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(54) **ENERGY ABSORBING RESTRAINT SYSTEMS, SUCH AS FOR USE WITH CHILD SEATS**

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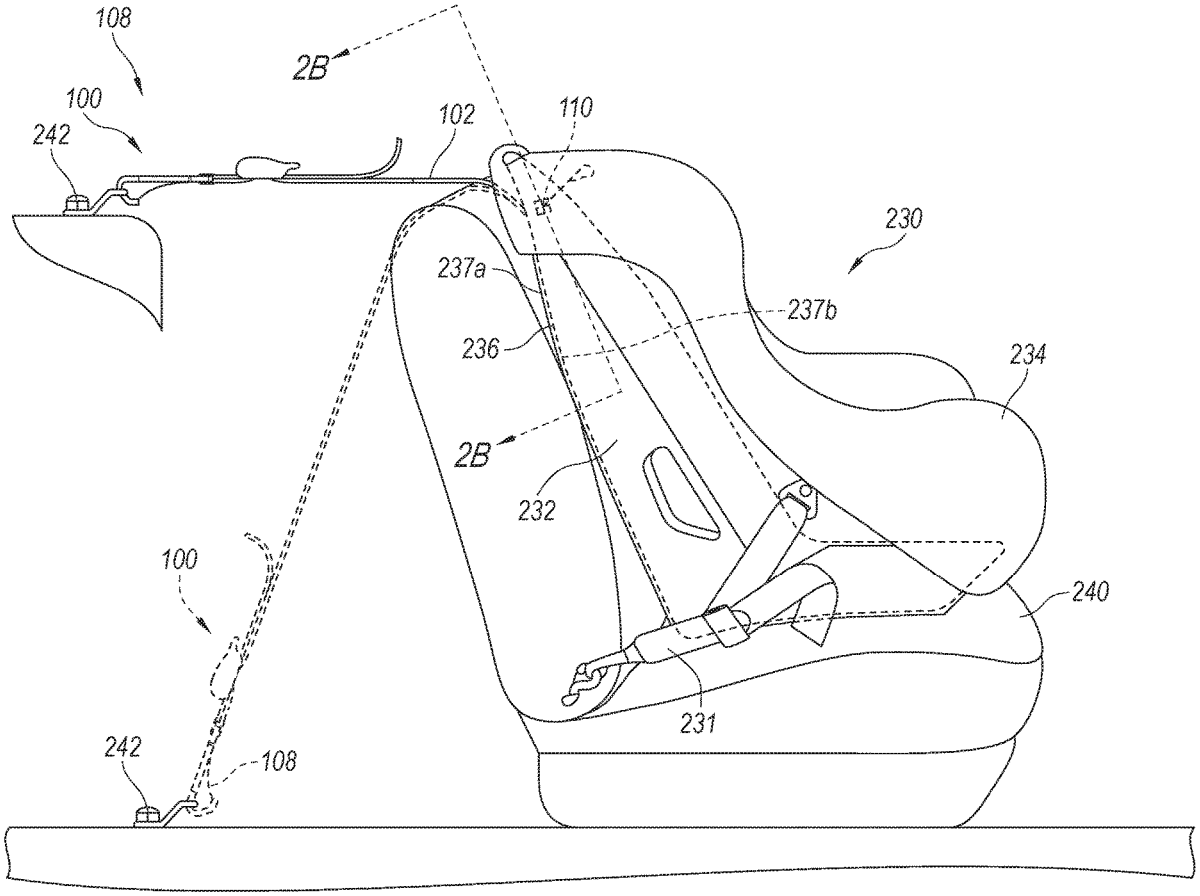
(57) **ABSTRACT**

Energy absorbing restraint systems for use with child seats and other devices are disclosed herein. In some embodiments, an energy absorbing restraint system includes a web slide and a web. The web slide can include first and second web apertures extending therethrough. The web can be threaded (a) through the first web aperture from a first side to a second side of the web slide and (b) back through the second web aperture from the second side to the first side of the web slide. The web is attached to itself with, for example, rip stitching to form a joined portion adjacent the second side of the web slide. When a shock load above a preset level is quickly applied to the web, the web is pulled against the web slide to rupture the rip stitching and absorb the shock load transmitted by the web.



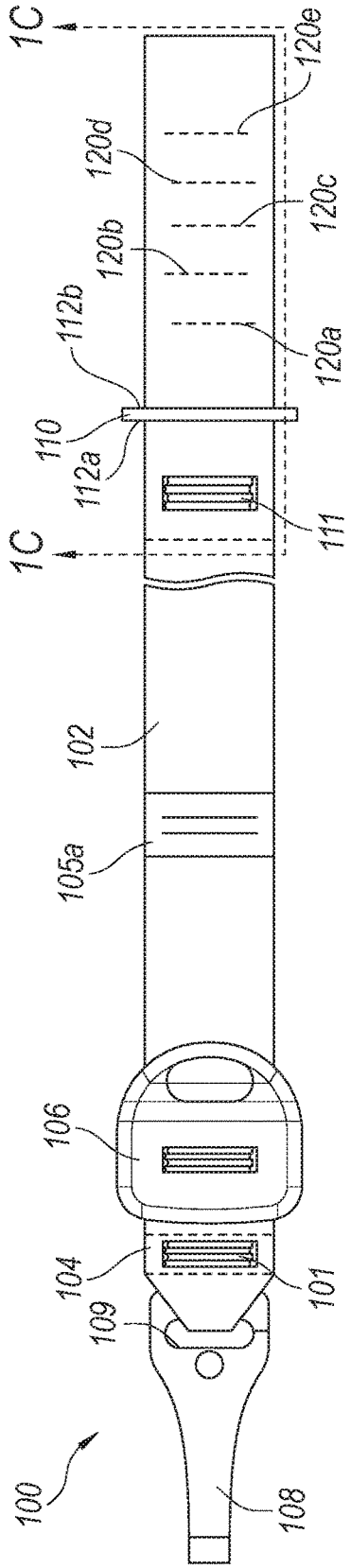

1C
120e
120d
120c
120b
120a
112b
110
112a
111
1C
102
105a
106
104
101
109
100
108

