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(54) Title: AIRCRAFT SEATING ASSEMBLY AND COMPONENTS

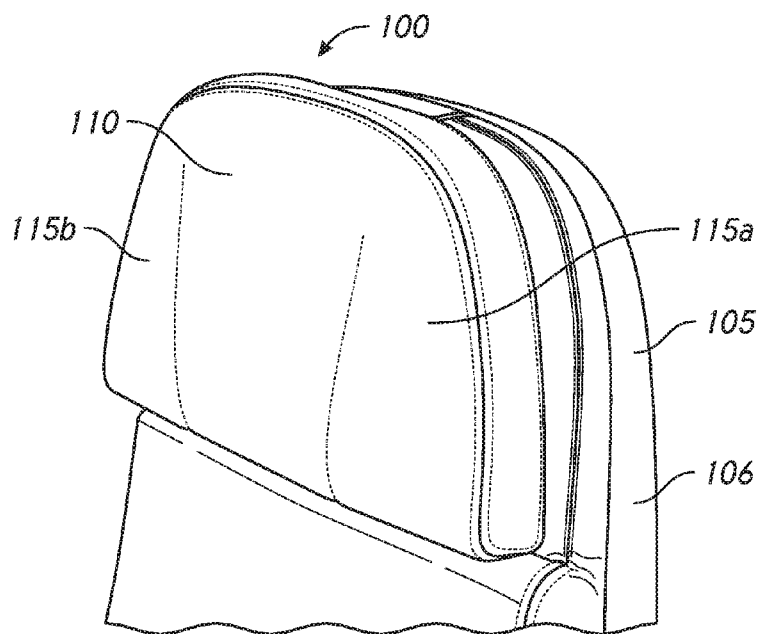


FIG. 1

(57) Abstract: Components and systems of an aircraft seating assembly are disclosed. The aircraft seating assembly can include an adjustable headrest that allows the headrest to be translated and/or rotated relative to a seat, a storage sleeve, and/or a spreader. The aircraft seating assembly can include an energy absorption system. The energy absorption system can include a bracket which can control pivoting of a seat back relative to the bracket when subject to forces exceeding a threshold force. The energy absorption system can include a movable wall coupled to the seat.



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AIRCRAFT SEATING ASSEMBLY AND COMPONENTS

RELATED APPLICATIONS

[0001] This application claims priority to U.S. Application No. 15/476,226 entitled “AIRCRAFT SEATING ASSEMBLY AND COMPONENTS”, filed on this same date (Attorney Docket No. ENCSE.010A), and U.S. Provisional Application No. 62/317,374, filed on April 1, 2016. The entire contents of each of the applications identified above are incorporated by reference herein and made a part of this specification.

BACKGROUND

Field

[0002] The embodiments described herein relate generally to seat devices, systems, and methods. In particular, some embodiments described herein relate to aircraft seat devices, systems, and methods.

Background

[0003] The structure of aircraft seats plays a significant role in the airline industry. As passenger seating is typically arranged in rows with one or more aisles separating parts of each row, aircraft seating assemblies typically are configured as 2, 3 or 4 seat units. These aircraft seating assemblies have a structure for withstanding forces caused not only due to acceleration and deceleration of the aircraft during normal operation, but also substantial forces caused during emergencies. Significantly, the aircraft seats desirably achieve this performance while being relatively lightweight. Further, while the structural integrity and weight of the seating assemblies is important, the cost of the assemblies is also an important consideration.

SUMMARY

[0004] Embodiments of an aircraft seating assembly and/or components thereof are disclosed which are both compliant with industry regulations and lightweight yet capable

of withstanding significant forces. In some embodiments, the aircraft seating assembly and/or components thereof can be installed in an aircraft.

[0005] In some embodiments, a seat assembly can include an adjustable headrest. The adjustable headrest can include a base. The adjustable headrest can include a mounting body coupled to the base. The mounting body can be removably coupled to the seat. The adjustable headrest can include one or more wing portions. The one or more wing portions can be rotatably coupled to lateral portions of the base.

[0006] In some embodiments, the seat assembly can include one or more rails coupled to the base. In some embodiments, the seat assembly can include one or more slides coupled to the mounting body. The one or more slides can be movably coupled to the one or more rails, such as via a slidable coupling. The base can be coupled to the mounting body via the one or more rails and one or more slides. In some embodiments, the slidable coupling of the one or more slides to the one or more rails can vertically adjust a position of the base. In some embodiments, the one or more rails can be oriented generally parallel to the base. In some embodiments, an axis of translation of the adjustable headrest pivots with the adjustable headrest. In some embodiments, the one or more slides can be rotatably coupled to the mounting body. In some embodiments, the rotatable coupling of the one or more slides to the mounting body can adjust a pitch of the base. In some embodiments, the axis of rotation of the rotatable coupling of the one or more slides to the mounting body is a horizontal axis in a plane generally parallel to the seat.

[0007] In some embodiments, an axis of rotation of the rotatable coupling between the one or more wing portions and the base is non-vertical. In some embodiments, an angle formed between the axis of rotation of the rotatable coupling between the one or more wing portions and the base is about 10 degrees.

[0008] In some embodiments, the mounting body comprises one or more prongs configured to removably couple with a housing of the seat. In some embodiments, the seat can include a seat back. The mounting body can be removably coupled to the seat back.

[0009] In some embodiments, a seat assembly can include a sleeve which can be attached to a surface of a seat of the seat assembly. The sleeve can include a frame. The sleeve can include a wall at least partially extending within the frame. The sleeve can include

a first retention component coupled to the frame. The first retention component can include a fastener configured to removably couple to the surface. The retention component can expand from a first effective length to a second effective length.

[0010] In some embodiments, the first retention component can include one or more inelastic portions and one or more expandable portions. The one or more expandable portions can allow the first retention component to expand from the first effective length to the second effective length. In some embodiments, the first retention component can include at least two inelastic portions and at least one expandable portion positioned between the elastic portions. In some embodiments, the first retention component can include one or more restriction portions configured to inhibit expansion of the first retention component beyond the second effective length. In some embodiments, the one or more restriction portions can be formed from an inelastic material. In some embodiments, the one or more restriction portions can form part of the one or more inelastic portions.

[0011] In some embodiments, the fastener of the first retention component can be a hook-and-loop fastener. In some embodiments, the first retention component can be positioned at or proximate a top side of the sleeve. In some embodiments, the frame can include a channel within the frame. In some embodiments, at least a portion of the retention component can be positioned within the channel to couple the retention component to the frame.

[0012] In some embodiments, the sleeve can include a second retention component coupled to the frame. The second retention component can include a fastener which can removably couple to the surface. In some embodiments, the second retention component can be coupled at or proximate a bottom side of the frame. In some embodiments, the second retention component can allow the frame to pivot relative to the surface.

[0013] In some embodiments, the frame can be formed from a rigid material. In some embodiments, the wall can be formed from a rigid material. In some embodiments, the seat can include a seat back. The mounting body can be attached to the seat back.

[0014] In some embodiments, a seat assembly can include a spreader which can be attached to a connection assembly of the seat assembly. The spreader can include a body

portion coupled to a first tube and a second tube of a connection assembly. The body portion comprises a recessed portion positioned along a bottom side of the spreader.

[0015] In some embodiments, an adjustable floor mount system can removably couple a seat to a floor. The floor mount can include one or more connection rails which can removably couple to a seat. The one or more connection rails can include a slidable portion which can move relative to other portions of the one or more connections rails. The floor mount can include one or more locking mechanisms. The one or more locking mechanisms can include a locked position which can lock the slidable portion relative to other portions of the one or more connection rails. The one or more locking mechanisms can include an unlocked position configured to allow the slidable portion to move relative to other portions of the one or more connection rails.

[0016] In some embodiments, the one or more locking mechanisms can include a biasing member which can bias the locking mechanisms towards the locked position. In some embodiments, the slidable portions can translate relative to other portions of the one or more connection rails.

[0017] In some embodiments, the adjustable floor mount system can include an indicator which can provide a user within an indication as to a specific parameter of a seat. In some embodiments, the parameter can be the pitch of the seat relative to a second seat positioned frontward of the seat.

[0018] In some embodiments, a seat assembly can include an adjustable headrest. The adjustable headrest can be attached to a seat of the seat assembly. The adjustable headrest can include a mounting assembly. The mounting assembly can be coupled to the seat. The mounting assembly can include a mounting body. The mounting assembly can include one or more slides. The one or more slides can be rotatably coupled to the mounting body such that the slides rotate about a first axis. The adjustable headrest can include a headrest assembly which can support the head of a passenger. The headrest assembly can include a base. The headrest assembly can include one or more rails coupled to the base. The one or more rails can be slidably received within the one or more slides of the mounting body to allow the headrest assembly to be translated along a second axis and rotated about the

first axis. The second axis can rotate about the first axis when the headrest assembly is rotated about the first axis.

[0019] In some embodiments, the headrest assembly can include one or more wing portions. The one or more wing portions can be coupled to lateral portions of the base. In some embodiments, the one or more wing portions can be rotatably coupled to lateral portions of the base. In some embodiments, an axis of rotation of the coupling between the one or more wing portions and the base can be non-vertical. In some embodiments, an angle formed between the axis of rotation of the rotatable coupling between the one or more wing portions and the base can be about 10 degrees.

[0020] In some embodiments, the one or more rails can be oriented generally parallel to the base. In some embodiments, the first axis can be a horizontal axis in a plane generally parallel to the seat.

[0021] In some embodiments, the mounting body can include one or more prongs which can removably couple with a housing of the seat. In some embodiments, the seat can include a seat back. The mounting body can be attached to the seat back.

[0022] In some embodiments, a seat assembly can include an energy absorption system. The seat assembly can be mounted to an aircraft. The energy absorption system can include a mount having a surface. The energy absorption system can include a seat having a seat back. The seat back can have a surface which can be positioned adjacent the surface of the mount. The energy absorption system can include an energy absorbing structure on one of the seat back and the mount. The energy absorbing structure can control movement of the seat relative to the mount. The energy absorbing structure can include a first movement-restricting region. The energy absorption system can include an interacting member having a surface. The interacting member can extend at least between the seat back and the mount. In some embodiments, when the seat is between a first position and a second position relative to the mount, the surface of the interacting member can interface with a surface defining the first movement-restricting region. This can inhibit movement of the seat back until the seat back is subject to a force greater than a first threshold force.

[0023] In some embodiments, the energy absorbing structure can include a second movement-restricting region. In some embodiments, when the seat is between a third

position and a fourth position relative to the mount, the surface of the interacting member is configured to interface with a surface defining the second movement-restricting region. This can inhibit movement of the seat back until the seat back is subject to a force greater than a second threshold force.

[0024] In some embodiments, at least one of the first movement-restricting region and the second movement-restricting region can include a detent. In some embodiments, the second movement-restricting region can include the detent. In some embodiments, the detent can deform to allow the interacting member to pass therethrough when subject to a force which exceeds the second threshold force. In some embodiments, the energy absorbing zone can include one or more cutouts proximate the detent to facilitate deformation of the detent.

[0025] In some embodiments, at least one of the first threshold force and the second threshold force can be primarily a frictional force between interfacing surfaces of the seat back, the mount, and the interacting member. In some embodiments, the first threshold force can be primarily the frictional force between interfacing surfaces of the seat back, the mount, and the interacting member.

[0026] In some embodiments, the energy absorbing structure can include a first free-movement region. In some embodiments, when the seat is between the second position and a third position relative to the mount, the seat back can be allowed to freely move relative to the mount. In some embodiments, the first free-movement region can include a recessed surface of the mount.

[0027] In some embodiments, the energy absorbing structure can include a third movement-restricting region. In some embodiments, when the seat is between the fourth position and a fifth position relative to the mount, the surface of the interacting member can interface with a surface defining the third movement-restricting region. This can inhibit movement of the seat back until the seat back is subject to a force greater than a third threshold force. In some embodiments, at least one of the first threshold force, the second threshold force, and the third threshold force can progressively increase across the extent of the corresponding movement-restricting region. In some embodiments, the third threshold force can progressively increase across the extent of the corresponding movement-restricting region.

[0028] In some embodiments, the energy absorbing structure can include a second free-movement region. In some embodiments, when the seat is between a fifth position and a sixth position relative to the mount, the seat back can be allowed to freely move relative to the mount.

[0029] In some embodiments, the first threshold force can be greater than 25 lb_f. In some embodiments, the first threshold force can be greater than 35 lb_f. In some embodiments, the first threshold force can be greater than 45 lb_f. In some embodiments, the first threshold force can be greater than 10 g-forces. In some embodiments, the first threshold force can be greater than 12 g-forces. In some embodiments, the first threshold force can be greater than 14 g-forces. In some embodiments, the first threshold force can be greater than 16 g-forces.

[0030] In some embodiments, the second threshold force can be greater than 75 lb_f. In some embodiments, the second threshold force can be greater than 100 lb_f. In some embodiments, the second threshold force can be greater than 125 lb_f. In some embodiments, the second threshold force can be greater than 30 g-forces. In some embodiments, the second threshold force can be greater than 35 g-forces. In some embodiments, the second threshold force can be greater than 40 g-forces. In some embodiments, the second threshold force can be greater than 45 g-forces.

[0031] In some embodiments, the seat back can be rotatably coupled to the mount. In some embodiments, the seat back can be rotatably coupled to the mount at a first mounting location and coupled to the mount at a second mounting location. The second mounting location can form part of the energy absorbing structure. In some embodiments, the second mounting location can form part of the first movement-restricting region.

[0032] In some embodiments, the seat back can include a movable wall positioned below a pivot axis between the seat back and the mount. The movable wall can move forwardly relative to the seat back when subject to a forwardly directed force. In some embodiments, the movable wall can pivot relative to the seat back when subject to a forwardly directed force.

[0033] In some embodiments, the mount can include a slot through which the interacting member is positioned. The slot can form at least part of the energy absorbing

structure. In some embodiments, the slot can have a radius of curvature which originates at or proximate a pivot axis between the seat back and the mount. This can allow the fastener to move along the slot when the seat is pivoted relative to the mount.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034] Embodiments of the present disclosure will now be described hereinafter, by way of example only, with reference to the accompanying drawings as indicated below.

[0035] Figure 1 illustrates a perspective view of an embodiment of a headrest in a first configuration.

[0036] Figure 2 illustrates a perspective view of the headrest of Figure 1 in a second configuration.

[0037] Figure 3 illustrates a front, perspective view of components of the headrest of Figure 1.

[0038] Figure 4 illustrates a front view of components of the headrest of Figure 1.

[0039] Figure 5 illustrates a rear, perspective view of components of the headrest of Figure 1.

[0040] Figure 6 illustrates a rear view of an embodiment of a storage sleeve attached to a seat.

[0041] Figure 7 illustrates a front perspective view of the storage sleeve of Figure 6.

[0042] Figure 8 illustrates a close-up, rear perspective view of the storage sleeve of Figure 6.

[0043] Figure 9 illustrates a side view of the storage sleeve of Figure 6.

[0044] Figure 10 illustrates a rear view of a component of the storage sleeve of Figure 6.

[0045] Figure 11 illustrates a front view of a component of the storage sleeve of Figure 6.

[0046] Figure 12A illustrates a perspective view of an embodiment of a retention component of the storage sleeve of Figure 6.

[0047] Figure 12B illustrates a top, schematic view of a portion of the retention component of Figure 12A in a first configuration.

[0048] Figure 12C illustrates a top, schematic view of a portion of the retention component of Figure 12A in a second configuration.

[0049] Figure 13 illustrates a perspective view of an embodiment of a spreader.

[0050] Figure 14 illustrates a top plan view of an embodiment of a floor mount.

[0051] Figure 15 illustrates a perspective view of the floor mount of Figure 14.

[0052] Figure 16A-C illustrate views of the headrest of Figure 1 in various configurations.

[0053] Figure 17 illustrates a front perspective view of an embodiment of a seat with an energy absorbing system.

[0054] Figure 18A illustrates a front view of the bracket of Figure 17.

[0055] Figure 18B illustrates a zoomed-in view of the bracket of Figure 18A.

[0056] Figure 18C illustrates a schematic cross-section of the seat and bracket of Figure 17 along a first zone.

[0057] Figure 18D illustrates a schematic cross-section of the seat and bracket of Figure 17 along a second zone.

[0058] Figure 19A illustrates a schematic of an embodiment of a seat with an energy absorbing system in a first, initial position relative to a bracket.

[0059] Figure 19B illustrates a schematic of the seat of Figure 19A in a second position relative to the bracket.

[0060] Figure 19C illustrates a schematic of the seat of Figure 19A in a third position relative to the bracket.

[0061] Figure 19D illustrates a schematic of the seat of Figure 19A in a fourth position relative to the bracket.

[0062] Figure 19E illustrates a schematic of the seat of Figure 19A in a fifth position relative to the bracket.

[0063] Figure 19F illustrates a schematic of the seat of Figure 19A in a sixth position relative to the bracket.

[0064] Figure 20 illustrates an embodiment of a seat with a lower energy absorbing system in a first or initial configuration.

[0065] Figure 21 illustrates the seat of Figure 20 with the lower energy absorbing system in a second configuration.

DETAILED DESCRIPTION

[0066] The following detailed description is merely illustrative in nature and is not intended to limit the embodiments of the subject matter or the application and uses of such embodiments. Any implementation described herein as exemplary is not necessarily to be construed as preferred or advantageous over other implementations. Furthermore, there is no intention to be bound by any expressed or implied theory presented in the proceeding technical field, background, brief summary, or the following detailed description.

[0067] Certain terminology may be used in the following description for the purpose of reference only, and thus are not intended to be limiting. For example, terms such as “upper”, “lower”, “above”, and “below” refer to directions in the drawings to which reference is made. Terms such as “front”, “back”, “rear”, “left side,” and “right side” describe the orientation and/or location of portions of the component within a consistent but arbitrary frame of reference which is made clear by reference to the text and the associated drawings describing the component under discussion. Such terminology may include the words specifically mentioned above, derivatives thereof, and words of similar import. Similarly, the terms “first”, “second”, and other such numerical terms referring to structures do not imply a sequence or order unless clearly indicated by the context.

[0068] The components described herein can be used with seats of an aircraft seating assembly, including but not limited to aircraft seating assemblies described in U.S. Publication Nos. 2014/0333100 and 2016/0297533, the entirety of each of which is incorporated by reference herein. While the components are described in connection with aircraft seats, the components described herein can be used in connection with other types of seats, including seats for automotive applications, or devices other than seats.

Adjustable Headrest

[0069] **Figures 1-5 and 16A-C** illustrate an embodiment of an adjustable headrest **100** of an aircraft seating assembly which can include one or more seats **105**. With reference first to **Figures 1 and 2**, in some embodiments the headrest **100** can be adjustable in one or more dimensions. This can beneficially enhance passenger comfort when utilizing the headrest **100** by allowing the passenger to adjust the headrest **100** into a position more suitable for the passenger's build. As shown in the illustrated embodiment, the headrest **100** can be attached to a seat **105** of the aircraft seating assembly. The seating assembly **101** can include a seat pan (not shown) upon which a passenger can sit and a seat back **106** which can support the passenger's back. The headrest **100** can include a base **110** and one or more wings **115a, 115b**. As shown in the illustrated embodiment, the wings **115a, 115b** can be attached to lateral portions of the base **110**; however, it is to be understood that the wings **115a, 115b** can be attached to other portions of the base **110** such as the top and/or bottom portions. Although two wings **115a, 115b** are shown, the headrest **100** can include a fewer or greater number of wings. For example, the headrest **100** can include two, three, four, or more wings on each lateral side of the headrest **100**. In some embodiments, each of the wings can be attached directly to the base **110**. In other embodiments, one or more wings can be attached to other wings which are directly attached to the base **110**. In some embodiments, the headrest **100** can have an upholstery covering over the base **110** and wings **115a, 115b** as well as other components of the headrest **100**.

