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(54) Title: SEAT BACK WITH INTEGRATED HEAD RESTRAINT

(57) Abstract: A one-piece seat back frame having an integrated head restraint for use in a vehicle seat assembly. The one-piece seat back frame includes a first side member and a second side member spaced apart from the first side member, an upper cross member and a lower cross member. The head restraint frame is integrated with the seat back frame and includes a first side member, a second side member spaced apart from the first side member, and an upper cross member. The seat back frame and head restraint frame are formed from a single stamping and as a single unitary body stamped from a single piece of material.

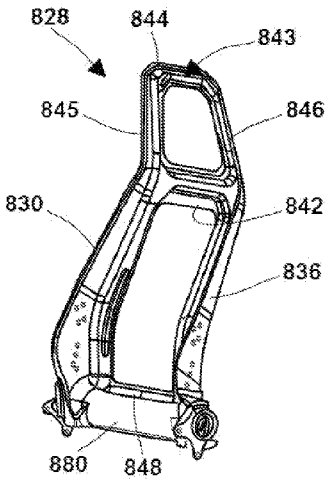

FIG.23

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SEAT BACK WITH INTEGRATED HEAD RESTRAINT

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of and priority to U.S. Provisional Application No. 61/321,736, filed April 7, 2010, which is incorporated herein by reference.

BACKGROUND

[0002] The present disclosure relates generally to the field of seating for vehicles and more particularly, to a one-piece seat back frame assembly, a one-piece seat back frame assembly having an integrated head restraint and method of making same.

DESCRIPTION OF THE RELATED ART

[0003] Seat structures, such as, seat back frames, seat base cushion frames, low seat structures, and back frame seat belt towers can provide strength to a seat assembly to meet strength and/or durability requirements. These requirements are commonly covered by governmental regulations, such as, FMVSS and ECE or dictated by other groups, such as, by vehicle manufacturers and insurance groups. Seat structures can also be configured to meet the desires of customers (and hence vehicle manufacturers) for seat assemblies that provide increased functionality or utility, such as, rotating, folding, and sliding, while improving user-adjustable comfort. Achieving the desired strength, durability, stiffness, functional, and utility characteristics typically requires the use of additional components which can have an undesirable

impact on mass, cost, and comfort. Therefore, seat structures are typically designed by balancing structural and functional characteristics against mass, comfort, and cost.

[0004] It is generally known to construct a seat structure by separately forming individual members through a conventional stamping process, such as by a multiple station progressive stamping die and then coupling those formed members through a process, such as, a laser welding process, a GMAW process, etc.. This method of construction has several disadvantages, at least some of which are as follows. First, the welding process for joining formed components, especially laser welding, requires tight tolerances with respect to parameters, such as gaps, to produce a reliable structural weld which can require complex and expensive fixtures or tooling during the manufacturing cycle. Second, concerns about reduced reliability resulting from the tight tolerances may cause manufacturers to couple the members with redundant welds to increase reliability which can add to piece cost and cycle time of manufacture. Third, individual stamping dies or tooling may be required to produce each individual member which can add to piece cost and maintenance cost. Fourth, a higher number of individual members used to construct a seat structure results in a higher likelihood that the lack of one member will stop the entire production process of a seat structure. Fifth, this method of construction requires significant part handling downstream in the manufacture process which can add to the piece cost. Sixth, this method of construction can inhibit optimization of mass and strength because the desire to reduce costs by having as few parts as possible in the assembly can cause manufacturers to structurally overdesign portions of the seat structure to achieve part reduction. Seventh, some conventional methods of coupling, such as GMAW and fasteners, require overlaps and/or the addition of material, such as extra parts or filler material, which negatively impacts mass and cost. Eighth, the coupling of multiple individual stamped members typically requires a

significant number of welds. For example, a conventional four member back frame structure may require more than twenty welds to couple the members into one assembly. The need for this high quantity of welds in combination with conventional weld fixtures, such as a rotating carousel fixture, result in slow manufacturing cycle times. This problem is further exacerbated when additional seat components are required, such as a head restraint, because the number of welds required and need to maneuver the seat back into various positions for welding are dramatically increased, as described further in PCT Application No. PCT/US10/56451 and incorporated by reference herein in its entirety.

[0005] Accordingly, there is a need to design and form structural components with reduced mass and reduced cost while meeting or exceeding increased strength and durability requirements. Additionally, because the structural components of a seat assembly of a vehicle provide safety related functionality, there is always a need to increase reliability of the processes and components that are in the load path during a dynamic vehicle impact event. There also is a need for additional functionality with a minimal impact on comfort, mass, and cost. Additionally, the cost to handle or modify the component increases significantly as a product moves downstream in its manufacturing cycle, hence there is a desire to reduce or eliminate downstream operations, such as the welding of separate head restraint, or the like.

SUMMARY

[0006] Accordingly, the present disclosure relates a one-piece seat back frame having an integrated head restraint for use in a vehicle seat assembly. The one-piece seat back frame includes a first side member and a second side member spaced apart from the first side member, an upper cross member and a lower cross member. The head restraint frame is integrated with

the seat back frame and includes a first side member, a second side member spaced apart from the first side member, and an upper cross member. The seat back frame and head restraint frame are formed from a single stamping and as a single unitary body stamped from a single piece of material.

[0007] Also provided is a one-piece seat back frame having an integrated head restraint for use in a vehicle seat assembly. The one-piece seat back frame includes a first side member and a second side member spaced apart from the first side member, an upper cross member and a lower cross member. The head restraint frame is integrated with the seat back frame and includes a first side member, a second side member spaced apart from the first side member, and an upper cross member. A lower cross bracket member is attached to the seat back frame such that the lower cross bracket member at least partially overlaps the seat back frame lower cross member forming a boxed section. The seat back frame and head restraint frame are formed from a single stamping and as a single unitary body stamped from a single piece of material.

[0008] Also provided is a method of manufacturing a one-piece seat back frame assembly having an integrated head restraint. The method includes the step of forming a one-piece seat back frame having a head restraint frame from a single stamping and a single piece of material.

[0009] An advantage of the present disclosure is that the system and method of forming a one-piece seat structure is provided that does not require separate installation of a head restraint. Another advantage of the present disclosure is that a system and method of forming a one-piece seat structure is provided that has reduced mass and cost and increased strength. Another advantage of the present disclosure is that the one-piece seat structure is easier to manufacture and assemble. Yet another advantage of the present disclosure is that the one-piece seat structure has fewer weld joints and improved reliability.

[0010] Other features and advantages of the present disclosure will be readily appreciated, as the same becomes better understood after reading the subsequent description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is a perspective view of a vehicle having vehicle seat assembly, according to an exemplary embodiment.

[0012] FIG. 2 is a perspective view of a vehicle seat assembly, according to an exemplary embodiment.

[0013] FIG. 3 is a front perspective view of a one-piece seat back frame assembly having a cross bracket member and pivot bracket attached thereto, according to an exemplary embodiment.

[0014] FIG. 4 is cross-sectional view of the one-piece seat back frame assembly of FIG. 3 along the A—A line.

[0015] FIG. 5 is a rear perspective view of the one-piece seat back frame assembly of FIG. 3.

[0016] FIG. 6 is an enlarged partial front perspective view of the one-piece seat back frame assembly of FIG. 3.

[0017] FIG. 7 is an enlarged partial rear perspective view of the one-piece seat back frame assembly of FIG. 3.

[0018] FIG. 8 is a perspective view of a cross bracket member having a pivot bracket and seat back pivot bracket attached thereto, according to an exemplary embodiment.

[0019] FIG. 9 is a perspective view of a pivot bracket, according to an exemplary embodiment.

[0020] FIG. 10 is a perspective view of a ring member, according to an exemplary embodiment.

[0021] FIG. 11 is a cross-sectional view of a cross bracket member coupled to a one-piece seat back frame and seat base frame, according to an exemplary embodiment.

[0022] FIG. 12 is a flow chart of a method of manufacturing/assembling a one-piece seat back frame, according to an exemplary embodiment.

[0023] FIG. 13 is front perspective view of a pivot bracket having a plurality of interlocking teeth, according to another embodiment.

[0024] FIG. 14 is a rear perspective view of the pivot bracket having of FIG. 13.

[0025] FIG. 15 is a partial perspective view of a one-piece seat back frame assembly having a cross bracket member, a head restraint attachment feature and coupled to a seat base frame, according to yet another embodiment.

[0026] FIG. 16 is a cross-sectional view of the one-piece seat back frame assembly of FIG. 15 along the A—A line.

[0027] FIG. 17 is a perspective view of the one-piece seat back frame assembly of FIG. 15 having an upper reinforcement brace coupled to the upper cross member.

[0028] FIG. 18 is a one-piece seat back frame assembly having a cross bracket member attached thereto, according to yet another embodiment

[0029] FIG. 19 is a cross-sectional view of the one-piece seat back frame assembly of FIG. 18 along the A—A line.

[0030] FIG. 20 is a cross-sectional view of the one-piece seat back frame assembly of FIG. 18 along the B—B line.

[0031] FIG. 21A is a rear perspective view of the one-piece seat back frame assembly of FIG. 18.

[0032] FIG. 21B is a front perspective view of the one-piece seat back frame assembly of FIG. 18 attached to a seat base frame.

[0033] FIG. 21C is a cross-sectional view of the one-piece seat back frame assembly of FIG. 21B taken along the A-A line.

[0034] FIG. 21D is a cross-sectional view of the one-piece seat back frame assembly of FIG. 21B taken along the B-B line.

[0035] FIG. 21E is a front perspective view of the one-piece seat back frame assembly of FIG. 21B.

[0036] FIG. 21F is a rear perspective view of a one-piece seat back frame of FIG. 21B including a shoulder restraint retractor system.

[0037] FIG. 22 is a front view of a one-piece seat back frame having an integrated head restraint according to yet another embodiment.

[0038] FIG. 23 is a front perspective view of the one-piece seat back frame of FIG. 22.

[0039] FIG. 24 is a rear perspective view of the one-piece seat back frame of FIG. 22.

[0040] FIG. 25 is a rear perspective view of the one-piece seat back frame of FIG. 22 having an integrated DVD system, according to another embodiment.

[0041] FIG. 26 is a rear perspective view of the one-piece seat back frame of FIG. 22 having an integrated projection surface, according to another embodiment.

[0042] FIG. 27 is a rear perspective view of the one-piece seat back frame of FIG. 22 having lighting and mirror components, according to another embodiment.

DESCRIPTION

[0043] Referring generally to the FIGURES and particularly to FIG. 1, a vehicle 10 is shown according to an exemplary embodiment. The vehicle 10 can include one or more seat assemblies 12 provided for occupant(s) of the vehicle 10. While the vehicle 10 shown is a four door sedan, it should be understood that the seat assembly 12 may be used in a mini-van, sport utility vehicle, airplane, boat, or any other type of vehicle.

[0044] Referring now to FIG. 2, a seat assembly 12 is shown. The seat assembly 12 includes a seat back 14 operatively connected to a seat base 16. The seat back 14 and seat base 16 provide comfort, support and protection to the seated occupant. A head restraint 18 is positioned at an upper end of the seat back 14 and also provides comfort, support and protection to the seated occupant. The seat assembly 12 can also include a recliner mechanism 20 having an actuator 21 operatively connected to the seat back 14 and seat base 16, to provide rotatable adjustability of the seat back 14 with respect to the seat base 16. The seat assembly 12 can also be secured to the vehicle 10 using a track assembly 22. In this example, the track assembly 22 enables the seat assembly to be repositioned relative the vehicle floor to enhance comfort and utility. The seat back 14 and seat base 16 can also include other components, such as, a trim cover 24, a seat cushion structure 26, or the like.

[0045] Referring to FIGS. 3-11 and FIGS. 22-27, a one-piece seat back frame assembly 28 for use in a vehicle seat is shown. The one-piece seat back frame assembly 28 can be used with a variety of seat assemblies with or without recliner systems. For example, the one-piece seat

back frame assembly can be used with recliner system, such as, a dual or single-sided recliner system, or the like.

[0046] The one-piece back frame 28 generally includes a first side member 30 having an upper and lower end 32, 34, an opposed second side member 36 having an upper and lower end 38, 40. The one-piece seat back frame 28 also includes an upper cross member 42 having a first and second end 44, 46 located between the upper end of first side member 32 and the upper end of the opposed second side member 38. An opposed lower cross member 48 having a first and second end 50, 52 is located between the lower end of the first side member 34 and the lower end of the second side member 40. The first side member 30, the second side member 36, the upper cross member 42 and lower cross member 48 form the substantially rectangular one-piece back frame 28, and the seat back frame 28 has a front surface 54 and a rear surface 56. The front and rear surfaces 54, 56 are generally substantially flat but can have a variety of profiles, contours, features, or the like, as needs or performance requirements dictate which are further described below.

