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(19) **United States**(12) **Patent Application Publication**
Johnson(10) **Pub. No.: US 2007/0199182 A1**(43) **Pub. Date: Aug. 30, 2007**(54) **BREAK-FREE SAFETY RELEASE BUCKLE
AND FASTENER**(57) **ABSTRACT**(76) Inventor: **Carroll L. Johnson**, Grand Junction,
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Grand Junction, CO 81506 (US)(21) Appl. No.: **11/031,679**(22) Filed: **Jan. 8, 2005****Related U.S. Application Data**(60) Provisional application No. 60/535,026, filed on Jan.
8, 2004.**Publication Classification**(51) **Int. Cl.**
A44B 11/00 (2006.01)(52) **U.S. Cl.** **24/265 BC**

A quick-release fastening device is disclosed. The device includes a first fastening component having upper and lower surfaces and first and second end portions. A pair of first and second elongated jaw elements are disposed on the first component first end portion and form a channel-like socket therebetween. The jaws define a gripping mechanism having an elongated jaw opening accessing the socket. The first jaw element has a length dimension less than the second jaw element. A tubular pocket is defined in the first member first end portion adjacent the channel-like socket to form a pivot point for the jaw elements. A second fastening component has first and second end portions, the second fastening component first end portion being adapted for releasable engagement with the first fastening component first end portion. Finally, a stud is mounted in the second fastening component first end portion. The stud is sized for releasable engagement within the channel-like socket and further includes an elongated cut-out portion which forms a slot along a substantial portion of the length of the stud, the slot being sized to match the first jaw element to enhance engagement of the stud within the socket without affecting release resistance of said stud imposed by said jaw elements.

