



(51) International Patent Classification:
A44B 11/26 (2006.01)

(21) International Application Number:
PCT/US2009/064703

(22) International Filing Date:
17 November 2009 (17.11.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/145,148 16 January 2009 (16.01.2009) US

(71) Applicant (for all designated States except US): **ILLINOIS TOOL WORKS INC.** [US/US]; 3600 West Lake Avenue, Glenview, Illinois 60026 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **PARISI, Brian M.** [US/US]; 3600 West Lake Avenue, Glenview, Illinois 60026 (US).

(74) Agent: **HAUPTMAN, Benjamin J.**; Lowe Hauptman Ham & Berner, LLP, 1700 Diagonal Road, Suite 300, Alexandria, Virginia 22314 (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, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, 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, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (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, 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:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

Published:

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

(54) Title: BUCKLE

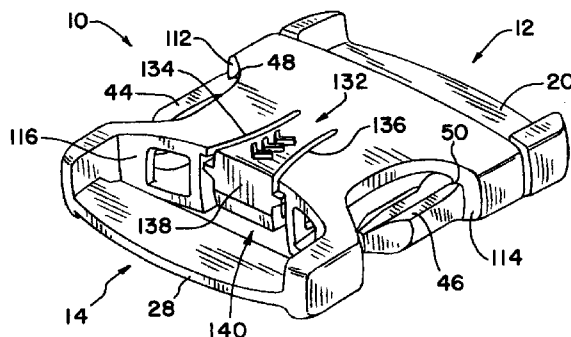


Fig. 1

(57) Abstract: A buckle includes first and second lateral latch connections formed by a male component in a female component, and a third latch connection between the lateral latch connections. The third latch connection includes a cantilevered latch hook disconnected by pressing against a portion of the upper surface of the buckle.

BUCKLE**CROSS-REFERENCE TO RELATED APPLICATIONS**

- [01] The present application claims the benefits of United States Provisional Application Serial No. 61/145,148 filed January 16, 2009.

FIELD OF THE INVENTION

- [02] The present invention relates generally to buckles and, more particularly, to so-called three point release buckles having male and female components that automatically engage one with the other for locking and require activation at three distinct points for unlocking.

BACKGROUND OF THE INVENTION

- [03] Two-piece buckles that snap together and latch automatically upon adequately inserting a male component into a female component are known and used in a variety of applications. It is known to have a piece of webbing or strap attached to each of the components, and to have one or both buckle components adjustably retained on the strap or webbing. It is also known to have one or both components in fixed locations relative to a strap or web that is sewn or otherwise fixedly secured to the buckle component. Such buckles are known and used for a variety of applications, including outdoor recreational products like backpacks, helmets, life vests and other general equipment; military and police equipment and the like. Two-part buckles are used also on luggage, bags, clothing and the like.
- [04] In one known design for buckles of this type, the female component defines a pocket and includes openings or windows on the lateral, opposed sides of the pocket. The male component includes arms having outward protrusions slightly wider than the width of the female component at some positions from the entrance to the window. As the male component is inserted into the female

-2-

component, the arms are deflected inwardly and thereafter are allowed to rebound outwardly when the protrusions align with the windows in the female component. With the protrusion extending slightly outwardly at the window, the male component is secured within the female component. To release the buckle, the exposed protrusions of the arms are squeezed inwardly through the windows of the female component, allowing the male buckle component to be withdrawn from the female buckle component. The strength of the buckle to resist unintended release when pulling force is applied against either component is determined by the nature of the engagement between the male and female component. The resistance to intended release, or stated another way, the difficulty in unlatching the buckle, is determined by the resistance to bending of the arms upon squeezing the protrusions inwardly from the window, and the resistance of the engaging surfaces to slide past or otherwise disengage from each other.

- [05] Buckles of the type described have had success in many applications; however, in some applications and uses for snap together buckles of this type it is desirable that the buckle be somewhat more difficult or complicated to unlatch, so that the buckle does not unlatch unintentionally, and so that individuals other than the user have difficulty in unlatching the buckle. For example, law enforcement officers, military personnel and the like can encounter individuals who are resistant to the orders and commands given them. Physical confrontations can occur. In such a confrontation, the individual may try to unlatch duty belts, equipment or weapons belts worn by the officer or military person. If successful, the individual could use the equipment as a weapon or otherwise entangle or ensnarl the law enforcement officer or military personnel in the loosened equipment. Accordingly, for police officers, military personnel and the like, it can be desirable that the buckle unlatching sequence be difficult to perform except by the individual wearing the equipment.

[06] It is known to provide buckles requiring release not only at the lateral windows along the sides of the buckle, but also at some third location on the buckle. If properly positioned, the user of the buckle can operate the buckle efficiently with one hand, while another person confronting the wearer would have difficulty operating the buckle, even with two hands.

[07] Improvements in a three-point release buckles are desirable so that the buckles are secure in use, resistant to release by persons other than the user, yet easily operated by the user to release when necessary.

SUMMARY OF THE INVENTION

[08] The present invention provides a three-point release buckle having lateral release points at the side of the buckle and a third release point on the external surface of the buckle positioned so that the buckle can be operated by an individual using three fingers of one hand, or two-hands if so desired.

