defining surfaces 102, and rear head housing 17 has hole-defining surfaces 104. Surfaces 102 and 104 together form a key ring-receiving orifice 106.

[0034] Turning to Figs. 6-8, the interior of rear head housing 17 is shown. A circuit board 108 is mounted in appropriately configured walls within head assembly 12. Circuit board 108 is connected by a set of leads 110 and to a pair of batteries 112 and 114. Also included in the electrical circuit is actuating button 28 and the switch which operates to close the circuit

between batteries 112 and 114 and the bulb in LED with lens 24. Head housing 13 has a circuit board compartment, an actuating button compartment and an LED with lens compartment.

[0035] A quick-disconnect key ring assembly 116 is attached to faux key tool and light device 10. Quick-disconnect key ring assembly 116 has an annular latch 118 with a jaw 120 which is fixed to a quick-release lever 122. Quick-release lever 122 and jaw 120 are pivotally mounted on a pivot pin 124 which extends between a pair of walls 126. Quick-disconnect key ring assembly 116 has a non-binding swivel 128 to which is attached a U-shaped member 130. Quick-disconnect key ring assembly 116 includes a key ring 132 which is attached to U-shaped member 130 by means of a relatively small ring 134. Key ring 132 is a split ring and can be used to accommodate various types of keys and other implements to be stored on a key ring.

[0036] In order to assembly quick-disconnect key ring assembly 116 onto faux key tool and light device 10, one simply rotates quick-release lever 122 in the direction towards non-binding swivel 128 to open jaw 120, and annular latch 118 is slid through key ring-receiving orifice 106. The quick-release lever is released, and an appropriate spring biases jaw 120 to its closed position to close annular latch 118 to latch quick-disconnect key ring assembly 116 to tool and light device 10. To remove quick-disconnect key ring assembly 116 from light device 10, one simply moves quick-release lever 122 to open jaw 120 and open annular latch 118 is slid out of key ring-receiving orifice 106.

[0037] It should be apparent that the preferred embodiment of the invention described above accomplishes all of the objects of the invention. Faux key tool and light device 10 is attractive in appearance and looks very much like a key. Knife blade 54 can easily be moved between the open and closed position, and actuating button 28 can easily be depressed to illuminate LED lens 24.

[0038] The invention has been described in detail with particular reference to the preferred embodiment, and variations and modifications within the spirit and scope of the invention may occur to those skilled in the art to which the invention pertains from the description set forth and from the appended claims.

We claim:

1. A faux key tool and light device comprising:

a head assembly including:

a head housing comprising:

a battery compartment configured to hold at least one battery in a snug relationship'

a lens opening for a lens; and

an actuating button opening for rendering an actuating button accessible; and

a faux key blade assembly including:

a faux key blade housing comprising:

a pair of opposing generally flat elongated walls extending from said head housing in a side-by-side relationship, said elongated walls being spaced from each other and defining a blade-receiving space therebetween, and having two pairs of opposing edges and free ends distal from said head housing, one of said pairs of opposing edges having opposing faux key teeth; and

a knife blade comprising:

a cutting edge portion said knife blade being pivotally mounted between said pair of opposing generally flat elongated walls for movement in said blade-receiving space between an open position having said cutting edge portion exposed and a closed position having said cutting edge portion unexposed.

2. A faux key tool and light device according to claim 1 wherein said head housing further comprises a circuit board compartment for holding a circuit board, an actuating button compartment for holding an actuating button in a snug relationship, and an LED-with-bulb compartment for holding an LED with lens in a snug relationship, and said faux key tool and light device further comprising:

a circuit board in said circuit board compartment and being electrically connectable to at least one battery in said battery compartment;

an actuating button in said actuating button compartment for selectively connecting at least one battery in said battery compartment to said circuit board, said actuating button being accessible through said actuating button opening; and

an LED with a lens operably connected to said circuit board and in alignment with said lens opening for sending illumination through said lens opening in response to actuation of said actuating button.