[0047] The one-piece back frame 28 also includes an inner side wall 58 extending from an inner edge 60 of the front surface 54 and an outer side wall 62 extending from an outer edge 64 of the front surface 54 to form and define a generally U-shaped channel or profile 66. The U-shaped channel bolsters the strength, rigidity, and performance of the seat back and also provides areas for attaching/inserting other components, such as padding, or the like. The one-piece back frame 28 can also have a bend or angled portion 68 that is positioned on a portion of the one-piece back frame 28 and that is angled at a predetermined degree. In this example, the bend 68 is located between the upper and the lower cross member 42, 48, respectively. The one-piece back frame 28 (and any of the other one-piece seat back frame assembly components such as the

lower cross bracket member, pivot bracket, recliner, or the like) can also include a plurality of surface features or structures 70, such as, rib/stiffeners, beads, darts, protrusions, elevations, depressions, deformations, stampings, or the like) 54 formed as part of or integrally with the back frame 28 to enhance the strength and rigidity performance of the seat back frame 28 without significantly increasing the mass thereof. The number, length, shape, width, dimensions, position, location, orientation, or the like, of the features 70 can vary as appropriate and/or as needed to optimize strength, stability and performance of the one-piece back frame 28. In this example, a vertical rib 72 is disposed on a portion of the first and second side member 30, 36 to enhance the fore/aft stiffness of the one-piece back frame 28. The complexity of these features 70 can vary depending on the type of material used. Generally, the complexity of the geometries can be increased with the use of lower strength material. The one-piece back frame 28 may also include a plurality of openings 74, such as, holes, extruded holes, apertures, grooves, channels, passageways, or the like, and interface/surface areas 76 for attachment of other components, such as, recliner mechanisms, recliner plates, recliner shafts, foam, trim covers, head restraints, or the like. The one-piece back frame 28 may also include a plurality of edges or flanges 78 disposed along or extending from the inner and outer side walls 58, 62 that provide stiffness to the structure, durability for the seat foam/upholstery, reduced sharp edges, and attachment/resting surfaces for other components, such as, foam, trim cover, or the like.

[0048] Referring now to FIGS. 22-24, the one-piece seat back frame 828 also includes a head restraint frame 843 integrated with the upper portion of the one-piece back frame 842. The head restraint frame 843 includes an upper member 844 that is located opposite the seat back upper cross member 842, a first side member 845, and a second side member 846. The seat back

members (first side member 830, the second side member 836, the upper cross member 842, lower cross member 848) and the head restraint frame 843 form the substantially rectangular one-piece back frame 828 having a front surface 854 and a rear surface 856. The seat back frame 828 and head restraint frame 843 may be angled in a predetermined direction and at a predetermined degree. In this example, the head restraint frame 843 is angled in a forward direction relative the seat back frame 828. The seat back 828 and head restraint 843 can be formed from a single stamping from a single piece of material. Alternatively, the seat back 828 and head restraint 843 can each be a single piece stamping that are attached together to form one piece. It should also be noted that the head restraint frame may have all or some of the same features described for the seat back frame, such as a U-shaped channel, ribs, edges, flanges, or the like. The head restraint frame 843 may also be tapered to enhance performance, functionality, and comfort.

[0049] The one-piece seat back frame may also include a variety of other components, such as electronic devices, or the like, attached thereto. For example, one-piece seat back frame 828 may include an integrated DVD system 850, such as a DVD screen, or the like, as shown in FIG. 25. The DVD system 850 can be coupled to the one-piece seat back frame 828, such as to the integrated head restraint 843. More particularly, the DVD system can be positioned against/within the space located between the head restraint members 844, 845, 846 at the center of the head restraint, as shown in FIG. 25. In another example, the one-piece seat back frame 828 may also include a planar member 852 having a surface that may be used as a video projection surface, as shown in FIG. 26. The planar member may be made of various materials, such as metal, fabric, plastic, or the like. The planar member may be secured to the seat back using a variety of techniques, such as fasteners, or the like. Alternatively, the planar member 852

could be incorporated, such as sewn, adhered, or the like to the seat cover, such as the trim cover, or the like. In yet another example, the one-piece seat back frame assembly 828 may include illuminating components 860, such as lights, a lighting ring, or the like, and mirror components 870, such as soft mirror technology, or the like, as shown in FIG. 27. The illuminating and mirror components 860, 870 may be incorporated to provide functionality and/or for decorative purposes to enhance performance and/or the aesthetic appearance of the seat.

[0050] Referring back to FIGS. 3-11, the one-piece back frame assembly 28 can also include a cross bracket member 80 having attachment/surface areas for mounting components or structures thereto, such as, recliners, pivot brackets, or the like, as shown in FIG. 8. The cross bracket member 80 may serve as a brace or reinforcement for the one-piece back frame assembly 28. The cross bracket member 80 includes a generally planar body portion 81 having a first end 82 and an opposed second end 84. The body portion includes a front surface 86 and a rear surface 88. A first wall 83 extends outwardly from the body portion first end and an opposed second wall 85 extends outwardly from the body portion second end 84. The cross bracket member 80 is coupled to the rear side of the lower cross member portion 48 to create a box-like structural section, as shown in FIG. 4. The box-like structural section enhances torsional integrity and compression strength of the seat assembly 12. It also reinforces the lower portion of the one-piece seat back frame 48 from forces, such as, side impact loads, or the like, as shown in FIGS. 3-7. The cross bracket member 80 may have higher torsional and lateral compression strength than other types of members used in a seat structure, such as, cross tubes, torsion tubes, or the like. The cross bracket member 80 may have a contour corresponding to the shape of the one-piece seat back frame 28, such as, the lower cross member 48, to facilitate coupling between the two components and create a tight and snug fit. The cross bracket member 80 can also

include a plurality of openings 90, such as, holes, apertures, slots, or the like, to couple other components thereto, such as, a pivot bracket 92, a recliner 118, or the like.

[0051] The one piece seat back frame may also include a pivot bracket 92 secured to at one or both ends of the cross bracket member 80 to enable the seat back to pivot relative to the seat base. The pivot bracket 92 includes a connector 94, such as, a ring member, bushing, or the like. The connector 94 includes a ring portion 96 having an outer diameter or edge 98 and an inner diameter or edge 100 that form an opening 102. The connector 94 also includes a substantially cylindrical wall or hollow collar portion 104 extending from the inner diameter 100. The connector 94 also includes a plate member 106, such as a base plate, or the like. The plate member 106 is a substantially planar member having a first surface 108, a second surface 110, a primary opening 112, such as, a hole, aperture, or socket, or the like, and a plurality of secondary openings or holes 114 for attachment to other seat structures, and/or components. The plate member 106 can also include a variety of structural features 116, such as, contours, shapes, extensions, attachment areas, or the like, to enhance the strength, rigidity and performance of the plate member 106 and to facilitate attachment to other structures. The ring member 94 (collar portion) is rotatably coupled to the socket 112 of the planar member 106 thereby creating a socket joint such that the ring member 94 rolls over the edge of the extruded socket hole 112 and can also include a bushing to enhance functionality.

[0052] The one piece seat back frame may also include a recliner coupled to one or both ends of the cross bracket member 80 to enable selective adjustment of the seat back relative to the seat base. The recliner 118 includes a plate member 120, such as a base plate, or the like. The plate member 120 is a substantially planar member having a first surface 122, a second surface 124, a primary opening 126, such as, a hole, aperture, or socket, or the like, and a

plurality of secondary openings or holes 128 for attachment to other seat structures, and/or components. The plate member 1120 can also include a variety of structural features 130, such as, contours, shapes, extensions, attachment areas, or the like, to enhance the strength, rigidity and performance of the plate member 120 and to facilitate attachment to other structures.

[0053] The pivot bracket 92 and recliner 118 can be coupled to the first and second end 82, 84, such as the inboard and outboard sides, of the cross bracket member 80, as shown in FIG. 8. The planar member of the pivot bracket 106 and/or the recliner 120 is rotatably coupled to another seat structure, such as the seat base frame, or the like, via the apertures of the planar members 114, 128. The pivot bracket 94 and recliner 118 and their components thereof can have a variety of shapes, sizes, dimensions, such as a flared extrusion, or the like. In this example, the plate member 106, 120 is a substantially triangular member.

[0054] The one-piece seat structure can be formed from various materials, such as, tailor welded blanks, tailor welded coils, monolithic blanks or coils having uniform or non-uniform material grade and thickness, or the like. The one-piece seat structures can be formed from a variety of steel grades and types, such as, HSLA, AHSS (Dual Phase, Complex Phase, TRIP, post form heat treatable steel, such as, aluminum, magnesium, or the like). The materials used can be optimized depending on various factors, such as, the type of structure or portion to be made, the location of the structure or portion, the geometry requirements of the structure or portion, the strength requirements of the structure or portion, or the like. For example, lower strength materials typically have higher formability which enable incorporation of more (or higher complexity) geometry in the design of a structure or portion, but may require greater thickness to recover strength lost by using lower strength material. The formability and strength

of the material can be optimized and balanced according to the needs dictated by the type of structure or portion and its location within the seat assembly.

[0055] In one example, the one-piece seat back frame 28 can be constructed from a tailor welded blank using various cold forming processes as disclosed in International Application No. PCT/US09/61027 filed October 16, 2009 and PCT/US10/43391 filed July 27, 2010 which are incorporated by reference herein in their entirety. Generally, the tailored welded blank can be formed to provide the ability to, for example, integrate components, minimize scrap, reduce handling, reduce cost and optimize strength and mass. For example, mass and cost can be optimized by flexibly optimizing the material, that is, mechanical properties and thickness at differing sections of a tailored welded blank to meet requirements of strength and manufacturing. The tailored welded blank can then be formed through a cold-forming process to produce a one-piece structural component, which may have complex geometry yet require fewer secondary operations and less expensive fixtures or tooling. The one-piece seat back frame 28 can be optimized for cost and mass, which meets or exceeds strength and durability requirements and the strength and durability of conventional seat structures. Also, this optimization of mass can allow for construction of a smaller seat, which in turn can provide increased space within the vehicle for cargo or comfort. The mass reduction of seat components can have a ripple effect for vehicle manufacturers, as mass reduction affects the design of other components, such as, brakes, powertrain, or the like, and can allow for other components that are lower mass, smaller, more efficient, or the like, which can lead to other cost savings in the vehicle.

[0056] Once the one-piece seat back frame is formed, the one-piece seat back frame assembly is then assembled together using a predetermined method. In an example,

manufacturing or assembling the one-piece seat back frame assembly 28 can be completed in an exemplary methodology, as shown in FIG. 12.

[0057] The methodology begins at the first step at 210. In this step the appropriate brackets and/or recliner mechanisms are selected, such as, the pivot brackets 92 and/or recliner mechanisms 118 and are installed on the cross bracket member 80. For example, the ring portion of the pivot bracket connector 94 is coupled to or disposed into the opening or hole 92 on the first end 82 and/or second end 84 of the cross bracket member 80. The cross bracket member 80 can be customized for either a one-sided recliner seat application or a dual-sided recliner seat application. For a single-sided recliner seat application a pivot bracket 92 is installed on one side of the cross bracket member 80 and a recliner mechanism is installed on the opposing side of the cross bracket member 80. For a dual-sided recliner seat application a recliner mechanism is installed on each side of the cross bracket member 80.

[0058] The methodology proceeds to the second step at 220. In this step the brackets and/or recliners are secured to the cross bracket member using a selected technique, such as, welding, fastening, or the like.

[0059] The methodology next proceeds to the third step at 230. In this step the cross bracket member 80 with installed brackets and/or recliners is installed in the seat back frame and secured thereto using a selected technique, such as, welding, fastening, or the like.

[0060] The one-piece seat back frame assembly 28 of the present disclosure provides a number of benefits. For example, the cross bracket member 80 of the one-piece seat back frame assembly 28 improves the overall structure by providing a box-like structural section that enhances torsional integrity and compression strength of the seat assembly 12, thereby requiring only one recliner. The one-piece seat back frame assembly 28 provides higher cost and mass

efficiency than other seat back frame structures. The one-piece seat back frame assembly 28 can also be configured as a left hand side seat assembly or a right hand side seat assembly and thereby eliminating the need to construct opposite seat components. The gage of material used to form the cross bracket member 80 (box stamping) can be increased without significant impact to the assembly in terms of cost, mass, or the like. The design of the cross bracket member 80 also enables easier mounting of other structures (e.g., recliner mountings, pivot brackets, etc.) and provides a relatively large surface area (planar surface/front face) to more efficiently distribute loads and retain occupants in the seat during impact. The flared extrusion of the planar member 106, 134 enables loads to be distributed into the stamping (seat structure/pivot assembly) and provides a relatively large surface area for a joint (e.g., joint between ring member and planar member, etc.) thereby further reducing manufacturing costs and part count requirements.