[09] In one aspect of one form thereof, the present invention provides a three-point release buckle with a male component, a female component and first and second releasable latching connections of the male component within the female component operable along opposite sides of the buckle. A third releasable latching connection of the male component within the female component is located between the first and second connections. The third releasable latching connection has a cantilevered spring latch operable along one face of the buckle for releasing a latch along an opposite face of the buckle.

[10] In another aspect of another form thereof, the present invention provides a buckle with a male component having lateral arms and a center bar, and a female component defining a pocket for receiving the lateral arms and the center bar. Lateral connections are provided between the lateral arms and the female component with the buckle in a latched condition. A cantilevered spring latch connection is provided between the male component and the female component, including parts of the spring latch on opposite sides of the center bar.

- [11] In a further aspect of a further form thereof, the present invention provides a buckle with a male component having lateral arms and a center bar having a lip; and a female component defining a pocket for receiving the lateral arms and the center bar. Lateral connections are established between the lateral arms and the female component with the buckle in a latched condition. A cantilevered spring latch connection is established between the male component and the female component, including a depressible portion of the female component operably connected to a latch hook engaging the lip with the buckle in a latched condition.
- [12] An advantage of one aspect of an embodiment of the buckle disclosed herein is providing a buckle that operates smoothly for release by the user, but is difficult to operate by someone other than the user.
- [13] Another advantage of another aspect of an embodiment of the buckle disclosed herein is providing a buckle that is strong and secure.
- [14] A further advantage of a further aspect of an embodiment of the buckle disclosed herein is providing a buckle that is resistant to damage from misuse of the buckle.
- [15] Other features and advantages will become apparent to those skilled in the art upon review of the following detailed description, claims and drawings in which like numerals are used to designate like features.

BRIEF DESCRIPTION OF THE DRAWINGS

- [16] Fig. 1 is a perspective view of an embodiment of a buckle;
- [17] Fig. 2 is a top view of the buckle shown in Fig. 1;
- [18] Fig. 3 is a perspective view of the male component for the buckle shown in Fig. 1;
- [19] Fig. 4 is a top view of the component shown in Fig. 3;
- [20] Fig. 5 is a perspective view of the male component, but showing the bottom or inverse face from that shown in Fig. 3;
- [21] Fig. 6 is an exploded view of the buckle, showing the male and female components aligned for latching;
- [22] Fig. 7 is a cross-sectional view of the buckle shown in Fig. 2; taken along line 7-7 of Fig. 2;
- [23] Fig. 8 is a cross-sectional view of the buckle shown in Fig. 2; taken along line 8-8 of Fig. 2
- [24] Fig. 9 is an enlarged, fragmentary, cross-sectional view showing the buckle in an unlatched condition.
- [25] Before the embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangements of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced or being carried out in various ways. Also, it is understood that the phraseology and terminology used herein are for the purpose of description and should not be regarded as limiting. The use herein of “including”, “comprising” and variations thereof is meant to encompass the items listed thereafter and equivalents thereof, as well as additional items and equivalents thereof.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[26] Referring now more specifically to the drawings and to Fig. 1 in particular, an embodiment of a buckle 10 is shown. Buckle 10 includes a male component 12 and a female component 14. Male component 12 includes a latch 16 and a web attachment structure 18 including a web bar 20. Female component 14 includes a receiving body or pocket 24 and a web attachment structure 26 including a web bar 28. Latch 16 of male component 12 is inserted into and received by pocket 24 of female component 14 whereby buckle 10 is latched. Male component 12 and female component 14 can be made as individual monolithic structures of plastic formed by injection molding processes, or the like.

[27] Straps or webs (not shown) can be attached to web bars 20 and 28 in known manner so that buckle 10 can be used to secure together opposite ends of a single web or to connect ends of separate webs. Alternatively, one or the other of male component 12 and female component 14, or both male component 12 and female component 14 can be attached directly to an item or article other than a strap or web. In the exemplary embodiment shown, web bars 20 and 28 can be used in a manner in which a strap or webbing encircles the bar, with the strap or webbing secured to itself by stitching, rivets or other types of fasteners, or adhesive or other type of attachment, to secure the strap or webbing in a fixed condition on the bar. Those skilled in the art will readily understand that other types of sliding clips or locks can be used with a strap or webbing encircling a web bar so that the end of the strap or webbing remains adjustable relative to the buckle. Further, rather than a single web bar, either or both of male component 12 and female component 14 can include multiple bars so that the strap or webbing can engage therewith in a serpentine pattern whereby the male and/or female component is securely positioned relative to the strap or webbing, but may be adjusted along the length of the strap or webbing, in known manner. The arrangement by which one or both of male component 12 and female component

-7-

14 are attached to articles, including a strap or webbing is not a limiting factor with respect to the application or use of the present invention.

[28] It should be understood that a buckle of the invention can be used in various orientations, vertically, horizontally and at various angles. To facilitate the explanation and description of the features of the buckle, terms such as top, bottom, upper, lower, side, lateral and the like may be used with reference to the common orientation of the buckle as shown in Figs, 1-4 and 6-9. However the use of such terms describing orientation should not be viewed as limiting either on the use of the invention, or the breadth of the claims to follow.

[29] Latch 16 of male component 12 includes first and second lateral latch arms 30, 32 and an intermediate or center bar 34 projecting outwardly from attachment structure 18 of component 12. Center bar 34 is positioned between and spaced from latch arms 30, 32. Arched braces 36, 38 extend to center bar 34 from proximal portions of arms 30, 32, respectively, and connect center bar 34 relative to each arm 30, 32 so that some relative deflection can occur between arms 30, 32 and center bar 34.