3. A faux key tool and light device according to claim 1 wherein said knife blade is pivotally mounted at said free ends of said generally flat elongated walls.

4. A faux key tool and light device according to claim 1 wherein said cutting edge portion of said knife blade includes a straight knife blade portion and a serrated knife blade portion.

5. A faux key tool and light device according to claim 2 wherein said head housing includes a front head housing and an opposing rear head housing, a key blade end side having said opposing generally flat elongated walls extending therefrom and an opposing free light-emitting side, said lens opening being disposed on said light-emitting side.

6. A faux key tool and light device according to claim 5 wherein said actuating button opening is disposed in said front head housing of said head housing.

7. A faux key tool and light device according to claim 5 wherein said battery compartment comprises at least one single battery compartment for holding at least one battery and a selectively removable battery compartment cover having an open cover position and a closed position for selectively opening and closing said single battery compartment, said selectively removable battery compartment cover being disposed on said rear head housing of said head housing when said selectively removable battery compartment cover is in the closed cover position.

8. A faux key tool and light device according to claim 1 wherein the free end of one of said pair of opposing generally flat elongated walls has a screwdriver head.

9. A faux key tool and light device according to claim 1 wherein said head housing includes a key ring-receiving orifice, and said faux key tool and light device further comprises:

a quick-disconnect key ring assembly, said quick-disconnect key ring assembly including:

an annular latch having a lever-operated jaw, said lever-operated jaw being manually openable to be received in said key ring-receiving orifice and being biased to a closed position; and

a key ring operatively connected to said annular latch for receiving keys.

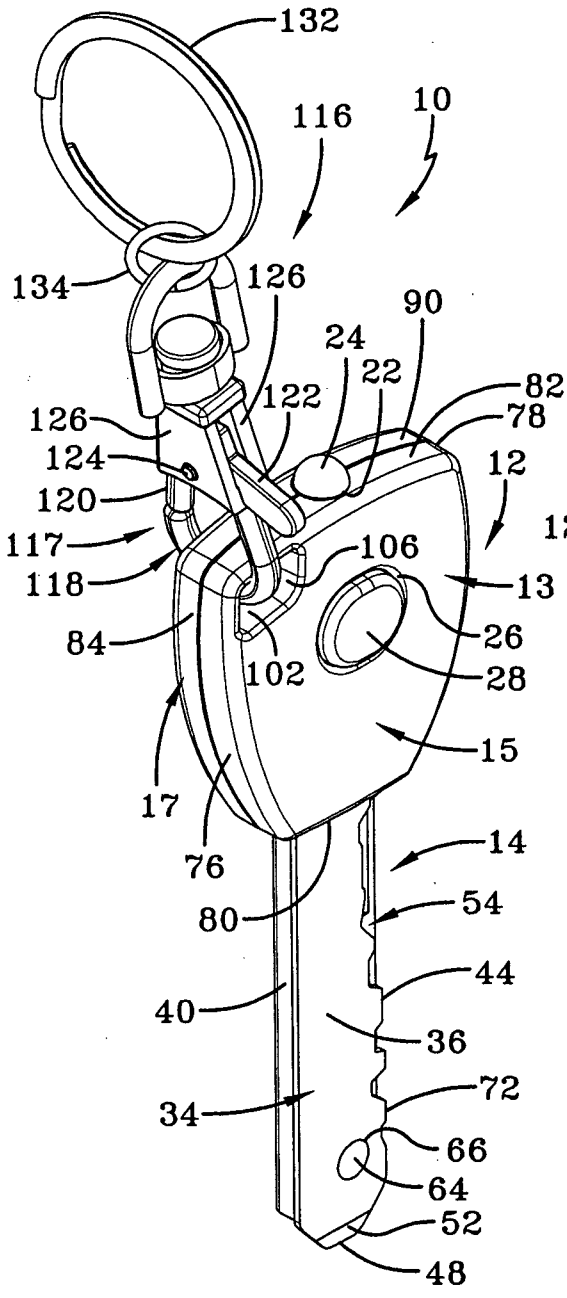
132
116
10
134
126
90
24
22
82
78
122
126
124
120
12
117
106
118
13
84
26
102
28
15
17
76
14
80
54
44
40
36
72
34
66
64
52
48