[0061] Referring now to FIGS. 13-14, a seat assembly 328 according to yet another embodiment is shown. In this embodiment, the pivot bracket 392 includes a ring member connector 394 and a plate member 406, such as a base plate, or the like. The pivot bracket 328 may be coupled to the first or second side (inboard and outboard sides) of the cross bracket member 380.

[0062] The plate member 406 is a substantially planar member having a first surface 408, a second surface 410 and a central opening 412 having an inner edge 414. At least a portion of the inner edge 414 includes a plurality of teeth 416 for engagement with the ring member connector 394 to be described in further detail below. The plate member 406 also includes a tab member 418 extending outwardly from the central opening inner edge 414. The tab member 418 has a lower portion 420 including a series of section bends 421 and an upper portion 422 having an

opening 424, such as, an extruded socket hole, or the like. In this example, the upper portion 422 is in the shape of a ring for attachment to the ring member connector 394. The plate member 406 also includes a plurality of secondary openings or holes 426 for attachment to other seat structures, and/or components. The plate member 406 may also include a variety of additional structural features, such as, contours, shapes, extensions, bends, ribs, corrugations, attachment areas, or the like, to enhance the strength, rigidity and performance of the plate member 406 and to facilitate attachment to other structures. The planar member 406 may be coupled to another seat structure, such as, a seat base frame, or the like, via the apertures 426. The planar member 406 can have a variety of shapes, sizes, dimensions, such as a flared extrusion.

[0063] The ring member 394 is coupled to the tab member opening 424 such that the ring member 394 rolls over the edge of the of the tab member opening 424 and may also include a bushing to enhance functionality. In this embodiment, the ring member connector 394 also includes a plurality of interlocking teeth 428 for engaging/interlocking with the plate member teeth 416. The interlocking teeth of the ring member connector 428 and the plate member teeth 416 may be angled in a predetermined manner (such as, forward, rearward, or the like) to facilitate engagement and locking. Alternatively, the teeth may be located on the tab member ring portion.

[0064] The section bends 421 provide structural integrity that constrains the pivot bracket 392 under normal loading and enables the pivot bracket 392 to be displaced under impact loading. For example, upon a rear impact the ring member connector 394 and tab member 418 are displaced rearward towards the inner edge of the plate member 414 thereby causing the ring member teeth 428 to engage/interlock with the plate member teeth 416. This provides a mechanism for preventing rotation of the seat back upon vehicle impact.

[0065] Referring now to FIGS. 15-17, a one-piece seat back frame assembly 528 according to yet another embodiment is shown. In this embodiment, the one-piece seat back frame 528 includes an upper-cross bracket member 648. The upper cross bracket member includes a first end 650 and an opposed second end 652 that generally forms a elongated member having a first side or surface 654 and an opposed second side or surface 656. The upper cross bracket member 648 may also include an opening and a guide member for a head restraint. In this example, the upper cross bracket member includes a first and a second aperture or passage 658, 660 having a first and a second guide member 662 disposed therein. The guide members can be a variety of structures, such as, shafts, tubes, or the like. The guide members are disposed within the passages and used for coupling other structures to the seat back, such as, a head restraint, or the like. In this example, the guide member 662 has a tubular channel 663 that is designed to receive the shafts or rods of a head restraint. The upper cross-bracket member 648 is positioned onto the first and second guide members 662 such that the upper cross member 648 lays adjacent or against the upper cross member 542 thereby reinforcing the upper cross member 542 of the one-piece seat back frame 528. To reduce costs and scrap material and improve manufacturing efficiency, the upper cross bracket 648 and/or the lower cross bracket 580 (along with other seat components) can be formed from excess or scrap material produced from forming the one-piece seat back frame, such as, the offal or center scrap portion of the back frame (S), or the like. The upper cross member 542 of the one-piece seat back frame 528 can also include a plurality of features, such as, sections, or the like, designed to prevent a moment in the clockwise direction caused by the head restraint upon a rear impact. In one example, the upper cross member includes a first and second slot for vertical insertion of the guide member therein. The upper

cross member 542 also includes slip planes 665 which enable movement of the guides/head restraint in the vertical (up and down) directions.

[0066] Referring now to FIGS. 18-21F a one-piece seat back frame assembly 728 according to yet another embodiment is shown. In this embodiment, the one-piece back frame 728 generally includes a first side member 730 and an opposed second side member 736. The one-piece seat back frame 728 also includes an upper cross member 742 located between the first side member 730 and the second side member 736. An opposed lower cross member 748 is located between the first side member 730 and the second side member 736. The first side member 730, the second side member 736, the upper cross member 742 and lower cross member 748 form the substantially rectangular one-piece back frame 728 having a front surface 754 and a rear surface 756. The one-piece seat back frame 728 also includes a cross bracket member 780 coupled to the rear surface of the seat back frame 756 on the lower cross member 748 to create torsional integrity and reinforce the lower portion of the one-piece seat back frame 748 from forces, such as, side impact loads, or the like. The cross bracket member 780 may also extend a predetermined distance laterally across the seat back 728 and up the seat back 728 towards the upper cross member 742 on the front surface 754 and/or rear surface to create a continuous box-like section completely or partially up and/or laterally across the seat back 728. For example, the cross bracket member 780 may extend partially or completely up one or a combination of the seat back first side member 730, the seat back second side member 736, the upper cross member 742, the lower cross member 748, the head restraint frame first side member 845, the head restraint frame second side member 846, the head restraint upper cross member 844, or the like. One or more cross bracket members 780 may also partially or completely span the space between the first side member 730, the second side member 736, the upper cross member 748, or

the lower cross member 742 in a predetermined design, pattern, or manner. In this example, the cross bracket member 780 extends up the second side member 736 creating an integrated structural seat (ISS) having a boxed-like section, as shown in FIG. 21F, which further enhances seat performance, strength, or the like.

[0067] As with the previous embodiments, this one-piece seat back frame 728 (ISS front stamping) may be used in conjunction with dual and/or single recliner systems. The one-piece seat back frame 728 can be located adjacent to and/or in vertical alignment with the first and/or second seat back side member 730, 736. The one-piece seat back frame can be coupled to a restraint system 733, such as shoulder restraints having a retractor 735, a belt 737, or the like. The retractor 735 can be attached to another component, such as the seat track assembly, upper track of seat track assembly, seat frame, seat frame base portion, vehicle floor, or the like. The one-piece seat back frame can also include a feature 739, such as a guide, aperture, extension, bracket, or the like, located on the one-piece seat back frame 728 to secure the restraint system 733 in position. For example, the one-piece seat back frame may include a guide 739 on the upper portion of the one-piece seat back frame 728 to hold the belt 737 in position and for guiding the belt 737 such that the belt 737 may be pulled forward or retracted as desired and required by the seat occupant, as shown in FIG. 21B.

[0068] While the innovation of the present disclosure has been described with respect to the one-piece seat back frame described, it is contemplated that other types of seat back frames may also be used with the present innovation, such as, a standard multi-piece seat back frame, tube frame, other one-piece seat back frame designs, or the like.

[0069] Many modifications and variations of the present disclosure are possible in light of the above teachings. Therefore, within the scope of the appended claim, the present disclosure may be practiced other than as specifically described.

WHAT IS CLAIMED IS:

1. A one-piece seat back frame assembly having an integrated head restraint for use in a vehicle seat, the one-piece seat back frame assembly comprising:

a one-piece seat back frame having a first side member, a second side member spaced apart from the first side member, an upper cross member having a first end that is formed to a first side member upper end and a second end that is formed to a second side member upper end, a lower cross member having a first end and an opposed second end such that the lower cross member first end is formed to the first side member lower end and the second end is formed to the second side member lower end; and

a head restraint frame having a first side member, a second side member spaced apart from the first side member, and a upper cross member, wherein the head restraint first side member has an upper end and a lower end that is formed to the seat back upper cross member first end, and the head restraint second side member has an upper end and a lower end that is formed to the seat back upper cross member second end, and the head restraint upper cross member has a first end that is formed to the head restraint first side member upper end and a second end that is formed to the head restraint second side member upper end.

2. The one-piece seat back frame assembly of Claim 1, wherein the seat back frame and head restraint frame are constructed from a single stamping and as a single unitary body stamped from a single piece of material.

3. The one-piece seat back frame assembly of Claim 1, further comprising a lower cross bracket member having an elongated body portion having a first end, an opposed second end, a front surface, an opposed rear surface, a first wall extending outwardly from the body portion first end, and an opposed second wall extending outwardly from the body portion second

end, wherein the lower cross bracket member is coupled to the seat back frame such that the lower cross bracket member at least partially overlaps the seat back frame lower cross member forming a boxed section thereon.

4. The one-piece seat back frame assembly of Claim 3, wherein the lower cross bracket member at least partially overlaps the seat back frame first side member forming a boxed section thereon.

5. The one-piece seat back frame assembly of Claim 3, wherein the lower cross bracket member at least partially overlaps the seat back frame first and second side members forming a boxed section thereon.

6. The one-piece seat back frame assembly of Claim 3, wherein the lower cross bracket member overlaps the seat back frame first side member and at least partially overlaps the head restraint first side member forming a boxed section thereon.

7. The one-piece seat back frame assembly of Claim 1, further comprising an upper cross bracket member having an elongated body portion having a first end, an opposed second end, a front surface, an opposed rear surface, wherein the upper bracket member is attached to the seat back frame such that the upper cross bracket member at least partially overlaps the seat back frame upper portion to bolster the strength and rigidity of the seat back frame.

8. The one-piece seat back frame assembly of Claim 1, wherein the head restraint frame is angled away from the seat back frame in a forward direction relative to the seat back frame.

9. The one-piece seat back frame assembly of Claim 1, wherein the head restraint frame includes a U-shaped channel that bolsters the strength and rigidity of the head restraint frame.

10. The one-piece seat back frame assembly of Claim 1, further comprising a DVD device attached to the seat back frame assembly.

11. The one-piece seat back frame assembly of Claim 1, further comprising a projection screen attached to the seat back frame assembly.

12. The one-piece seat back frame assembly of Claim 1, further comprising lighting and mirror fixtures attached to the seat back frame assembly.

13. A one-piece seat back frame assembly having an integrated head restraint for use in a vehicle seat, the one-piece seat back frame assembly comprising:

a one-piece seat back frame having a first side member, a second side member spaced apart from the first side member, an upper cross member having a first end that is formed to a first side member upper end and a second end that is formed to a second side member upper end, a lower cross member having a first end and an opposed second end, such that the lower cross member first end is formed to the first side member lower end and the second end is formed to the second side member lower end;

a lower cross bracket member having an elongated body portion having a first end, an opposed second end, a front surface, an opposed rear surface, a first wall extending outwardly from the body portion first end, and an opposed second wall extending outwardly from the body portion second end, wherein the lower cross bracket member is coupled to the seat back frame such that the lower cross bracket member at least partially overlaps the seat back frame lower cross member forming a boxed section thereon; and

a head restraint frame having a first side member, a second side member spaced apart from the first side member, and a upper cross member, such that the head restraint first side member has an upper end and a lower end that is formed to the seat back upper cross member

first end, the head restraint second side member has an upper end and a lower end that is formed to the seat back upper cross member second end, and the head restraint upper cross member has a first end that is formed to the head restraint first side member upper end and a second end that is formed to the head restraint second side member upper end, wherein the seat back frame and head restraint frame are constructed from a single stamping as a single unitary body stamped from a single piece of material.

14. A method of manufacturing a one-piece seat back frame assembly having an integrated head restraint, the method comprising the steps of:

forming a one-piece seat back frame having an a head restraint frame constructed from a single stamping as a single unitary body stamped from a single piece of material.

15. The method of manufacturing a one-piece seat back frame assembly having an integrated head restraint, the method further comprising the step of:

providing a cross bracket member to be installed on the one-piece seat back frame;

selecting appropriate pivot brackets and recliner mechanisms to be installed onto the cross bracket member;

installing and securing the pivot brackets and recliner mechanisms onto the cross bracket member; and

installing and securing the cross bracket member to the one-piece seat back frame.