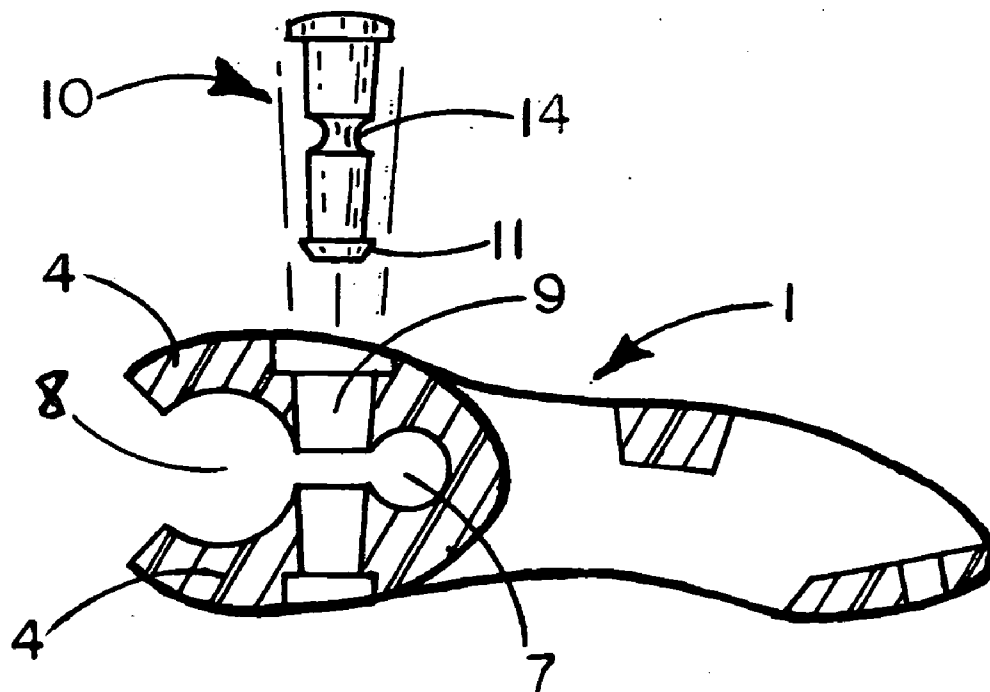


FIG. 1

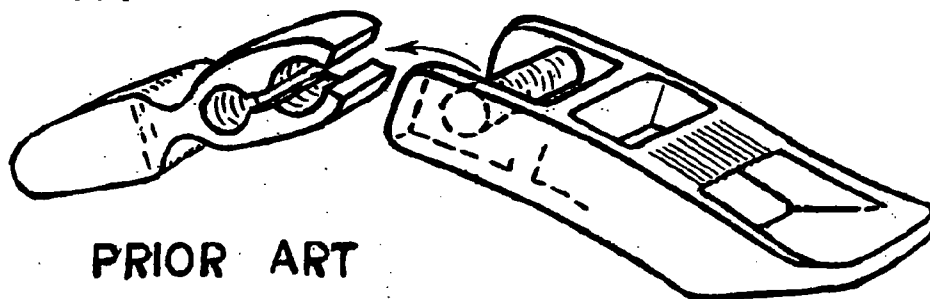


FIG. 2

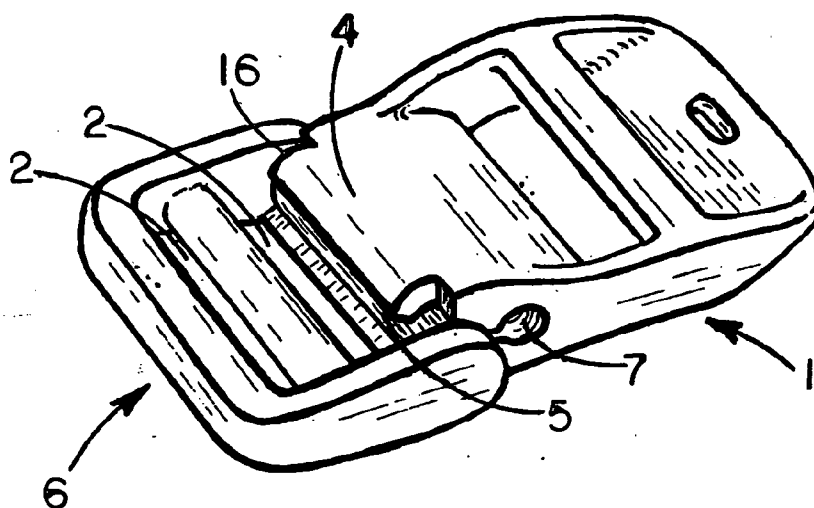