[30] Arms 30, 32 are mirroring structures of one another and extend into female component 14 when buckle 10 is latched. Proximal ends of arms 30, 32 define thinner flex segments 40, 42 respectively, and distal ends of arms 30, 32 define enlarged or bulbous portions 44, 46 respectively. Bulbous portions 44, 46 project laterally both inwardly and outwardly from axes defined by the non-deflected conditions of flex segments 40, 42, respectively. Upon lateral force exerted against bulbous portions 44, 46 arms 30, 32 deflect or bend along flex segments 40, 42, respectively, proximate attachment structure 18.

[31] On the outer sides thereof, bulbous portions 44, 46 define catch ledges 48, 50 respectively for engaging the female component 14 in a manner to be described subsequently herein. In the exemplary embodiment shown, catch ledges 48, 50 angle outwardly and rearward toward the proximal ends of arms 30, 32. Further with respect to the exemplary embodiment, on the inner sides

thereof, bulbous portions 44, 46 define thinner, guide plates 52, 54 which can be used with cooperating structure within female component 14 for directing relative movement of the male and female components with respect to one another and/or for stiffening distal portions of arms 30, 32.

[32] Center bar 34 of the exemplary embodiment shown is a substantially rectangular, box-like structure including side members 60, 62 and a base member 64. Braces 36, 38 are generally connected to base member 64 near the juncture of base member 64 with side members 60, 62. A plate 66 extends between side members 60, 62 and forwardly from base member 64. A distal portion 68 of plate 66 angles downwardly. A lip 70 depends downwardly at the distal end edge of plate 66, from the distal edge of angular distal portion 68. As can be seen in Fig. 5, side members 60, 62; base member 64; plate 66 and lip 70 define a generally open box-like structure on the underside of center bar 34. A cutout 72 extends from the free edge of base member 64 substantially intermediate the connections to braces 36 and 38.

[33] Receiving body pocket 24 includes upper and lower plates 100, 102 on the top and bottom thereof, and sides 104, 106 between plates 100, 102 along the lateral edges. Sides 104, 106 define inset openings or windows 108, 110, respectively, which are elongated in configuration. Windows 108, 110 are sized and positioned to receive the laterally outwardly projecting segments of bulbous portions 44, 46 respectively when male component 12 is fully inserted into female component 14. Windows 108, 110 are defined partly by latch surfaces 112, 114 for engaging catch ledges 48, 50 of male component 12 when the buckle is latched. Latch surfaces 112, 114 can be angularly oriented complementary to the angles of catch ledges 48, 50 to provide secure engagement inhibiting unintentional unlatching of the buckle. An end panel 116 is provided at the inner end of body pocket 24 in the exemplary embodiment.

[34] Upper and lower plates 100, 102 and sides 104, 106 define an entrance opening 120 to the pocket-like structure of receiving body 24, and define the

entrance for insertion of the distal ends of latch arms 30, 32 and center bar 34. The inner surfaces of upper and lower plates 100, 102 can define ridges, channels or other configurations for guiding and directing the insertion of male component 12 into female component 14. Accordingly, as shown in Fig. 6, ridges 122, 124 extend inwardly along the inner surface of lower plate 102, and define outwardly flared curved entrance surfaces 126, 128, respectively, for receiving and engaging the lower edges of side members 60, 62 on center bar 34 and directing center bar 34 to a centered position in receiving body 24.

[35] A center ridge 130 extends inwardly on the inner surface of lower plate 102 from entrance opening 120. Center ridge 130 allows male component 12 to be inserted in only one orientation whereby ridge 130 can pass through cutout 72 as male component 12 reaches full insertion in female component 14. If male component 12 is inverted such that the outer surface of plate 66 slides along ridge 130, the male component can not be fully inserted for latching in that insufficient space is provided between the top edge of ridge 130 and the inner surface of upper plate 100 for male component 12 to be inserted beyond the angular portion of distal portion 68. Proper orientation of male component 12 in female component 14 is needed for proper operation of the third latch structure to be described.

[36] A spring latch 132 is provided on the inner end of receiving pocket 24, the end away from entrance opening 120. Spring latch 132 cooperates with center bar 34, and more specifically lip 70 of center bar 34 to provide a third latch area in addition to the latch areas provided by latch arms 30, 32 engaging windows 108, 110. Spring latch 132 is defined by slits 134, 136 in upper plate 100, an end plate 138 contiguous with and extending downwardly from the segment of upper plate 100 between slit 134 and slit 136, and a latch hook 140 at the opposite end of end plate 138. Latch hook 140 projects into the pocket from the lower end of end plate 138, and includes a horizontal segment 142 and a vertical lip 144. Latch hook 140 presents an angular surface 146 exposed to entrance opening 120

-10-

whereby, upon insertion of male component 12 into female component 14, lip 70 of male component 12 can ride up and over latch hook 140. The exposed outer surface of the spring latch 132 between slits 134, 136 can be provided with knurls or ridges 148 to facilitate pushing there against when unlatching the buckle.