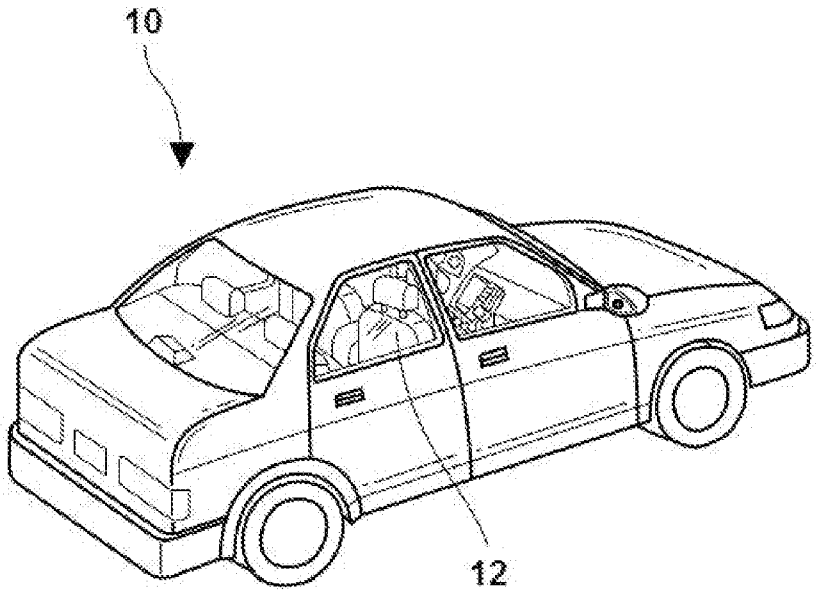

FIG.1

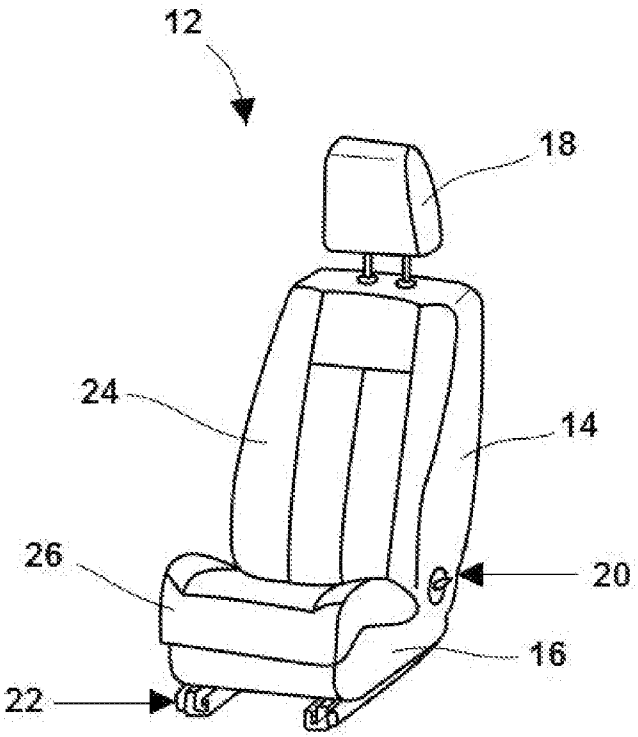

FIG.2

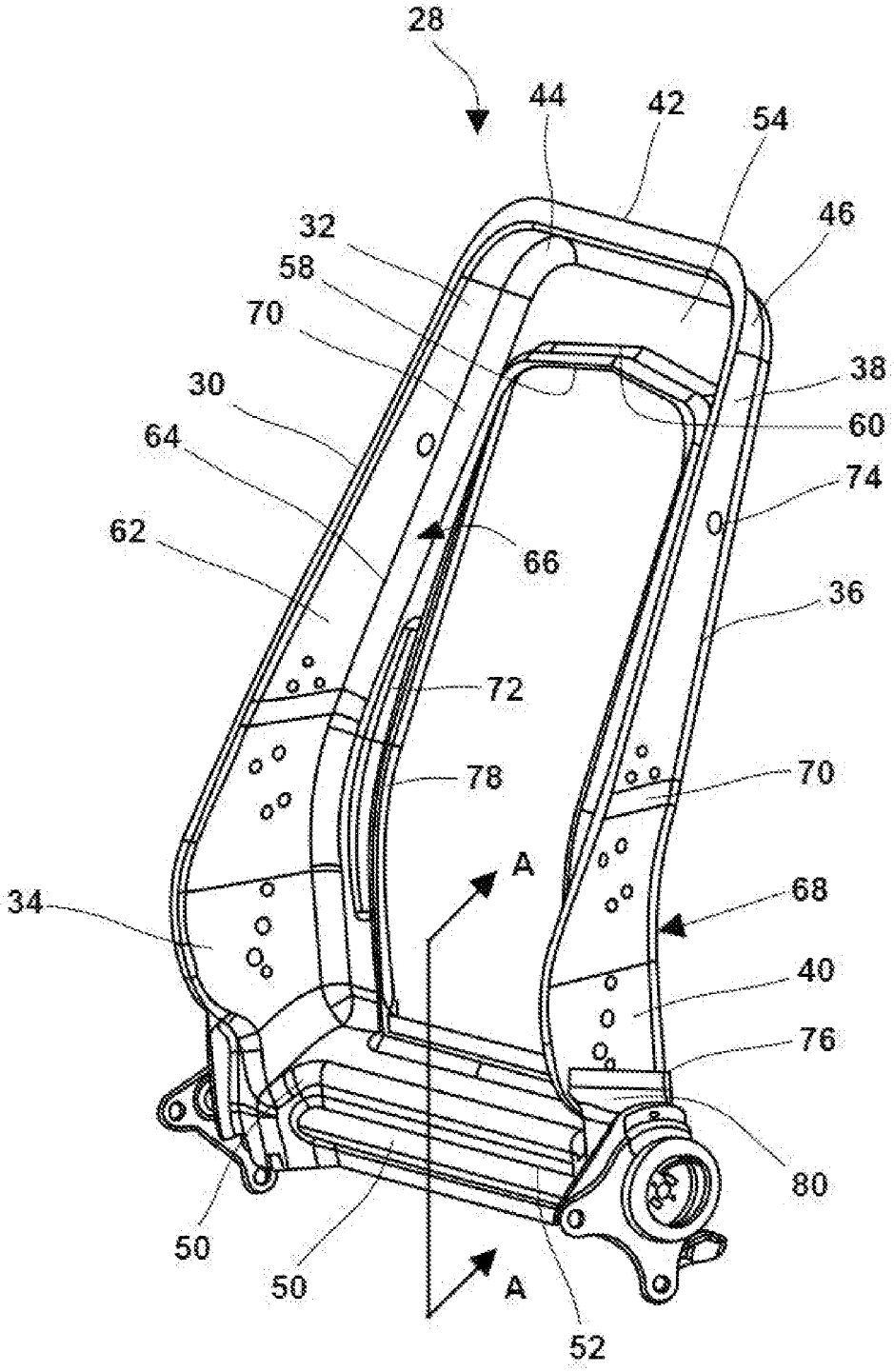
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FIG.3