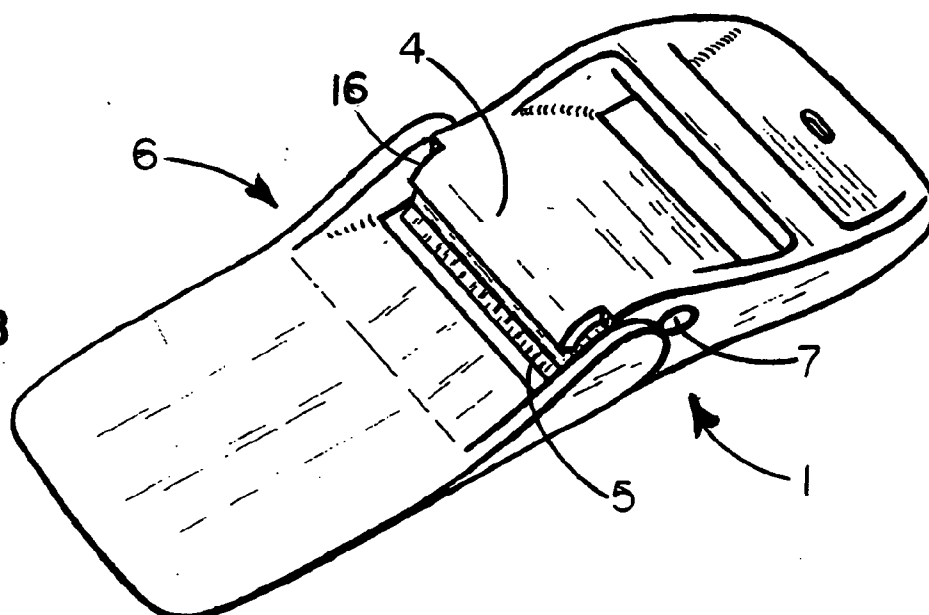
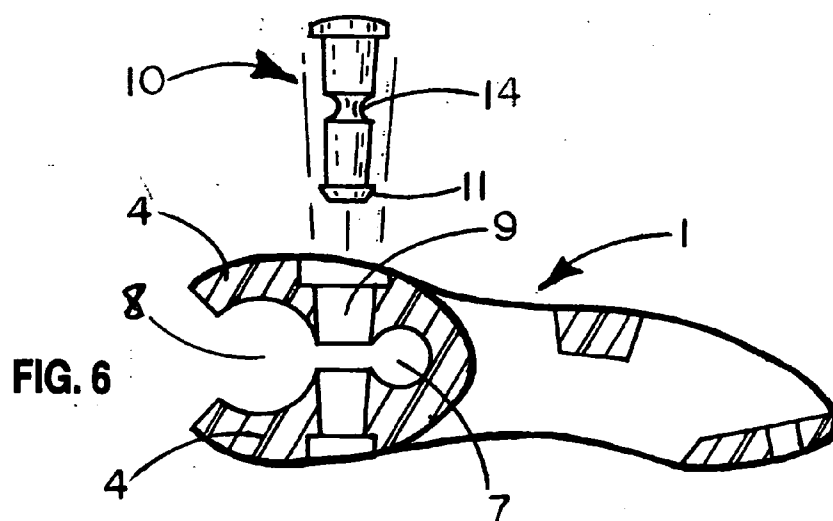
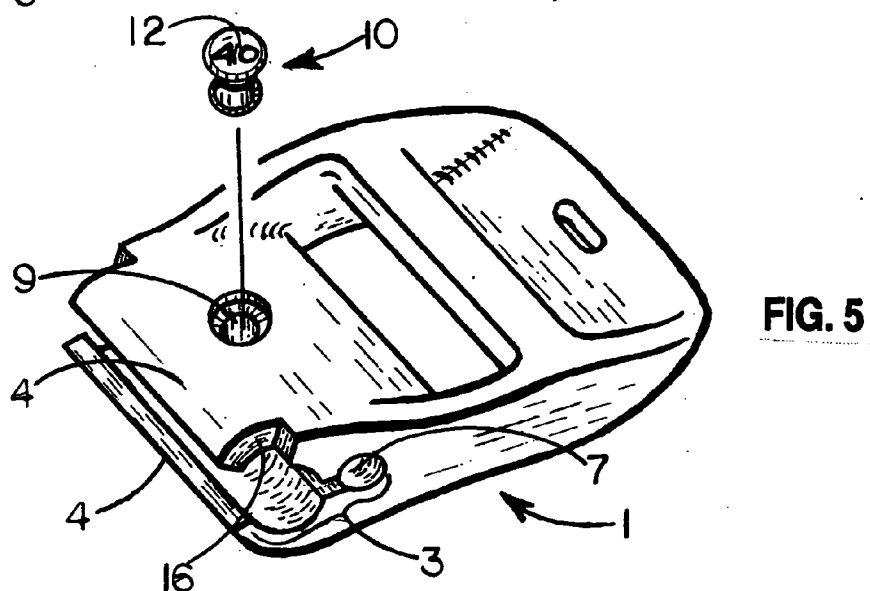
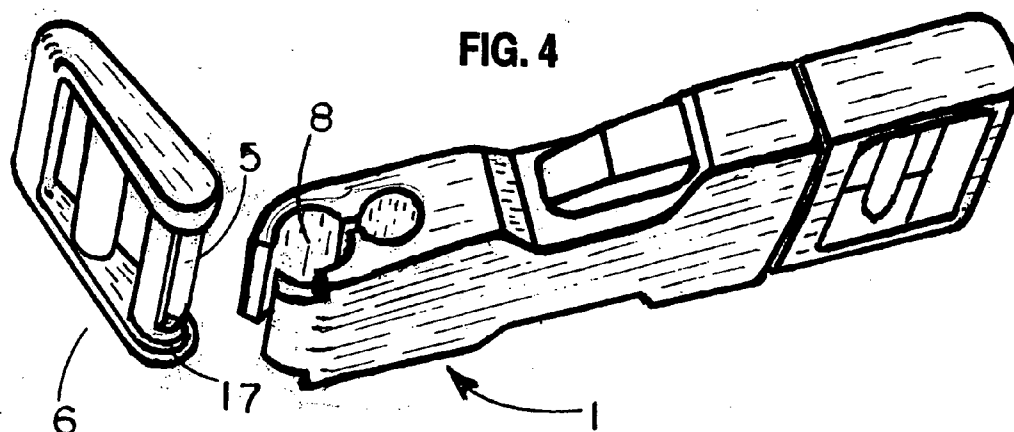