FIG-1

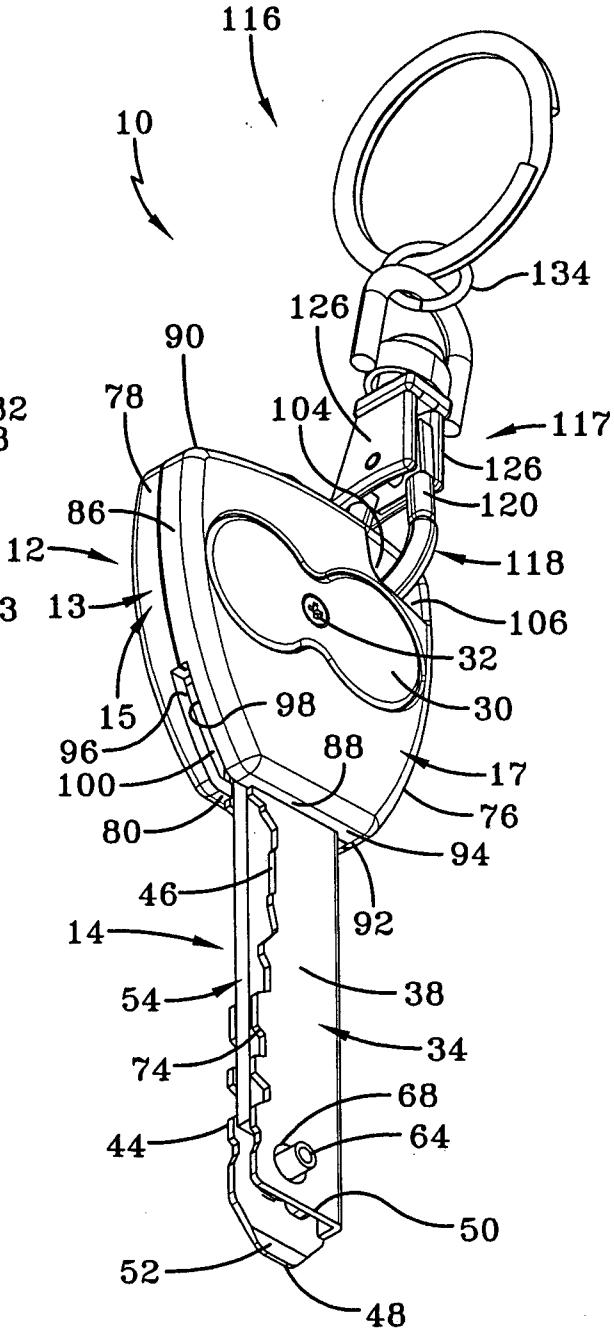
116
10
134
126
90
78
104
117
126
120
86
12
118
13
106
32
15
98
30
96
88
17
100
76
80
94
46
92
14
38
54
34
74
68
44
64
50
52
48