Fig. 1A

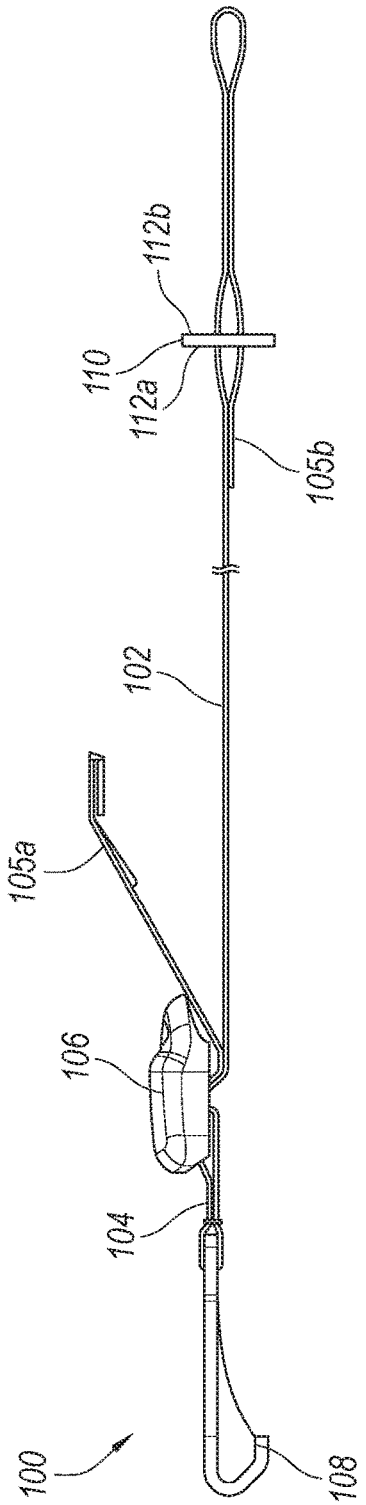

112b
110
112a
105b
102
105a
106
104
100
108

Fig. 1B

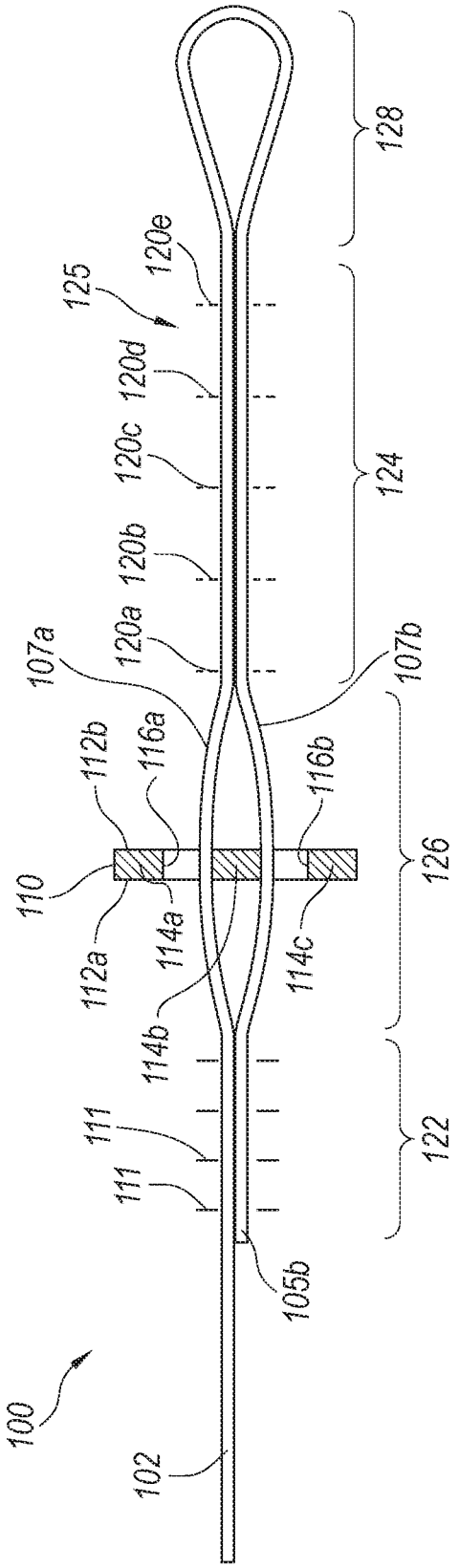

100
102
105b
111
111
122
126
128
124
125
110
112a
112b
114a
114b
114c
116a
116b
107a
107b
120a
120b
120c
120d
120e