[0070] As shown in **Figures 1 and 2**, in some embodiments, the headrest **100** can be translatably adjusted. For example, the headrest **100** can be translated in a generally vertical direction relative to the seat **105**. This can beneficially account for varying heights of a passenger. In some embodiments, the headrest **100** can be rotatably adjusted. For example, the pitch of the headrest **100** can be adjusted (i.e., rotational adjustment along a horizontal axis in a plane generally parallel to the seat back **106** of the seat **105**). This can beneficially account for a passenger's preferred head position. In some embodiments, one or more components of the headrest **100** can also be translated and/or rotated relative to each other. For example, wings **115a, 115b** can be translated and/or rotated relative to a base **110**. This can beneficially provide lateral support for a passenger's head.

[0071] With reference next to **Figures 3-5** which illustrate underlying components of the headrest **100**, one or both wings **115a, 115b** can be rotatably coupled to the base **110** via a rotatably coupling, such as hinges **120a, 120b** with a single degree of rotational freedom. Other types of mechanical couplings can be used such as those which provide additional rotational degrees of freedom, such as ball joints, and/or those which provide one or more translational degrees of freedom. In some embodiments, one or both wings **115a, 115b** can be unitarily formed with base **110** and connected via a living hinge. In some embodiments, the couplings, such as hinges **120a, 120b** can provide some degree of frictional engagement to maintain the wings **115a, 115b** in position relative to the base **110**. This can beneficially retain a configuration desired by the passenger.

[0072] As shown in the illustrated embodiment, the base **110** can include one or more rods or rails **125a, 125b**. The rails **125a, 125b** can slidably engage one or more corresponding slides **130a, 130b**. The slides **130a, 130b** can be maintained in position on the rails **125a, 125b** via an engagement mechanism such as, but not limited to, friction, detents, clips, and the like. Sliding engagement between the slides **130a, 130b** on the rails **125a, 125b** can allow the base **110** and/or the headrest **100** to translate relative to the slides **130a, 130b**. For example, as shown in the illustrated embodiment, the rails **125a, 125b** and slides **130a, 130b** can allow the base **110** and/or the headrest **100** to translate in a generally vertical direction. In some embodiments, the rails **125a, 125b** and slides **130a, 130b** can be oriented to provide translation in other directions. In some embodiments, additional rails, slides, or other translatable couplings can be used to provide additional translational degrees of freedom. Moreover, other types of mechanical couplings can be used such as those which provide additional rotational degrees of freedom, such as ball joints, and/or those which provide one or more translational degrees of freedom.

[0073] As shown in the illustrated embodiment, one or both slides **130a, 130b** can be coupled to one or more units **135a, 135b**. As shown, the slides **130a, 130b** are integrally formed with the bodies; however, it is to be understood that the slides **130a, 130b** can be separate units which are fastened to units **135a, 135b** via mechanical fasteners, such as screws, bolts, clips, chemical fasteners such as adhesives, fastening techniques such as welding, any other fastener or technique as desired, and/or a combination of such fasteners

and/or techniques. The units **135a**, **135b** can be rotatably coupled to a mounting body **140** which can provide one or more rotational degrees of freedom. As shown, the coupling between the units **135a**, **135b** and the mounting body **140** can provide a single degree of rotational freedom, such as a pin coupling. For example, the coupling can allow pitch adjustment of the base **110** and/or the headrest **100**. Other types of mechanical couplings can be used such as those which provide additional rotational degrees of freedom, such as ball joints, and/or those which provide one or more translational degrees of freedom.

[0074] With reference to **Figures 3 and 5**, the mounting body **140** can be coupled to the seat **105**, such as the seat back **106**, via a coupling assembly. As shown, the coupling assembly can include a housing **145** attached to the seat **105** and fasteners, such as a prongs **150a**, **150b**, attached to the mounting body **140**. The prongs **150a**, **150b** can be inserted into an opening and engage sides of the housing **145**. This snap-fit coupling assembly can advantageously facilitate attachment and removal of the headrest **100** from the seat **105**. For example, to remove the headrest **100** from the seat **105**, the prongs **150a**, **150b** can be bent inwardly by the fingers of a flight attendant or maintenance work so that the ends of the prongs **150a**, **150b** do not engage sides of the housing **145**. Other types of coupling mechanisms can also be used including, but not limited to, mechanical fasteners, such as screws, bolts, clips, chemical fasteners such as adhesives, fastening techniques such as welding, any other fastener or technique as desired, and/or a combination of such fasteners and/or techniques.

[0075] With reference to **Figure 4**, in some embodiments, the angle **155** formed between the axes of rotation of one or both wings **115a**, **115b** and a vertical axis can be between about 0 degrees (i.e., vertical) to about 45 degrees, between about 5 degrees to about 20 degrees, between about 10 degrees to about 15 degrees, any sub-range within these ranges, and/or any other angle as desired. In some embodiments, the angle **155** can be about 10 degrees which can beneficially provide lateral support for a typical passenger when rotated outwards to support a passenger's head. In some embodiments, the distance **160** between the centerline of the headrest **100** and the axes of rotation of one or both wings **115a**, **115b** can be between about 2 inches to about 6 inches, between about 2.5 inches to about 5 inches, between about 3 inches to about 4 inches, any sub-range within these ranges, and/or any other

distance as desired. In some embodiments, the distance **160** can be about 3 inches which can beneficially provide lateral support for a typical passenger when rotated outwards to support a passenger's head.

[0076] With reference next to **Figures 16A-C**, the adjustability of the base **110** of the headrest **100** is illustrated in further detail. **Figure 16a** illustrates the headrest **100** in an initial configuration. **Figure 16B** illustrates the headrest **100** in a rotated configuration. As shown in **Figure 16B**, the base **110** can be rotated relative to the housing **145** which can be attached to the seat (not shown). In this manner, the base **110** can be rotated relative to the seat. The base **110** can be rotated via components of the headrest **100**, such as unit **135a**, which are rotatably coupled to mounting body **140**. This rotation is represented by arrow **165**. **Figure 16C** illustrates the headrest **100** in a rotated and translated configuration. As shown in **Figure 16C**, the base **110** can be translated relative to a housing **145** attached to the seat. In this manner, the base **110** can be translated relative to the seat. The axis of translation, represented by arrow **170**, can rotate when the base **110** is rotated relative to the housing **145**.

Storage Sleeve

[0077] **Figures 6-12C** illustrate an embodiment of a storage sleeve **200**. With reference first to **Figure 6**, in some embodiments, the storage sleeve **200** can be attached to a seat **105**, such as a seat back. For example, the storage sleeve **200** can be attached to a rear side and/or a lower portion of a seat **105**. In some embodiments, when the storage sleeve **200** is attached to a seat **105**, a pocket can be formed between the seat **105** and the storage sleeve **200**. This can advantageously be used for storage of items, such as passenger's belongings, travel literature, and the like. In some embodiments, the storage sleeve **200** can be pulled away from the seat **105** from the top side **205** thereby providing a passenger with access to the pocket formed between the storage sleeve **200** and the seat **105**. The storage sleeve **200** can be shaped to fit contours of the seat **105** to which it is attached.

[0078] As shown in the illustrated embodiment, the storage sleeve **200** can include a frame **202** extending around at least a portion, or the entirety, of the periphery of the storage sleeve **200**. The frame **202** can be at least partially, or entirely, hollow. This can

beneficially allow components, such as retention components, to at least partially be retained within the frame **202**. The storage sleeve **200** can include a wall **203** which can extend within at least a portion, or the entirety, of the area between the frame **202**. The storage sleeve **200** can include a handle portion **204**. In some embodiments, the handle portion **204** can include a portion of the frame **202** as well as a material wrap, such as but not limited to leather or fabric. As will be described in further detail below, the handle portion **204** can be used to move the storage sleeve **200** relative to the seat **105**. Accordingly, use of a material wrap such as leather or fabric can provide a more comfortable gripping surface for a passenger utilizing the storage sleeve **200**. A portion of the frame **202** can be offset at or around the top side **205** to allow the material wrap to be generally flush with the frame **202**.

[0079] In some embodiments, the wall **203** can be formed from a similar material to the frame **202**. For example, the wall **203** and the frame **202** can be formed from metals and/or hard plastics. The material can be relatively rigid such that the wall **203** and/or the frame **202** generally maintain their shape even when subjected to forces applied by items stored between the storage sleeve **200** and the seat **105**. In some embodiments, the wall **203** can be formed from a different material from the frame **202**. For example, the wall **203** can be formed from a more compliant material than the frame **202**. This can beneficially allow the wall **203** to deform slightly and conform to the shape of items stored between the storage sleeve **200** and the seat **105**. In some embodiments, the wall **203** can be formed from compliant materials such as textiles, leather, soft plastics, and the like. The frame **202** and/or wall **203** can be formed from any desired materials such as, but not limited to, plastics, metals, composites, and/or combinations of such materials. In some embodiments, the wall **203** can be a mesh or netting. The mesh or netting can be concealed via use of covering, such as a thin plate of material.

[0080] With reference next to **Figures 7-9**, the storage sleeve **200** can include one or more apertures, such as apertures **210a-b**, **215a-d**, along a front face **220** of the storage sleeve **200**. One or more of apertures **210a-b**, **215a-d** can be used to couple the front face **220** of the storage sleeve **200** to the seat **105**. For example, retention components, such as but not limited to hook-and-loop fasteners, can include portions or ends which extend within the sleeve **200** and are coupled within the sleeve **200**. The retention components can have

ends which extend outwardly of the apertures **210a-b**, **215a-d** for attachment to a corresponding fastening mechanism on the seat **105**.

[0081] In some embodiments, one or more retention components **235** extending from apertures **210a-b** can allow the storage sleeve **200** to be pulled away from a rear of the seat **105**. For example, the one or more retention components **235** extending from apertures **210a-b** can include an elastic material which allows for the storage sleeve **200** to be pulled away from the rear of the seat **105** while applying a biasing force towards on the storage sleeve **200** towards the seat **105**. In this manner, when the storage sleeve **200** is released, the storage sleeve **200** can be directed back towards the seat **105** to secure items stored between the storage sleeve **200** and the seat **105**. In some embodiments, the storage sleeve **200** can be pulled away from a rear of the seat **105** a sufficient distance to allow storage of standard beverage bottles and like-sized materials.

[0082] In some embodiments, one or more retention components **240** extending from apertures **215a-d** can generally serve as a virtual living hinge thereby allowing the storage sleeve **200** to pivot along the bottom side **230** of the storage sleeve **200**. For example, the one or more retention components **240** extending from apertures **215a-d** can allow sufficient movement of the bottom side **230** of the storage sleeve **200** to allow the storage sleeve **200** to pivot along the bottom side **230**.

[0083] With reference next to **Figures 9-11**, the frame **202** of the storage sleeve **200** can be formed from one or more components. For example, as shown, the frame **202** can include a front portion **245a** and a rear portion **245b**. The front portion **245a** can include a portion of frame **202**, apertures **210a-b**, **215a-d** and/or the wall **203**. The front portion **245a** can include a channel **250a** which can be utilized for a retention component **235**, such as a partially or entirely elastic band, described in further detail below. The rear portion **245b** can include a portion of frame **202**. The rear portion **245b** can include a channel **250b** which can provide additional space for a retention component **235**. In some embodiments, the rear portion **245b** can be removed to service one or more retention components **235**, **240** and/or other components of the storage sleeve **200**. The rear portion **245b** can be replaced to cover the internal components of the storage sleeve **200** and reduce the likelihood of tampering by a

passenger. In some embodiments, at least a portion of the retention component **235** can be positioned between the front portion **245a** and the rear portion **245b**

[0084] With reference next to **Figures 12A-C**, the storage sleeve **200** can include a retention component **235** which is at least partially expandable. As shown in the illustrated embodiment, the retention component **235** can include generally inelastic portions **255a**, **255b**, **255c**, **255d**, **255e** with one or more expandable portions **265a-d** which can be positioned between inelastic portions **255a**, **255b**, **255c**, **255d**, **255e**. The expandable portions **265a-d** can allow the retention component to expand from a first effective length between ends of the retention component **235** to a second effective length between ends of the retention component **235**. In some embodiments, the expandable portion **265a-d** can apply a biasing force which tends to transition the retention component **235** towards the first effective length. The expandable portion **265a-d** can be formed from a generally elastic material. The expandable portion **265a-d** can be formed from other types of materials such as metals and can be a spring, such as but not limited to a coil spring, a torsion spring, or a spiral spring. The expandability and/or biasing force of the retention component **235** can be modified by altering the number of expandable portions, the elasticity of the material and/or spring coefficient, and/or the length of the expandable portions.

[0085] In some embodiments, the retention component **235** can include one or more restriction portions **260a-d**. The restriction portions **260a-d** can resist or inhibit further expansion beyond a desired effective length. The restriction portions **260a-d** can be attached to at least one of the inelastic portions **255a**, **255b**, **255c**, **255d**, **255e** and the expandable portions **265a-d**. For example, the restriction portions **260a-d** can form part of the inelastic portions **255a**, **255b**, **255c**, **255d**, **255e** as shown in **Figures 12B** and **12C**. The restriction portions **260a-d** can be separate components from the inelastic portions **255a**, **255b**, **255c**, **255d**, **255e** and can be attached to the In some embodiments, one or more of the restriction portions **260a-d** can be formed from an inelastic material collapsed or bundled together. The one or more portions **260a-d** can be maintained in this collapsed configuration via one or more expandable portions **265a-d**. The retention component **235** can include fastening mechanisms **270a-b**, such as a hook-and-loop fastener, at its ends which can be used to attach the retention component **235** to the seat **105**.

[0086] In some embodiments, during operation, as the retention component **235** is stretched due to pulling of the storage sleeve **200** away from the seat **105**, the expandable portions **265a-d** are stretched and the restriction portions **260a-d** are straightened as shown in **Figure 12C**. In some embodiments, when the restriction portions **260a-d** are fully straightened, the retention component **235** will generally not stretch further due to generally inelasticity of the portions **255a**, **255b**, **255c**, **255d**, **255e** and restriction portions **260a-d**. This can define a generally fully extended position of the storage sleeve **200**. When the storage sleeve **200** is released, the expandable portions **265a-d** can apply a biasing force back towards the initial state as shown in **Figure 12B**, thereby reducing the length between both ends of the retention component **235** and causing the storage sleeve **200** to move towards the seat **105**. The restriction portions **260a-d** can also transition back to a collapsed or bundled configuration due to this reducing in length between ends of the retention component **235**. The length of a generally fully expanded retention component **235** can be modified by altering the number of restriction portions, the elasticity of the material and/or spring coefficient, and/or the length of the restriction portions. In some embodiments, the generally fully extended position can be sufficient to fit standard beverage bottles and the like.

Spreader

[0087] With reference to **Figure 13**, an embodiment of a spreader **300** is illustrated, the spreader **300** can be a structural member positioned between seats of a seating assembly. The spreader **300** can include a first end **305** coupled to a tube, such as fore tube **315a**, of a connection assembly of an aircraft seating assembly. The connection assembly can include structures which couple the seat and spreaders to the deck of the aircraft. A portion **310** of the spreader **300** can be attached to a tube, such as aft tube **315b**, of a connection assembly of an aircraft seating assembly. As shown in the illustrated embodiment, a body portion **320** of the spreader **300** can include a recessed area **325**, such as along a bottom side of the spreader **300**. This can advantageously allow for mounting of other components, such as an electronic box **330**, higher up beneath the seat to maintain storage space beneath the seat. For example, as shown in the illustrated embodiment, the electronic box **330** can be

mounted parallel to the seat rather than to a side of the seat which can reduce the width of storage space beneath the seat. The electronic box **330** can be retained within a carrier **335**.

[0088] As shown in the illustrated embodiment, the electronic box **330** and carrier **335** can be used with a centrally located actuators **350** such as those described in U.S. Application No. 15/089,366 entitled “AIRCRAFT SEATING ASSEMBLY”, filed on April 1, 2016, and U.S. Application Nos. 62/146,925 and 62/146,932, both filed on April 13, 2015, the entirety of each of which is incorporated by reference herein.

Floor Mount System

[0089] With reference to **Figures 14 and 15**, an embodiment of a floor mount system **400** is illustrated. The floor mount system **400** can be used to attach an aircraft seating assembly to a floor, such as the floor of an aircraft or a showroom floor. In some embodiments, the floor mount system **400** can be adjustable and allow for an adjustment of seat pitch relative to other seats in a separate row of seats. This can beneficially allow a user to make quick changes to seat pitch without having to wholly detach the seat from the floor mount. For example, a second row of seats can be mounted frontwards or rearwards of the seat mounted on the floor mount system **400**.

[0090] As shown in the illustrated embodiment, the floor mount system **400** can include one or more connection rails **405a, 405b**. The connection rails **405a, 405b** can allow a seated mounted thereon to be translated relative to the connection rails **405a, 405b**. The connection rails **405a, 405b** can include one or more indicators **410a, 410b** which can provide a user with an indication as to a specific parameter of the seat, such as the seat's pitch. In some embodiments, the connection rails **405a, 405b** can include one or more locking mechanisms **415a, 415b**. Actuation of these one or more locking mechanisms **415a, 415b** from a locked position to an unlocked position can unlock the movement mechanism thereby allowing the seat to be moved. In some embodiments, portions **420a, 420b** of the connection rails **405a, 405b** can slide relative to other portions of the connection rails **405a, 405b**. In some embodiments, the one or more locking mechanisms **415a, 415b** can be biased into a locked position.

Energy Absorption Assemblies or Systems

[0091] **Figures 17-19F** illustrate an embodiment of a seat having a seat back **500** and an energy absorption assembly or system. The energy absorption assembly or system can assist in reducing injuries and traumas to passengers in the event of a high deceleration event. In some implementations, the energy absorption assembly or system can control movement of the seat back **500** to reduce impact forces on passengers during a high deceleration event. For example, a passenger seated behind the seat back **500** (hereinafter “rear-seated passenger”) may contact the rear of the seat back **500** with the rear-seated passenger’s head during a high deceleration event. The energy absorption system can allow the seat back **500** to cushion the rear-seated passenger’s head in such circumstances.

[0092] With reference first to **Figure 17**, the seat back **500** can be pivotally coupled to one or more spreaders **505** via fasteners **510** such as, but not limited to, pins, screws, rivets, bolts, nuts, and the like. In some embodiments, the seat back **500** can rotate about an axis **511** at the coupling. This axis **511** can be generally horizontal such that it is parallel to the bottom of the seat, and can extend through the seat back **500**. As shown in the illustrated embodiment, the seat back **500** can be coupled to components of a recline mechanism **515**. The recline mechanism **515** can include features and/or components which are the same or similar to those described in U.S. Publication No. 2016/0297533, the entirety of which has been incorporated by reference herein. As shown, the seat back **500** can be indirectly coupled to components of the recline mechanism **515** via a mount such as a bracket **520**. The seat back **500** can be attached to the bracket **520** via one or more fasteners including, but not limited to, mechanical fasteners, such as pins, screws, rivets, bolts, nuts, chemical fasteners such as adhesives, fastening techniques such as welding, any other fastener or technique as desired, and/or a combination of such fasteners and/or techniques. In the illustrated embodiment, the seat back **500** can be attached to the bracket **520** via a first fastener **525** and a second fastener **530**. The first fastener **525** can be unitary with the fastener **510** used to pivotally couple the seat back **500** to the spreader **505**.