FIG-2

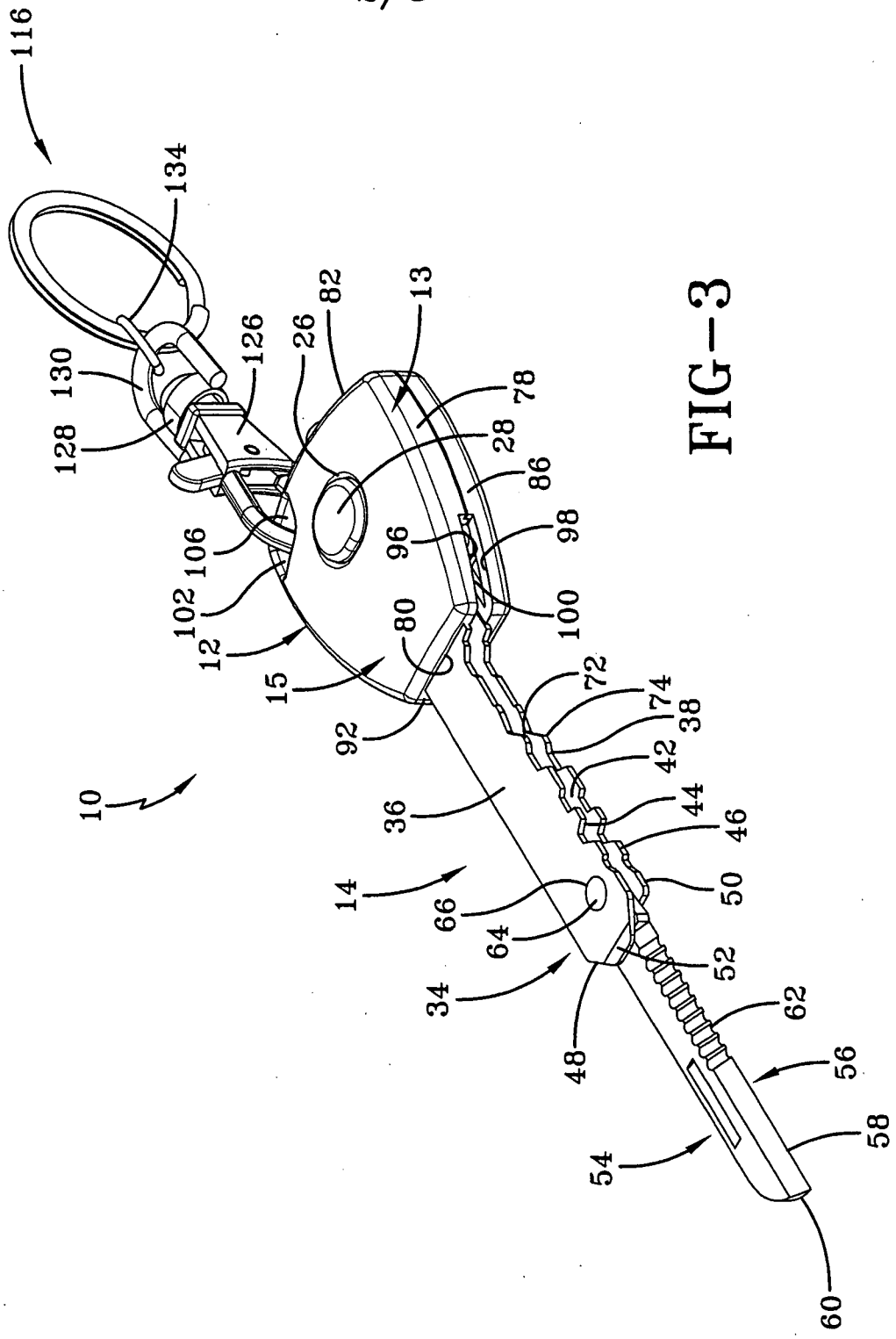
116
134
130
128
126
26
82
13
78
28
86
98
96
106
102
12
15
80
100
72
74
38
42
92
10
36
44
46
14
66
50
64
52
34
62
48
56
54
58
60