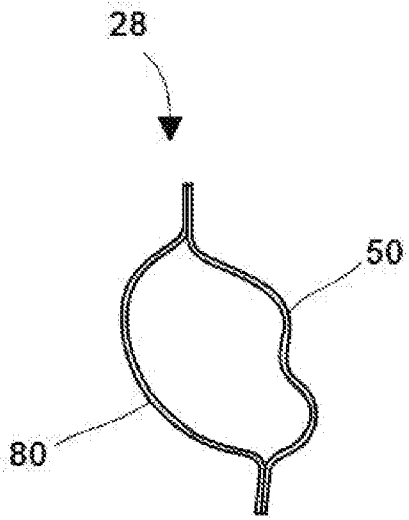

FIG.4

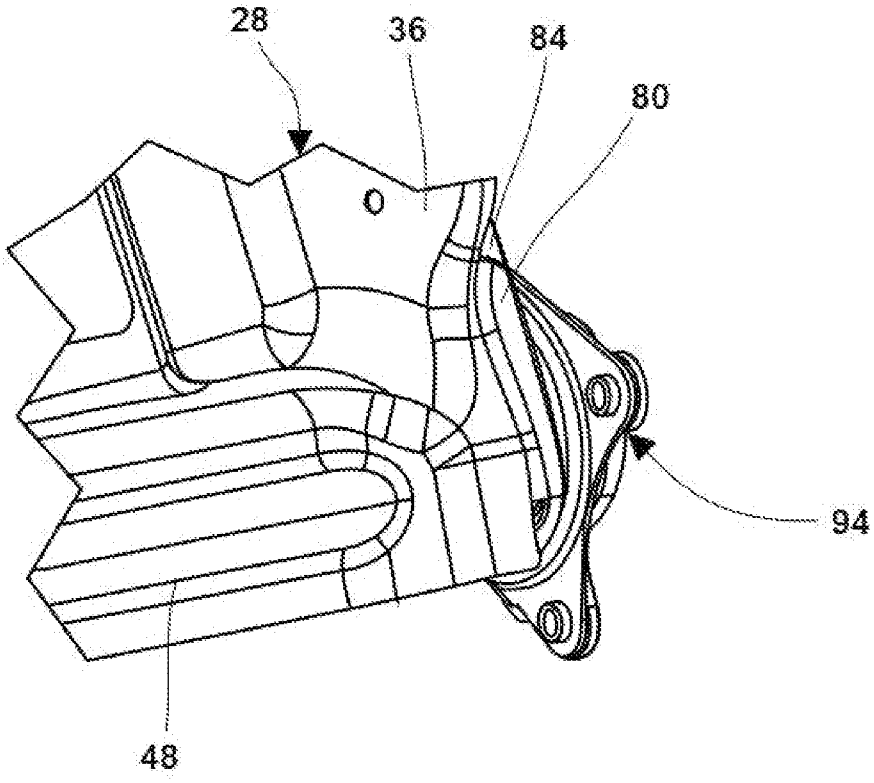

FIG.6

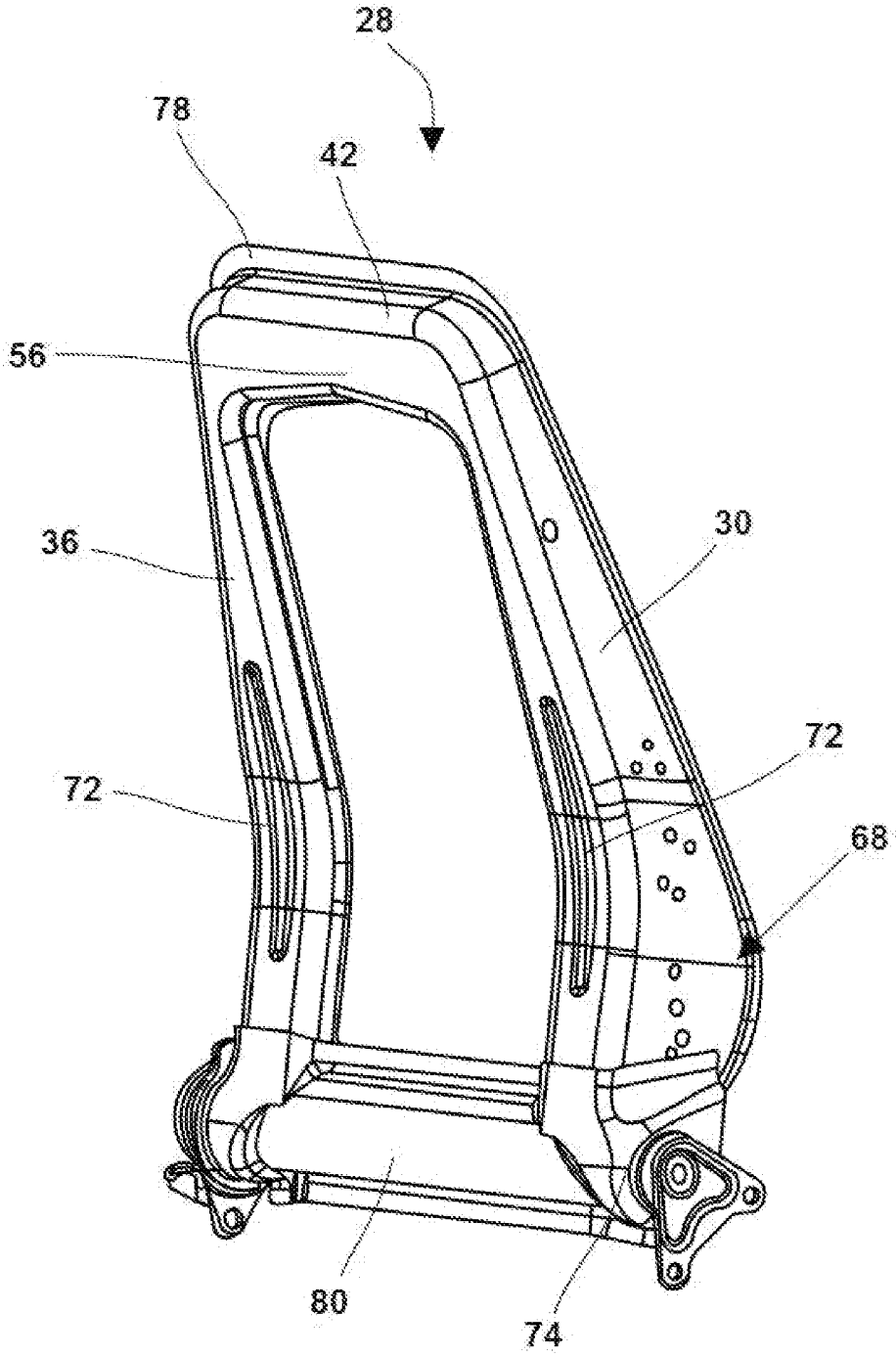

FIG.5

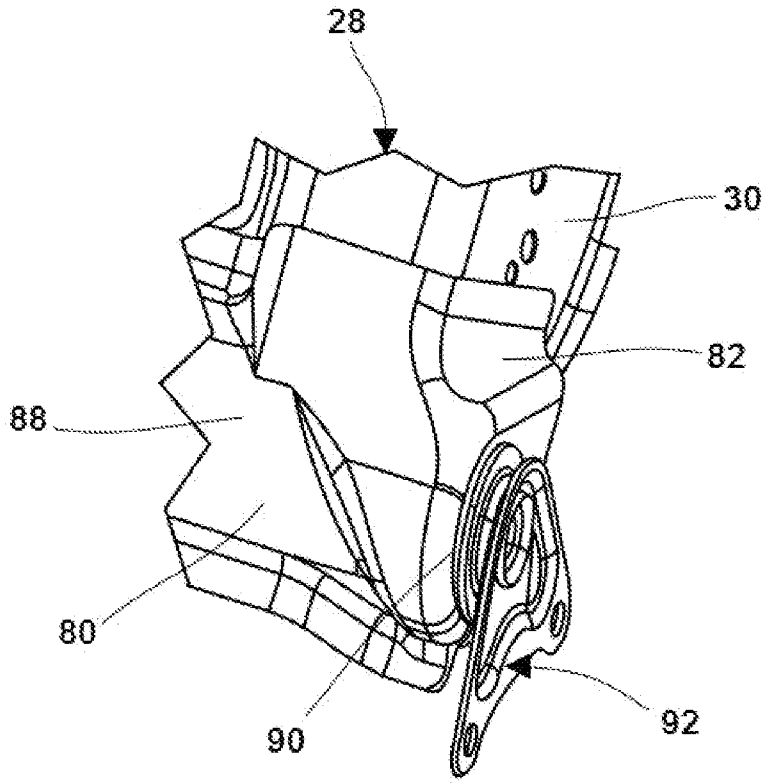
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FIG.7

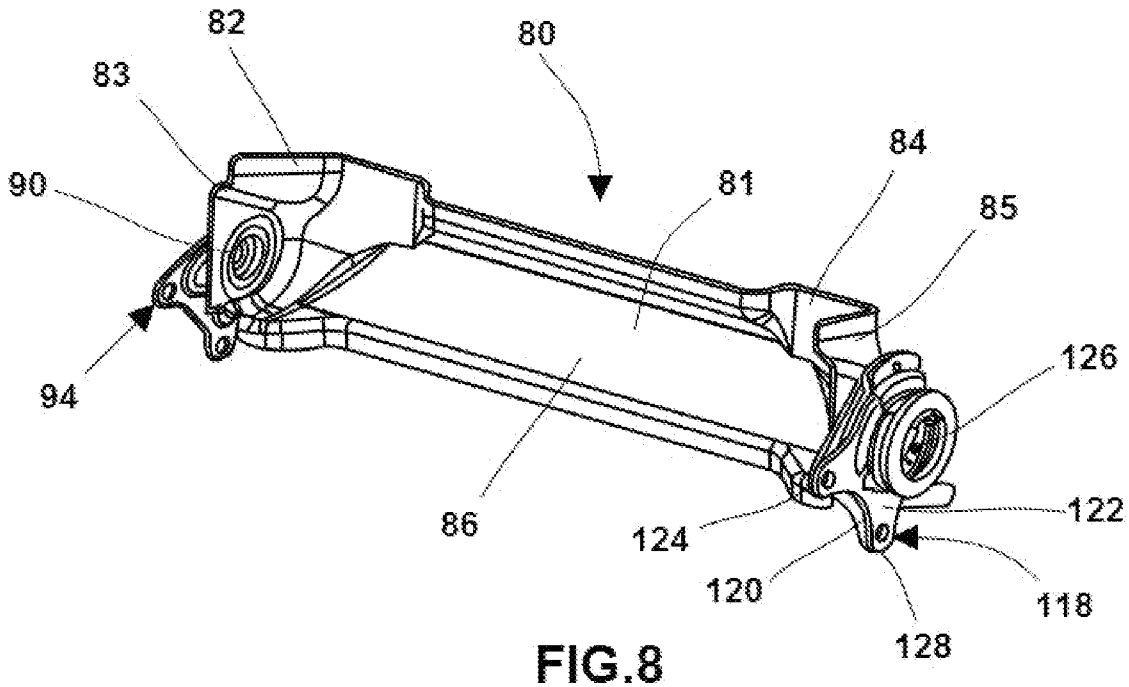
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FIG.8