[0093] With reference next to **Figures 18A-18D**, an embodiment of a bracket **520** is illustrated. With reference first to **Figure 18A**, the bracket **520** can include a first mounting location **535**, such as a hole or aperture, which can receive the first fastener **525**. In

some embodiments, this can allow the bracket **520** to be coupled to the seat back **500** at the pivot point between the seat back **500** and the spreader **505**. This can allow the bracket **520** to pivot along with the seat back **500**. For example, the bracket **520** can pivot along with the seat back **500** when the seat back **500** is reclined via the recline mechanism **515**.

[0094] The bracket **520** can include an energy absorption zone **540**. As shown in the illustrated embodiment, the energy absorption zone **540** can include a first interacting surface or set of surfaces, such as outer surface **521**, inner surface **522**, and/or transverse surface **523** of the bracket **520** (as shown in **Figure 18C**), defining a slot **545** which can interface with a second interacting surface or set of surfaces, such as the inner surface **531** and/or transverse surface **532** of a second fastener **530** received in the slot **545**. The slot **545** can allow the bracket **520** to be coupled to the seat back **500** at a point separate from first mounting location **535**. In embodiments where the seat **500** and bracket **520** pivot about the first mounting location **535**, this can allow the bracket **520** to resist torques about the pivot point thereby maintaining the seat back **500** in position relative to the bracket **520**.

[0095] As shown in the illustrated embodiment, the slot **545** can be curved. The slot **545** can be curved such that the radius of curvature originates at or proximate the center of the pivot point (e.g., fastener **510**) of the seat back **500** and the spreader **505**. This can follow the arcuate path of the fastener **530** as the seat back **500** rotates relative to the bracket **520**. Although the slot **545** is shown positioned below the first mounting location **545**, it is to be understood that the slot **545** can be positioned at any other location on the bracket **520** such as above the bracket **520**. Moreover, although the slot **545** is shown with a curved configuration, it is to be understood that the slot **545** can have other shapes. For example, the slot **545** can be linear. This can be advantageous in situations where the seat back **500** is intended to translate relative to the bracket **520**.

[0096] The bracket **520** can include a second mounting location **536**, such as a hole or aperture, which can receive a fastener **518** which can allow the bracket **520** to be coupled to other components of the seating assembly. For example, this can allow the bracket **520** to be coupled to the recline mechanism **515**. As shown, the bracket **520** can be rotatably coupled to the recline mechanism **515**.

[0097] With reference next to **Figure 18B**, the energy absorption zone **540** can include geometry and/or structures which provide for various stages of energy absorption. These various stages of energy absorption can control movement of the seat back **500** (e.g., pivoting of the seat back **500**) to reduce potential trauma to passengers, such as rear-seated passengers whose head may contact the rear of the seat back **500** during a high deceleration event. In some embodiments, this geometry can be implemented about the slot **545**.

[0098] As shown, a first region **550** of the energy absorption zone **540** can include a location **551** at which the second fastener **530** would be initially positioned when the seat back **500** is in a default or initial position relative to the bracket **520** (as shown in **Figure 19A**). The first region **550** can extend between a range of positions of the seat back **500** relative to the bracket **520**. For example, the seat can be in the first region **550** while the seat back **500** is positioned at the first, initial position relative to the bracket **520** (see **Figure 19A**) and until the seat back **500** reaches a second position relative to the bracket **520** (see **Figure 19B**). In some embodiments, such as those where the seat back **500** pivots relative to the bracket **520**, the first region **550** can encompass a pivot range of between about 1 degree to about 10 degrees, between about 2 degrees to about 8 degrees, between about 3 degrees to about 6 degrees, between about 1 degrees to about 5 degrees, any sub-range within these ranges, or any other range as desired. This can beneficially allow the seat back **500** to move relative to the bracket **520** from the first, initial position relative to the bracket **520** to the second position relative to the bracket **520** when initially subject to a high deceleration event.

[0099] However, it is to be understood that other ranges of movement are contemplated. In some embodiments, such as those where the seat back **500** pivots relative to the bracket **520**, the first region **550** can encompass a pivot range of between about 0.5 degrees to about 60 degrees, between about 0.75 degrees to about 45 degrees, between about 1 degree to about 30 degrees, between about 1 degree to about 10 degrees, between about 2 degrees to about 8 degrees, between about 3 degrees to about 6 degrees, between about 1 degrees to about 5 degrees, any sub-range within these ranges, or any other range as desired. It is to be understood that the range of positions of the first region **550** can be chosen based on usage for the seat back **500** and/or desired movement of the seat back **500** in the event of a high deceleration event.

[0100] With reference to **Figures 18B and 18C**, the first region **550** can be a movement-restricting region **550**. At the first region **550** of the energy absorption zone **540**, the seat back **500** can be inhibited from moving relative to the bracket **520** until subject to a force which exceeds a first threshold force. This can be beneficial in ensuring that the seat back **500** remains in position relative to the bracket **520** under normal operating conditions. This first threshold force can be primarily static and/or dynamic frictional forces between interfacing surfaces of the fastener **530**, the bracket **520**, and/or the seat back **500**. For example, in the illustrated embodiment, this can be a cumulative frictional force between at least the outer surface **521** of the bracket **520** and the inner surface **531** of the fastener **530** as well as the inner surface **522** of the bracket **520** and the inner surface **502** of the seat back **500**.

[0101] As shown in the illustrated embodiment, friction between the fastener **530**, the bracket **520**, and/or the seat back **500** at the first region **550** can inhibit the seat back **500** from pivoting relative to the bracket **520** about the pivot point (e.g., first mounting location **535**) during normal operation of the seat back **500** (e.g., forces caused by a seated passenger and/or forces caused by a rear-seated passenger interacting with the seat back **500**). However, the friction between the fastener **530**, the bracket **520**, and/or the seat back **500** may allow the seat back to pivot about the pivot point (e.g., first mounting location **535**) during abnormal operation of the seat back **500**. For example, friction between the fastener **530**, the bracket **520**, and/or the seat back **500** may allow the seat back to pivot about the pivot point (e.g., first mounting location **535**) due to a high deceleration event.

[0102] In some embodiments, the first threshold force can be greater than about 15 lb_f, greater than about 20 lb_f, greater than about 25 lb_f, greater than about 30 lb_f, greater than about 35 lb_f, greater than about 40 lb_f, greater than about 45 lb_f, greater than about 50 lb_f, greater than about 55 lb_f, any amount within these stated amounts, or other forces as desired. In some embodiments, the first threshold force can be between about 10 lb_f to about 60 lb_f, between about 15 lb_f to about 55 lb_f, between about 20 lb_f to about 50 lb_f, about 25 lb_f to about 45 lb_f, any sub-range within these ranges, or any other range as desired. This can beneficially allow the seat back **500** to move relative to the bracket **520** when subject to a high

deceleration event while inhibiting movement of the seat back **500** relative to the bracket **520** due to forces imposed on the seat back **500** during normal operation.

[0103] However, it is to be understood that other ranges of threshold forces are contemplated. In some embodiments, the first threshold force can be greater than about 5 lb_f, greater than about 10 lb_f, greater than about 15 lb_f, greater than about 20 lb_f, greater than about 25 lb_f, greater than about 30 lb_f, greater than about 35 lb_f, greater than about 40 lb_f, greater than about 45 lb_f, greater than about 50 lb_f, greater than about 55 lb_f, greater than about 60 lb_f, greater than about 65 lb_f, greater than about 70 lb_f, greater than about 80 lb_f, greater than about 90 lb_f, greater than about 100 lb_f, greater than about 120 lb_f, greater than about 140 lb_f, greater than about 160 lb_f, greater than about 180 lb_f, any amount within these stated amounts, or other forces as desired. In some embodiments, the first threshold force can be between about 1 lb_f to about 150 lb_f, between about 5 lb_f to about 100 lb_f, between about 10 lb_f to about 60 lb_f, between about 15 lb_f to about 55 lb_f, between about 20 lb_f to about 50 lb_f, about 25 lb_f to about 45 lb_f, any sub-range within these ranges, or any other range as desired.

[0104] In some embodiments, the first threshold force can be based on acceleration/deceleration (e.g., g-forces). In some embodiments, the threshold force can be greater than about 8 g-forces, greater than about 10 g-forces, greater than about 12 g-forces, greater than about 14 g-forces, greater than about 16 g-forces, greater than about 18 g-forces, any sub-range within these ranges, or any other force as desired. In some embodiments, the first threshold force can be between about 10 g-forces to about 20 g-forces, between about 12 g-forces to about 18 g-forces, between about 14 g-forces to about 16 g-forces, any sub-range within these ranges, or any other g-force as desired. This can beneficially allow the seat back **500** to move relative to the bracket **520** when subject to a high deceleration event while inhibiting movement of the seat back **500** relative to the bracket **520** due to forces imposed on the seat back **500** during normal operation.

[0105] However, it is to be understood that other ranges of threshold forces are contemplated. In some embodiments, the threshold force can be greater than about 2 g-forces, greater than about 4 g-forces, greater than about 6 g-forces, greater than about 8 g-forces, greater than about 10 g-forces, greater than about 12 g-forces, greater than about 14 g-

forces, greater than about 16 g-forces, greater than about 18 g-forces, greater than about 20 g-forces, greater than about 25 g-forces, greater than about 30 g-forces, greater than about 35 g-forces, greater than about 40 g-forces, greater than about 50 g-forces, greater than about 60 g-forces, greater than about 70 g-forces, greater than about 80 g-forces, greater than about 100 g-forces, any sub-range within these ranges, or any other force as desired. In some embodiments, the first threshold force can be between about 1 g-forces to about 100 g-forces, between about 2 g-forces to about 80 g-forces, between about 5 g-forces to about 50 g-forces, between about 8 g-forces to about 30 g-forces, between about 10 g-forces to about 20 g-forces, between about 12 g-forces to about 18 g-forces, between about 14 g-forces to about 16 g-forces, any sub-range within these ranges, or any other g-force as desired.

[0106] In some embodiments, the first threshold force can be chosen based on operating parameters for the seat. For example, the first threshold force can differ for a heavier seat as compared to a lighter seat. As another example, the first threshold force can differ for different types of vehicles (e.g., aircraft, automobiles, etc.). In some embodiments, the first threshold force can be modified by altering the amount of force applied by the fastener **530** on the bracket **520** and the seat back **520** which can modify the friction between the fastener **530**, the bracket **520**, and the seat back **520**. In embodiments utilizing a rotating fastener, such as a screw, nut or bolt, this can be accomplished by altering the torque. In some embodiments, the first threshold force can be modified by altering one or more interfacing surfaces. For example, one or more interfacing surfaces can be altered to increase or decrease the coefficient of friction. As another example, a chemical adhesive can be used between one or more interfacing surfaces to couple the surfaces together. When subject to the first threshold force, the chemical adhesive can sever.

[0107] With reference to **Figures 18B** and **18D**, a second region **555** of the energy absorption zone **540** can include a recessed area **556**. The second region **555** can extend between a range of positions of the seat back **500** relative to the bracket **520**. For example, the seat can be in the second region **555** while the seat back **500** is positioned at the second position relative to the bracket **520** (see **Figure 19B**) and until the seat back **500** reaches a third position relative to the bracket **520** (see **Figure 19C**). In some embodiments, such as those where the seat back **500** pivots relative to the bracket **520**, the second region **555** can

encompass a pivot range of between about 1 degree to about 18 degrees, between about 2 degrees to about 16 degrees, between about 3 degrees to about 14 degrees, between about 4 degrees to about 12 degrees, any sub-range within these ranges, or any other range as desired. This can beneficially allow the seat back **500** to move relative to the bracket **520** from the second position relative to the bracket **520** to the third position relative to the bracket **520** after being initially subject to a high deceleration event. The third position can be more advantageously oriented to receive an initial impact when struck by the head of a rear-seated passenger.

[0108] However, it is to be understood that other ranges of movement are contemplated. In some embodiments, such as those where the seat back **500** pivots relative to the bracket **520**, the second region **555** can encompass a pivot range of between about 0.5 degrees to about 60 degrees, between about 0.75 degrees to about 45 degrees, between about 1 degree to about 30 degrees, between about 1 degree to about 18 degrees, between about 2 degrees to about 16 degrees, between about 3 degrees to about 14 degrees, between about 4 degrees to about 12 degrees, any sub-range within these ranges, or any other range as desired. It is to be understood that the range of positions of the second region **555** can be chosen based on usage for the seat back **500** and/or desired movement of the seat back **500** in the event of a high deceleration event.

[0109] In some embodiments, such as those where the seat back **500** pivots relative to the bracket **520**, the first region **550** and the second region **555** can encompass a pivot range of between about 2 degree to about 20 degrees, between about 4 degrees to about 18 degrees, between about 6 degrees to about 16 degrees, between about 8 degrees to about 14 degrees, any sub-range within these ranges, or any other range as desired. This can beneficially allow the seat back **500** to move relative to the bracket **520** from the first, initial position relative to the bracket **520** to the third position relative to the bracket **520** after being initially subject to a high deceleration event. The third position can be more advantageously oriented to receive an initial impact when struck by the head of a rear-seated passenger.

[0110] However, it is to be understood that other ranges of movement are contemplated. In some embodiments, such as those where the seat back **500** pivots relative to the bracket **520**, the first region **550** and the second region **555** can encompass a pivot

range of between about 0.5 degrees to about 60 degrees, between about 0.75 degrees to about 45 degrees, between about 1 degree to about 30 degrees, between about 2 degree to about 20 degrees, between about 4 degrees to about 18 degrees, between about 6 degrees to about 16 degrees, between about 8 degrees to about 14 degrees, any sub-range within these ranges, or any other range as desired. It is to be understood that the range of positions of the second region **555** can be chosen based on usage for the seat back **500** and/or desired movement of the seat back **500** in the event of a high deceleration event.

[0111] The second region **555** can be a free-movement region. At the second region **555** of the energy absorption zone **540**, the seat back **500** may be allowed to move relatively freely relative to the bracket **520**. For example, the seat back **500** may be subject to little to no resistance while the seat is in the second region **555**. This can be beneficial in ensuring that the seat back **500** rapidly traverses the extent of the second region **555** and is at the third position relative to the bracket **520** (see **Figure 19C**). In some embodiments, this third position can be chosen such that the seat back **500** is angled at a position which would reduce potential trauma to a rear-seated passenger's head in the event of a high deceleration event. It is to be understood that while the seat back **500** has been described as relatively freely relative to the bracket **520**, in some embodiments the seat back **500** can be inhibited from moving relative to the bracket **520** until subject to a force which exceeds a second threshold force. For example, there may be some frictional forces between surfaces of the fastener **530**, the bracket **520**, and/or the seat back **500**.

[0112] As shown in the illustrated embodiment, the fastener **530** can enter a recessed area **556**. The recessed area **556** can have a reduced thickness as compared to the initial location **551**. Due to the reduced thickness of the recessed area **556**, there can be substantially less friction between the fastener **530**, the bracket **520**, and/or the seat back **500**. As such, the seat back **500** is allowed to further pivot with substantially less resistance as compared to the first region **550**. As shown in the illustrated embodiment, the recessed area **556** immediately follows the location **551** at which the fastener **530** is located when the seat back **530** is in the first, initial position relative to the bracket **520**. This can beneficially allow the seat back **500** to quickly pivot once the first threshold force is initially exceeded.

[0113] With reference to **Figure 18B**, a third region **560** of the energy absorption zone **540** can include a narrowed or reduced-size region **561** in the slot **545**. The third region **560** can extend between a range of positions of the seat back **500** relative to the bracket **520**. For example, the seat can be in the third region **560** while the seat back **500** is positioned at the third position relative to the bracket **520** (see **Figure 19C**) and until the seat back **500** reaches a fourth position relative to the bracket **520** (see **Figure 19D**). In some embodiments, such as those where the seat back **500** pivots relative to the bracket **520**, the third region **560** can encompass a pivot range of between about 0.5 degrees to about 5 degrees, between about 1 degree to about 4 degrees, between about 1.5 degrees to about 3 degrees, any sub-range within these ranges, or any other range as desired. This can beneficially allow the seat back **500** to move relative to the bracket **520** from the third position relative to the bracket **520** to the fourth position relative to the bracket **520** when initially subject to a strike from the head of a rear-seated passenger.

[0114] However, it is to be understood that a other ranges of movement are contemplated. In some embodiments, such as those where the seat back **500** pivots relative to the bracket **520**, the third region **560** can encompass a pivot range of between about between about 0.1 degrees to about 25 degrees, between about 0.2 degrees to about 20 degrees, between about 0.25 degrees to about 15 degrees, 0.5 degrees to about 5 degrees, between about 1 degree to about 4 degrees, between about 1.5 degrees to about 3 degrees, any sub-range within these ranges, or any other range as desired. It is to be understood that the range of positions of the third region **560** can be chosen based on usage for the seat back **500** and/or desired movement of the seat back **500** in the event of a high deceleration event.

[0115] The third region **560** can be a movement-restricting region. At the third region **560** of the energy absorption zone **540**, the seat back **500** can be inhibited from moving relative to the bracket **520** until subject to a force which exceeds a third threshold force. This can be beneficial in ensuring that the seat back **500** remains in position relative to the bracket **520** until the seat back **500** is acted upon by another force. For example, this can be the force caused by a rear-seated passenger's head due to a high deceleration event. This third threshold force can be primarily based on deforming material of the bracket **520**. For example, in the illustrated embodiment, the reduced-size region **561** can form a detent in the

slot **545** and the third threshold force can be the amount of force needed to deform the detent sufficiently to allow the fastener **530** to pass therethrough. In some implementations, this third threshold force can be based on force that may be applied to the seat back **500** due to a rear-seated passenger's head striking the seat back **500**. This can help to initially cushion the rear-seated passenger's head and reduce impact forces on a passenger's head during a high deceleration event.

[0116] In some embodiments, the third threshold force can be greater than about 60 lb_f, greater than about 80 lb_f, greater than about 100 lb_f, greater than about 120 lb_f, greater than about 140 lb_f, greater than about 160 lb_f, greater than about 180 lb_f, any amount within these stated amounts, or other forces as desired. In some embodiments, the third threshold force can be between about 60 lb_f to about 180 lb_f, between about 80 lb_f to about 160 lb_f, between about 100 lb_f to about 140 lb_f, any sub-range within these ranges, or any other range as desired. This can beneficially allow the seat back **500** to move relative to the bracket **520** after being subject to an initial impact from the head of a rear-seated passenger.

[0117] However, it is to be understood that other ranges of threshold forces are contemplated. In some embodiments, the third threshold force can be greater than about 5 lb_f, greater than about 10 lb_f, greater than about 15 lb_f, greater than about 20 lb_f, greater than about 25 lb_f, greater than about 30 lb_f, greater than about 35 lb_f, greater than about 40 lb_f, greater than about 45 lb_f, greater than about 50 lb_f, greater than about 55 lb_f, greater than about 60 lb_f, greater than about 80 lb_f, greater than about 100 lb_f, greater than about 120 lb_f, greater than about 140 lb_f, greater than about 160 lb_f, greater than about 180 lb_f, any amount within these stated amounts, or other forces as desired. In some embodiments, the third threshold force can be between about 10 lb_f to about 300 lb_f, between about 20 lb_f to about 250 lb_f, between about 40 lb_f to about 200 lb_f, between about 60 lb_f to about 180 lb_f, between about 80 lb_f to about 160 lb_f, between about 100 lb_f to about 140 lb_f, any sub-range within these ranges, or any other range as desired.