FIG-3

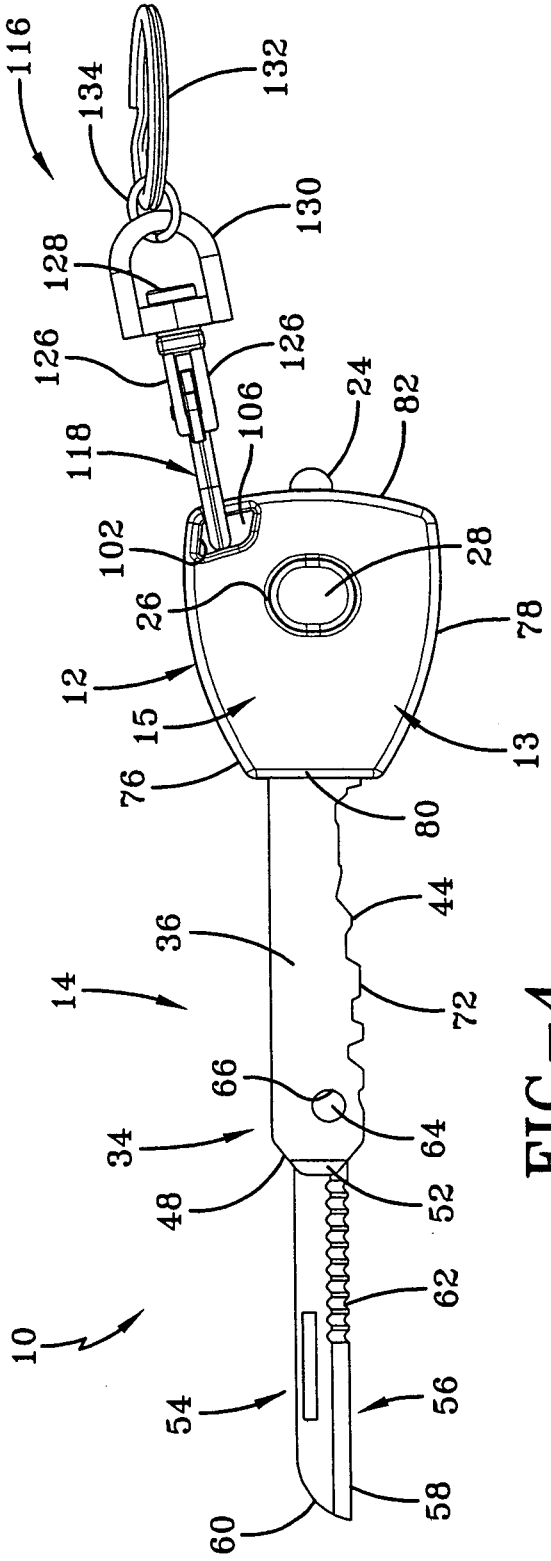
116
134
132
130
128
126
126
106
24
82
118
102
28
26
78
12
15
13
76
80
44
36
14
72
66
64
34
48
52
62
10
54
56
58
60

FIG-4

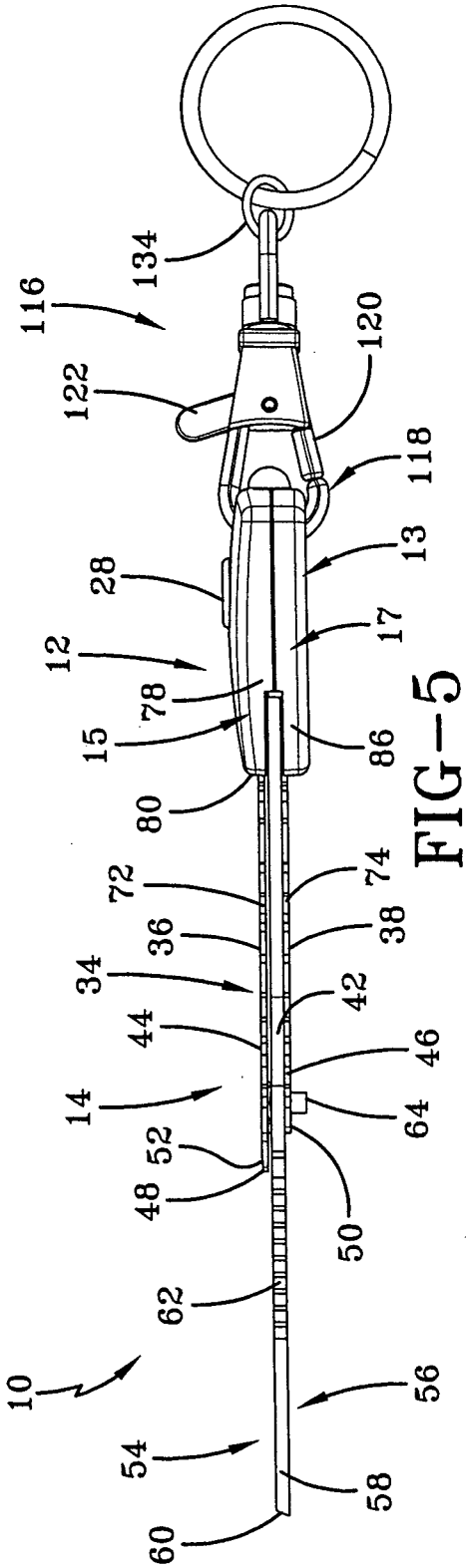
116
134
120
122
118
13
28
17
12
78
15
86
80
72
74
38
36
34
42
44
46
14
64
52
48
50
62
10
56
54
58
60