FIG. 3





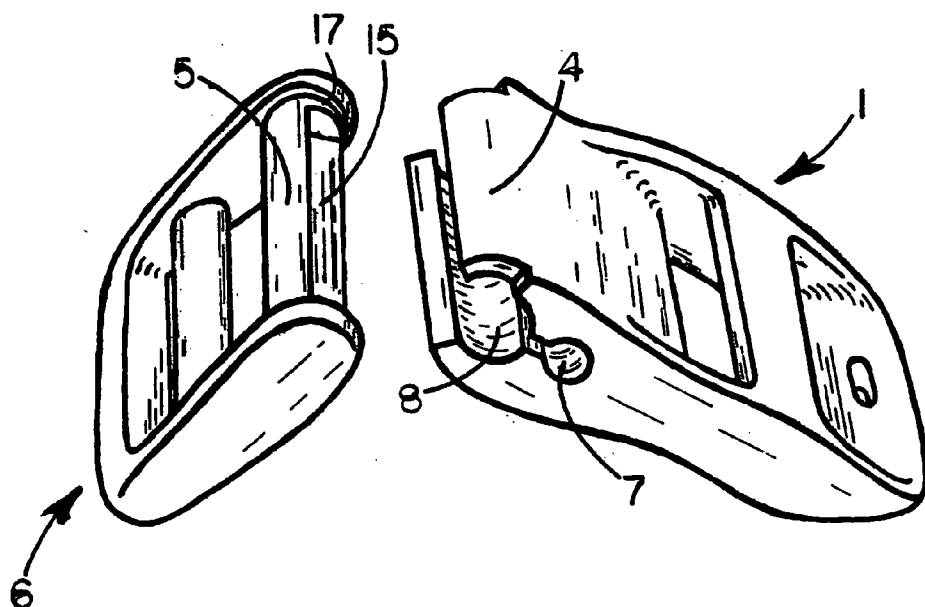


FIG. 7

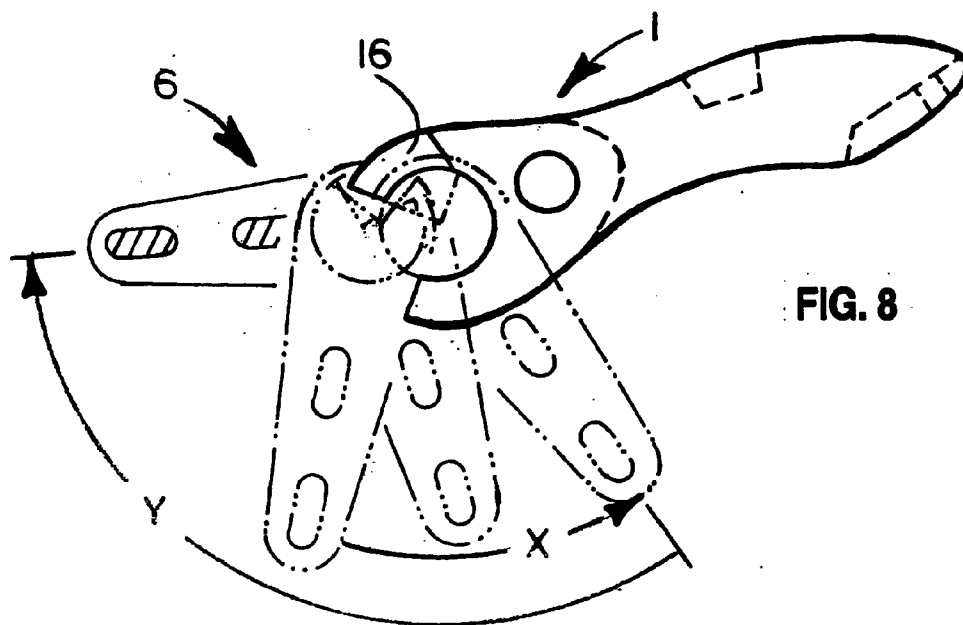


FIG. 8

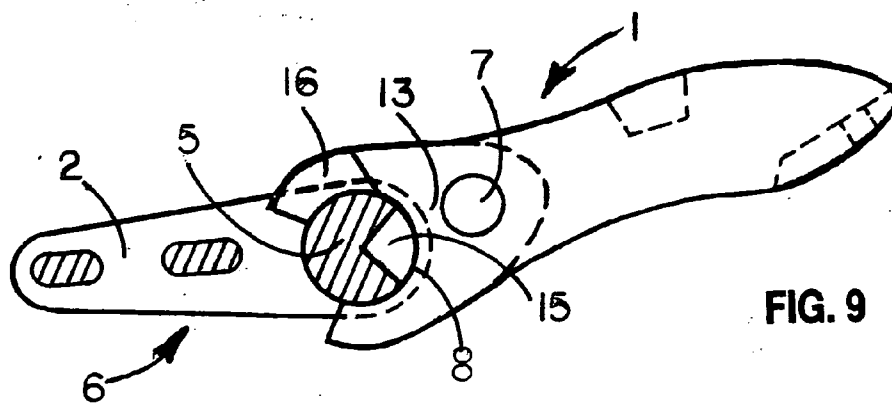
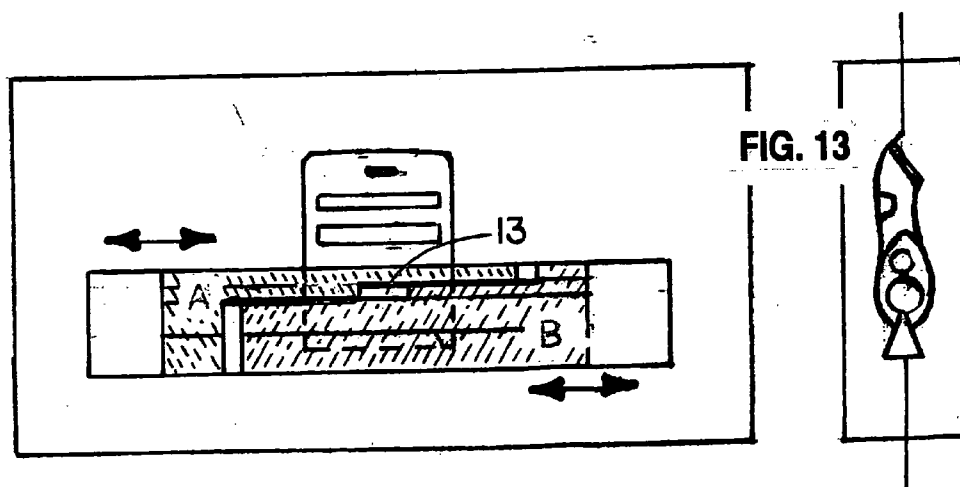
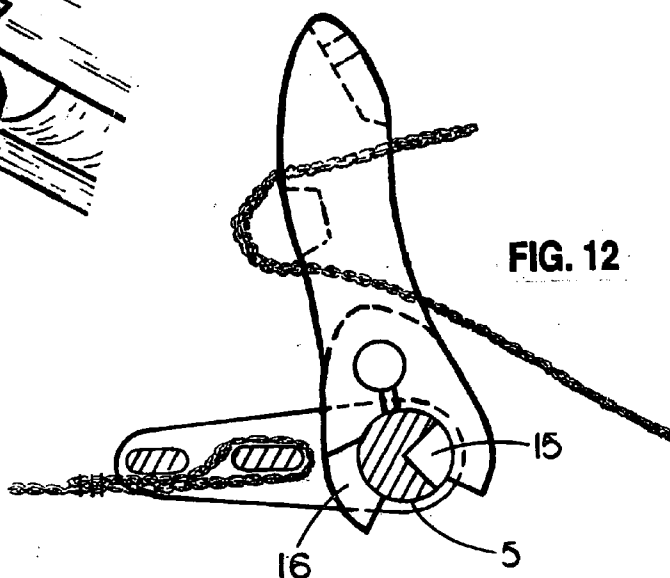
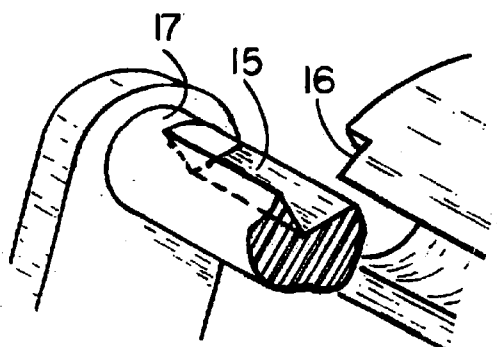
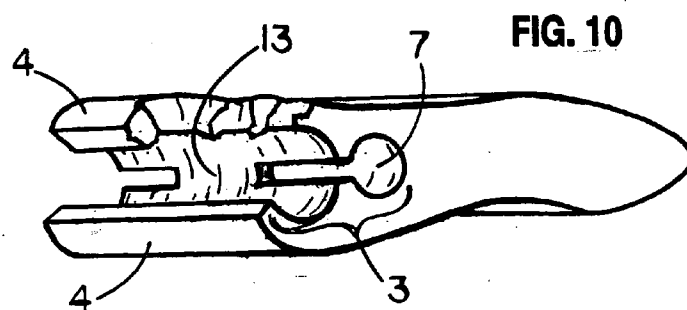


FIG. 9



BREAK-FREE SAFETY RELEASE BUCKLE AND FASTENER

RELATED PATENT APPLICATIONS

[0001] This application is related to U.S. provisional patent application No. 60/535,026, filed Jan. 8, 2004.