Fig. 1C

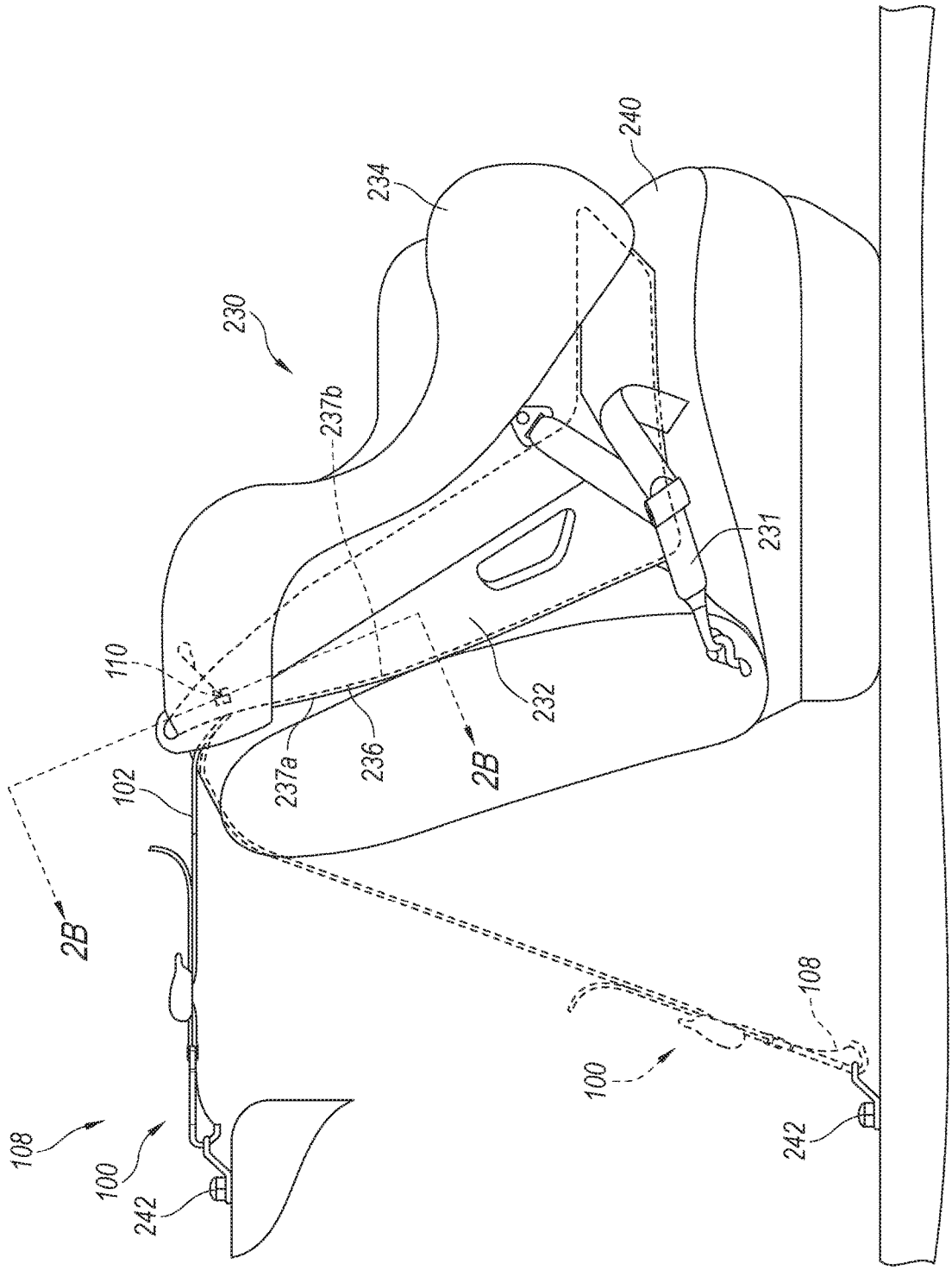

240
234
230
237b
231
110
232
237a
236
2B
102
2B
108
100
242
100
108
242

Fig. 2A

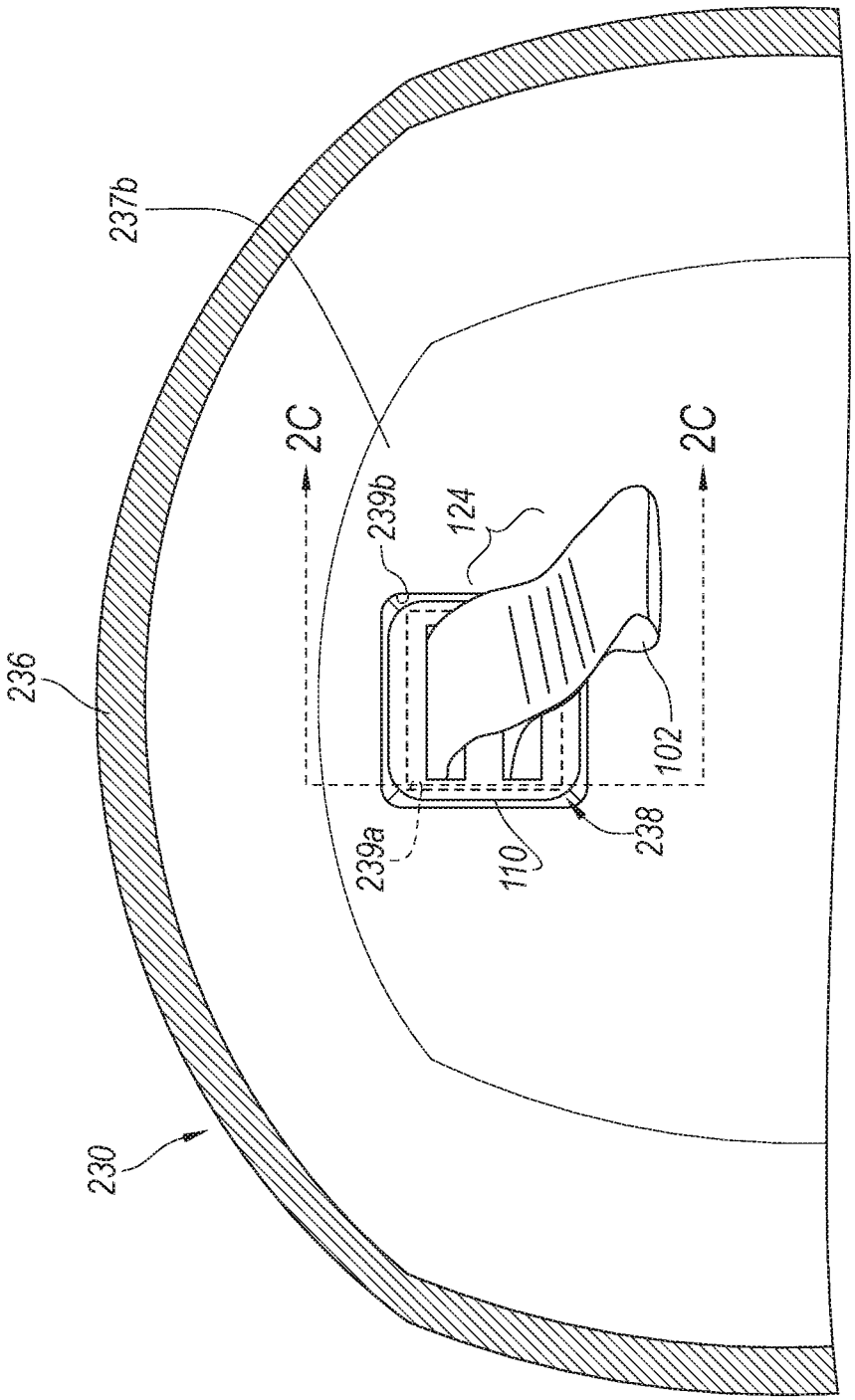