[0118] In some embodiments, the third threshold force can be based on acceleration/deceleration (e.g., g-forces). In some embodiments, the third threshold force can be greater than about 20 g-forces, greater than about 40 g-forces, greater than about 60 g-forces, greater than about 80 g-forces, greater than about 100 g-forces, greater than about 120

g-forces, any sub-range within these ranges, or any other force as desired. In some embodiments, the third threshold force can be between about 20 g-forces to about 120 g-forces, between about 30 g-forces to about 90 g-forces, between about 40 g-forces to about 60 g-forces, any sub-range within these ranges, or any other g-force as desired. This can beneficially allow the seat back **500** to move relative to the bracket **520** after being subject to an initial impact from the head of a rear-seated passenger.

[0119] However, it is to be understood that other ranges of threshold forces are contemplated. In some embodiments, the third threshold force can be greater than about 2 g-forces, greater than about 4 g-forces, greater than about 6 g-forces, greater than about 8 g-forces, greater than about 10 g-forces, greater than about 12 g-forces, greater than about 14 g-forces, greater than about 16 g-forces, greater than about 18 g-forces, greater than about 20 g-forces, greater than about 40 g-forces, greater than about 60 g-forces, greater than about 80 g-forces, greater than about 100 g-forces, greater than about 120 g-forces, any sub-range within these ranges, or any other force as desired. In some embodiments, the third threshold force can be between about 1 g-forces to about 200 g-forces, between about 5 g-forces to about 175 g-forces, between about 10 g-forces to about 150 g-forces, be between about 20 g-forces to about 120 g-forces, between about 30 g-forces to about 90 g-forces, between about 40 g-forces to about 60 g-forces, any sub-range within these ranges, or any other g-force as desired.

[0120] In some embodiments, the third threshold force can be chosen based on operating parameters for the seat. For example, the third threshold force can differ for a heavier seat as compared to a lighter seat. As another example, the third threshold force can differ for different types of vehicles (e.g., aircraft, automobiles, etc.). In some embodiments, the third threshold force can be modified by altering the material used in the third region **560** such that a lesser or greater amount of force is required to deform the material. In some embodiments, the third threshold force can be modified altering the structure surrounding the third region **560**. For example, as shown in the illustrated embodiment, cutouts **562** can be positioned proximate the reduced-size region **561**. The size and geometry of these cutouts **562** can be chosen to vary the threshold force. As another example, the thickness of the reduced-size region **561** can be altered.

[0121] With continued reference to **Figure 18B**, a fourth region **565** of the energy absorption zone **540** can include a tapering region in the slot **545** such that the slot **545** progressively narrows over the fourth region **565**. The fourth region **565** can extend between a range of positions of the seat back **500** relative to the bracket **520**. For example, the seat can be in the fourth region **565** while the seat back **500** is positioned at the fourth position relative to the bracket **520** (see **Figure 19D**) and until the seat back **500** reaches a fifth position relative to the bracket **520** (see **Figure 19E**). In some embodiments, such as those where the seat back **500** pivots relative to the bracket **520**, the fourth region **565** can encompass a pivot range of between about 1 degree to about 18 degrees, between about 2 degrees to about 16 degrees, between about 3 degrees to about 14 degrees, between about 4 degrees to about 12 degrees, any sub-range within these ranges, or any other range as desired. This can beneficially allow the seat back **500** to move relative to the bracket **520** from the fourth position relative to the bracket **520** to the fifth position relative to the bracket **520** while cushioning a head of a rear-seated passenger.

[0122] However, it is to be understood that other ranges of movement are contemplated. In some embodiments, such as those where the seat back **500** pivots relative to the bracket **520**, the fourth region **565** can encompass a pivot range of between about 0.5 degree to about 60 degrees, between about 0.75 degrees to about 45 degrees, between about 1 degree to about 30 degrees, between about 1 degree to about 18 degrees, between about 2 degrees to about 16 degrees, between about 3 degrees to about 14 degrees, between about 4 degrees to about 12 degrees, any sub-range within these ranges, or any other range as desired. It is to be understood that the range of positions of the fourth region **565** can be chosen based on usage for the seat back **500** and/or desired movement of the seat back **500** in the event of a high deceleration event.

[0123] The fourth region **565** can be a movement-restricting region. At the fourth region **565** of the energy absorption zone **540**, the seat back **500** can be inhibited from moving relative to the bracket **520** until subject to a force which exceeds a fourth threshold force. This fourth threshold force can be constant, progressively increase, and/or progressively decrease across the extent of the fourth region **565**. This can beneficially apply a counter force to a rear-seated passenger's head which can decelerate the rear-seated

passenger's head in a controlled manner. This fourth threshold force, or range of forces, can be primarily based on deforming material of the bracket **520**. For example, in the illustrated embodiment, the tapering in the slot **545** can require a sufficient amount of force to deform the detent sufficiently to allow the fastener **530** to pass therethrough. In some implementations, this fourth threshold force can be based on force that may be applied to the seat back **500** due to a rear-seated passenger's head striking the seat back **500**. This can help to cushion the rear-seated passenger's head and reduce impact forces on a passenger's head during a high deceleration event.

[0124] In some embodiments, the fourth threshold force can be initially less third threshold force. In some embodiments, the fourth threshold force can increase to an amount which is equal to or greater than the third threshold force.

[0125] In some embodiments, the fourth threshold force can be greater than about 40 lb_f, greater than about 60 lb_f, greater than about 80lb_f, greater than about 100 lb_f, greater than about 120 lb_f, greater than about 140 lb_f, greater than about 160lb_f, any amount within these stated amounts, or other forces as desired. In some embodiments, the fourth threshold force can be between about 40 lb_f to about 160 lb_f, between about 60 lb_f to about 140 lb_f, between about 80 lb_f to about 120 lb_f, any sub-range within these ranges, or any other range as desired. This can beneficially allow the seat back **500** to move relative to the bracket **520** while imparting a counteracting force upon a rear-seated passenger's head to cushion and decelerate the rear-seated passenger's head.

[0126] However, it is to be understood that other ranges of threshold forces are contemplated. In some embodiments, the fourth threshold force can be greater than about 5 lb_f, greater than about 10 lb_f, greater than about 20 lb_f, greater than about 40 lb_f, greater than about 60 lb_f, greater than about 80lb_f, greater than about 100 lb_f, greater than about 120 lb_f, greater than about 140 lb_f, greater than about 160lb_f, greater than about 200 lb_f, greater than about 250 lb_f, any amount within these stated amounts, or other forces as desired. In some embodiments, the fourth threshold force can be between about 5 lb_f to about 300 lb_f, between about 10 lb_f to about 250 lb_f, between about 20 lb_f to about 200 lb_f, between about 40 lb_f to about 160 lb_f, between about 60 lb_f to about 140 lb_f, between about 80 lb_f to about 120 lb_f, any sub-range within these ranges, or any other range as desired.

[0127] In some embodiments, the fourth threshold force can be based on acceleration/deceleration (e.g., g-forces). In some embodiments, the threshold force can be greater than about 10 g-forces, greater than about 20 g-forces, greater than about 30 g-forces, greater than about 40 g-forces, greater than about 50 g-forces, greater than about 60 g-forces, any sub-range within these ranges, or any other force as desired. In some embodiments, the fourth threshold force can be between about 10 g-forces to about 60 g-forces, between about 20 g-forces to about 50 g-forces, between about 30 g-forces to about 40g-forces, any sub-range within these ranges, or any other g-force as desired. This can beneficially allow the seat back **500** to move relative to the bracket **520** while imparting a counteracting force upon a rear-seated passenger's head to cushion and decelerate the rear-seated passenger's head.

[0128] However, it is to be understood that other ranges of threshold forces are contemplated. In some embodiments, the threshold force can be greater than about 1 g-forces, greater than about 2 g-forces, greater than about 5 g-forces, greater than about 10 g-forces, greater than about 20 g-forces, greater than about 30 g-forces, greater than about 40 g-forces, greater than about 50 g-forces, greater than about 60 g-forces, greater than about 80 g-forces, greater than about 100 g-forces, greater than about 125 g-forces, greater than about 150 g-forces, any sub-range within these ranges, or any other force as desired. In some embodiments, the fourth threshold force can be between about 1 g-force to about 200 g-forces, between about 2 g-forces to about 150 g-forces, between about 5 g-forces to about 100 g-forces, between about 10 g-forces to about 60 g-forces, between about 20 g-forces to about 50 g-forces, between about 30 g-forces to about 40g-forces, any sub-range within these ranges, or any other g-force as desired.

[0129] In some embodiments, the fourth threshold force can be chosen based on operating parameters for the seat. For example, the fourth threshold force can differ for a heavier seat as compared to a lighter seat. As another example, the fourth threshold force can differ for different types of vehicles (e.g., aircraft, automobiles, etc.). In some embodiments, the fourth threshold force can be modified by altering the material used in the fourth region **565** such that a lesser or greater amount of force is required to deform the material. In some embodiments, the fourth threshold force can be modified altering the structure surrounding the fourth region **565**. For example, cutouts (not shown) can be incorporated into the

structure. As another example, the thickness of material in the fourth region **565** can be altered.

[0130] With continued reference to **Figure 18B**, a fifth region **570** of the energy absorption zone **540** can include a wide portion of the slot **545**. The fifth region **570** can extend between a range of positions of the seat back **500** relative to the bracket **520**. For example, the seat can be in the fifth region **570** while the seat back **500** is positioned at the fifth position relative to the bracket **520** (see **Figure 19E**) and until the seat back **500** reaches a sixth position relative to the bracket **520** (see **Figure 19F**). In some embodiments, such as those where the seat back **500** pivots relative to the bracket **520**, the fifth region **570** can encompass a pivot range of between about 1 degree to about 18 degrees, between about 2 degrees to about 16 degrees, between about 3 degrees to about 14 degrees, between about 4 degrees to about 12 degrees, any sub-range within these ranges, or any other range as desired. This can beneficially allow the seat back **500** to rapidly move relative to the bracket **520** from the fifth position relative to the bracket **520** to the sixth position relative to the bracket **520** after cushioning the rear-seated passenger's head. The sixth position can be advantageously chosen to avoid contacting a rear-seated passenger's head or reduce any further trauma due to further contact with the rear-seated passenger's head.

[0131] However, it is to be understood that other ranges of movement are contemplated. In some embodiments, such as those where the seat back **500** pivots relative to the bracket **520**, the fifth region **570** can encompass a pivot range of between about 0.5 degrees to about 60 degrees, between about 0.75 degrees to about 45 degrees, between about 1 degree to about 30 degrees, between about 1 degree to about 18 degrees, between about 2 degrees to about 16 degrees, between about 3 degrees to about 14 degrees, between about 4 degrees to about 12 degrees, any sub-range within these ranges, or any other range as desired. It is to be understood that the range of positions of the fifth region **570** can be chosen based on usage for the seat back **500** and/or desired movement of the seat back **500** in the event of a high deceleration event.

[0132] The fifth region **570** can be a free-movement region. At the fifth region **570** of the energy absorption zone **540**, the seat back **500** may be allowed to move relatively freely relative to the bracket **520**. For example, the seat back **500** may be subject to little to

no resistance while the seat is in the fifth region **570** as a result of the wide portion of the slot **545**. This can be beneficial in ensuring that the seat back **500** rapidly traverses the extent of the fifth region **570** and is at the sixth position relative to the bracket **520** (see **Figure 19F**). In some embodiments, this sixth position can be chosen such that the seat back **500** is angled at a position which would reduce potential trauma to a rear-seated passenger's head in the event of a high deceleration event. It is to be understood that while the seat back **500** has been described as relatively freely relative to the bracket **520**, in some embodiments the seat back **500** can be inhibited from moving relative to the bracket **520** until subject to a force which exceeds a fifth threshold force. For example, there may be some frictional forces between surfaces of the fastener **530**, the bracket **520**, and/or the seat back **500**.

[0133] Although structures of the energy absorption zone **540** is illustrated on the bracket **520**, it is to be understood that these structures can be implemented on the seat back **500** in part or in its entirety. For example, one or more of the regions **550**, **555**, **560**, **565**, **570** can be implemented on the seat back **500** and the remaining regions **550**, **555**, **560**, **565**, **570** can be implemented on the bracket **520**. As another example, all of the regions **550**, **555**, **560**, **565**, **570** can be implemented on the seat back **500**. Moreover, although five regions are described, it is to be understood that a fewer or greater number of regions can be implemented. In some embodiments, the fourth region **565** and the fifth region **570** can be omitted. It is also to be understood that any of the structures and/or geometries described in connection with a particular region can be implemented in any other region.

[0134] In the illustrated embodiment, a separate fastener **530** is shown passing through the energy absorption zone **540** and interacting with structures and/or geometry of the energy absorption zone **540** to control movement of the seat back **500** relative to the bracket **520**. However, it is to be understood that other interacting structures can be used. For example, in some embodiments, a protrusion which projects from the surface of the seat back **500** can extend into the slot **545** and interact with structures and/or geometry of the energy absorption zone **540** to control movement of the seat back **500** relative to the bracket **520**. Moreover, although the illustrated embodiment includes an interacting member in the form of a fastener **530** which couples the seat back **500** to the bracket **520**, it is to be understood that the interacting member need not couple the seat back **500** to the bracket **520**.

[0135] In the illustrated embodiment, the seat back **500** pivots relative to bracket **520**. It is to be understood that in other embodiments, the seat back **500** can translate in one or more directions and/or rotate in one or more directions. Moreover, while the seat back **500** and the bracket **520** is coupled to a recline mechanism **515**, it is to be understood that the seat back **500** and/or the bracket **520** can be attached to other components of the seat. It is also to be understood that the energy absorption assemblies and systems can be implemented with seats which do not have a recline mechanism.

[0136] **Figures 20 and 21** illustrate an embodiment of a seat back **600** having a lower energy absorption system. In some embodiments, the components and features of seat back **600** can be used in combination with the components and features of seat back **500**. However, it is to be understood that the components and features of seat back **600** can be used separately from the components and features of seat back **500**.

[0137] With reference first to **Figure 20**, the seat back **600** can be pivotally coupled to one or more spreaders (not shown) via fasteners such as pins, screws, bolts, nuts, and the like. As noted above, the seats described herein, such as seat back **500**, can include components which allow an upper portion of the seat back to pivot forwardly relative to a coupling location **605**. This can cause a lower portion of the seat back **600** to pivot rearwardly relative to the coupling location **605**. In some situations, the ability of the upper portion of the seat back **600** to pivot forwardly relative to the coupling location **605** can be inhibited due to forwardly-directed forces applied below the coupling location **605**. This can be caused due to contact between a rear-seated passenger's lower body (e.g., the passenger's knees, legs, and feet) contacting the lower portion of the seat back **600** during a higher deceleration event. This likelihood can be heightened when seats are positioned with a smaller distance or pitch between the seat backs.

[0138] In some embodiments, the seat back **600** can include a movable wall **610** below the coupling location **605** which can move forwardly or inwardly relative to other portions of the seat back **600**. This can beneficially allow the upper portion of the seat back **600** to pivot forwardly even in the event that the lower portion of the seat back **600** is subject to a forwardly-directed force. As shown in **Figure 21**, the movable portion **610** can be pivotal relative to other portions of the seat back **600**. In some embodiments, the movable

portion **610** can be translatable and/or rotatable relative to other portions of the seat back **600**. As shown in the illustrated embodiment, the movable wall **610** can include pivot at a location below the coupling location **605**. However, it is to be understood that the movable wall **610** can include a pivot at any other location of the seat back **600**.

[0139] In some embodiments, the movable portion **610** can be a breakaway part which disassociates from other portions of the seat back **600** when subjected to forwardly-directed force which exceeds a threshold amount.

Other Embodiments

[0140] Any value of a threshold, limit, duration, etc. provided herein is not intended to be absolute and, thereby, can be approximate. In addition, any threshold, limit, duration, etc. provided herein can be fixed or varied either automatically or by a user. Furthermore, as is used herein relative terminology such as exceeds, greater than, less than, etc. in relation to a reference value is intended to also encompass being equal to the reference value. For example, exceeding a reference value that is positive can encompass being equal to or greater than the reference value. In addition, as is used herein relative terminology such as exceeds, greater than, less than, etc. in relation to a reference value is intended to also encompass an inverse of the disclosed relationship, such as below, less than, greater than, etc. in relations to the reference value.

[0141] While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the disclosure. Indeed, the novel devices, system and methods described herein may be embodied in a variety of other forms. Furthermore, various omissions, substitutions and changes in the systems and methods described herein may be made. The accompanying claims and their equivalents are intended to cover such forms or modifications as would fall within the scope of the disclosure. Accordingly, the scope of the present disclosure is defined only by reference to the claims presented herein or as presented in the future.

[0142] Features, materials, characteristics, or groups described in conjunction with a particular aspect, embodiment, or example are to be understood to be applicable to any other aspect, embodiment or example described in this section or elsewhere in this

specification unless incompatible therewith. All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive. The protection is not restricted to the details of any foregoing embodiments. The protection extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

[0143] Furthermore, certain features that are described in this disclosure in the context of separate implementations can also be implemented in combination in a single implementation. Conversely, various features that are described in the context of a single implementation can also be implemented in multiple implementations separately or in any suitable subcombination. Moreover, although features may be described above as acting in certain combinations, one or more features from a claimed combination can, in some cases, be excised from the combination, and the combination may be claimed as a subcombination or variation of a subcombination.

[0144] For purposes of this disclosure, certain aspects, advantages, and novel features are described herein. Not necessarily all such advantages may be achieved in accordance with any particular embodiment. Thus, for example, those skilled in the art will recognize that the disclosure may be embodied or carried out in a manner that achieves one advantage or a group of advantages as taught herein without necessarily achieving other advantages as may be taught or suggested herein.

[0145] Conditional language, such as “can,” “could,” “might,” or “may,” unless specifically stated otherwise, or otherwise understood within the context as used, is generally intended to convey that certain embodiments include, while other embodiments do not include, certain features, elements, and/or steps. Thus, such conditional language is not generally intended to imply that features, elements, and/or steps are in any way required for one or more embodiments or that one or more embodiments necessarily include logic for deciding, with or without user input or prompting, whether these features, elements, and/or steps are included or are to be performed in any particular embodiment.

[0146] Conjunctive language such as the phrase “at least one of X, Y, and Z,” unless specifically stated otherwise, is otherwise understood with the context as used in general to convey that an item, term, etc. may be either X, Y, or Z. Thus, such conjunctive language is not generally intended to imply that certain embodiments require the presence of at least one of X, at least one of Y, and at least one of Z.

[0147] The scope of the present disclosure is not intended to be limited by the specific disclosures of preferred embodiments in this section or elsewhere in this specification, and may be defined by claims as presented in this section or elsewhere in this specification or as presented in the future. The language of the claims is to be interpreted broadly based on the language employed in the claims and not limited to the examples described in the present specification or during the prosecution of the application, which examples are to be construed as non-exclusive.

WHAT IS CLAIMED IS:

1. A seat assembly comprising an adjustable headrest configured to be attached to a seat of the seat assembly, the adjustable headrest comprising:
 - a base;
 - a mounting body coupled to the base, the mounting body configured to be removably coupled to the seat; and
 - one or more wing portions rotatably coupled to lateral portions of the base.
2. The seat assembly of Claim 1, further comprising one or more rails coupled to the base and one or more slides coupled to the mounting body, wherein the one or more slides are slidably coupled to the one or more rails and wherein the base is coupled to the mounting body via the one or more rails and one or more slides.
3. The seat assembly of Claim 2, wherein the slidable coupling of the one or more slides to the one or more rails is configured to vertically adjust a position of the base.
4. The seat assembly of Claim 3, wherein the one or more rails are oriented generally parallel to the base.
5. The seat assembly according to any of Claims 2-4, wherein the one or more slides are rotatably coupled to the mounting body.
6. The seat assembly of Claim 5, wherein the rotatable coupling of the one or more slides to the mounting body is configured to adjust a pitch of the base.
7. The seat assembly of Claim 5, wherein the axis of rotation of the rotatable coupling of the one or more slides to the mounting body is a horizontal axis in a plane generally parallel to the seat.
8. The seat assembly according to any of Claims 1-8, wherein an axis of rotation of the rotatable coupling between the one or more wing portions and the base is non-vertical.
9. The seat assembly according to Claim 8, wherein an angle formed between the axis of rotation of the rotatable coupling between the one or more wing portions and the base is about 10 degrees.
10. The seat assembly according to any of Claims 1-9, wherein the mounting body comprises one or more prongs configured to removably couple with a housing of the seat.