[37] With reference to Fig. 9 an exemplary embodiment of the invention includes an end edge 150 of lower plate 102 providing a spring latch stop positioned so to confront and engage the outer edge of latch hook 140 when the latch hook is depressed adequately to release center bar 34. This allows spring latch 132 to be depressed sufficiently to disengage latch hook 140 from lip 70 without over deflecting the spring latch, whereby the spring latch could break, or lip 70 could be deflected downward a sufficient amount that it would encounter lower plate 102 and be difficult to remove. Spring latch 132 in the exemplary embodiment shown further includes lateral wings 152, 154 projecting from opposite sides of end plate 138. Lateral wings 152, 154 extend outwardly beyond the outer edges of slits 134, 136 to prevent excessive movement of spring latch 132 in an upward direction. Lateral wings 152, 154 can confront and engage the inside surface of upper plate 100 if spring latch 132 is moved upward excessively. End edge 150 and wings 152, 154 guard against accidental breakage through misuse of buckle 10

[38] In using buckle 10, the buckle is latched by inserting male component 12 into female component 14. Specifically, latch 16 is aligned with receiving body pocket 24, and distal ends of latch arms 30, 32 are moved into entrance opening 120. The angular distal ends of latch arms 30, 32, which are longer than center bar 34, begin first orientation of male component 12 relative to female component 14. As center bar 34 enters entrance opening 120, entrance surfaces 126, 128 and ridges 122, 124 more accurately align male component 12 with female component 14. If male component 12 is positioned inverted from the desired orientation, as angular distal portion 68 of plate 66 fully enters the pocket

further advancement is inhibited. Final advancement of male component 12 into female component 14 can occur only if center ridge 130 aligns with cutout 72.

[39] The inside width of receiving body pocket 24 is of slightly narrower dimension than the non-deflected width of latch arms 30, 32; at least upstream of windows 108, 110. Accordingly, the latch arms are deflected inwardly until bulbous portions 44, 46 progress into receiving body pocket windows 108, 110. When aligned with the windows, bulbous portions 44, 46 rebound outwardly such that catch ledges 48, 50 thereof engage latch surfaces 112, 114, respectively. The angular orientations of catch ledges 48, 50 and latch surfaces 112, 114 inhibit unintended unlatching if the male and female components are pulled in opposite directions.

[40] At the same time that the bulbous portions 44, 46 are moving into windows 108, 110; lip 70 encounters angular surface 146, and passes over and beyond latch hook 140 until lip 70 has progressed beyond vertical lip 144. The buckle is then latched at three locations, first and second latch connections along the sides of the buckle whereat catch latches 48, 50 engage latch surfaces 112, 114. A third latch between male component 12 and female component 14 is established by spring latch 132; specifically latch hook 140 engaging lip 70. The latched condition of buckle 10 can be seen In Figs. 1, 2, 7 and 8.

[41] To unlatch buckle 10, male component 12 is removed from female component 14 by simultaneously disconnecting the first and second lateral latches established by catch ledges 48, 50 engaging latch surfaces 112, 114; and also disengaging latch hook 140 from lip 70. A user of the buckle simultaneously squeezes the sides of the buckle to deflect latch arms 30, 32 inwardly to disengage catch ledges 48, 50 from latch surfaces 112, 114, while at the same time using a finger or fingers to apply pressure against the outer surface of upper plate 100 in the area between slits 134, 136, specifically against knurls or ridges 148. Pressure applied on the outer surface of female component 14 in the area between slits 134, 136 unlatches spring latch 132 from center bar 34. Spring

-12-

latch 132 is thereby moved downwardly, including downward movement of latch hook 140 until vertical lip 144 is moved beyond engagement with lip 70. Disengaging the three latch connections simultaneously allows male component 12 to be pulled from female component 14. If only one or two of the latch connections are operated, the buckle will not disengage. All three must be operated simultaneously to disengage the latch.

[42] Variations and modifications of the foregoing are within the scope of the present invention. It is understood that the invention disclosed and defined herein extends to all alternative combinations of two or more of the individual features mentioned or evident from the text and/or drawings. All of these different combinations constitute various alternative aspects of the present invention. The embodiments described herein explain the best modes known for practicing the invention and will enable others skilled in the art to utilize the invention. The claims are to be construed to include alternative embodiments to the extent permitted by the prior art.

[43] Various features of the invention are set forth in the following claims.

CLAIMS

WHAT IS CLAIMED IS:

1. A three-point release buckle, comprising:
 - a male component;
 - a female component;
 - first and second releasable latching connections of said male component within said female component operable along opposite sides of said buckle;
 - a third releasable latching connection of said male component within said female component, said third releasable latching connection located between said first and second connections; and
 - said third releasable latching connection having a cantilevered spring latch operable on one face of said buckle for releasing a latch along an opposite face of said buckle.
2. The buckle of claim 1, said female component defining windows along sides thereof, and said male component having deflectable arms having catch ledges engaging surfaces of said windows with said buckle in a latched condition.
3. The buckle of claim 2, said cantilevered spring latch being defined by said female component.
4. The buckle of claim 3, said male component including a center bar having a lip engaging said spring latch with said buckle in a latched condition.

-14-

5. The buckle of claim 4, said female component defining a spring latch stop limiting travel of said spring latch during unlatching.

6. The buckle of claim 4, said male and female components having cooperating structure orienting said components for insertion of said male component in said female component.

7. The buckle of claim 6, said female component having a surface one of above and below said male component, said surface having a ridge thereon, and said male component having a cutout for receiving said ridge.

8. The buckle of claim 1, said cantilevered spring latch being defined by said female component and having a deflectable portion on an exposed surface of said female component, said deflectable portion being connected to a latch hook on an opposite side of said male component from said deflectable portion.