Fig. 2B

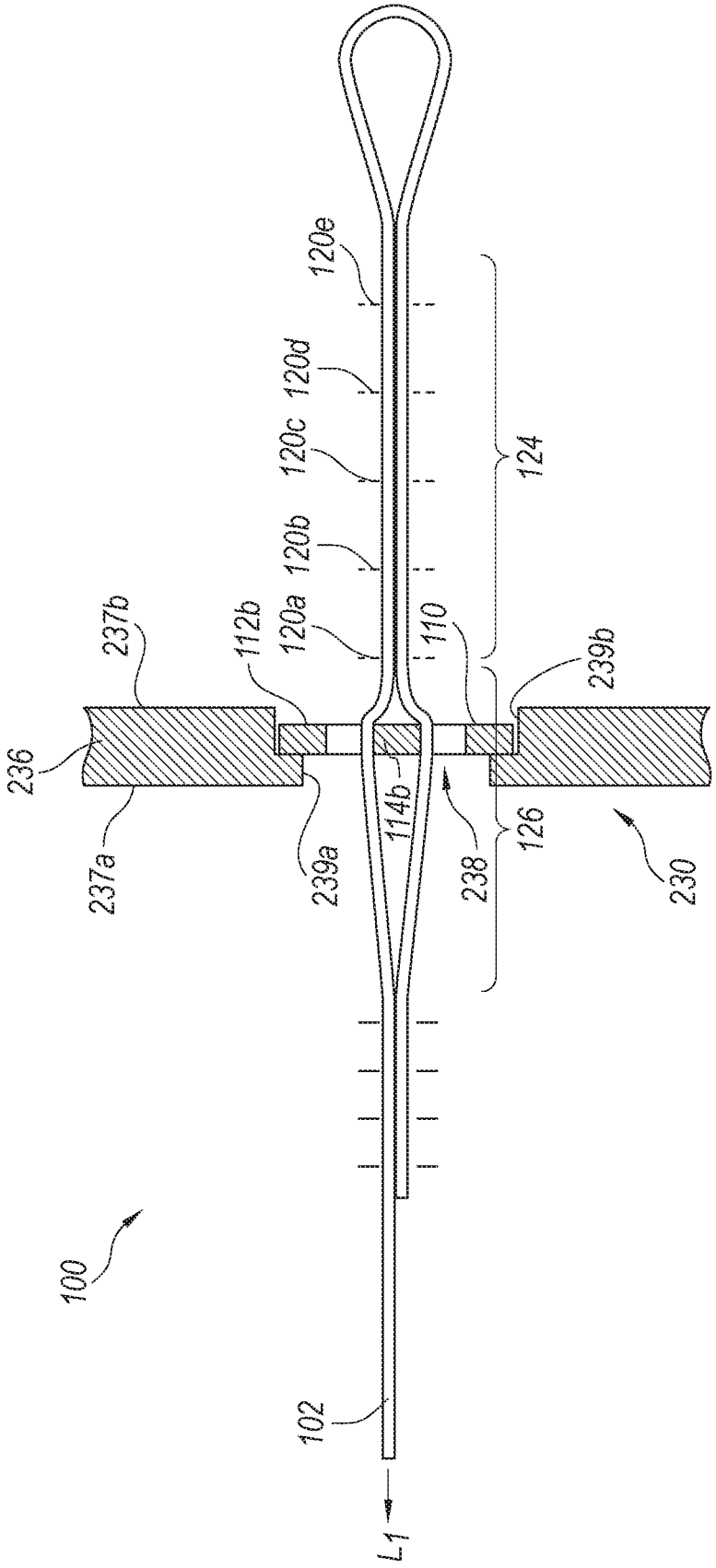

120e
120d
120c
120b
120a
124
237b
112b
110
239b
236
237a
239a
114b
238
126
230
100
102
L1