FIG-5

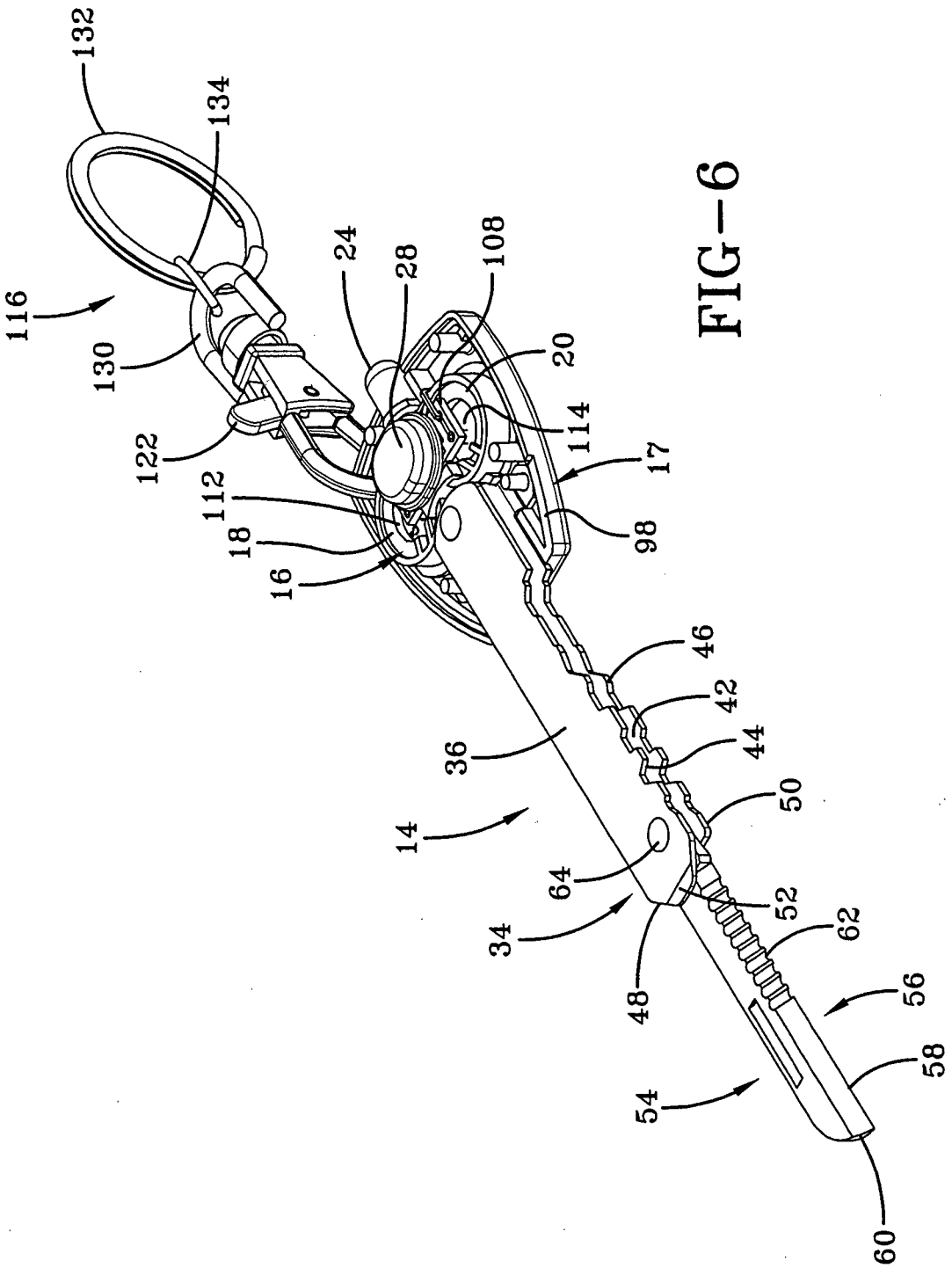
132
134
116
130
122
112
18
16
24
28
108
20
114
17
98
46
42
44
50
36
14
64
34
52
62
48
56
58
54
60