9. The buckle of claim 8, said male component including a center bar having a lip engaging said latch hook with said buckle in a latched condition.

10. A buckle comprising:
a male component having lateral arms and a center bar;
a female component defining a pocket for receiving said lateral arms and said center bar;
lateral connections between said lateral arms and said female component with said buckle in a latched condition; and
a cantilevered spring latch connection between said male component and said female component including components of said spring latch on opposite sides of said center bar.

-15-

11. The buckle of claim 10, said female component having upper and lower plates, with slots defined in said upper plate defining a portion of said upper plate for said spring latch.

12. The buckle of claim 11, including an end plate depending downwardly from said portion of said upper plate, and a latch hook extending into said pocket from said end plate.

13. The buckle of claim 12, said center bar of said male component having a lip for engaging said latch hook with said buckle in a latched condition.

14. The buckle of claim 13, said female component defining a ridge and a said male component defining a cutout orienting said male component relative to said female component.

15. A buckle comprising:
a male component having lateral arms and a center bar having a lip;
a female component defining a pocket for receiving said lateral arms and said center bar;
lateral connections between said lateral arms and said female component with said buckle in a latched condition; and
a cantilevered spring latch connection between said male component and said female component, including a depressible portion of said female component operably connected to a latch hook engaging said lip with said buckle in a latched condition.

-16-

16. The buckle of claim 15, including slits extending inwardly from an edge of said female member and thereby defining between said slits said depressible portion of said female component.

17. The buckle of claim 16, including an end plate depending from said depressible portion and wings on said end plate extending outwardly beyond said slits.

18. The buckle of claim 17, said latch hook having an angular surface engaging said lip as said buckle is connected.

19. The buckle of claim 17, said latch hook and said depressible portion being on opposite sides of said center bar with said buckle in a latched condition.

20. The buckle of claim 17, including orienting features between said male and female components enabling insertion of said male component in said female component only in a single relative orientation.