Fig. 2C

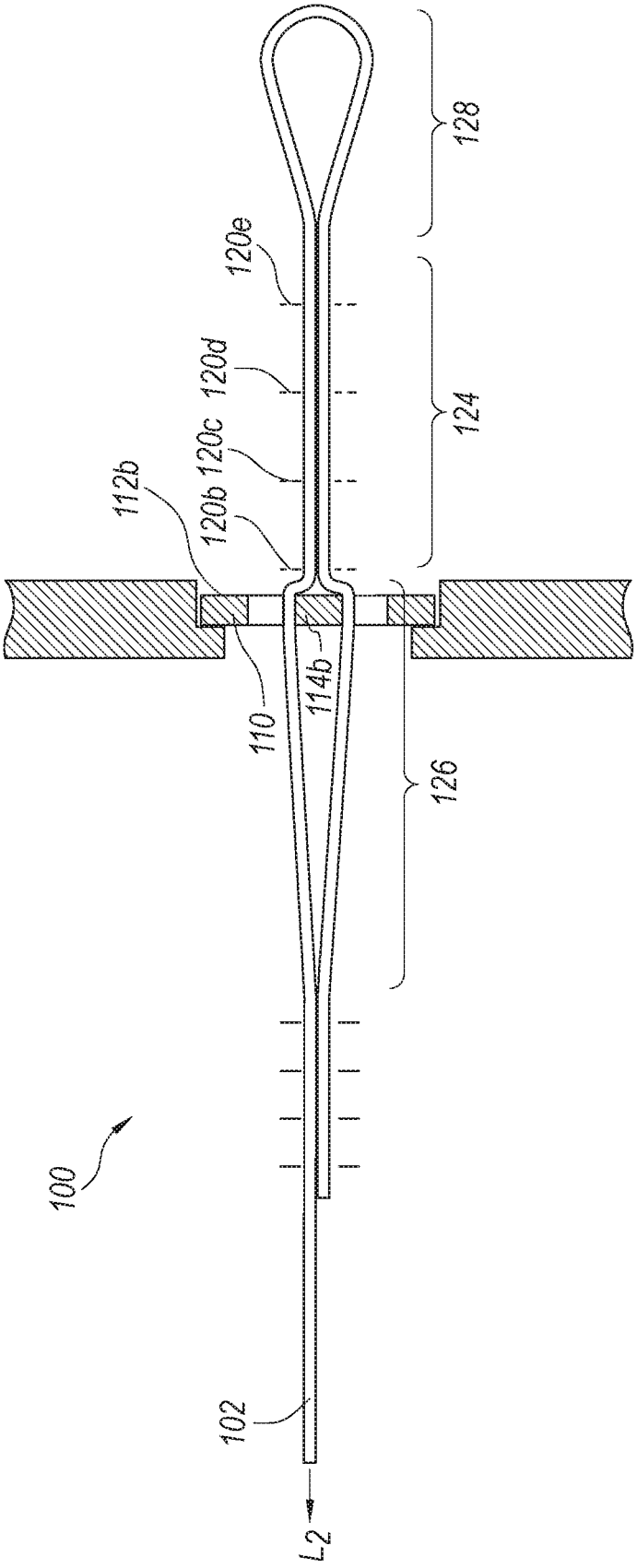


Fig. 3

ENERGY ABSORBING RESTRAINT SYSTEMS, SUCH AS FOR USE WITH CHILD SEATS

TECHNICAL FIELD

[0001] The present disclosure is generally directed to energy absorbing occupant restraint systems, such as for use in restraining a child seat in an automobile or other vehicle.

BACKGROUND

[0002] Many types of personal restraint systems are used in automobiles, utility task vehicles (UTVs), and other vehicles. Small children, for example, are typically secured in a portable child seat that can be mounted to a passenger seat in an automobile or other vehicle. The child seat can be secured to the passenger seat by attaching one or more straps, belts, etc., (e.g., webs) from the child seat to corresponding anchor points in the vehicle, and then adjusting the tension in the webs to securely hold the child seat in place. During a crash or other significant dynamic event, substantial loads can be applied to the webs as the vehicle rapidly decelerates. The webs can stretch a small amount and absorb some energy during the crash, but the anchor points in the vehicle are generally rigid and offer little energy absorption. As a result, significant shock loads can be partially transmitted to the child seat during a crash.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] FIGS. **1**A and **1**B are top and side views, respectively, of a restraint system configured in accordance with embodiments of the present of the technology, and FIG. **1**C is an enlarged cross-sectional side view of a portion of the restraint system taken along the line **1**C-**1**C in FIG. **1**A.

[0004] FIG. **2**A is a side view of a child seat secured to a vehicle seat with the restraint system of FIGS. **1**A--**1**C in accordance with embodiments of the present technology, FIG. **2**B is an enlarged, partially cross-sectional front view of the child seat and the restraint system taken along the line **2**B-**2**B in FIG. **2**A, and FIG. **2**C is an enlarged, partially cross-sectional front view of the child seat and the restraint system taken along the line **2**C-**2**C in FIG. **2**B.

[0005] FIG. **3** is an enlarged, cross-sectional side view of the child seat and restraint system of FIG. **2**C when a tension load is applied to the restraint system in accordance with embodiments of the present technology.

DETAILED DESCRIPTION

[0006] The following disclosure describes various embodiments of energy absorbing systems for restraining child seats. For example, some embodiments of the present technology are directed to a restraint system including a web slide having first and second web apertures. A web can be threaded through the web slide such that the web extends (a) through the first web aperture from a first side to a second side of the web slide and (b) back through the second web aperture from the second side to the first side of the web slide. The web can further be folded and attached to itself to form a joined portion adjacent the second side of the web slide. For example, the web can be attached to itself with frangible stitching to form the joined portion of the web. Upon application of a tension load to the web (e.g., during a crash), the joined portion of the web is pulled taught against the web slide, thereby rupturing the frangible stitching and absorbing a portion of the energy transmitted by the web.

[0007] In one aspect of the present technology, the restraint system can be used to securely attach a child seat to an anchor point in a vehicle. For example, the web can be coupled to the anchor point, and the web slide can be coupled to the child seat such that the joined portion of the web is adjacent to a front side of a rear wall or panel of the child seat. During a crash or other dynamic event, the joined portion of the web is pulled against the web slide to break the stitching and absorb kinetic energy transmitted by the web to thereby reduce the shock on a child secured in the child seat.

[0008] Certain details are set forth in the following description and in FIGS. **1**A-**3** to provide a thorough understanding of various embodiments of the present technology. In other instances, well-known structures, materials, operations and/or systems often associated with webs, web adjusters, child seats, and other personal restraint system hardware, etc., are not shown or described in detail in the following disclosure to avoid unnecessarily obscuring the description of the various embodiments of the present technology. Those of ordinary skill in the art will recognize, however, that the present technology can be practiced without one or more of the details set forth herein, or with other structures, methods, components, and so forth.

[0009] The terminology used below is to be interpreted in its broadest reasonable manner, even though it is being used in conjunction with a detailed description of certain examples of embodiments of the technology. Indeed, certain terms may even be emphasized below; however, any terminology intended to be interpreted in any restricted manner will be overtly and specifically defined as such in this Detailed Description section.

[0010] The accompanying Figures depict embodiments of the present technology and are not intended to be limiting of its scope. The sizes of various depicted elements are not necessarily drawn to scale, and these various elements may be arbitrarily enlarged to improve legibility. Component details may be abstracted in the Figures to exclude details such as position of components and certain precise connections between such components when such details are unnecessary for a complete understanding of how to make and use the invention. Many of the details, dimensions, angles and other features shown in the Figures are merely illustrative of particular embodiments of the disclosure. Accordingly, other embodiments can have other details, dimensions, angles and features without departing from the spirit or scope of the present invention. In addition, those of ordinary skill in the art will appreciate that further embodiments of the invention can be practiced without several of the details described below.

[0011] In the Figures, identical reference numbers identify identical, or at least generally similar, elements. To facilitate the discussion of any particular element, the most significant digit or digits of any reference number refers to the Figure in which that element is first introduced. For example, element **110** is first introduced and discussed with reference to FIG. **1**.