FIG-6

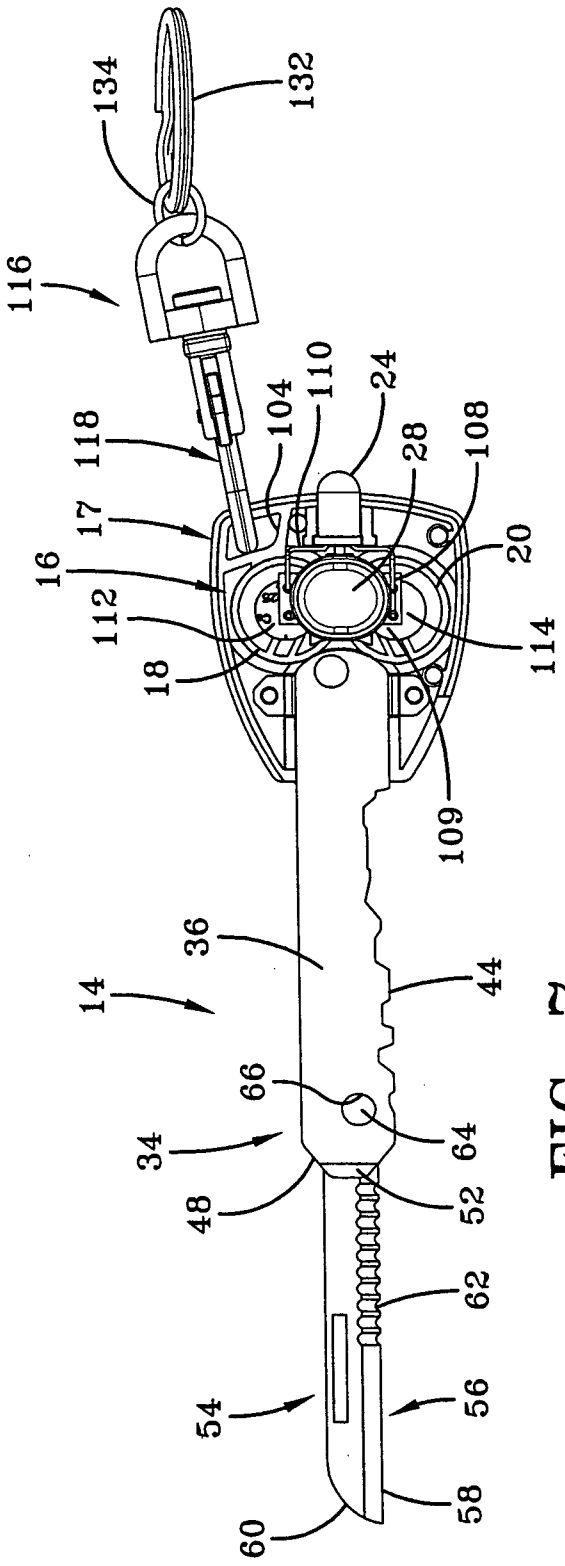
134
132
116
118
104
110
24
28
108
17
20
16
112
114
18
109
36
14
44
66
34
64
48
52
62
54
56
58
60