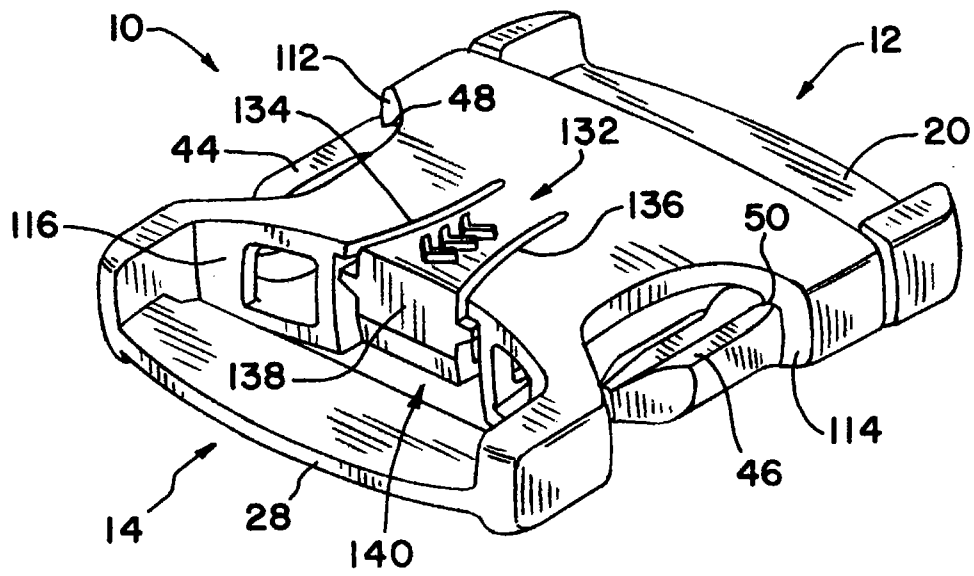


Fig. 1

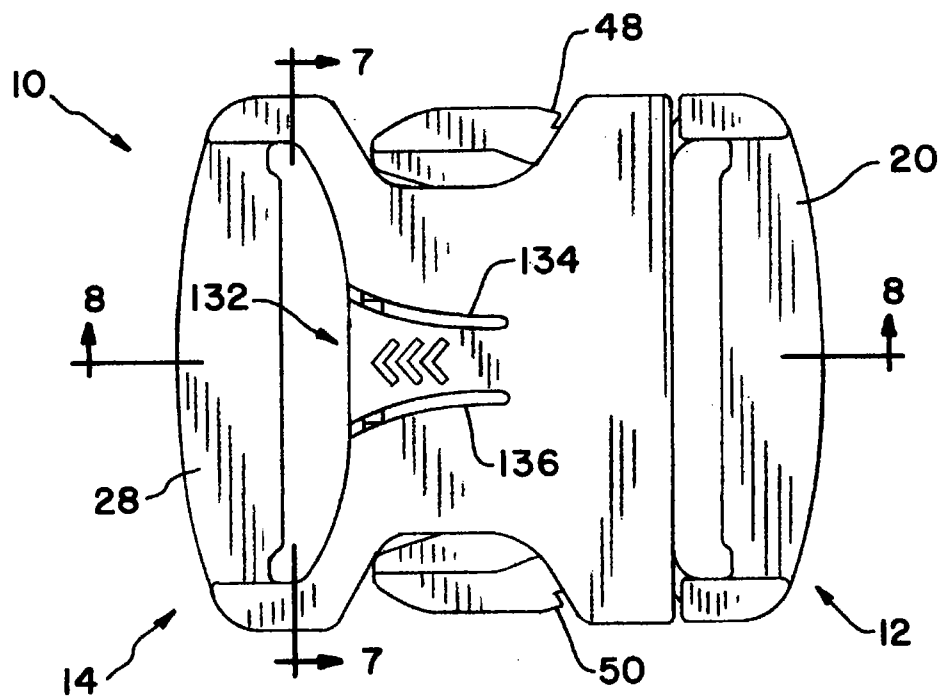


Fig. 2

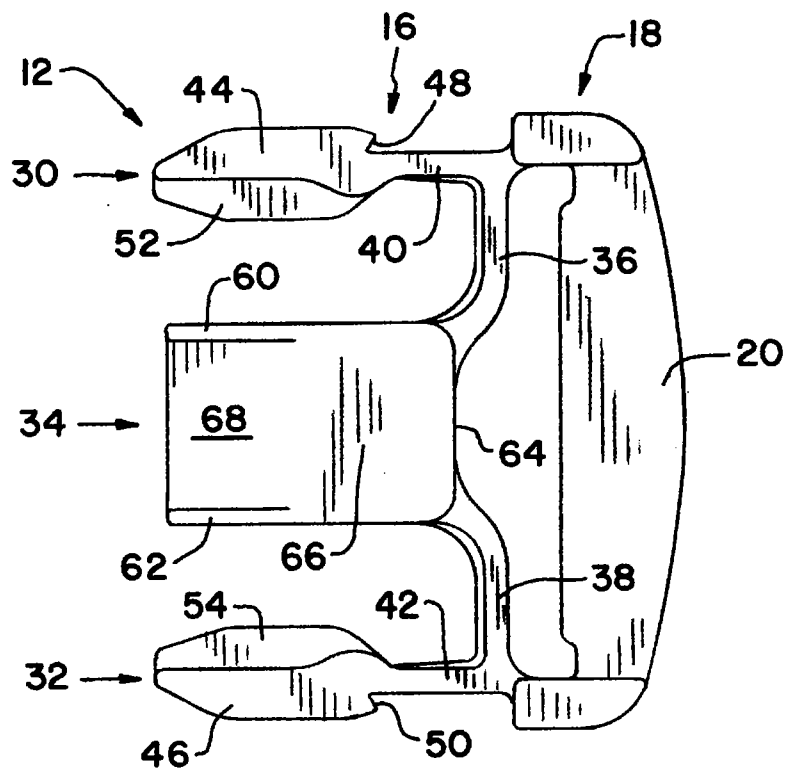