[0012] FIGS. **1**A and **1**B are top and side views, respectively, of a restraint system **100** configured in accordance with embodiments of the present of the technology. FIG. **1**C is an enlarged cross-sectional side view of a portion of the

restraint system **100** taken along the line **1**C-**1**C in FIG. **1**A. Referring to FIGS. **1**A-**1**C together, the restraint system **100** includes a first web **102** and a second web **104** coupled together by a web adjuster **106** (e.g., a tilt-lock web adjuster, a push-button web adjuster, etc.) that is operable to adjust the tension in the webs **102**, **104**. In other embodiments, the web adjuster **106** can be omitted. The webs **102**, **104** can be any type of flexible web, strap, seat belt web, etc., well known in the art for use with seat belts, child seats, and/or other restraint systems, and can be constructed of various suitable materials known in the art, such as woven nylon.

[0013] In the illustrated embodiment, the first web **102** includes a first end portion **105***a* and a second end portion **105***b*. The first end portion **105***a* extends through the web adjuster **106** and is configured to be grasped and pulled by a user to increase the tension in the webs **102**, **104**. The second web **104** is coupled to a hook **108** that can be releasably attached to, for example, an anchor point in a vehicle, More specifically, in the illustrated embodiment the second web **104** includes an attachment loop (e.g., a portion of web material that is formed in a loop and stitched to itself by stitching **101**) that extends through a web aperture **109** in the hook **108** to couple the second web **104** to the hook **108**.

[0014] In the illustrated embodiment, the restraint system **100** includes a web slide **110** (e.g., a three-bar slide) having a first side **112***a*, a second side **112***b* opposite the first side **112***a*, a first web aperture **116***a* (e.g., a generally rectangular opening) extending through the web slide **110** between the sides **112***a, b*, and a second web aperture **116***b* (e.g., a generally rectangular opening) extending through the web slide **110** between the sides **112***a, b*. More specifically, the web apertures **116** are formed between pairs of adjacent crossmembers **114** (identified individually in FIG. **1**C as first through third crossmembers **114***a*-**114***c*, respectively). In other embodiments, the web apertures **116***a, b* can have circular, square, polygonal, irregular, or other shapes, and/or can be positioned differently on the web slide **110**. The web slide **110** can be manufactured using suitable materials and methods known in the art. For example, the web slide **110** can be formed from suitable metal (e.g., steel plate) or composite materials.

[0015] As shown in FIG. **1**C, the second end portion **105***b* of the first web **102** can be threaded through (i) through the first web aperture **116***a* from the first side **112***a* to the second side **112***b* of the web slide **110** and (b) back through the second web aperture **116***b* from the second side **112***b* to the first side **112** of the web slide **110**. As such, a first length **107***a* of the first web **102** overlays a second length **107***b* of the first web **102** and forms a loop **125**. Additionally, a first portion of the first length **107***a* is attached to the second length **107***b* by first stitching **111** (shown exploded in FIG. **1**C) to form a first joined portion **122** of the first web **102** that is adjacent to the first side **112***a* of the web slide **110**. Another portion of the length **107***a* is attached to the second length **107***b* by second stitching **120** (shown exploded in FIG. **1**C; identified individually as first through fifth rows/lines of second stitching **120***a*-**120***e*) to form a second joined portion **124** of the first web **102** that is adjacent to the second side **112***b* of the web slide **110**. In the illustrated embodiment, each of the crossmembers **114** is oriented generally parallel to the rows of second stitching **120** as shown in FIG. **1**A, and the rows of second stitching **120** are generally spaced equally apart. The first web **102** further includes a first looped portion **126** between the joined portions **122** and **124** and a second looped portion **128** adjacent to the second joined portion **124**. The first looped portion **126** spans/crosses through the web slide **110** such that the second cross member **114***b* is positioned between adjacent portions of the first and second lengths **107***a, b* of the first web **102** within the first looped portion **126**.

[0016] The first stitching **111** is configured to maintain the web attachment at the first joined portion **122** even when a tension load is applied to the first web **102**. That is, the first stitching **111** is configured not to break when a tension load is applied to the first web **102**. As described in detail below with reference to FIG. **3**, the second stitching **120** is configured to rip, break, or otherwise rupture when a shock or tension load is applied to the first web **102** to absorb a portion of the dynamic energy transmitted by the first web **102**. For example, in some embodiments the second stitching **120** can comprise frangible (e.g., rip) stitching that is selected to break when a tension load above a preset magnitude is applied to the first web **102**. In other embodiments, the first web **102** can be attached to itself in other manners to form the first and second joined portions **122** and **124**. For example, one or more clamps, adhesives, etc., can be used to attach the first web **102** to itself to form the joined portions. Likewise, in other embodiments the stitching **111** and **120** can have other suitable arrangements and configurations. For example, the second stitching **120** can include more or less than the illustrated five rows of stitching, and the rows can have different arrangements relative to the web slide **110** (e.g., arranged at angles other than parallel relative to the crossmembers **114**). Moreover, the rows of second stitching **120** can have different (e.g., irregular) spacings.

[0017] The restraint system **100** can be used to absorb kinetic energy and reduce shock loads in a wide variety of applications. FIG. **2**A, for example, is a side view of a child seat **230** secured to a vehicle seat **240** (e.g., a seat within an automobile) with the restraint system **100** of FIGS. **1**A-**1**C in accordance with embodiments of the present technology. The child seat **230** can be one of any of a number of child seats well known to those of ordinary skill in the art, and can include, for example, a shell **232** having a seat cushion **234** thereon. In the illustrated embodiment, the restraint system **100** securely attaches an upper portion of the child seat **230** to an upper anchor **242** (e.g., a bar) in a vehicle. More specifically, the hook **108** can be attached to the upper anchor **242**, and the web slide **110** can be engaged with to a rear wall or panel **236** of the seat shell **232** as explained in greater detail below with reference to FIG. **2**B. In other embodiments, the hook **108** can be secured to a lower anchor **244** in the vehicle as illustrated in dashed lines in FIG. **2**A. A lower portion of the child seat **230** can be secured to the vehicle seat **240** with additional restraints, such as a restraint **231** of a type well known to those of ordinary skill in the art.