11. The seat assembly according to any of Claims 1-10, wherein an axis of translation of the adjustable headrest pivots with the adjustable headrest.

12. The seat assembly according to any of Claims 1-11, wherein the seat comprises a seat back and the mounting body is configured to be removably coupled to the seat back.

13. A seat assembly comprising a sleeve configured to be attached to a surface of a seat of the seat assembly, the sleeve comprising:

a frame;

a wall at least partially extending within the frame; and

a first retention component coupled to the frame, the first retention component comprising a fastener configured to removably couple to the surface, the retention component being configured to expand from a first effective length to a second effective length.

14. The seat assembly of Claim 13, wherein the first retention component comprises one or more inelastic portions and one or more expandable portions, wherein the one or more expandable portions are configured to allow the first retention component to expand from the first effective length to the second effective length.

15. The seat assembly of Claim 14, wherein the first retention component comprises at least two inelastic portions and at least one expandable portion positioned between the elastic portions.

16. The seat assembly according to any of Claims 13-15, wherein the first retention component comprises one or more restriction portions configured to inhibit expansion of the first retention component beyond the second effective length.

17. The seat assembly according to Claim 16, wherein the one or more restriction portions is formed from an inelastic material.

18. The seat assembly of Claim 16 or 17, wherein the one or more restriction portions forms part of the one or more inelastic portions.

19. The seat assembly according to any of Claims 13-18, wherein the fastener of the first retention component is a hook-and-loop fastener.

20. The seat assembly according to any of Claims 13-19, wherein the first retention component is positioned at or proximate a top side of the sleeve.

21. The seat assembly according to any of Claims 13-20, wherein the frame comprises a channel within the frame.

22. The seat assembly of Claim 21, wherein at least a portion of the retention component is positioned within the channel to couple the retention component to the frame.

23. The seat assembly according to any of Claims 13-22, further comprising a second retention component coupled to the frame, the second retention component comprising a fastener configured to removably couple to the surface.

24. The seat assembly of Claim 23, wherein the second retention component is coupled at or proximate a bottom side of the frame.

25. The seat assembly of Claim 23 or 24, wherein the second retention component is configured to allow the frame to pivot relative to the surface.

26. The seat assembly according to any of Claims 13-25, wherein the frame is formed from a rigid material.

27. The seat assembly according to any of Claims 13-26, wherein the wall is formed from a rigid material.

28. The seat assembly according to any of Claims 13-27, wherein the seat comprises a seat back and the mounting body is configured to be attached to a surface of the seat back.

29. A seat assembly comprising a spreader configured to be attached to a connection assembly of the seat assembly, the spreader comprising:

a body portion coupled to a first tube and a second tube of a connection assembly, wherein the body portion comprises a recessed portion positioned along a bottom side of the spreader.

30. An adjustable floor mount system configured for removably coupling a seat to a floor, the floor mount comprising:

one or more connection rails configured to removably couple to a seat, the one or more connection rails comprising a slidable portion which can move relative to other portions of the one or more connections rails; and

one or more locking mechanisms, the one or more locking mechanisms comprising a locked position configured to lock the slidable portion relative to other portions of the one or more connection rails and an unlocked position configured to allow the slidable portion to move relative to other portions of the one or more connection rails.

31. The adjustable floor mount system of Claim 30, wherein the one or more locking mechanisms comprise a biasing member configured to bias the locking mechanisms towards the locked position.

32. The adjustable floor mount system of Claim 30 or 31, wherein the slidable portions are configured to translate relative to other portions of the one or more connection rails.

33. The adjustable floor mount system according to any of Claims 30-32, further comprising an indicator configured to provide a user within an indication as to a specific parameter of a seat.

34. The adjustable floor mount system of Claim 33, wherein the parameter is the pitch of the seat relative to a second seat positioned frontward of the seat.

35. A seat assembly comprising an adjustable headrest configured to be attached to a seat of the seat assembly, the adjustable headrest comprising:

a mounting assembly configured to be coupled to the seat, the mounting assembly comprising a mounting body and one or more slides rotatably coupled to the mounting body such that the slides rotate about a first axis; and

a headrest assembly configured to support the head of a passenger, the headrest assembly comprising a base and one or more rails coupled to the base, the one or more rails configured to be movably received within the one or more slides of the mounting body to allow the headrest assembly to at least be translated along a second axis and rotated about the first axis;

wherein the second axis rotates about the first axis when the headrest assembly is rotated about the first axis.

36. The seat assembly of Claim 35, wherein the headrest assembly comprises one or more wing portions coupled to lateral portions of the base.

37. The seat assembly of Claim 36, wherein the one or more wing portions are rotatably coupled to lateral portions of the base.

38. The seat assembly of Claim 37, wherein an axis of rotation of the coupling between the one or more wing portions and the base is non-vertical.

39. The seat assembly of Claim 38, wherein an angle formed between the axis of rotation of the rotatable coupling between the one or more wing portions and the base is about 10 degrees..

40. The seat assembly according to any of Claims 35-39, wherein the one or more rails are oriented generally parallel to the base.

41. The seat assembly according to any of Claims 35-40, wherein the first axis is a horizontal axis in a plane generally parallel to the seat.

42. The seat assembly according to any of Claims 35-41, wherein the mounting body comprises one or more prongs configured to removably couple with a housing of the seat.

43. The seat assembly according to any of Claims 35-42, wherein the seat comprises a seat back and the mounting body is configured to be removably coupled to the seat back.

44. A seat assembly comprising an energy absorption system, the seat assembly configured to be mounted to an aircraft, the energy absorption system comprising:

a mount having a surface;

a seat comprising a seat back, the seat back having a surface configured to be positioned adjacent the surface of the mount;

an energy absorbing structure on one of the seat back and the mount, the energy absorbing structure configured to control movement of the seat relative to the mount, the energy absorbing structure comprising a first movement-restricting region;

an interacting member having a surface, the interacting member configured to extend at least between the seat back and the mount;

wherein, when the seat is between a first position and a second position relative to the mount, the surface of the interacting member is configured to interface with a surface defining the first movement-restricting region to inhibit movement of

the seat back until the seat back is subject to a force greater than a first threshold force.

45. The seat assembly of Claim 44, wherein the energy absorbing structure comprises a second movement-restricting region and wherein, when the seat is between a third position and a fourth position relative to the mount, the surface of the interacting member is configured to interface with a surface defining the second movement-restricting region to inhibit movement of the seat back until the seat back is subject to a force greater than a second threshold force.

46. The seat assembly of Claim 45, wherein at least one of the first movement-restricting region and the second movement-restricting region comprises a detent.

47. The seat assembly of Claim 46, wherein the second movement-restricting region comprises the detent.

48. The seat assembly of Claim 47, wherein the detent is configured to deform to allow the interacting member to pass therethrough when subject to a force which exceeds the second threshold force.

49. The seat assembly according to any of Claims 46-48, wherein the energy absorbing zone comprises one or more cutouts proximate the detent to facilitate deformation of the detent.

50. The seat assembly according to any of Claims 45-49, wherein at least one of the first threshold force and the second threshold force is primarily a frictional force between interfacing surfaces of the seat back, the mount, and the interacting member.

51. The seat assembly of Claim 50, wherein the first threshold force is primarily the frictional force between interfacing surfaces of the seat back, the mount, and the interacting member.

52. The seat assembly according to any of Claims 44-51, wherein the energy absorbing structure comprises a first free-movement region and wherein, when the seat is between the second position and a third position relative to the mount, the seat back is allowed to freely move relative to the mount.

53. The seat assembly of Claim 52, wherein the first free-movement region comprises a recessed surface of the mount.

54. The seat assembly according to any of Claims 45-53, wherein the energy absorbing structure comprises a third movement-restricting region and wherein, when the seat is between the fourth position and a fifth position relative to the mount, the surface of the interacting member is configured to interface with a surface defining the third movement-restricting region to inhibit movement of the seat back until the seat back is subject to a force greater than a third threshold force.

55. The seat assembly of Claim 54, wherein at least one of the first threshold force, the second threshold force, and the third threshold force progressively increases across the extent of the corresponding movement-restricting region.

56. The seat assembly of Claim 55, wherein the third threshold force progressively increases across the extent of the corresponding movement-restricting region.

57. The seat assembly according to any of Claims 50-56, wherein the energy absorbing structure comprises a second free-movement region and wherein, when the seat is between a fifth position and a sixth position relative to the mount, the seat back is allowed to freely move relative to the mount.

58. The seat assembly according to any of Claims 44-57, wherein the first threshold force is greater than 25 lb_f.

59. The seat assembly according to any of Claims 58, wherein the first threshold force is greater than 35 lb_f.

60. The seat assembly according to any of Claims 59, wherein the first threshold force is greater than 45 lb_f.

61. The seat assembly according to any of Claims 44-60, wherein the first threshold force is greater than 10 g-forces.

62. The seat assembly according to any of Claims 61, wherein the first threshold force is greater than 12 g-forces.

63. The seat assembly according to any of Claims 62, wherein the first threshold force is greater than 14 g-forces.

64. The seat assembly according to any of Claims 63, wherein the first threshold force is greater than 16 g-forces.

65. The seat assembly according to any of Claims 45-64, wherein the second threshold force is greater than 75 lb_f.

66. The seat assembly according to any of Claims 65, wherein the second threshold force is greater than 100 lb_f.

67. The seat assembly according to any of Claims 66, wherein the second threshold force is greater than 125 lb_f.

68. The seat assembly according to any of Claims 45-67, wherein the second threshold force is greater than 30 g-forces.

69. The seat assembly according to any of Claims 68, wherein the second threshold force is greater than 35 g-forces.

70. The seat assembly according to any of Claims 69, wherein the second threshold force is greater than 40 g-forces.

71. The seat assembly according to any of Claims 70, wherein the second threshold force is greater than 45 g-forces.

72. The seat assembly according to any of Claims 44-71, wherein the seat back is configured to be rotatably coupled to the mount.

73. The seat assembly according of Claim 72, wherein the seat back is configured to be rotatably coupled to the mount at a first mounting location and coupled to the mount at a second mounting location, the second mounting location forming part of the energy absorbing structure.

74. The seat assembly of Claim 73, wherein the second mounting location forms part of the first movement-restricting region.

75. The seat assembly according to any of Claim 72-74, wherein the seat back comprises a movable wall positioned below a pivot axis between the seat back and the mount, the movable wall configured to move forwardly relative to the seat back when subject to a forwardly directed force.

76. The seat assembly of Claim 75, wherein the movable wall is configured to pivot relative to the seat back when subject to a forwardly directed force.

77. The seat assembly according to any of Claims 44-76, wherein the mount comprises a slot through which the interacting member is positioned, the slot forming at least part of the energy absorbing structure.

78. The seat assembly of 77, wherein the slot has a radius of curvature which originates at or proximate a pivot axis between the seat back and the mount such that the fastener is configured to move along the slot when the seat is pivoted relative to the mount.