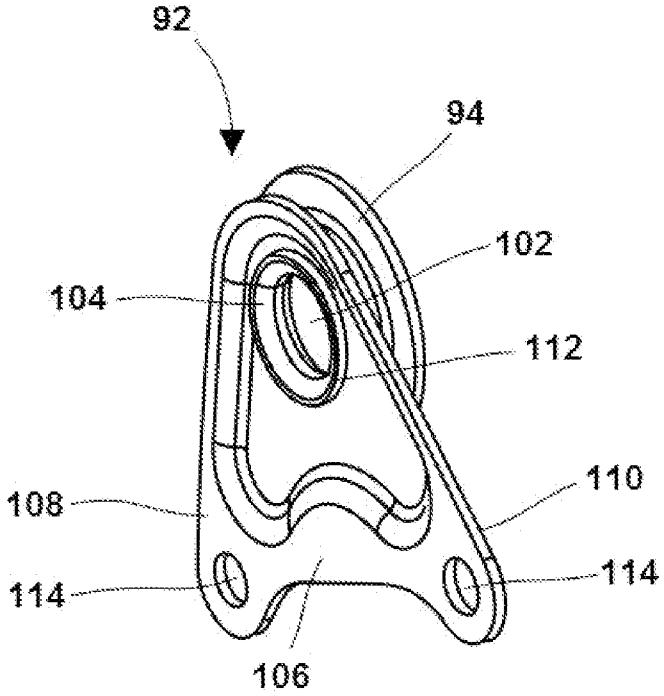

FIG.9

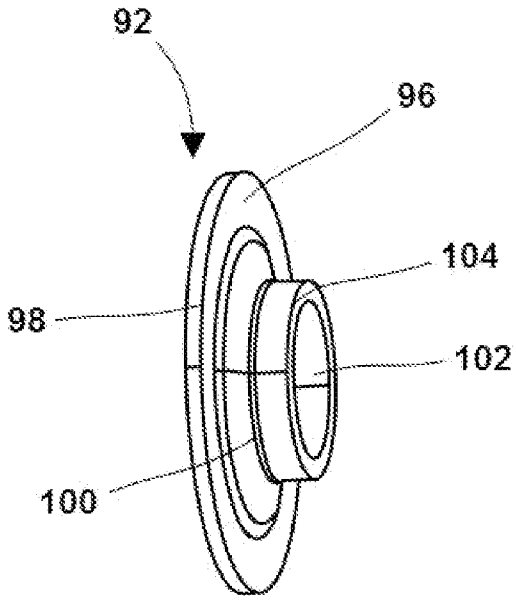

FIG.10

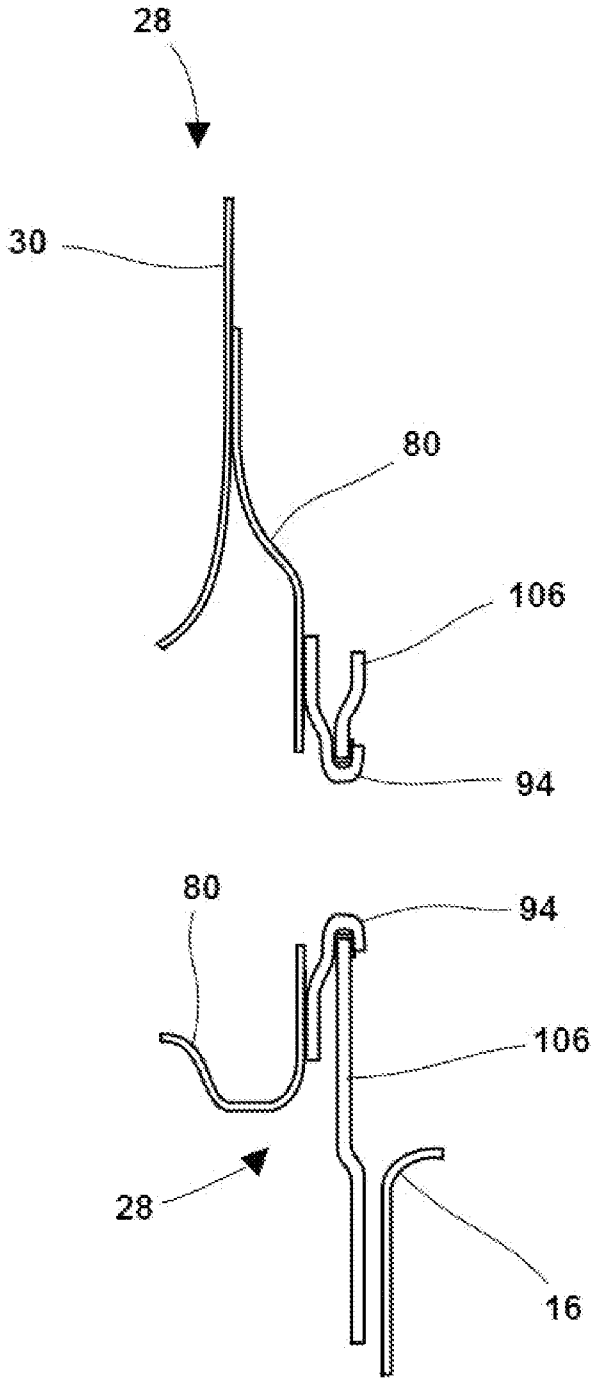

FIG.11

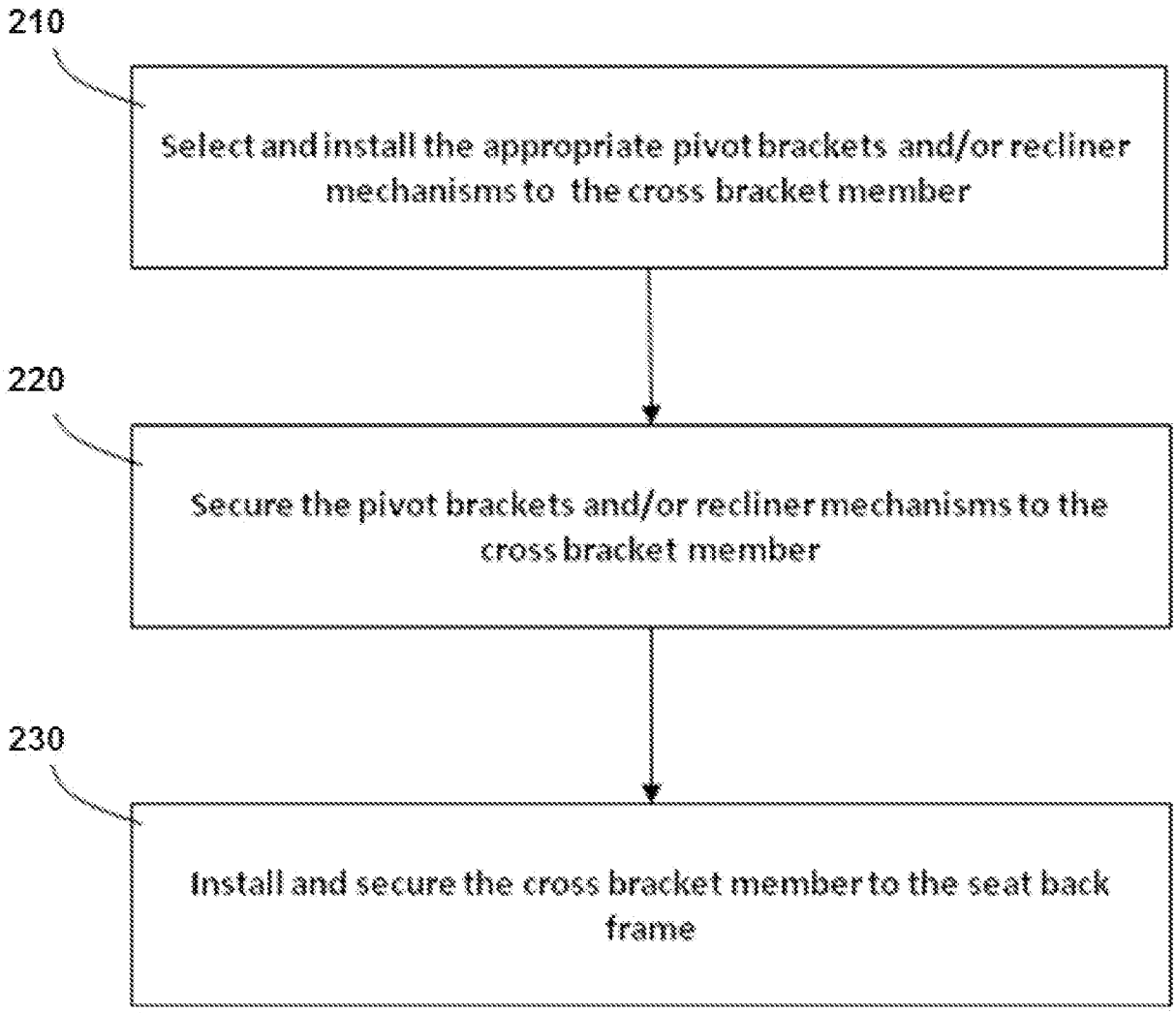
210
Select and install the appropriate pivot brackets and/or recliner mechanisms to the cross bracket member
220
Secure the pivot brackets and/or recliner mechanisms to the cross bracket member
230
Install and secure the cross bracket member to the seat back frame

FIG.12

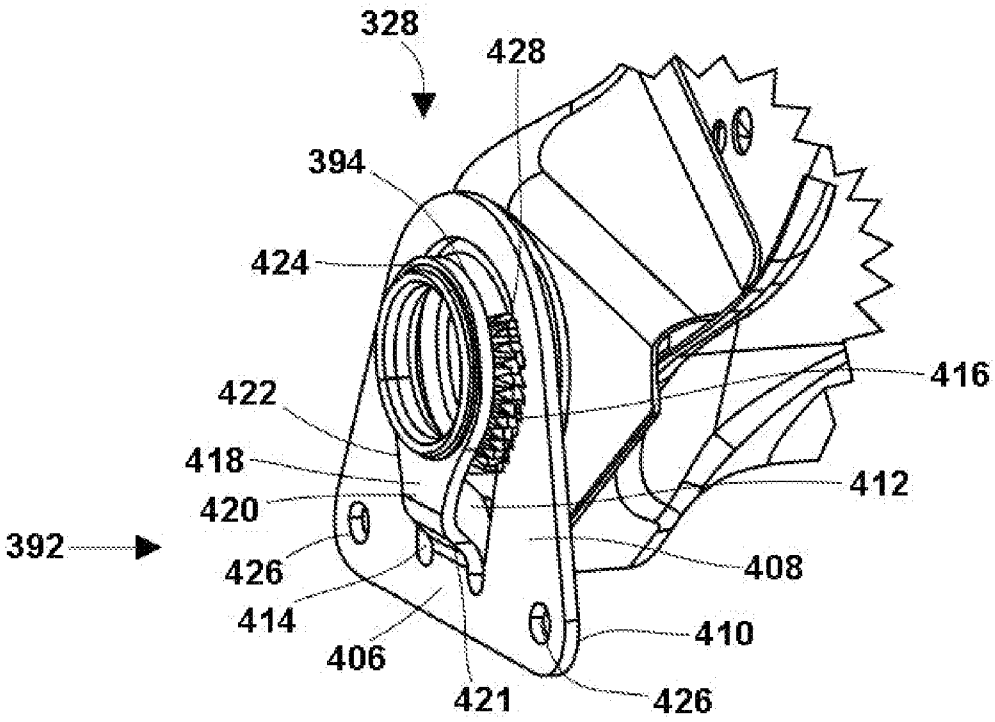
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FIG.13

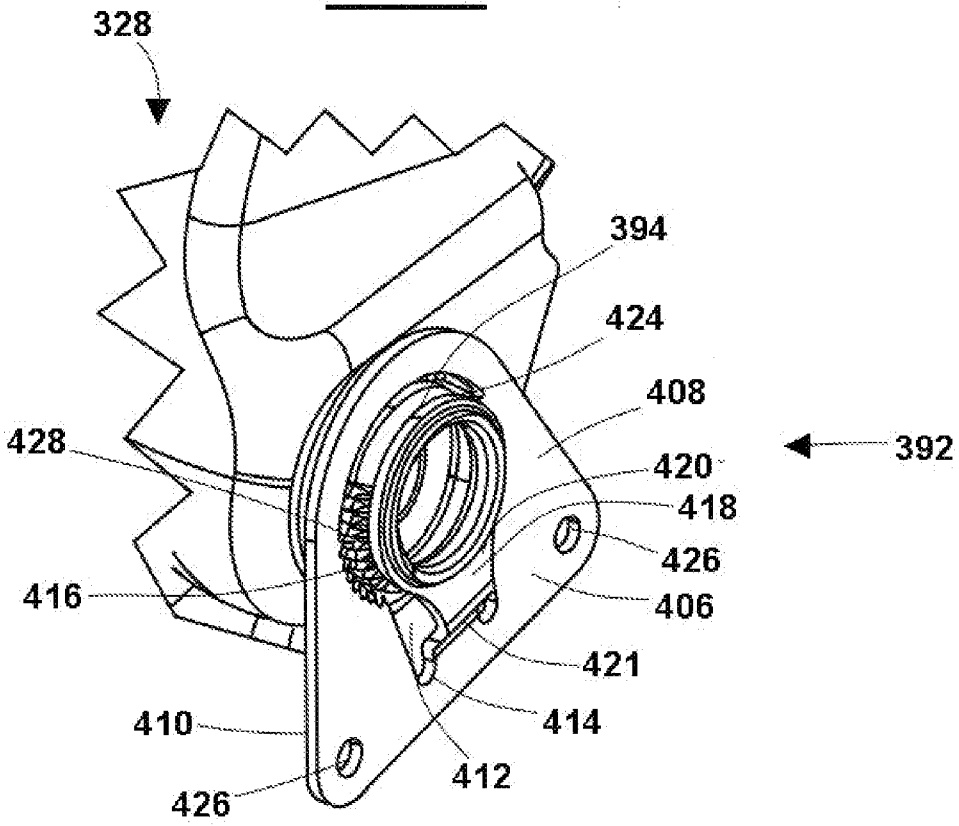
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FIG.14