[0018] FIG. **2**B is an enlarged, partially cross-sectional front view of an upper portion of the child seat **230** and the restraint system **100** taken along the line **2**B-**2**B in FIG. **2**A, and FIG. **2**C is an enlarged, partially cross-sectional front view of the child seat **230** and restraint system **100** taken along the line **2**C-**2**C in FIG. **2**B. Referring to FIGS. **2**B and **2**C together, the rear wall **236** of the shell **232** can include a rear side **237***a* facing the vehicle seat **240** (FIG. **2**A), a front side **237***b* opposite the rear side **237***a* and configured to face a child seated in the child seat **230**, and an aperture **238** extending through the rear wall **236** between the sides **237***a, b*. In the illustrated embodiment, the aperture **238** is

stepped and includes a flange portion **239***a* having a smaller cross-sectional area than a recessed portion **239***b* formed in the front side **237***b* of the rear wall **236**. That is, the flange portion **239***a* of the aperture **238** can be narrower in height and/or width than the second portion **239***b* of the aperture **238**.

[0019] The web slide **110** is positioned in the recessed portion **239***b* of the aperture **238** such that first web **102** (e.g., the first looped portion **126**) extends through/past the rear wall **236** of the shell **232**. For example, the web slide **110** can be positioned in the recessed portion **239***b* of the aperture **238** and against the flange portion **239***a* to resist being pulled through the flange portion **239***a* of the aperture **238** in the direction L. In other embodiments, the flange portion **239***a* of the aperture **238** can be omitted and the web slide **110** can be secured directly against the front side **237***b* of the rear wall **236** (e.g., not within a recess therein) with, for example, fasteners, adhesives, etc. In one aspect of the present technology, the restraint system **100** extends through only a single aperture formed in the rear wall **236** of the shell **232**.

[0020] Accordingly, referring to FIGS. **2**A-**2**C together, the second joined portion **124** of the first web **102** is positioned adjacent to the front side **237***b* of the rear wall **236** of the shell **232** of the child seat **230** when the restraint system **100** is installed onto the child seat **230**. As best shown in FIG. **2**C, when the tension in the webs **102**, **104** is increased (e.g., as indicated by arrow L_1), the web slide **110** is pulled against the rear wall **236** of the shell **232** (e.g., against the flange portion **239***a* of the aperture **238**) and the first web **102** is pulled against the web slide **110**. More specifically, the second crossmember **114***b* of the web slide **110** contacts/engages the first web **102** at or proximate to the second joined portion **124** (e.g., at or proximate to the first row **120***a* of second stitching **120**).

[0021] Referring to FIG. **2**C, when a sufficient shock or tension load is applied to the first web **102** (as a result of, e.g., a crash or other rapid deceleration of the vehicle that causes the child seat **230** to jolt forward on the vehicle seat **240**), the tension force in the first web **102** pulls the first web **102** against the web slide **110** (e.g., against the second crossmember **114***b*) to at least partially separate the first length **107***a* of the first web **102** from the second length **107***b* at the second joined portion **124**, to thereby absorb and dissipate the shock energy transmitted by the first web **102**. More specifically, the tension force can pull the first web **102** against the web slide **110** to rip or break all or a portion of the second stitching **120**.

[0022] FIG. **3**, for example, is an enlarged, partially cross-sectional side view of the upper portion of the shell **232** of the child seat **230** and restraint system **100** of FIG. **2**C after a sufficient tension load (e.g., indicated by arrow L_2) has been applied to the first web **102** to rip or otherwise rupture the first row **120***a* of the second stitching **120** (FIG. **2**C). The rupture of the first row **120***a* of the second stitching **120** decreases the length of the second joined portion **124** of the first web **102** while correspondingly increasing the length of the first looped portion **126** as shown in FIG. **3**. After the rupture of the first row **120***a* of the second stitching **120**, the second crossmember **114***b* engages the first web **102** at or proximate to the second row **120** of the second stitching **120**.

[0023] If the applied shock or tension load is great enough, subsequent rows of the second stitching **120** can sequentially rupture in a rapid zipper effect, thereby decreasing the length of the second joined portion **124** and dissipating the energy from the crash. After all the second stitching **120** is ruptured, the second looped portion **128** can be pulled against the web slide **110** and form a single looped portion together with the first looped portion **126** that stops any further extension of the first web **102**. The combined rupture of the second stitching **120** and lengthening of the first looped portion **126** can absorb at least a portion of the shock energy during a rapid deceleration event that would otherwise be transmitted to the child seat **230** by the first web **102**—thereby reducing the shock exerted on the child in the child seat **230**.

[0024] In one aspect of the present technology, by arranging the rows of second stitching **120** generally parallel to the second cross member **114***b* of the web slide, the web slide **110** can apply a consistent force along the rows of second stitching **120** to generally maximize the force each row of the second stitching **120** can absorb before breaking. In another aspect of the present technology, the second crossmember **114***b* is configured to generally apply a force only to the row of second stitching **120** directly adjacent thereto (e.g., the first row **120***a* of the second stitching **120** in FIG. **2**C, the second row **120***b* of the second stitching **120** in FIG. **3**, etc.).

[0025] In some embodiments, the restraint system **100** is configured such that the second stitching **120** ruptures when the force applied to the first web **102** is greater than or equal to a preset value or "design-level load." For example, the restraint system **100** can be configured such that each of the rows of the second stitching **120** rupture at a design-level load of between about 250-500 lbf, and the number of rows of the second stitching **120** can control the overall design-level load for the restraint system **100**. More generally, the shape and size of the rows of second stitching **120**, the thread material type and mechanical properties of the thread and/or other components of the restraint system **100**, and the shape and size of the second crossmember **114***b* can be selected to provide a desired amount of rupture and corresponding decrease in the length of the second joined portion **124** at any of a variety of design-level loads. These and other features can be selected and modified to match or correspond to a calculated design-level load.

[0026] The foregoing description of embodiments of the technology is not intended to be exhaustive or to limit the disclosed technology to the precise embodiments disclosed. While specific embodiments of, and examples for, the present technology are described herein for illustrative purposes, various equivalent modifications are possible within the scope of the present technology, as those of ordinary skill in the relevant art will recognize. For example, although the restraint systems illustrated in FIGS. **1**A-**3** are described in the context of restraining a child seat, those of ordinary skill in the art will understand that the restraint systems described herein can be utilized in a wide variety of other applications utilizing webs as restraints or tethers. For example, the restraint systems of the present technology could be advantageously used in fall-arrest harness systems (e.g., employed at a construction site), recreational utility vehicles (RUVs), automobiles, etc. Accordingly, the restraint systems described herein are not limited to use in any particular restraint system, but can be used with a wide-variety of such systems without departing from the present disclosure. Further, various aspects of the technology described herein can be combined to provide yet other embodiments.