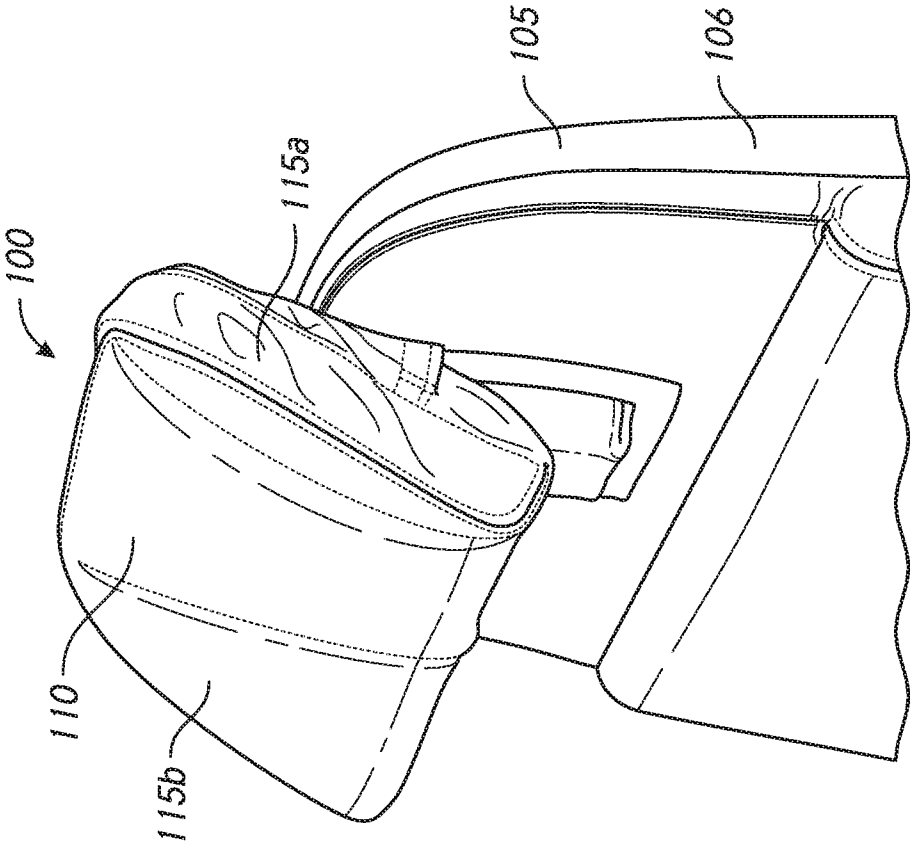


FIG. 2

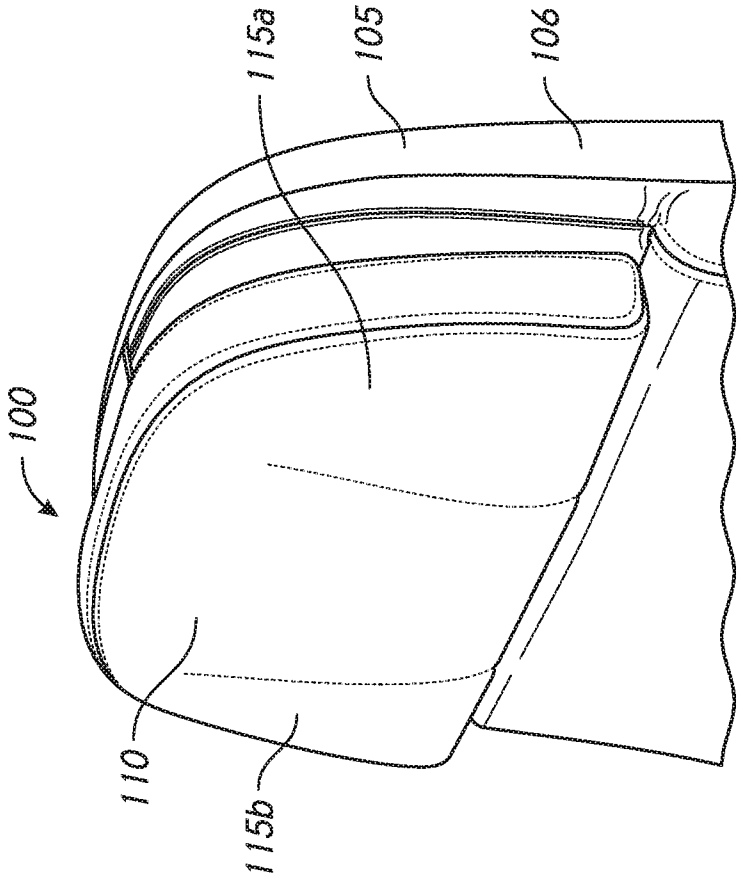


FIG. 1

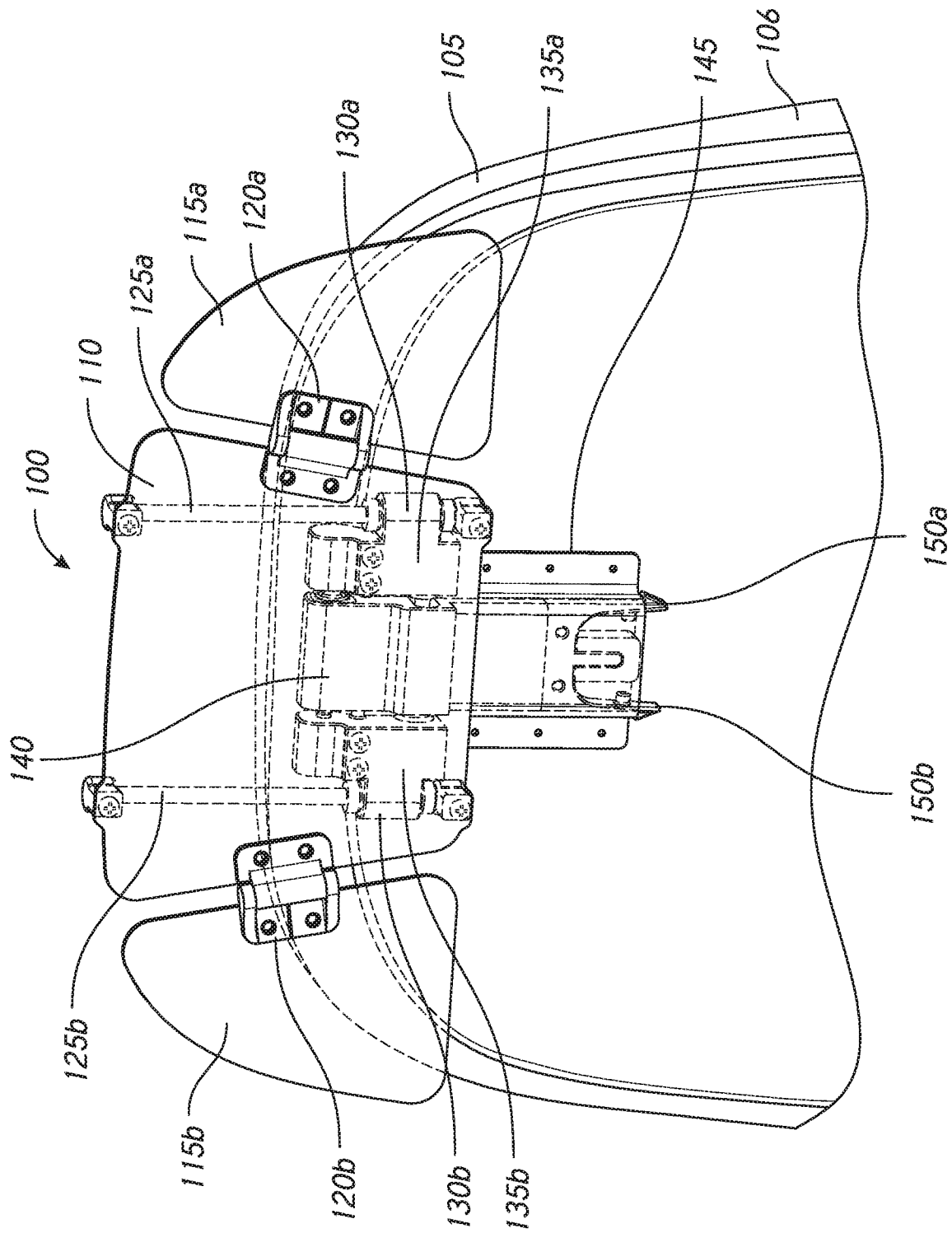


FIG. 3

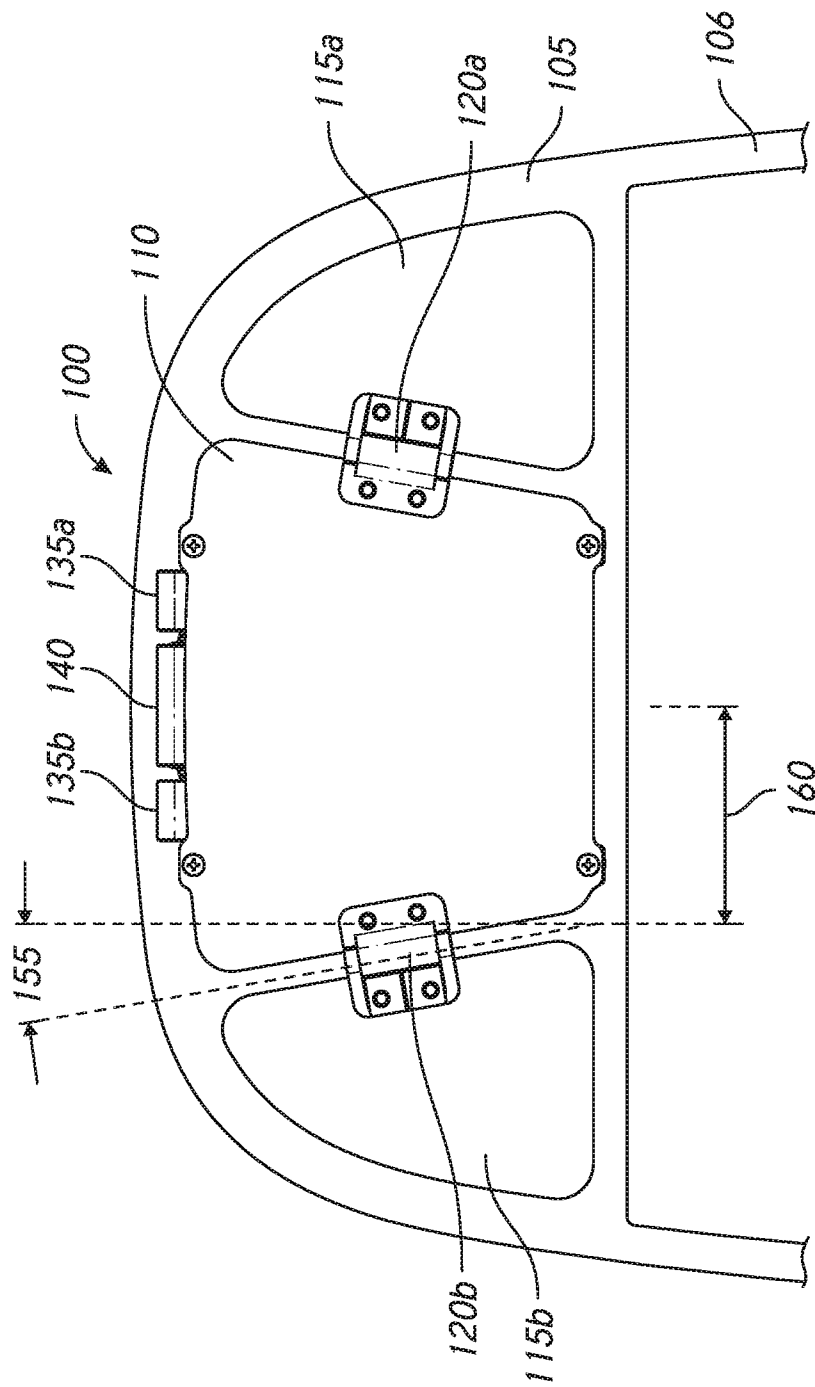


FIG. 4

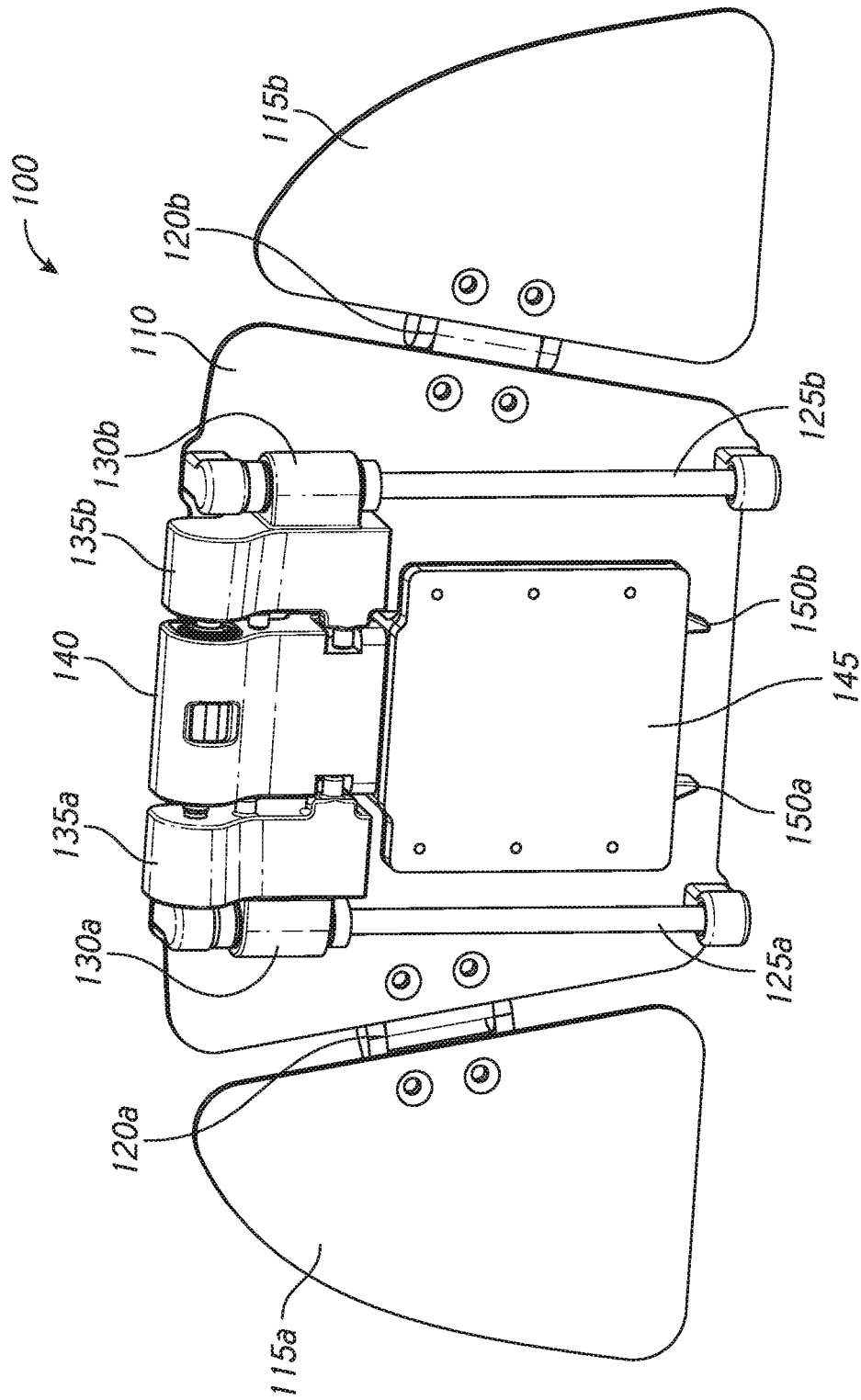


FIG. 5

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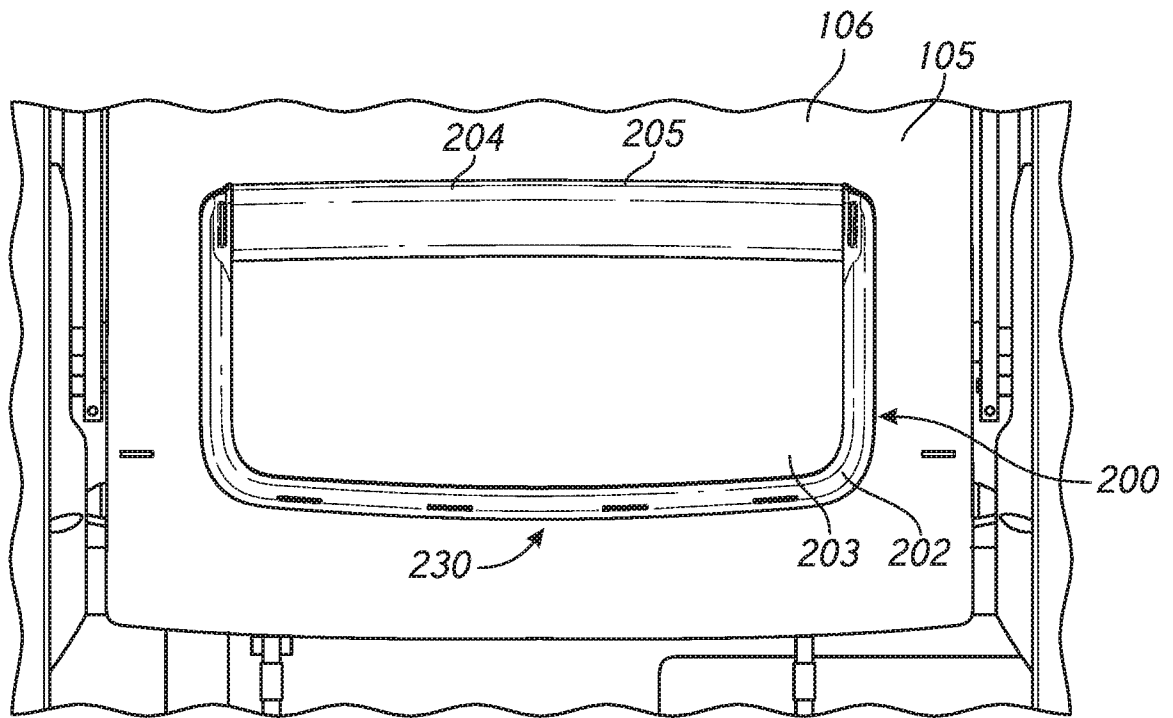


FIG. 6

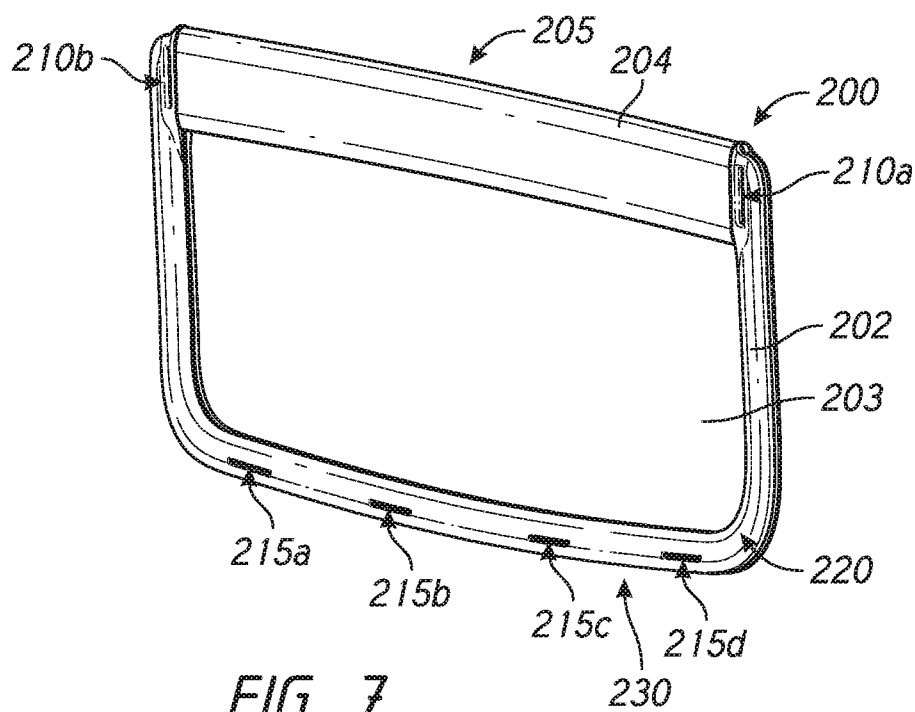


FIG. 7

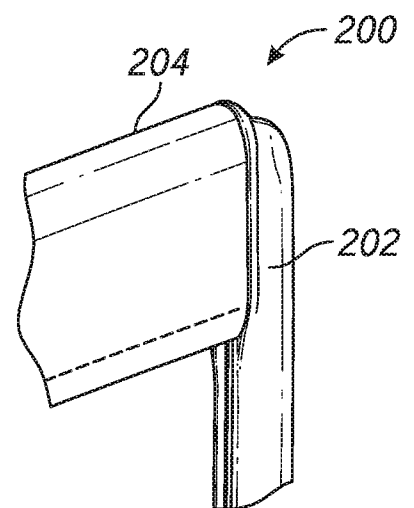
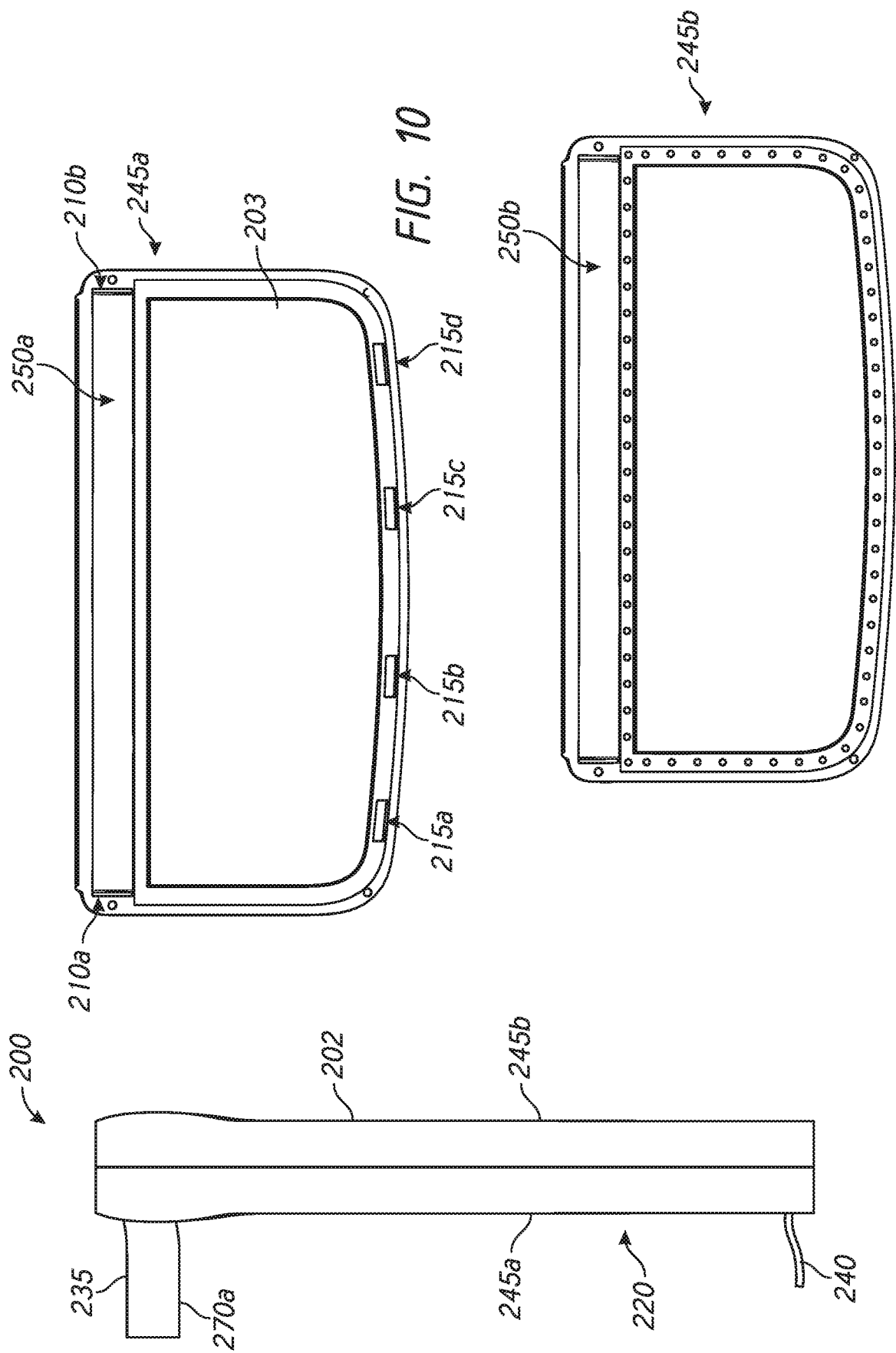