FIG-7

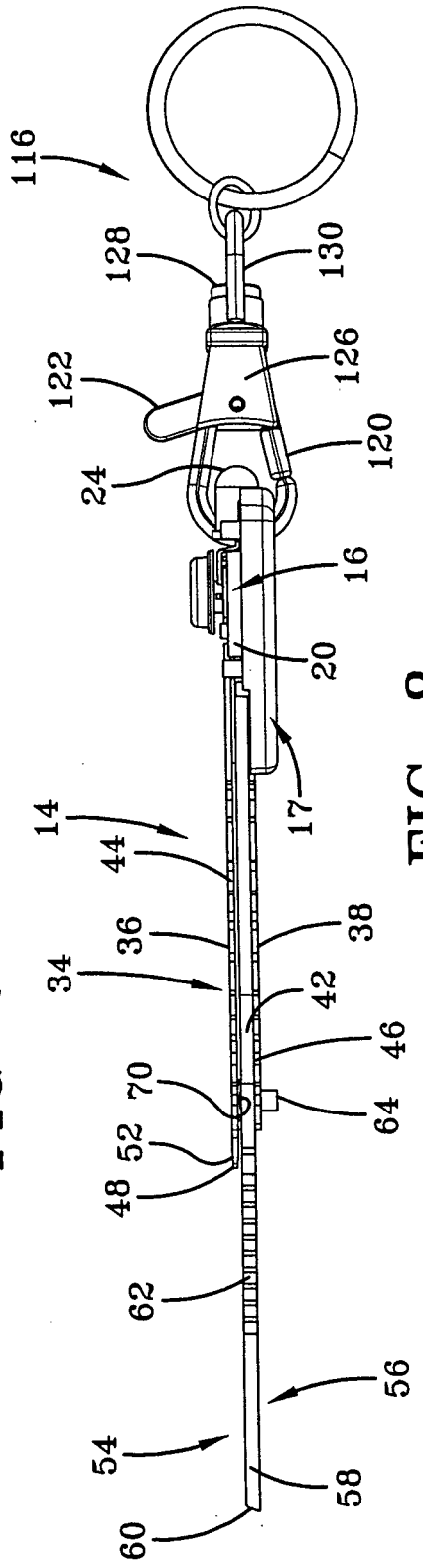
116
128
130
122
126
24
120
16
20
17
14
44
36
38
34
42
46
70
64
52
48
62
56
54
58
60

FIG-8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US201 1/001 496

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A44B 15/00 (2012.01)
USPC - 30/155
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - A44B 15/00; B26B 3/06; F41B 13/02; F41C 27/18 (2012.01)
USPC - 30/155, 162, 329, 337; 40/330, 493.1; 70/456R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
ECLA - E05B 19/00K

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Patbase

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,966,972 A (CHUANG) 19 October 1999 (19.10.1999) entire document	1-9
Y	US 3,453,729 A (LARSON) 08 July 1969 (08.07.1969) entire document	1-9
Y	US 7,325,312 B1 (JANICH) 05 February 2008 (05.02.2008) entire document	1-9
Y	US 6,223,372 B1 (BARBER) 01 May 2001 (01.05.2001) entire document	4
Y	US 2001/0034910 A1 (TAGGART et al) 01 November 2001 (01.11.2001) entire document	8
Y	US 4,376,383 A (WOLTER) 15 March 1983 (15.03.1983) entire document	9

☐ Further documents are listed in the continuation of Box C. ☐

* 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 application or patent 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 when the document is taken alone
"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

Date of the actual completion of the international search	Date of mailing of the international search report
19 January 2012	01 FEB 2012
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)