BACKGROUND OF THE INVENTION

[0002] This invention relates generally to safety release mechanisms, quick release mechanisms, and fasteners which are designed to free a wearer (including humans and other animals) from equipment, harnesses, and bindings of such equipment which secure it on or about the wearer. These devices are also appropriate for use on luggage and other items which could become entangled with other equipment such as in automated handling systems, conveyers, etc. In many situations items attached to or around the wearer can become caught or entangled, thereby trapping and subjecting the wearer or equipment to potential injury including possible fatal injury or equipment damage which could occur if the worn device and/or harness remained firmly connected. Specifically, this invention is related to fasteners, buckles, and tension releasing devices which are designed to automatically release or separate when a designed tension or pull against the device is exceeded.

DESCRIPTION OF PRIOR ART

[0003] Potential dangers of entrapment, strangulation, drowning, broken bones and other disastrous injury from entangled equipment worn on or about persons and animals have been long known and recognized as is evidenced by the number of releasing collars, bindings, harnesses and various fittings for such harnesses, which are designed as quick release fasteners, or as automatically separating connectors of such equipment. Typical of these devices are separating lanyards used for identification cards and badges worn about the neck, and various animal and pet collars. Most such devices are constructed with a low tension release, which makes them unsuited for use in other applications which require them to hold under a greater release tension. Further, many are a separate member sewn or otherwise integrated into the harness or securement of the device in addition to still other fasteners which are used to connect and disconnect the device from the wearer.

OBJECTS AND ADVANTAGES

[0004] It is one object of the present invention to provide a safety release mechanism which is adaptable to the design of many known buckles and fasteners, such that the release member is a combined part of the fastener, providing an inexpensive compact safety release fastener which can also be selectively attached, removed, or adjusted for length and fit by conventional means.

[0005] It is an additional object to provide a safety release fastener which can easily be adapted in a tamper-proof design, such that a universal separating member can be adapted by the manufacturer to provide various pre-determined fixed release tensions in the same device, thereby reducing manufacturing costs and providing greater flexibility of application by eliminating the need for separate additional tooling to duplicate the basic member for each of various release tensions.

[0006] A further object of the present invention is to provide a safety release connection which allows the fitting to swivel on its attachment to the fastener to better conform to contours such as the generally rounded contours normally surrounded by belts, shoulder straps and neck collars.

[0007] Still further, it is an objective to provide a releasable buckle connection of fewer parts at lower overall cost by providing greater efficiency in manufacturing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The accompanying drawings which are incorporated in and form a part of the specification illustrate preferred and alternate embodiments of the present invention and, together with a description, serve to explain the principles of the invention.

[0009] In the drawings:

[0010] FIG. 1 is a drawing of a safety release ladderlock fastener which is used on some downhill ski pole straps. This snap together design is typical of known prior art fasteners.

[0011] FIG. 2 is a perspective drawing showing the release member and strap link of the present invention as it would be adapted to a present one piece (length adjustable) webbing fastener commonly known as a ladderlock fastener.

[0012] FIG. 3 illustrates a safety release ladderlock buckle member assembled to a sewable connecting link as one example of alternate fastening members which could be used with the present invention.

[0013] FIG. 4 is a perspective drawing showing the release member of the present invention as it would be adapted to a two piece separable fastener commonly known as a side release buckle.

[0014] FIG. 5 is a perspective drawing of a ladderlock release member showing an alternate embodiment in which a break-away rivet is used to modify the release portion of a standard break free buckle member for a greater tension to be necessary to separate the members.

[0015] FIG. 6 is a cross section drawing of the alternate embodiment of FIG. 5, showing details of the aperture and barbed rivet used in the release member of the modified fastener.

[0016] FIG. 7 shows the strap link and ladderlock release member as separate components, oriented as they would be positioned for assembly.

[0017] FIG. 8 shows the rotational movement of the link member to connect the link to the release member. FIG. 8 illustrates various positions of the members in connecting the stud into the grip jaws of the release member, shown as a connected assembly in FIG. 9.

[0018] FIG. 9 is a cross-section through the strap link and a side view of the release member of the preferred tamper proof ladderlock embodiment showing additional details of the bridged rib between the hinge and grip apertures of the release member, and a cut-out portion which allows the stud to be assembled into the rigid jaws of the bridged release member.

[0019] FIG. 10 is a partially broken away drawing which illustrates a preferred tamper proof embodiment of the release member in which an interior portion of the open

distance between the hinge aperture and grip aperture is bridged, forming an integral rib or webbed portion of the buckle which is sized to break when a predetermined pull tension is exceeded allowing the two buckle portions to separate.

[0020] FIG. 11 is an enlarged perspective detail drawing showing the configuration of one of the cylindrical structures formed on the terminal ends of the stud. These structures prevent the stud from exiting the jaws of the release member when the buckle members are rotated 180° from their assembly position. Also shown is a cut-out notch on the side of one of the jaws which allow the cylindrical structures to pass into the grip aperture when the buckle members are assembled as shown in FIGS. 8 and 9.