FIG. 8



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FIG. 9

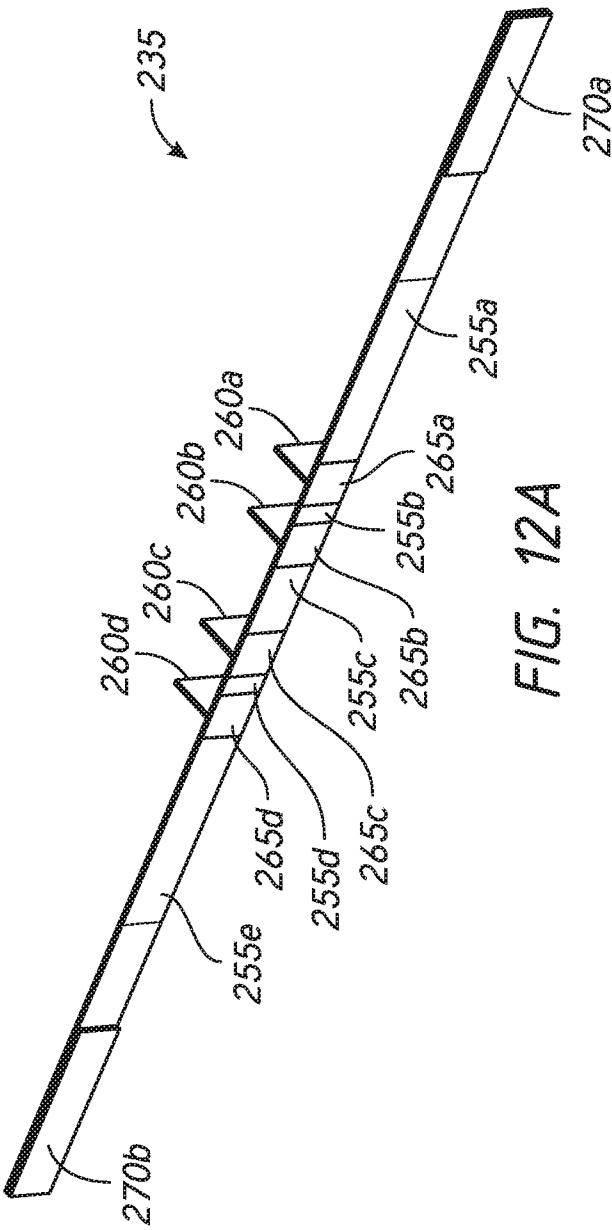


FIG. 12A

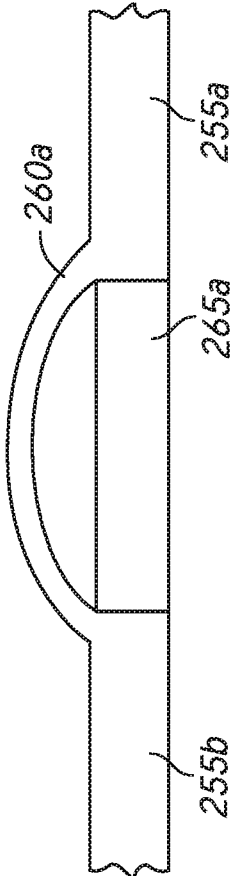


FIG. 12B

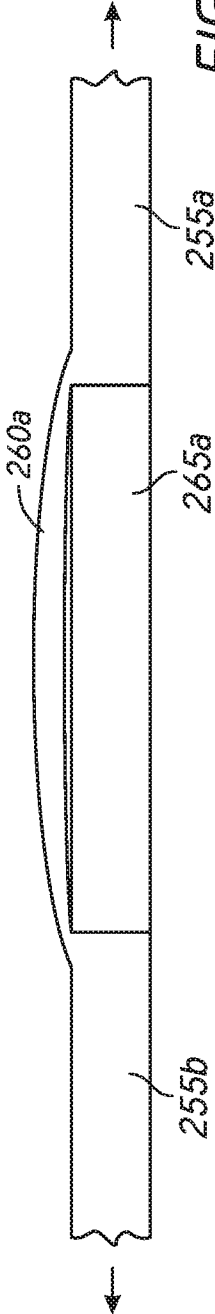


FIG. 12C

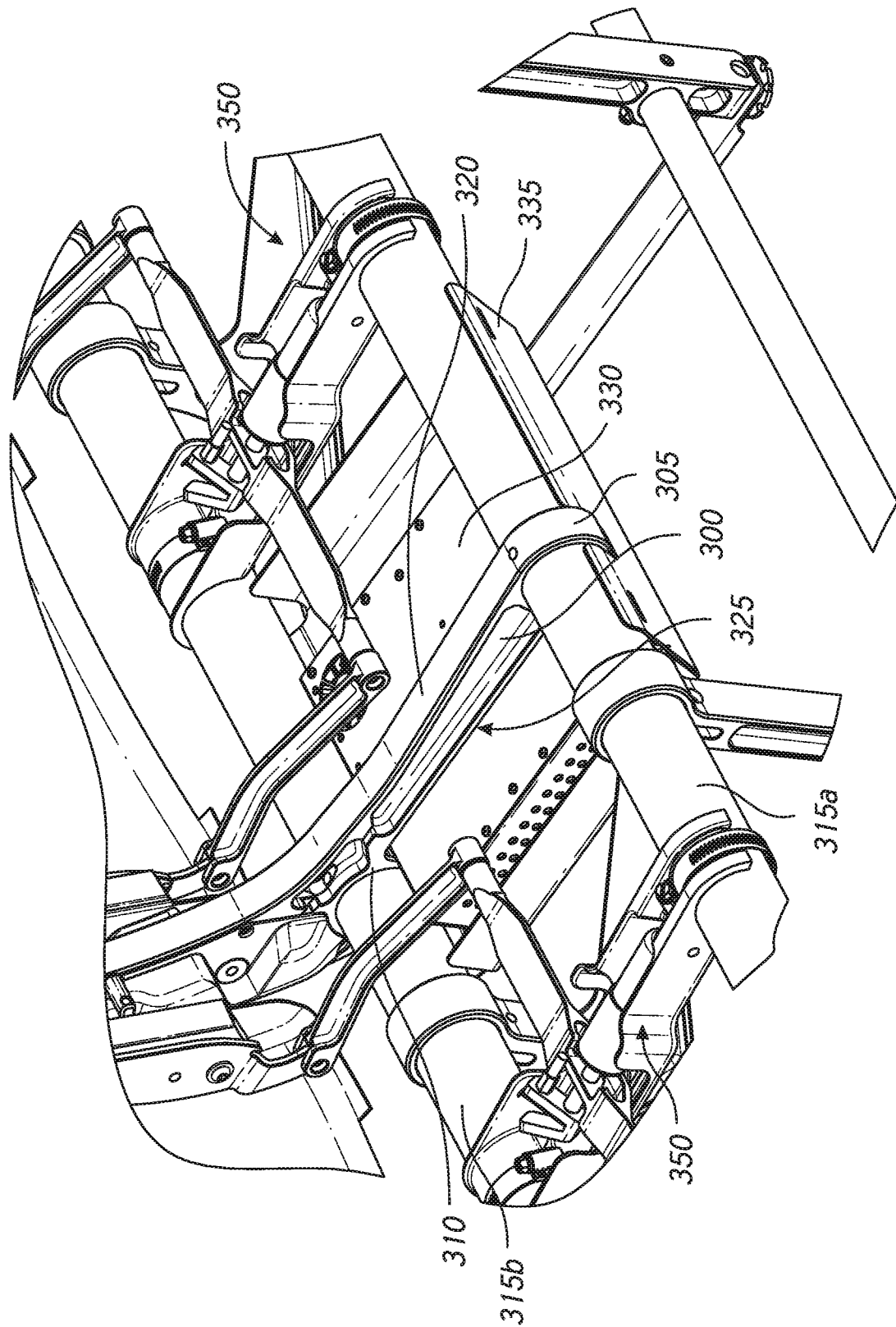


FIG. 13

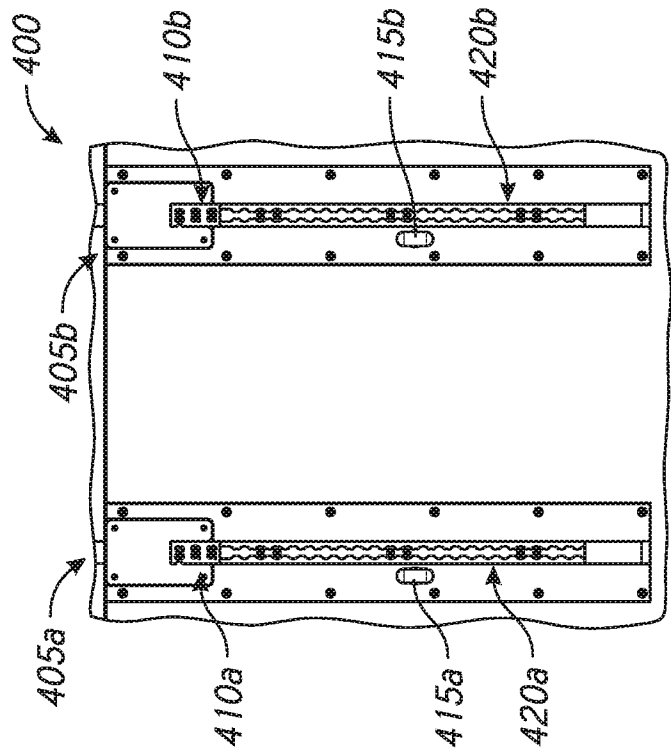


FIG. 14

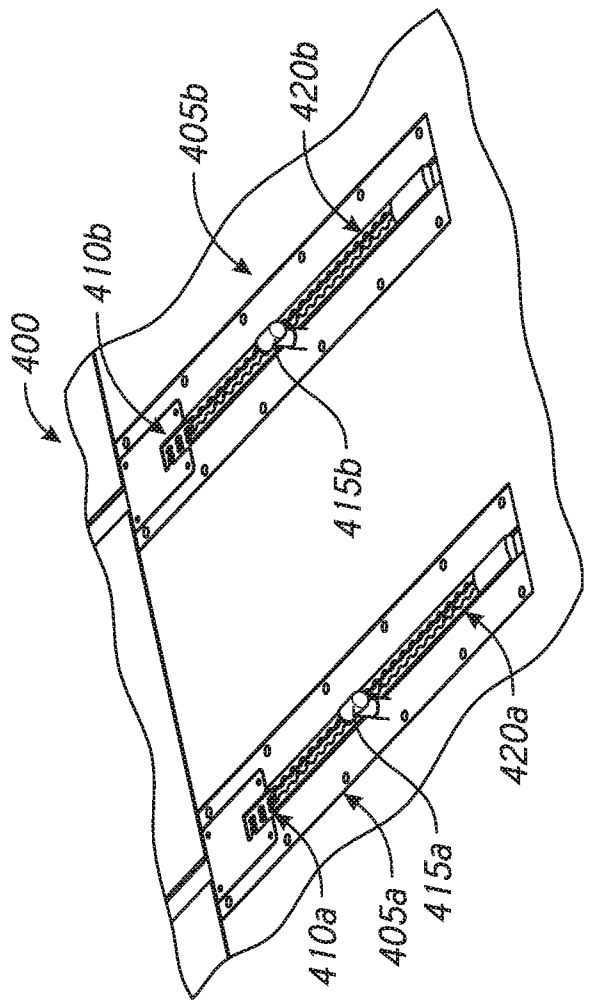


FIG. 15

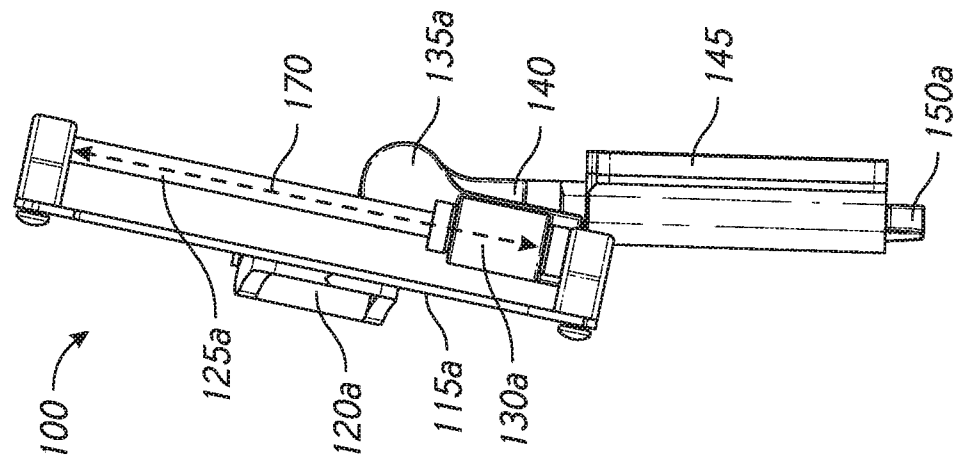


FIG. 16C

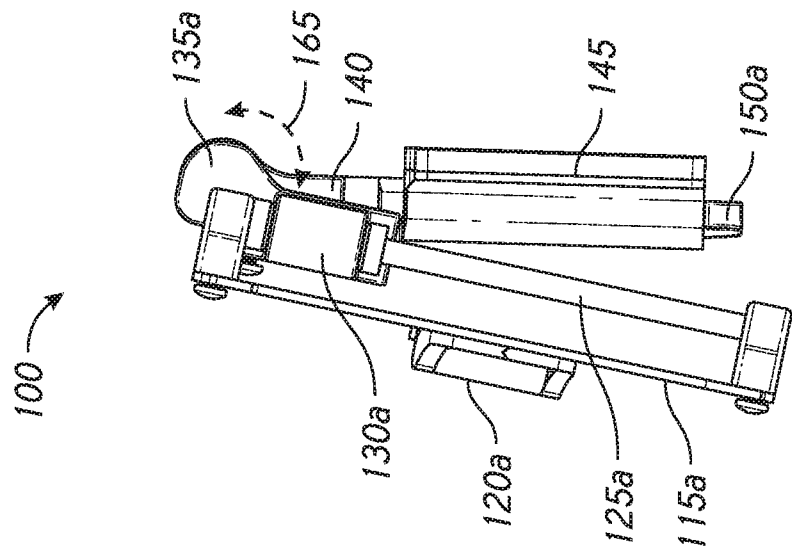


FIG. 16B

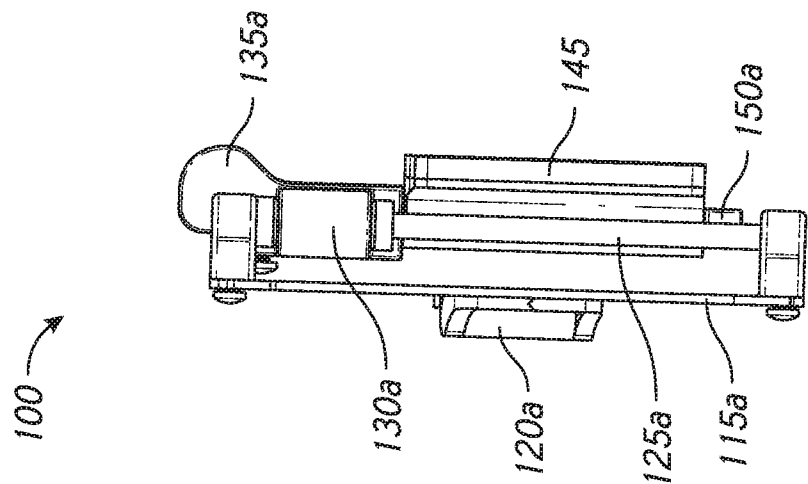


FIG. 16A

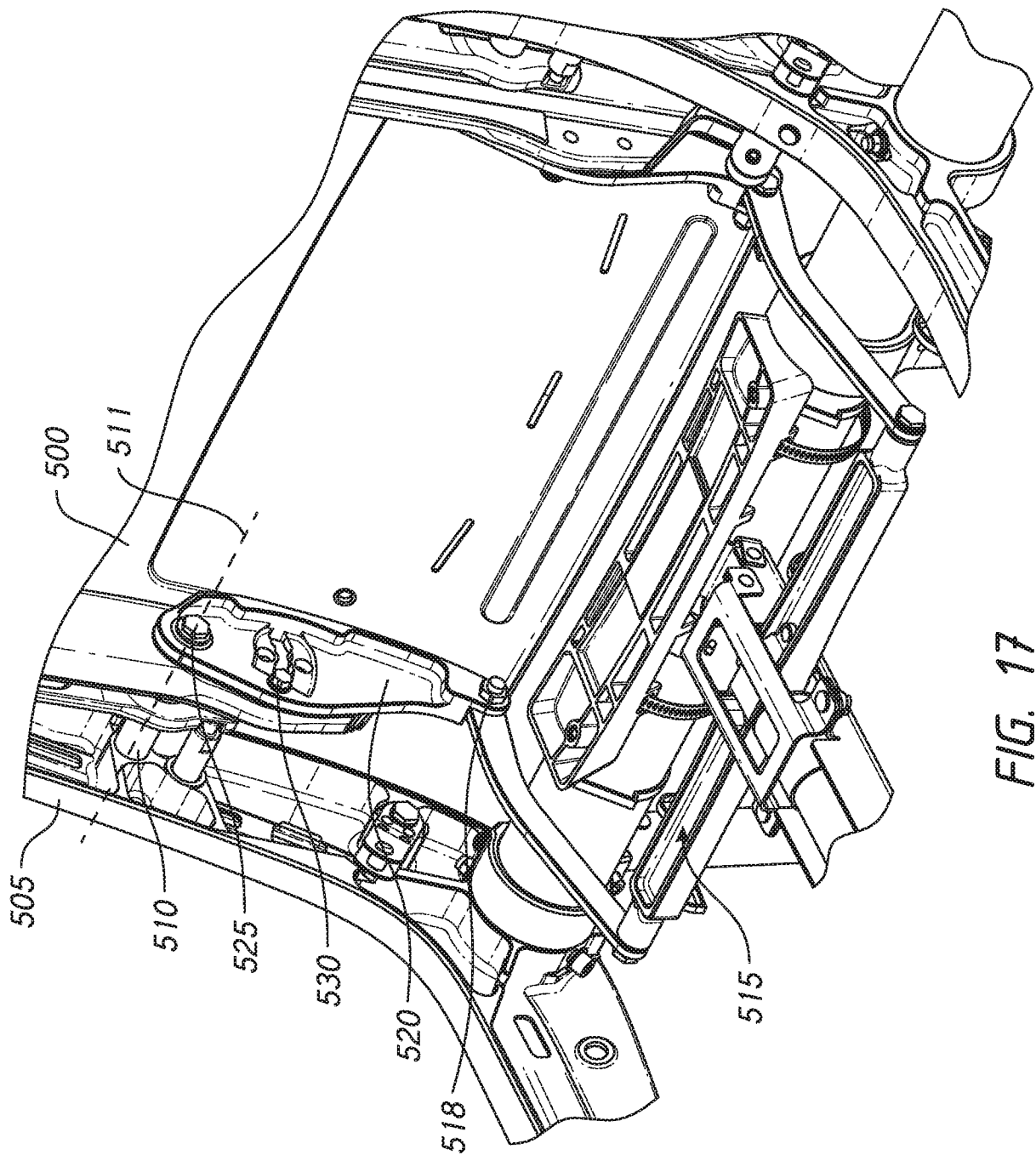


FIG. 17

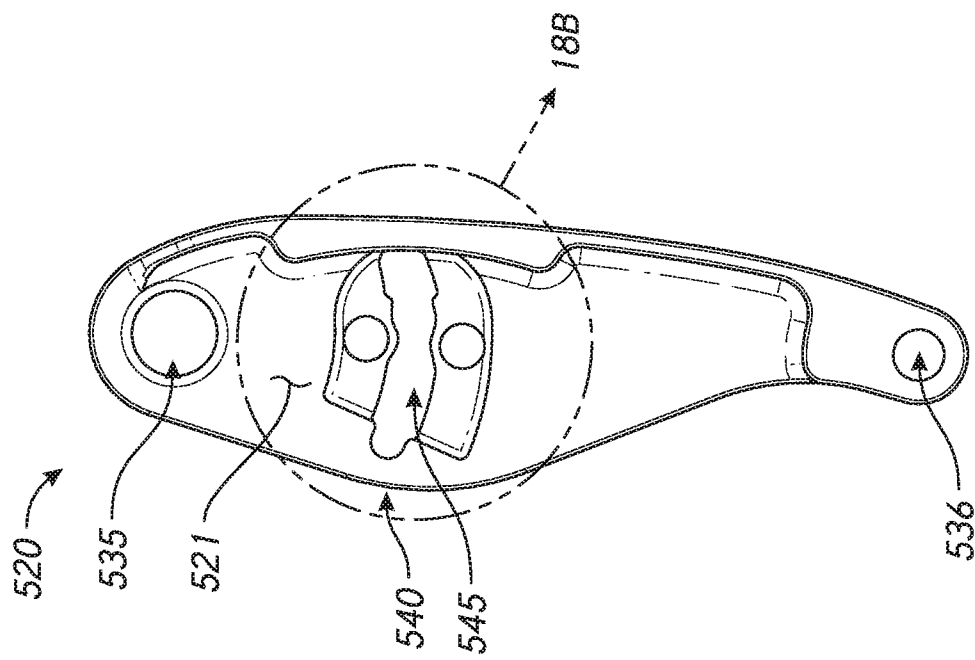


FIG. 18A

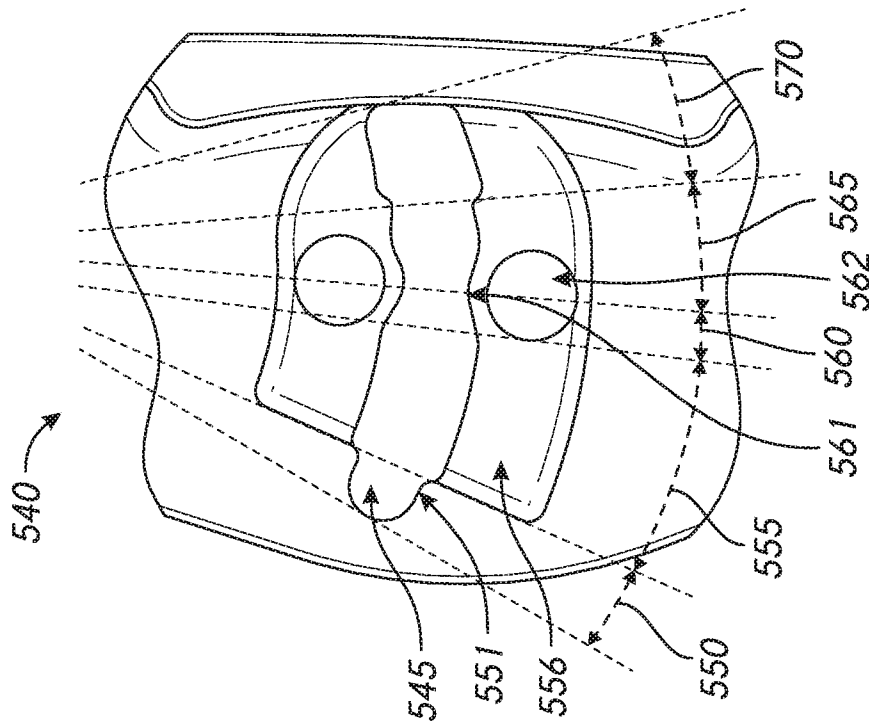


FIG. 18B

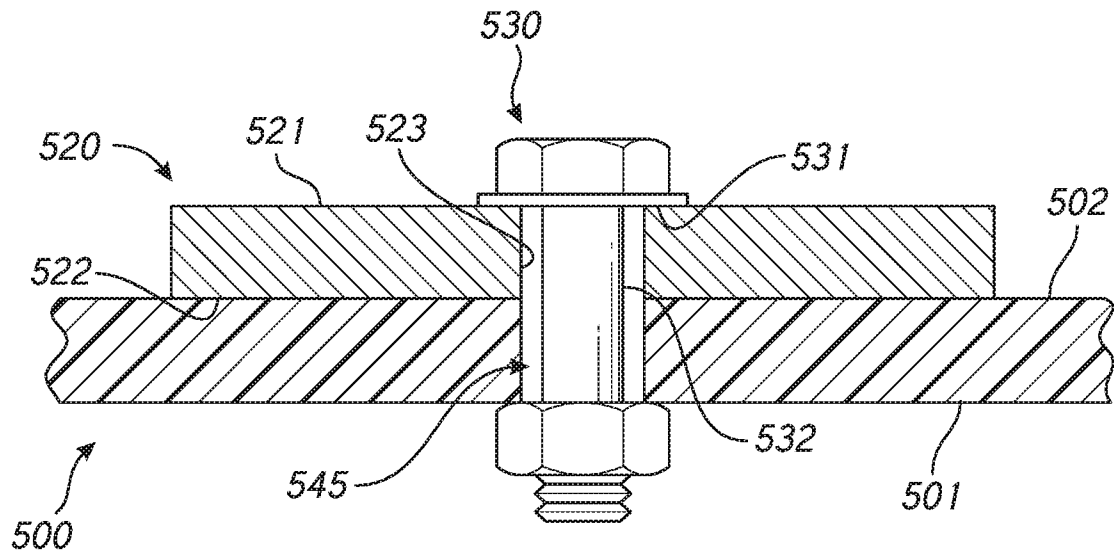


FIG. 18C

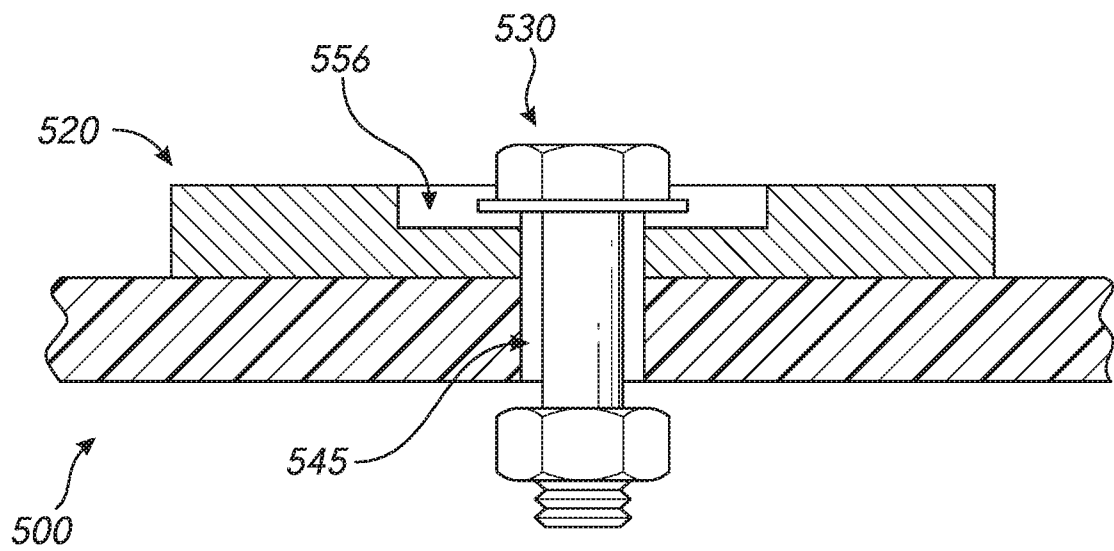


FIG. 18D

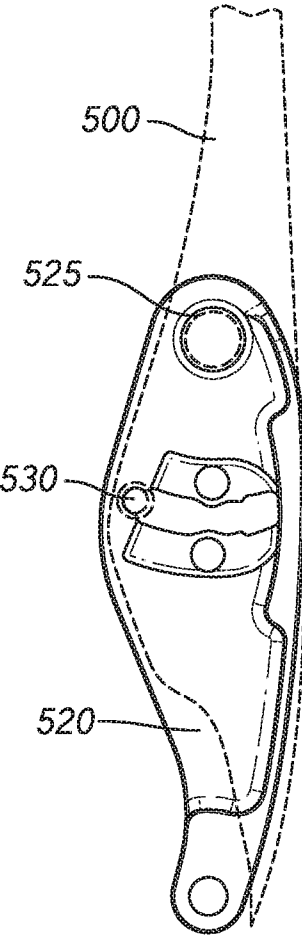


FIG. 19A

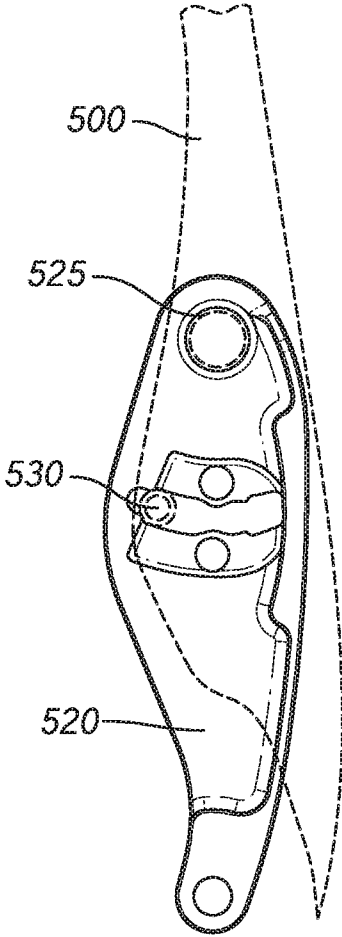


FIG. 19B

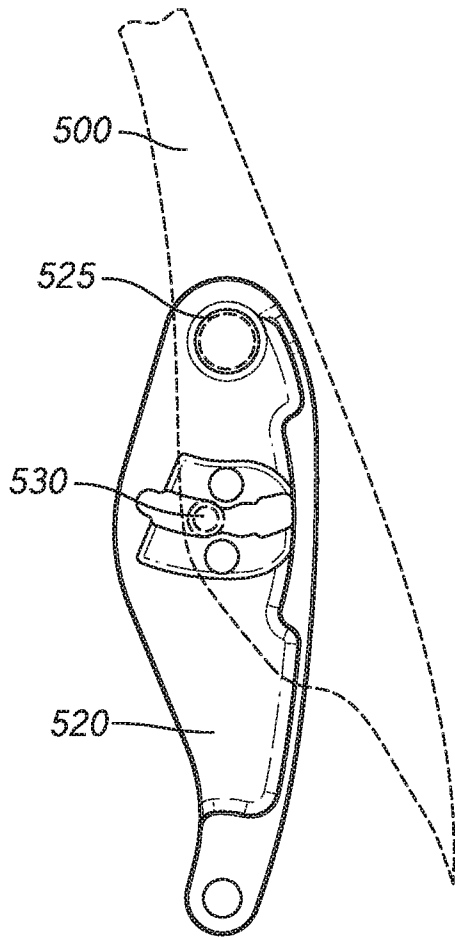


FIG. 19C

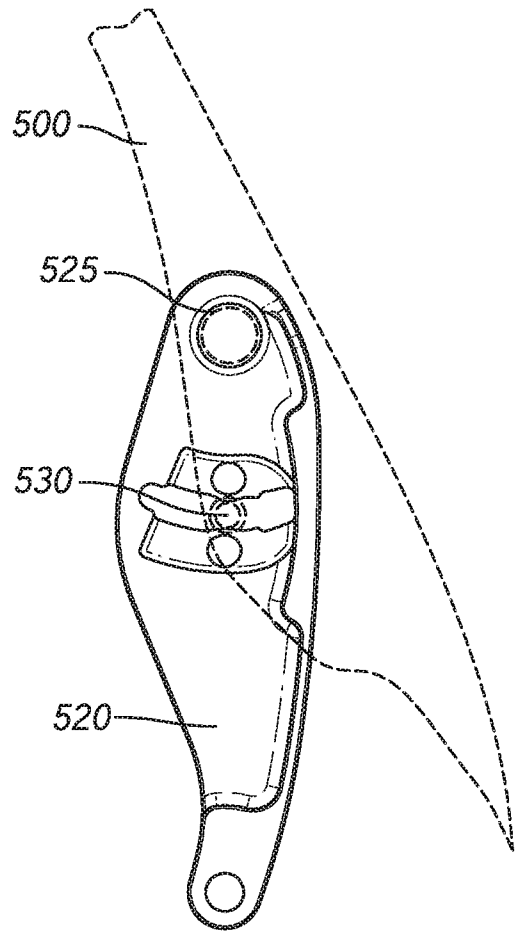


FIG. 19D

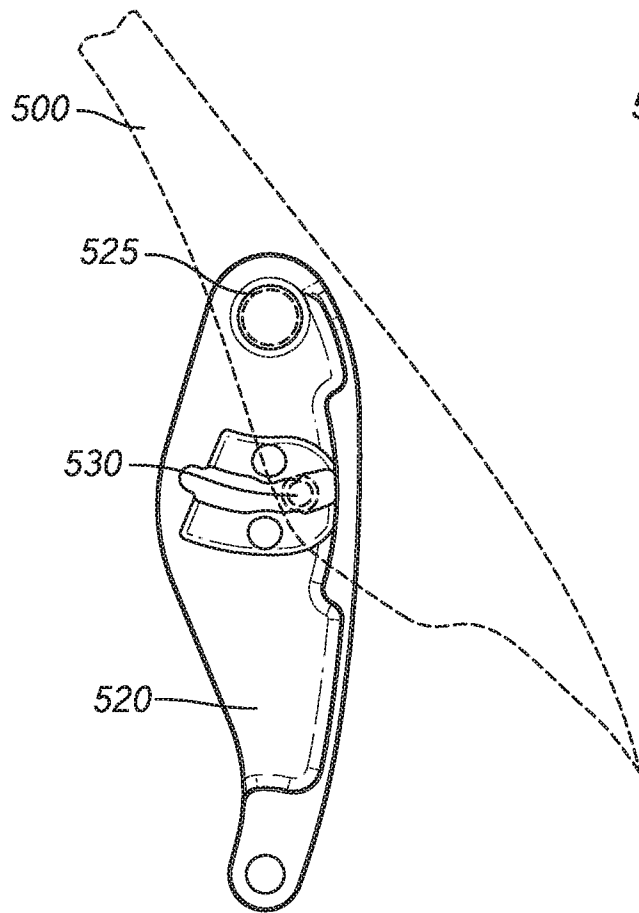


FIG. 19E

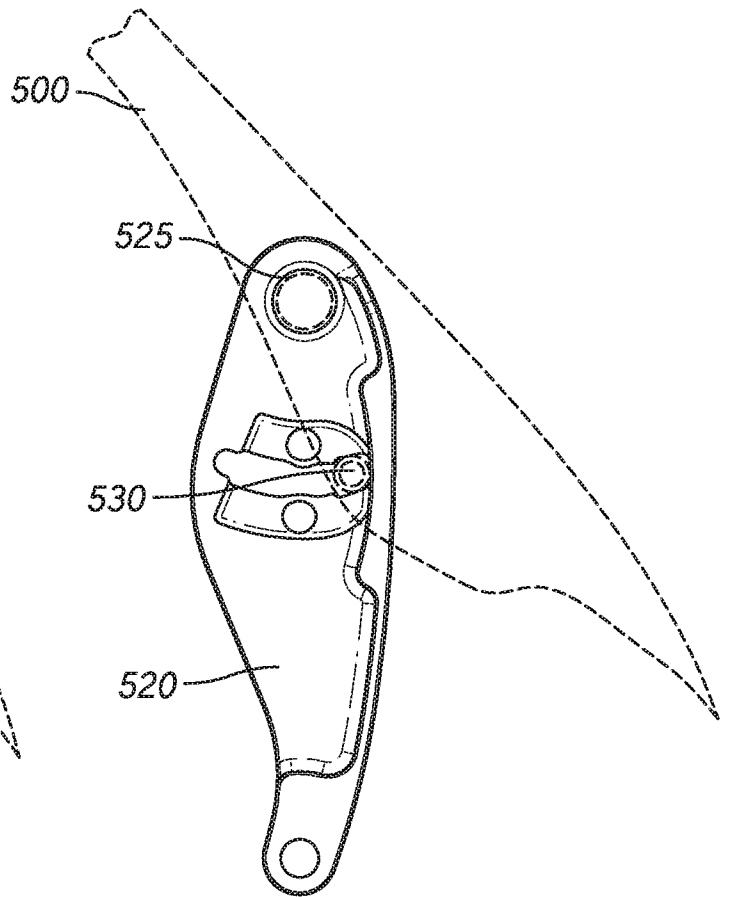


FIG. 19F

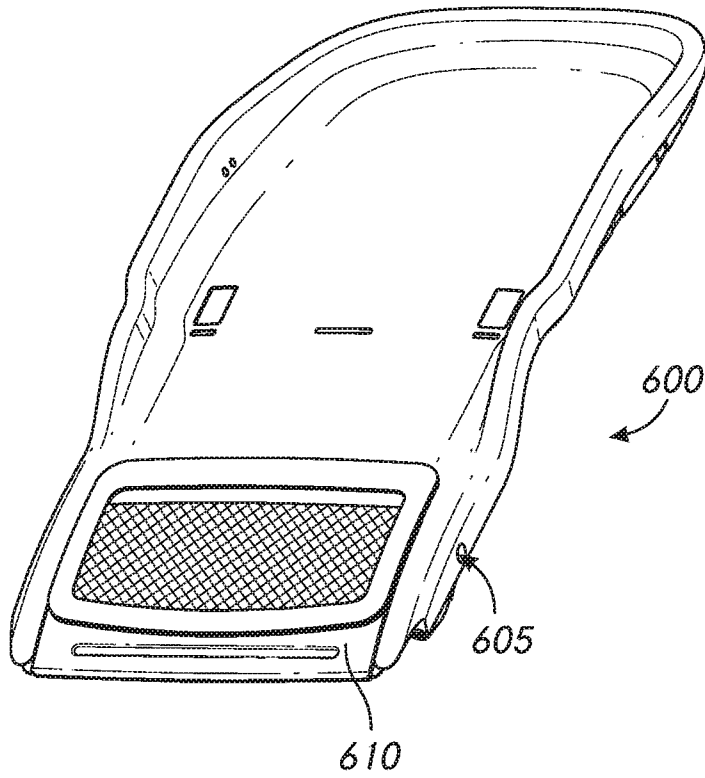


FIG. 20

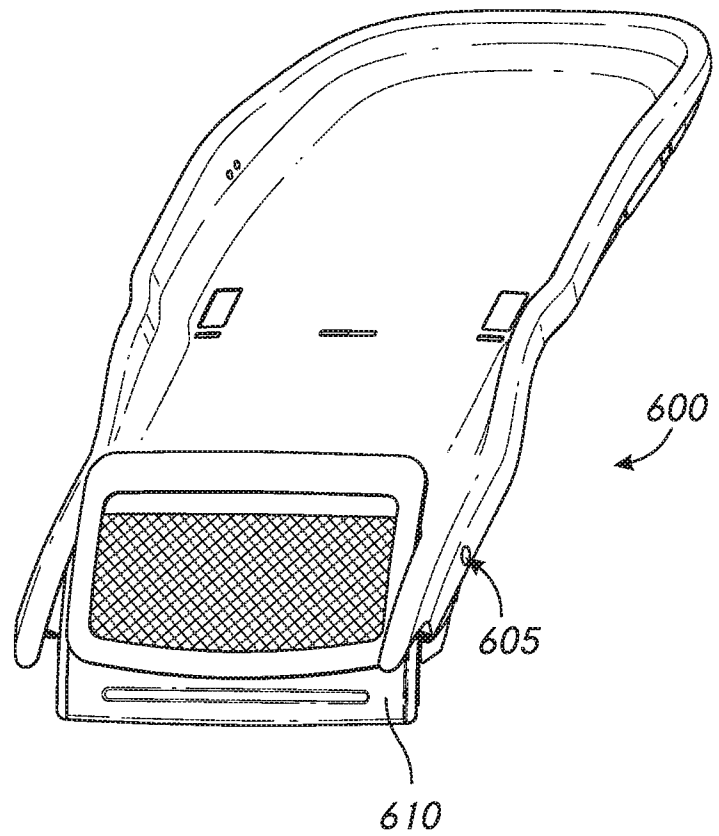


FIG. 21

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2017/025599

A. CLASSIFICATION OF SUBJECT MATTER

INV. B60N2/48 B64D11/06 B60R7/00 B60R7/04
ADD.

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)

B60N B64D B60R

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)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 102 15 058 C1 (RECARO AIRCRAFT SEATING GMBH [DE]) 24 July 2003 (2003-07-24)	1-7, 10-12, 35-37, 40-43