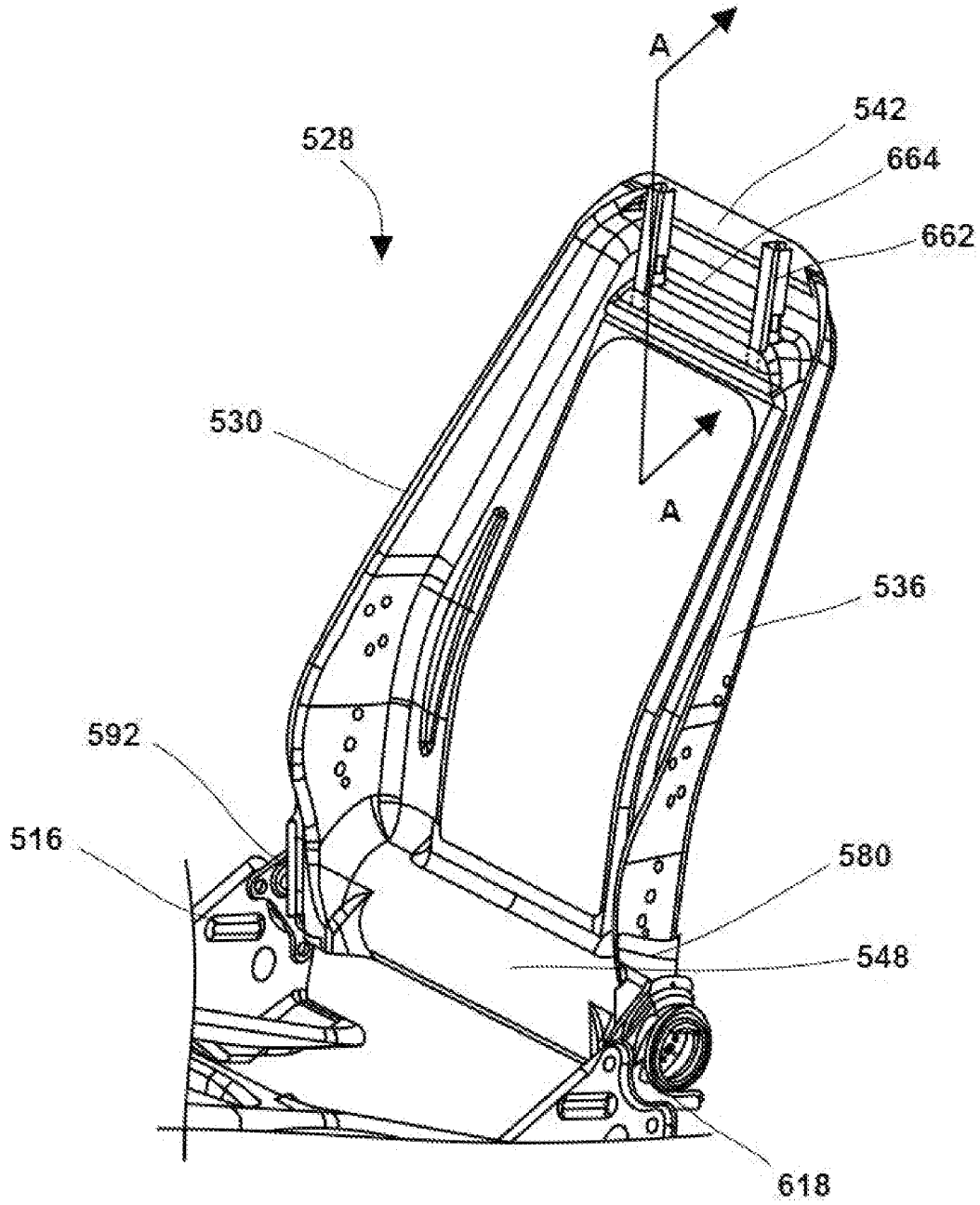


FIG.15

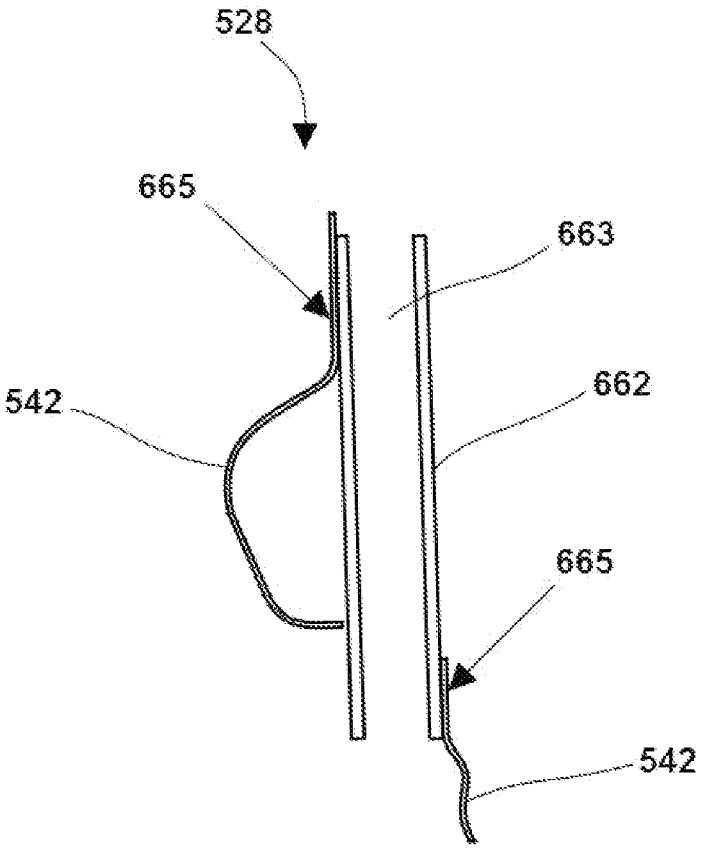


FIG.16

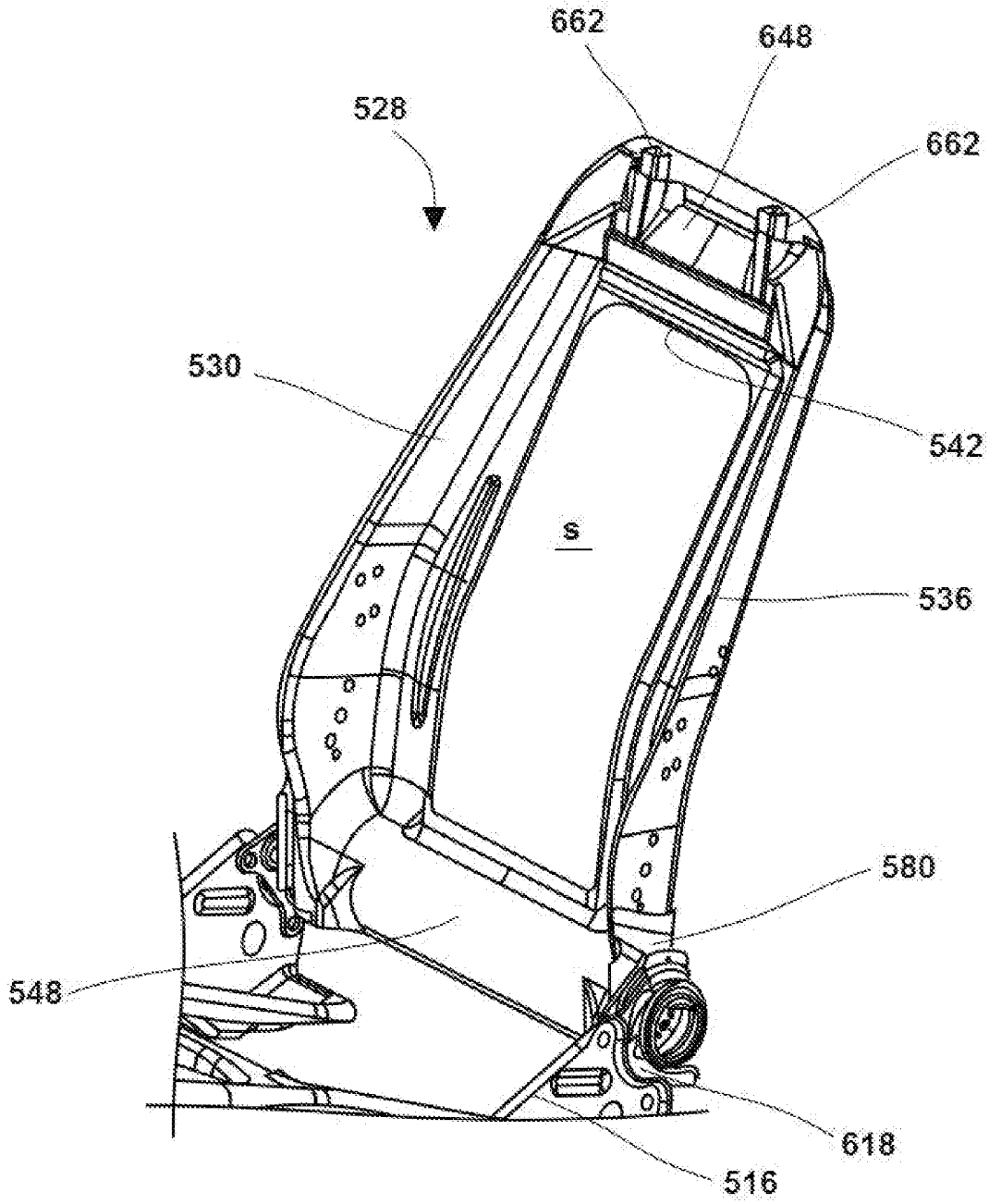


FIG.17

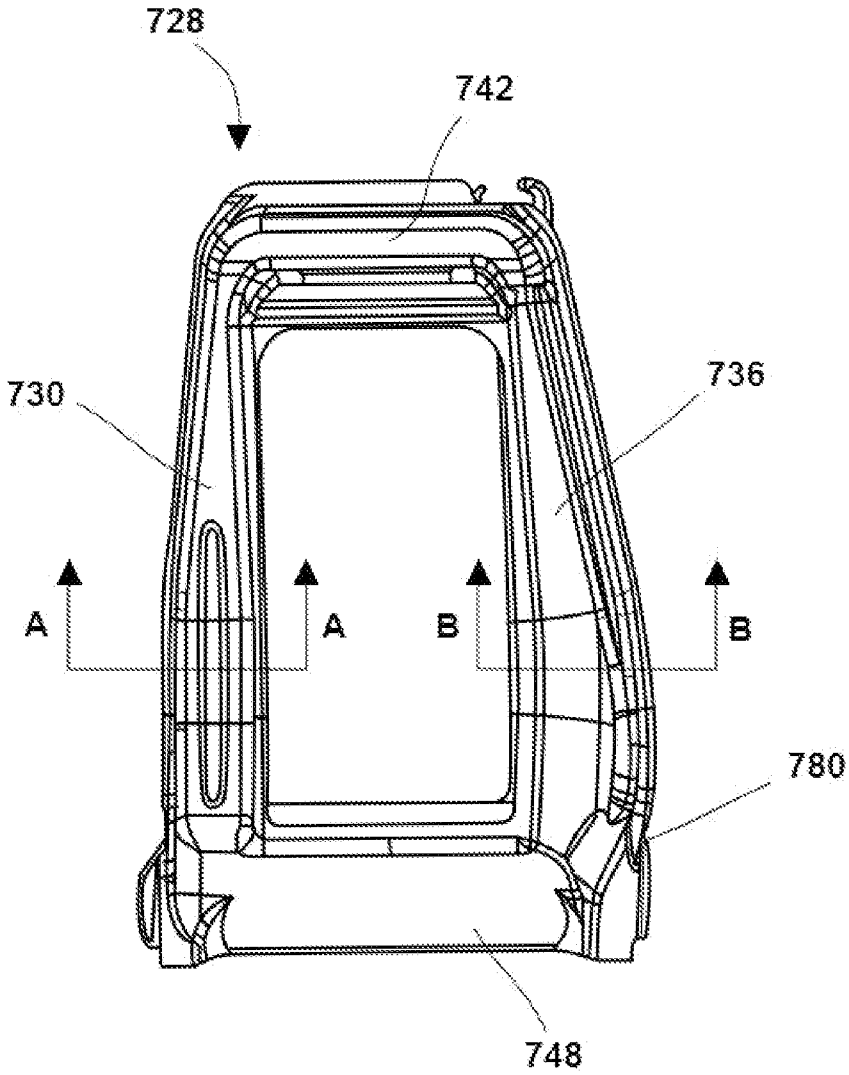


FIG.18

FIG.19

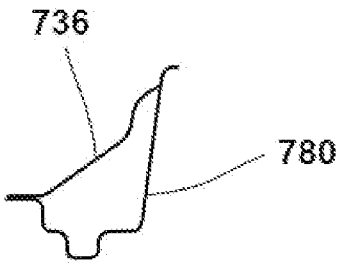


FIG.20

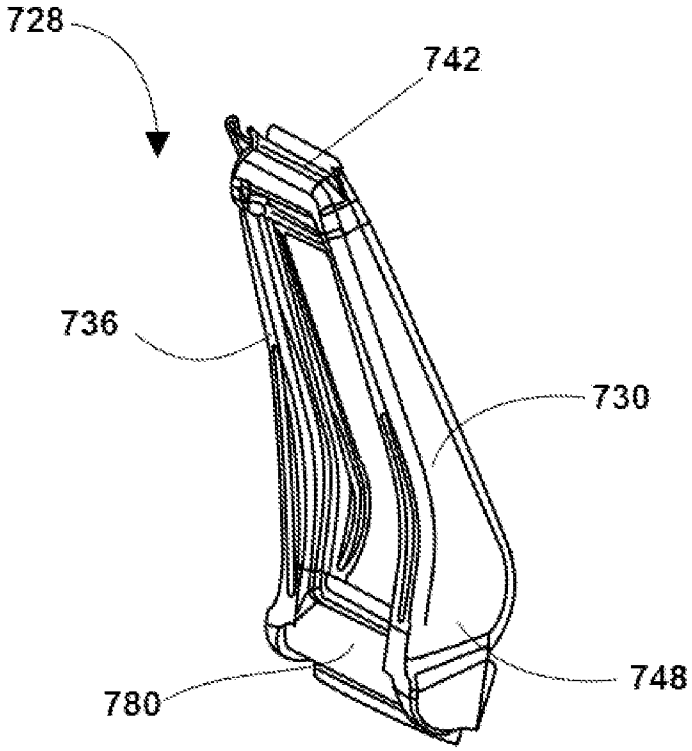


FIG.21A

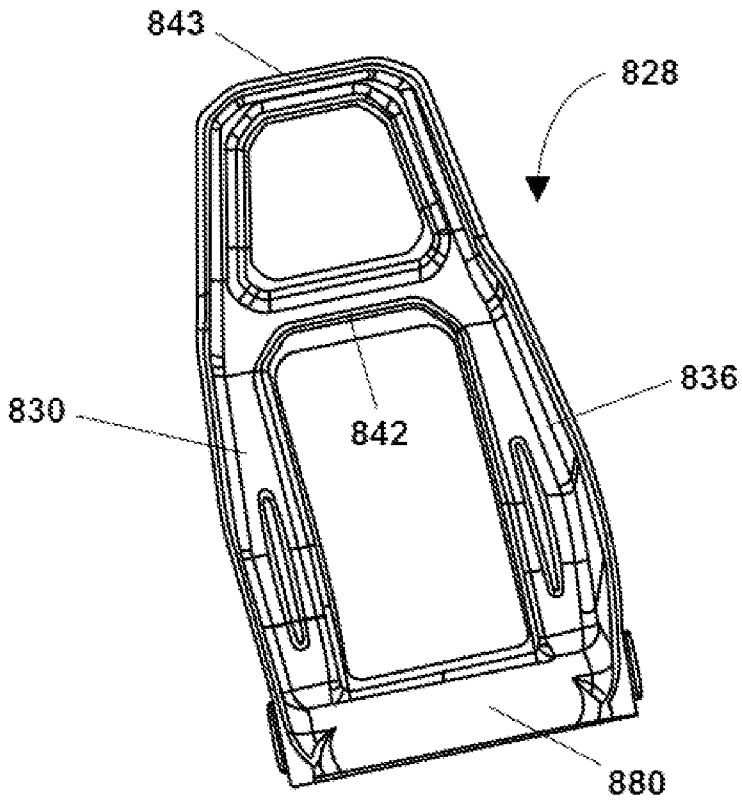


FIG.22

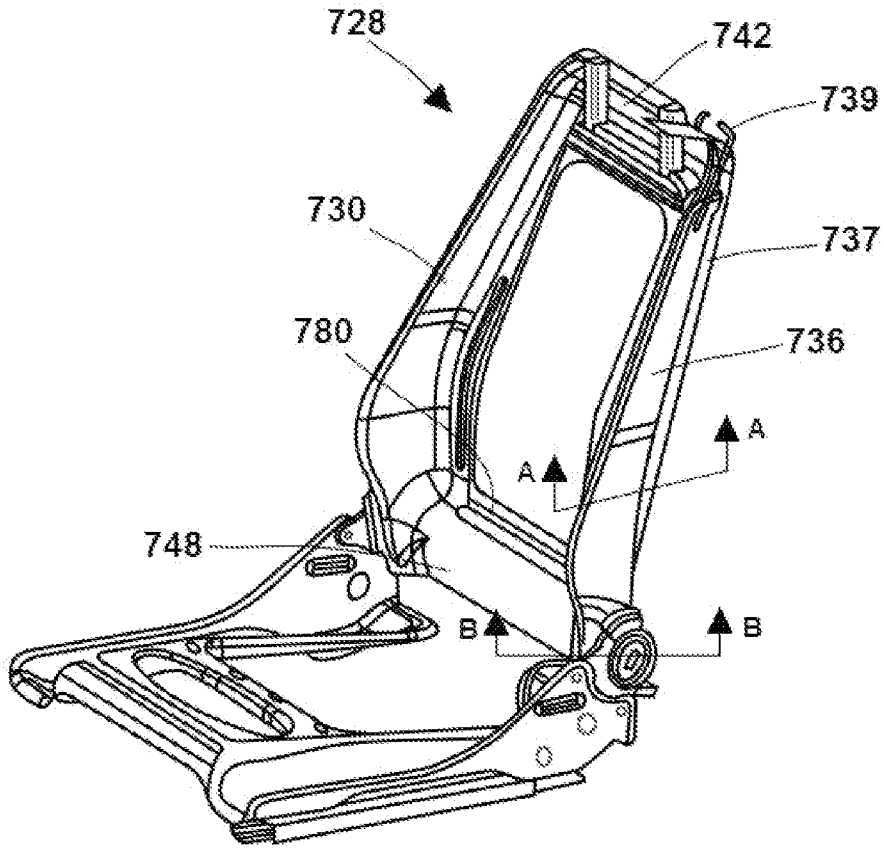
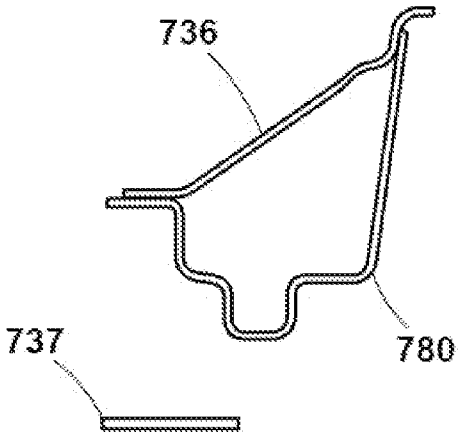
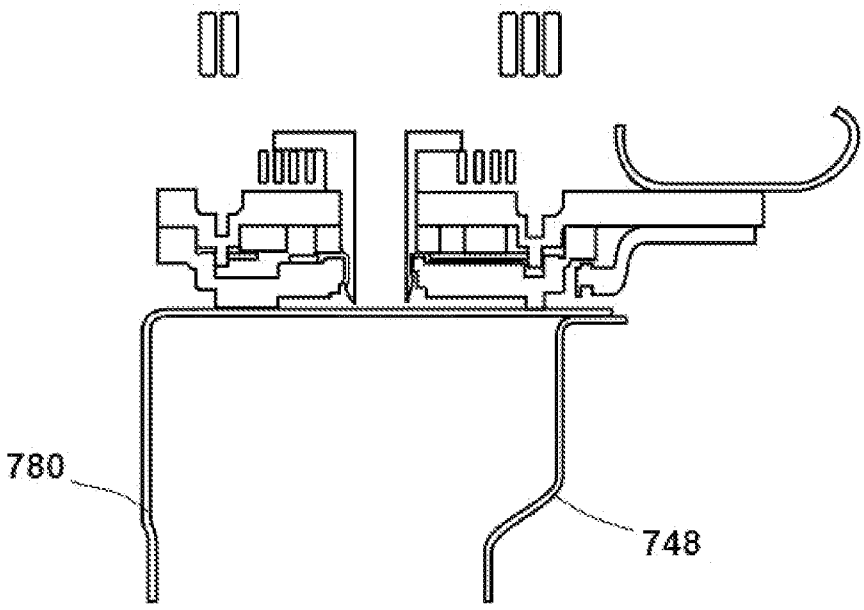