[0021] FIG. 12 shows a ladderlock assembly in which the primary buckle member has been raised to slack off the length/tension adjustment of the webbing straps. The drawing illustrates how the short cylindrical structures on the ends of the stud prevent its exiting from the grip jaws when the members are rotated 180° from their assembled position.

[0022] FIG. 13 is a simplified drawing of the manner in which cores are positioned in a hand cast mold to form the bridge between the apertures in the release member. Cores of production molds would be similarly positioned to form the bridge or rib between the apertures.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0023] The present invention will generally be constructed of semi-rigid material similar to that used in the manufacture of plastic fasteners and buckles which are generally formed by injection molding, although other suitable material and methods of forming may be used.

[0024] In the following description major parts of the assembly will be referred to as a release member 1 and a fastening link 6. While the jaws 4, stud 5, and related structures can be incorporated on either buckle portion, in the preferred and illustrated embodiment the jaws 4 will be incorporated as part of the primary buckle member to which the break free invention is adapted. In this manner, when the rivet 10, bridge 13, or other such limiting device is broken or the jaws 4 eventually fail, the broken or failed members can be easily replaced as part of a replacement release member. If the jaws were reversed, as being part of the fastening link, it would be necessary to remove stitching or other fastenings which were originally used to attach the broken member, and to re-sew or otherwise re-attach a replacement onto the article to which the break free buckle was attached.

[0025] In preferred form the notched jaw 4 is the upper jaw when adapted to a ladderlock buckle to prevent the stud from exiting the jaws 4 when the buckle member is raised to slack off tension on the strap, as illustrated in FIG. 12. Conversely, it may be preferred for the notched jaw 4 to be incorporated as the lower jaw of side release buckles for a better visual appearance when the buckle is viewed in its normal position, and to prevent the stud from exiting the jaws if the buckle members are rotated to an extreme contour beyond that around which the assembly would be normally fastened. It should be understood, however, that the notched jaw 4 may be in either upper or lower position.

[0026] Referring to FIGS. 2, 3 and 7, perspective views are shown of a known one piece ladderlock buckle adapted with jaws 4 and other break free structures of this invention as the primary release member 1 and a fastening link 6. In FIG. 4 a known side release buckle is illustrated as being adapted with the jaws 4 and other structures of this invention as the primary release member 1. Although only two types of buckles are shown as examples in this specification other buckles and fasteners can be adapted in a similar manner to function as safety release devices. The fastening link 6 has one or more apertures 2 which define transverse bar structures through which a webbing or strap passes, the strap being further connected to itself after passing through and around the bar(s) by sewing or other known means to secure the link member 6 to the webbing. Alternately, for specific uses a length of webbing could be integrally molded, welded or made secure to the link 6 by any other known means. In alternate forms a sewable tab such as is shown in FIG. 3, other known fastenings such as rivets, or still other fastening devices can be incorporated in the fastening link 6. A hinge and grip aperture 3 is formed through the separating member 1 with jaws 4 which clasp a connecting structure or stud 5 which is formed integral in the strap link 6. The release member 1 can swivel around the stud 5, allowing the complete assembled fastener to conform to irregular or rounded contours around which the strap may be fastened. When the fastener is subjected to a tension pull in excess of the limits of the material characteristics and configuration of the release portion, the jaws 4 open to allow the stud 5 to pass through separating the primary release member 1 from the link 6. The release member 1 can normally be re-connected to the separating link 6 for a number of cycles depending on the characteristics and strength of the material used in its manufacture.

[0027] An alternate embodiment is shown in FIGS. 5 and 6 in which one or more apertures 9 are formed through the release member 1 perpendicular to the hinge and grip aperture 3. A non-removable manufacturer installed limiting fastener such as a tamper proof rivet 10 or the like passes through and is permanently installed in the aperture 9, being retained in the aperture 9 by a barbed retainer 11 or other permanent fastening means. In this fashion the rivet 10 restricts the function of the hinge 7, requiring a greater tension pull to break the limiting fastener or rivet 10, thus allowing the jaws 4 to open and the buckle or fastener members to separate. When the rivet 10 has broken, the release member 1 can normally be reconnected to the fastening link 6, but the members will separate at the lower tension of the previously described standard buckle assembly shown in FIGS. 2 & 4. A new break-free release member 1 (or rivet 10, at the manufacturer's discretion) must be installed to restore the original break free tension. Rivets constructed in various breaking strengths determined by material composition and/or reduced diameter controlled breaking portions 14 can be used to provide various higher release tensions than that of the standard release buckle. In this manner, and by using color coding or a marked identification 12 to indicate the breaking strength or other designation of the rivets 10, manufacturers can provide buckles and fasteners with varying pre-determined safety release tensions at minimum cost, since additional tooling is needed only for limiting rivets 10 and installation hardware (or tooling for other limiting means which may be installed into the release portion of universal fasteners).

[0028] A preferred alternate embodiment of the standard release member 1 of the buckle assembly is illustrated by a broken-away section in FIG. 10. In this construction a portion of the open distance between the hinge aperture 7 and grip aperture 8 in the jaws 4 is bridged, forming a limiting connection 13 of the jaws 4 which will break, allowing the buckle portions 1 & 6 to separate when a predetermined pull tension greater than that of the standard (unbridged) buckle portions shown in FIGS. 2 & 4 is exceeded. When only the connecting bridge portion 13 is broken the buckle members can be reassembled, although they will only grip at the lower release tension of the first described standard embodiments. In this construction, the release member 1 of the buckle assembly is a sacrificial tamper-proof part which must be replaced with a new part when the bridge 13 is broken to restore the designed release tension of the member 1, whereas the safety control function of the previously described riveted member could be circumvented by the installation of a bolt, screw or other connecting member.