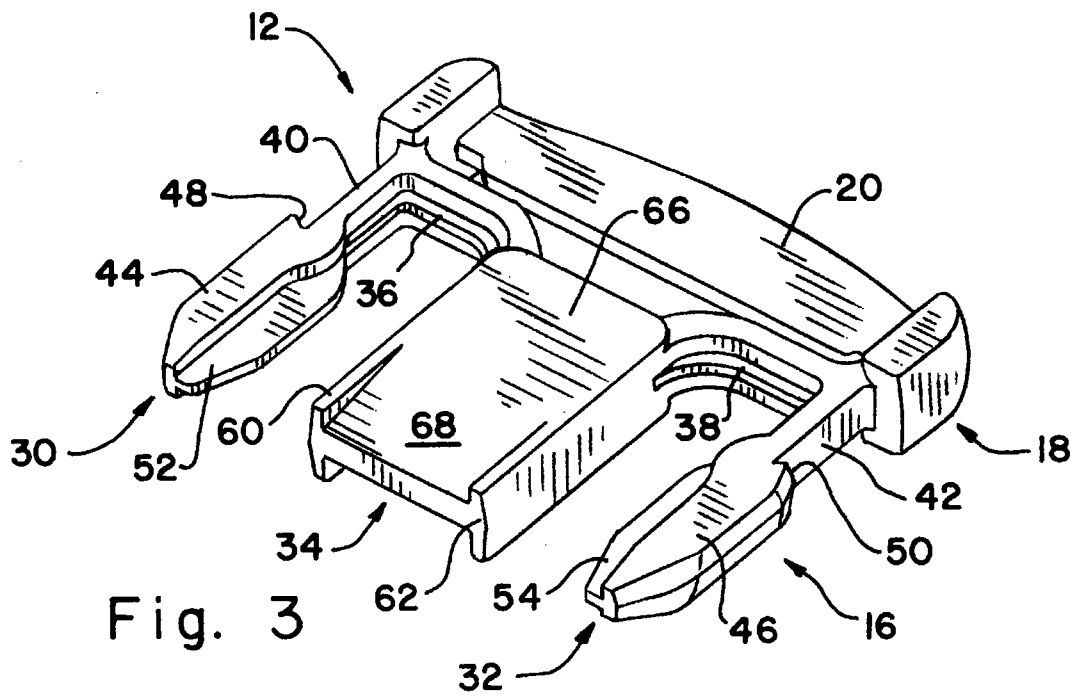
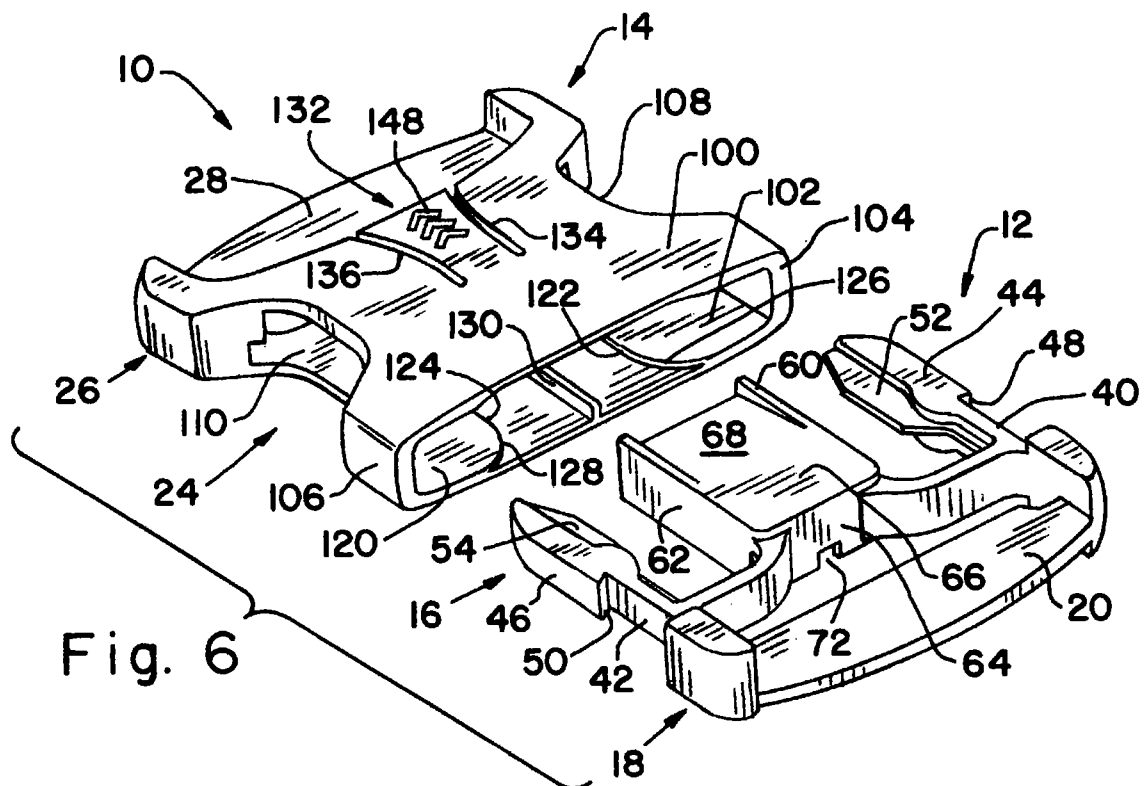
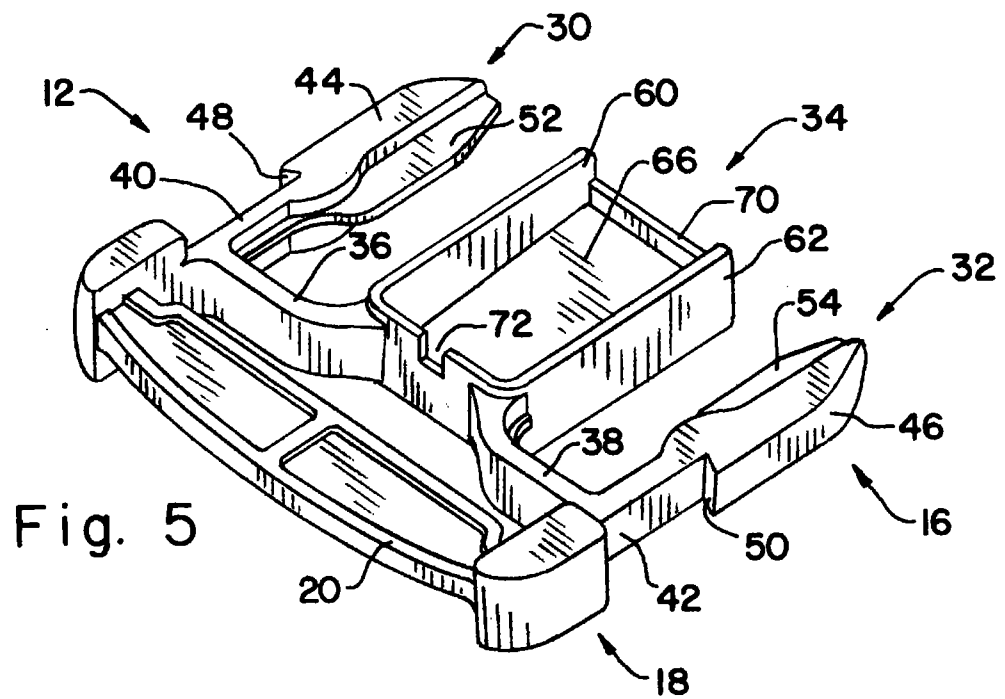