Y	figures	8,9,38, 39
Y	----- WO 95/09742 A1 (AIRCRAFT FURNISHING LTD [GB]; THOMPSON JAMES HANNA [GB]; KELLY FRANCIS) 13 April 1995 (1995-04-13) figures	8,9,38, 39
Y	----- EP 2 639 102 A1 (CERA [FR]) 18 September 2013 (2013-09-18) figures -----	8,9,38, 39



Further documents are listed in the continuation of Box C.



See patent family annex.

* 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

29 June 2017

Date of mailing of the international search report

04/09/2017

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
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Fax: (+31-70) 340-3016

Authorized officer

Douhet, Hervé

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2017/025599

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-12, 35-43

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-12, 35-43

a seat assembly having a particular headrest

2. claims: 13-28

a seat assembly having a particular storage sleeve

3. claim: 29

A seat assembly having a particular spreader

4. claims: 30-34

a seat assembly having a particular coupling means to the floor

5. claims: 44-78

a seat assembly having a particular energy absorption system

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2017/025599

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 10215058	C1	24-07-2003	AT 301576 T 15-08-2005
			DE 10215058 C1 24-07-2003
			EP 1492702 A1 05-01-2005
			US 2005116524 A1 02-06-2005
			WO 03084812 A1 16-10-2003

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EP 2639102	A1	18-09-2013	EP 2639102 A1 18-09-2013
			ES 2552582 T3 30-11-2015
			FR 2988049 A1 20-09-2013