[0029] A stud 5 on the link member is shown in a cross-section drawing in FIG. 9, and in a detail perspective drawing in FIG. 11. A cut-out portion 15 in the stud 5 and cut-away notches 16 in the upper jaws of the release member 1 allow entry of the stud 5 into the rigid jaws 4 of the release member 1 when the link 6 is rotated downward (upward in the case of a side release buckle) opposite the notched jaw 4 and toward the release member 1 of the assembly as is indicated by an arrow X shown in FIG. 8. The buckle members are also shown in various positions in FIG. 9. Short cylindrical structures 17 at both ends of the stud 5 are sized to pass through notches 16 in the upper jaw 4 of the release member 1 when the buckle members 1 & 6 are assembled. The cylindrical structures 17 prevent the stud 5 from exiting the jaws 4 of the release member 1 when the strap link 6 is positioned 180° from its installed position, as is shown in FIG. 12. These cylindrical structures 17 also help provide smooth pivotal movement of the interconnected buckle members 1 & 6 and prevent the cut-out portion 15 of the stud 14 catching on the jaws 4 of the release member 1 of the buckle when the strap link 6 is rotated within the separating member 1.

[0030] FIG. 13 is a simplified drawing which illustrates the method of forming the bridge 13. Mold cores A & B can be selectively positioned closer together or farther apart from each other in the mold cavity as shown by arrows A & B to adjust the length of the bridge 13 for greater or lesser length and breaking strength related to various pull tensions. To prepare a mold for manual casting processes a continuous core cavity of sufficient length to accommodate casting a bridge across the width of the jaws 4 of the release member is formed in the mold. Before casting the part cores A & B are placed in the mold cavity and adjusted to form the required length of the bridge. The mold is then closed and cast in usual fashion. For machine molding processes, tooling adjustment is provided to position the cores A & B in the correct proximity to form the required bridge length. Normally the cores would be assembled to automatic slides, cams or other pull devices which draw the cores from the parts as the mold halves open, and reposition the cores in the mold cavity when the halves close.

[0031] In other alternate embodiments requiring still greater release tensions the hinge aperture 7 could be

eliminated, with the entire space of the hinge aperture 7 and bridge 13 filled in solid, leaving only the grip aperture 8 in the release member 1. In this construction the jaws 4, stud 5 or other desired buckle portions could be designed to break under a maximum load.

[0032] Although the illustrations in this application show only two common fasteners it should be understood that the principles and break-free design disclosed in this application can be adapted to many common fasteners, including but not limited only to center release and cam buckles, snap hooks and fasteners, webbing rings, cord closures, tie-downs and associated hardware. Therefore, the specification and claims should be interpreted to include modification of all appropriate fasteners to function as a break-free release device in combination with separating members generally similar to those which are disclosed herein.

[0033] The foregoing description and the illustrative embodiments of the present invention have been described in detail in varying modifications and alternate embodiments. It should be understood that the foregoing description is exemplary only, and that the scope of the present invention is to be limited to the claims as interpreted in view of the prior art. Moreover, the invention illustratively disclosed herein may suitably be practiced in the absence of any element which is not specifically disclosed herein.

I claim:

1. A quick-release fastening device comprising:

a first fastening component having upper and lower surfaces and first and second end portions;

a pair of first and second elongated jaw elements disposed on said first component first end portion and forming a channel-like socket therebetween to define a gripping mechanism having an elongated jaw opening accessing said socket, said first jaw element having a length dimension less than said second jaw element;

a tubular pocket defined in said first member first end portion adjacent said channel-like socket to form a pivot point for said jaw elements;

a second fastening component having first and second end portions, said second fastening component first end portion being adapted for releasable engagement with said first fastening component first end portion; and

a stud mounted in said second fastening component first end portion, said stud being sized for releasable engagement within said channel-like socket and further including an elongated cut-out portion forming a groove along a substantial portion of the length of said stud, said groove being sized to match said first jaw element to enhance engagement of said stud within said socket without affecting release resistance of said stud imposed by said jaw elements.

2. The quick-release fastening device as claimed in claim 1, wherein the length dimension of said first jaw element is defined by a pair of notched end portions.

3. The quick-release fastening device as claimed in claim 2, wherein said stud includes a pair of cylindrical end portions disposed at the ends of said groove, said cylindrical end portions being sized and shaped to match the notched end portions of said first jaw element to enhance entry of said stud into said socket.

4. The quick-release fastening device as claimed in claim 1, wherein the release resistance of said stud from the elongated jaw opening of said gripping mechanism is defined by the elasticity of said jaw elements and the spacing between said channel-like socket and said tubular pocket pivot point adjacent thereto.

5. The quick-release fastening device as claimed in claim 4, wherein said device further comprises a variable release resistance mechanism.

6. The quick-release fastening device as claimed in claim 5, wherein said variable release resistance mechanism comprises a slot defined in the spacing between said channel-like socket and said tubular pocket pivot point to interconnect the same, said slot extending the entire width of said first fastening component.

7. The quick-release fastening device as claimed in claim 6, wherein a connection bridge is disposed in a central portion of said slot to increase the release resistance of said stud.