[0027] Unless the context clearly requires otherwise, throughout the description and the claims, the words "com-

prise," "comprising," and the like are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense; that is to say, in the sense of "including, but not limited to". Words using the singular or plural number also include the plural or singular number respectively. Additionally, the words "herein," "above," "below," and words of similar import, when used in this application, shall refer to this application as a whole and not to any particular portions of this application. When the claims use the word "or" in reference to a list of two or more items, that word covers all of the following interpretations of the word: any of the items in the list, all of the items in the list, and any combination of the items in the list.

[0028] From the foregoing, it will be appreciated that specific embodiments of the disclosed technology have been described herein for purposes of illustration, but that various modifications may be made without deviating from the present technology. Certain aspects of the disclosure described in the context of particular embodiments may be combined or eliminated in other embodiments. Further, while advantages associated with certain embodiments of the disclosed technology have been described in the context of those embodiments, other embodiments may also exhibit such advantages, and not all embodiments need necessarily exhibit such advantages to fall within the scope of the disclosed technology. Accordingly, the disclosure and associated technology can encompass other embodiments not expressly shown or described herein.

[0029] In general, the terms used in the following claims should not be construed to limit the present technology to the specific embodiments disclosed in the specification, unless the above-detailed description explicitly defines such terms. Accordingly, the actual scope of the present technology encompasses the disclosed embodiments and all equivalent ways of practicing or implementing the disclosure under the claims.

I/we claim:

1. A restraint system, comprising:
- a web slide including a first side, a second side, and first and second web apertures extending therethrough from the first side to the second side; and
- a web extending (a) through the first web aperture from the first side to the second side of the web slide and (b) back through the second web aperture from the second side to the first side of the web slide,
  - wherein the web is attached to itself to form a joined portion adjacent the second side of the web slide, and
  - wherein, when a shock load above a preset level is applied to the web, the web is pulled against the web slide to separate at least a portion of the joined portion and absorb energy in the web.

2. The restraint system of claim **1**, further comprising stitching attaching the web to itself, wherein at least a portion of the stitching is configured to break when the shock load is applied to the web.

3. The restraint system of claim **2** wherein the stitching includes a plurality of spaced apart rows of stitching.

4. The restraint system of claim **1** wherein the web slide further includes a crossmember between the first and second web apertures, and wherein the joined portion of the web is pulled against the cross member to decrease the length of the joined portion when the tension load is applied to the web.

5. The restraint system of claim **1** wherein the joined portion of the web is a first joined portion, and wherein the web is further attached to itself to form a second joined portion adjacent the first side of the web slide.

6. The restraint system of claim **5**, further comprising:
- first stitching attaching the web to itself to form the first joined portion, wherein the first stitching is configured to break when the shock load is applied to the web; and
- second stitching attaching the web to itself to form the second joined portion.

7. The restraint system of claim **6** wherein the second stitching is configured not to break when the shock load is applied to the web,

8. The restraint system of claim **1** wherein the web is a first web, and further comprising:
- a web adjuster coupled to the first web and configured to adjust he tension in the first web;
- a second web coupled to the web adjuster; and
- a hook coupled to the second web and configured to be attached to an anchor point within a vehicle.

9. A restraint system for use with a child seat including a shell having a rear wall, the restraint system comprising:
- a web slide configured to be positioned adjacent an aperture in the rear wall of the shell, wherein a front side of the rear wall of the shell is configured to face a child seated in the child seat, and wherein the web slide includes first and second web apertures extending therethrough; and
- a web extending through the first and second apertures and attached to itself to form a joined portion,
  - wherein the joined portion is adjacent to the front side of the rear wall of the shell, and
  - wherein, when a shock load above a preset level is applied to the web, the joined portion of the web is pulled against the web slide to decrease a length of the joined portion to absorb kinetic energy in the web.

10. The restraint system of claim **9**, further comprising the child seat.

11. The restraint system of claim **9** wherein the web slide is configured to be positioned in a recess in the front side of the rear wall of the shell.

12. The restraint system of claim **9**, further comprising stitching attaching the web to itself, wherein the stitching is configured to break when the shock load is applied to the web.

13. The restraint system of claim **9** wherein the web slide includes a first aperture, a second aperture, and a crossmember between the first and second apertures, wherein the restraint system further comprises stitching attaching the web to itself, and wherein the web is pulled against the crossmember to at least partially shear the stitching when the shock load is applied to web.

14. The restraint system of claim **13** wherein the web slide is a three-bar slide.

15. The restraint system of claim **9** wherein the web is coupled to a web adjuster, and wherein the web adjuster is configured to be coupled to an anchor point within a vehicle and to adjust the tension in the web.

16. A restraint system, comprising:
- a web slide including first and second web apertures and a crossmember positioned between the first and second web apertures;
- a web extending (a) through the first web aperture from a first side of the web slide to a second side of the web

slide and (b) back through the second web aperture from the second side to the first side; and

attachment means attaching the web to itself to form a joined portion adjacent the second side of the web slide, wherein, when a shock load above a preset level is applied to the web, the joined portion of the web is pulled against the crossmember to separate at least a portion of the attachment means and absorb energy in the web.

17. The restraint system of claim **16** wherein the attachment means include stitching, and wherein the web is pulled against the crossmember to at least partially shear the stitching when the shock load is applied to the web.

18. The restraint system of claim **16** wherein the stitching includes a plurality of spaced apart lines of stitching, and wherein the crossmember has a length that is generally parallel to the lines of stitching.

19. The restraint system of claim **16** wherein the web includes first and second end portions, wherein the first end portion is coupled to a web adjuster configured to adjust the tension in the web, and wherein the second end portion is attached to a portion of the web between the first and second end portions and adjacent to the first side of the web slide.

20. The restrain system of claim **16** wherein the web slide is a three-bar slide.

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