Fig. 4



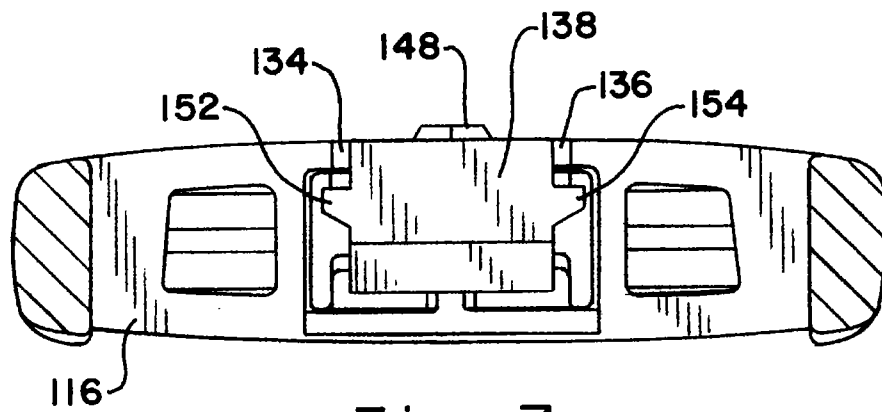


Fig. 7

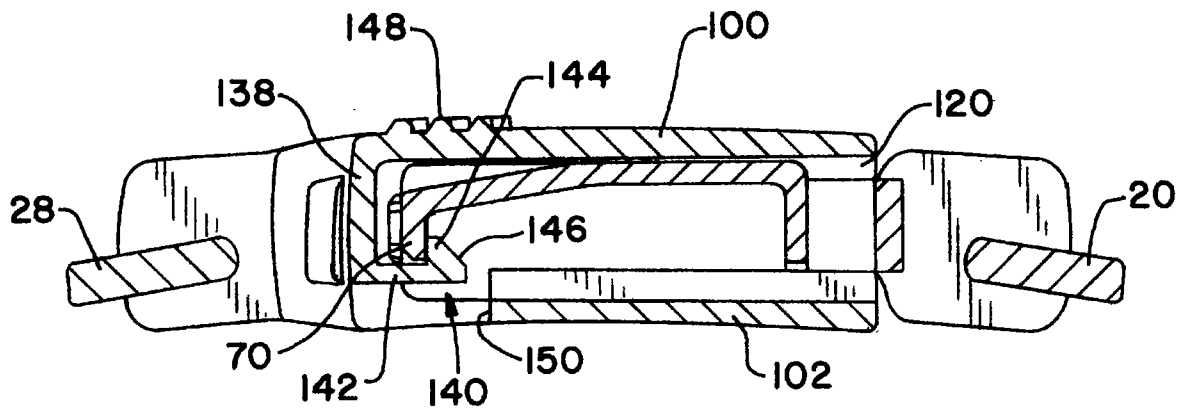


Fig. 8

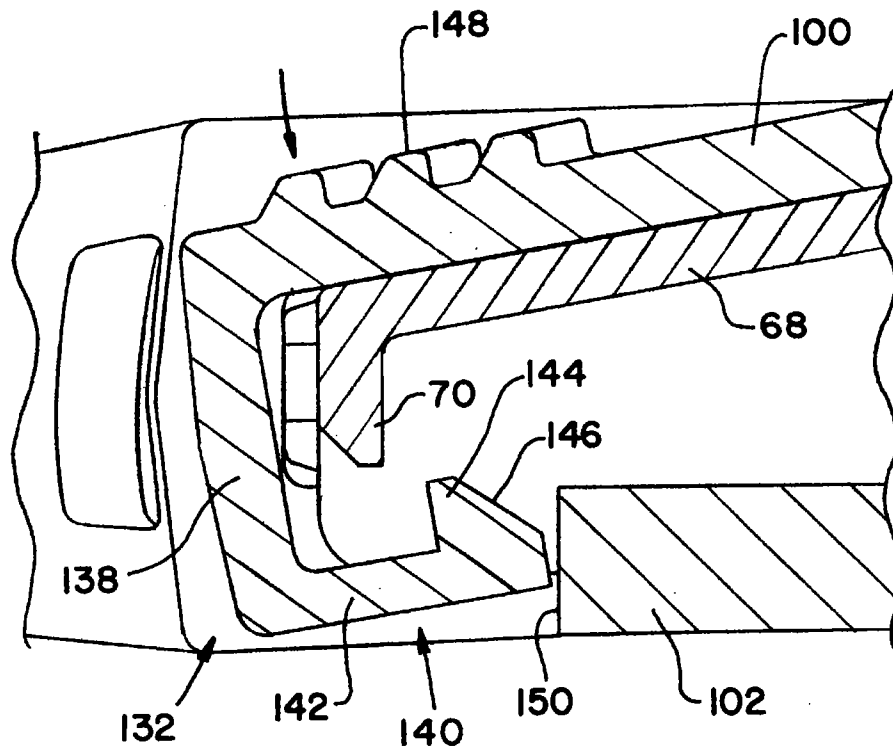


Fig. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/064703

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A44B 11/26 (2010.01)

USPC - 24/625

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 11/25, 11/26 (2010.01)

USPC - 24/615, 625

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

PatBase; Google Patents

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6,138,330 A (GALBREATH) 31 October 2000 (31.10.2000) entire document	1-20
A	US 6,684,466 B2 (NISHIDA et al) 03 February 2004 (03.02.2004) entire document	1-20
A	US 5,774,956 A (FRENCH et al) 07 July 1998 (07.07.1998) entire document	1-20
A	US 4,825,515 A (WOLTERSTORFF JR) 02 May 1989 (02.05.1989) entire document	1-20

☐ 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

28 December 2009

Date of mailing of the international search report

13 JAN 2010

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