8. The quick-release fastening device as claimed in claim 5, wherein a vertical aperture is disposed through said first fastening component at the center of said spacing and is adapted to receive a rivet member to increase the release resistance of said stud.

9. The quick-release fastening device as claimed in claim 8, wherein said rivet member includes a central portion having a reduced diameter to vary the release resistance of said stud.

10. The quick-release fastening device as claimed in claim 1, wherein said first fastening component comprises a release member in the form of a buckle adapted to adjustably attach to a connecting strap, and wherein said second fastening component comprises a fastening link adapted to attach to a second article.

11. A safety release system for fasteners to provide a break-away release fastener and buckle mechanism adapted for attachment to webbing and other devices used to secure equipment on or about a wearer and to other equipment and devices, such that the separating member of the system may be constructed as a reusable assembly or component of an assembly or as a tamper-proof replaceable sacrificial safety break fastener to provide automatic release under varied pre-determined amounts of tension on the buckle assembly, said system comprising:

- a release member having upper and lower surfaces and first and second end portions;

- a pair of upper and lower elongated jaw elements disposed on said release member first end portion and forming a channel-like socket therebetween to define a gripping mechanism having an elongated jaw opening accessing said socket, said upper jaw element having a length dimension less than said lower jaw element;

- a lateral opening defined in said release member first end portion adjacent said channel-like socket to form a pivot point for said jaw elements;

- an open slot defined in the space between said lateral opening and said channel-like socket;

- a buckle assembly attached to said release member second end portion;

- a fastening link having first and second end portions, said fastening link first end portion being adapted for releasable engagement with said release member first end portion;

- a transversely oriented stud mounted in said fastening link first end portion, said stud being sized for releasable engagement within said channel-like socket and further including an elongated cut-out portion forming a groove along a substantial portion of the length of said stud, said groove being sized to match said upper jaw element to enhance engagement of said stud within said socket.

12. The safety release system as claimed in claim 11, wherein the length dimension of said upper jaw element is defined by a pair of notched end portions, and said stud includes a pair of cylindrical end portions disposed at the ends of said groove, said cylindrical end portions being sized and shaped to match the notched end portions of said upper jaw element to enhance angled entry of said stud into said socket yet not effect break-away release resistance of said stud from said gripping mechanism socket.

13. The safety release system as claimed in claim 11, wherein the break-away release resistance of said stud through the elongated jaw opening of said gripping mechanism is defined by the elasticity of said jaw elements and the slot between said channel-like socket and said lateral opening pivot point adjacent thereto.

14. The safety release system as claimed in claim 13, wherein said device further comprises a variable break-away release resistance mechanism.

15. The safety release system as claimed in claim 14, wherein said slot extends the entire width of said release member.

16. The safety release system as claimed in claim 14, wherein a bridge is disposed in a central portion of said slot to increase the break-away release resistance of said stud by limiting movement of said jaw elements relative to each other until breakage of said bridge.

17. The safety release system as claimed in claim 14, wherein a vertical aperture is disposed through said release member at the center of said slot and is adapted to receive a rivet member to increase the break-away release resistance of said stud by limiting movement of said jaw elements relative to each other until breakage of said rivet member.

18. The quick-release fastening device as claimed in claim 17, wherein said rivet member includes a central portion having a reduced diameter to vary the break-away release resistance of said stud by varying the breakage strength of said rivet member.

19. The safety release system as claimed in claim 15, wherein said release member is in the form of a buckle mechanism adapted for attachment to webbing and other devices used to secure equipment on or about a wearer and to other equipment and devices, and wherein said fastening link is the separating member and is adapted to attach to a second article including webbing and other devices.

20. A quick-release buckle and fastener device having a break-away safety release mechanism, said device comprising:

- a buckle member having upper and lower surfaces, a buckle end portion and quick-release end portion;

- a pair of upper and lower elongated jaw elements disposed on said quick-release end portion and forming a channel-like socket therebetween to define a gripping mechanism having an elongated jaw opening accessing said socket, said upper jaw element having a length dimension less than said lower jaw element;

- a tubular pocket defined in said quick-release end portion adjacent said channel-like socket to form a pivot point for said jaw elements;
- an open slot defined in the space between said tubular pocket and said channel-like socket;
- a variable break-away release resistance mechanism disposed in a central portion of said open slot to increase the break-away release resistance of said device by limiting movement of said jaw elements relative to each other;
- a fastening link having a release attachment end portion and a connector end portion, said fastening link release attachment end portion being adapted for releasable engagement with said buckle member quick-release end portion; and
- a transversely oriented stud mounted in said fastening link release attachment end portion, said stud being sized for releasable engagement within said channel-like socket and further including an elongated cut-out portion forming a groove along a substantial portion of the length of said stud, said groove being sized to match

said upper jaw element to enhance engagement of said stud within said socket without affecting break-away release resistance imposed by said jaw elements.

21. The quick-release fastening device as claimed in claim 20, wherein said variable break-away release resistance mechanism comprises a bridge disposed in a central portion of said slot to increase the break-away release resistance of said stud by limiting movement of said jaw elements relative to each other until breakage of said bridge.

22. The quick-release fastening device as claimed in claim 20, wherein said variable break-away release resistance mechanism comprises a vertical aperture disposed through said buckle member at the center of said slot, and a removable rivet member disposed in said vertical aperture to increase the break-away release resistance of said stud by limiting movement of said jaw elements relative to each other until breakage of said rivet member, said rivet member including a central portion having a selectively variable reduced diameter to vary the break-away release resistance of said stud by varying the breakage strength of said rivet member.

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