FIG.21B



SECTION A-A

FIG.21C



SECTION B-B

FIG.21D

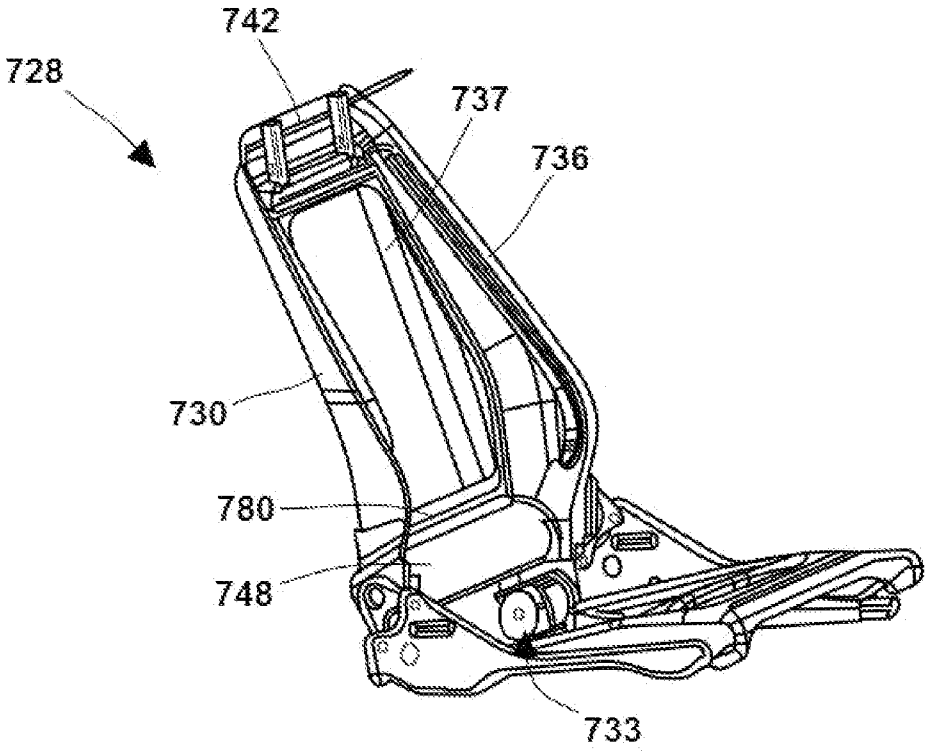


FIG.21E

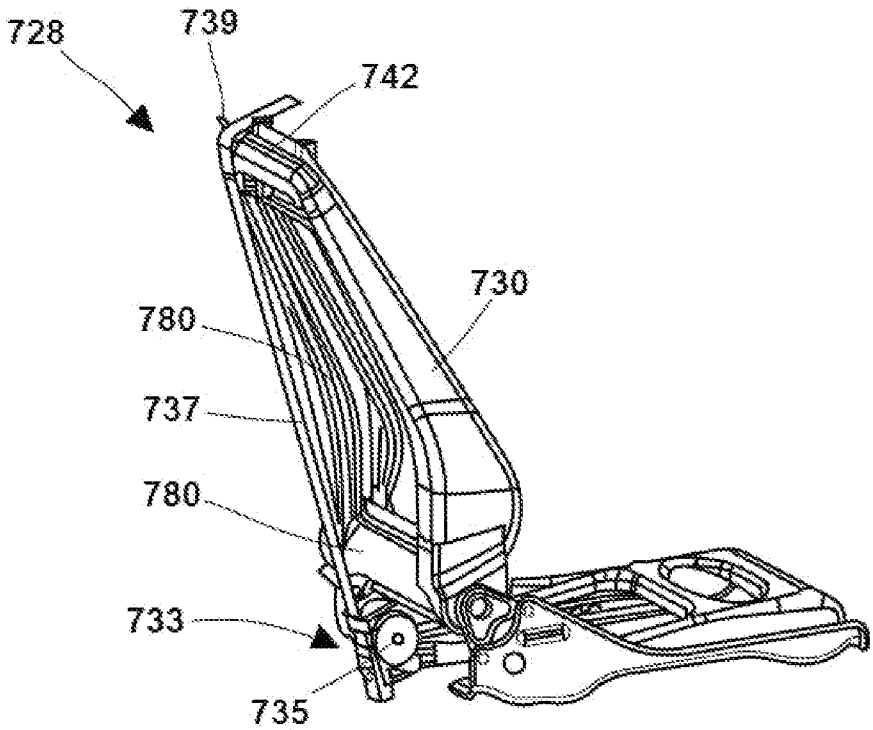


FIG.21F

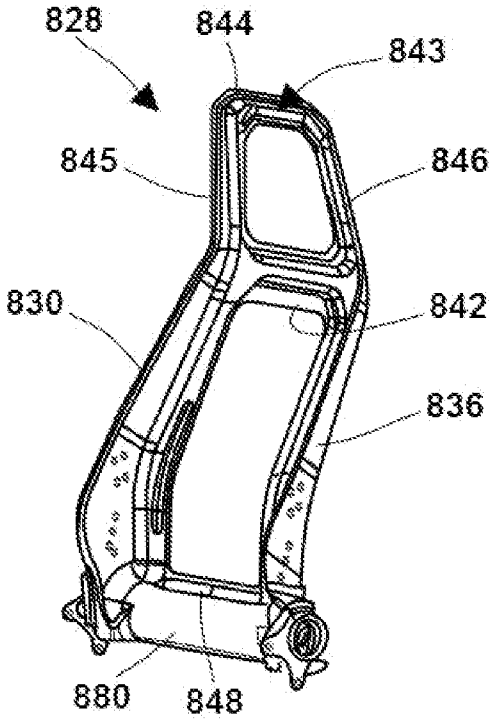

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FIG.23

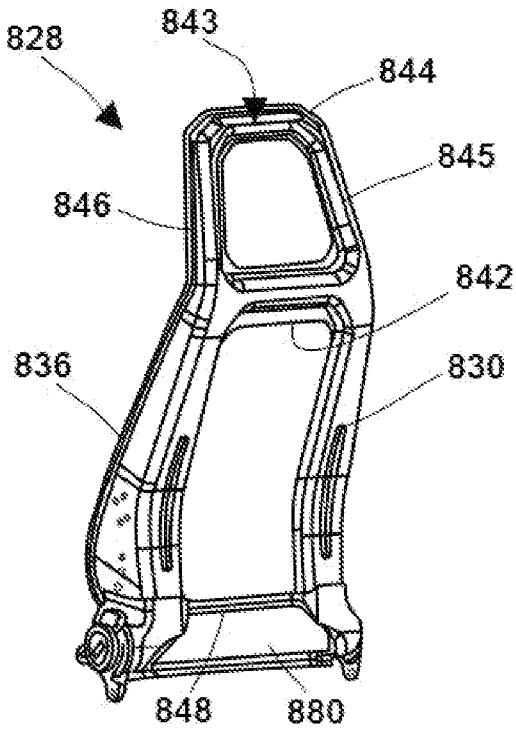
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FIG.24

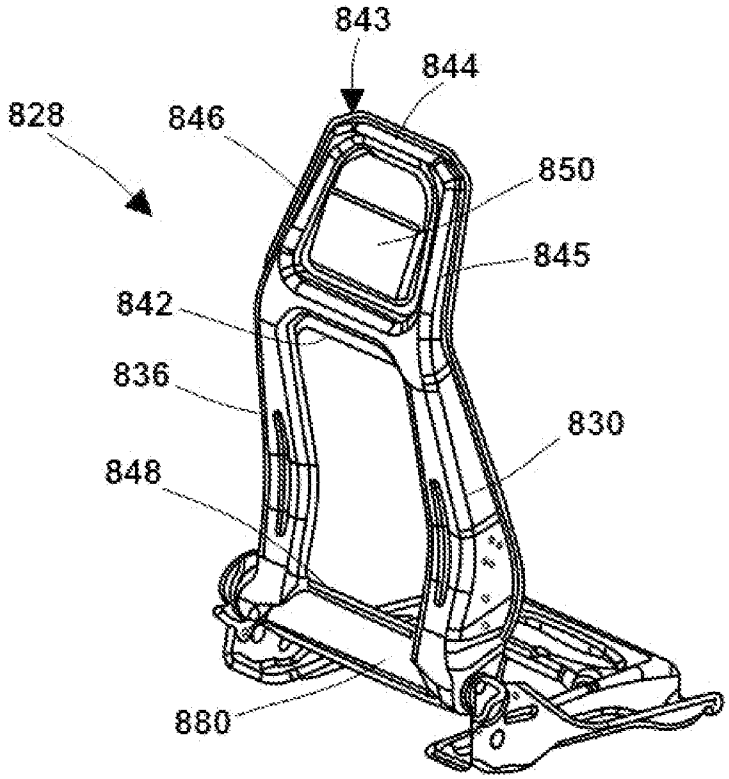
843
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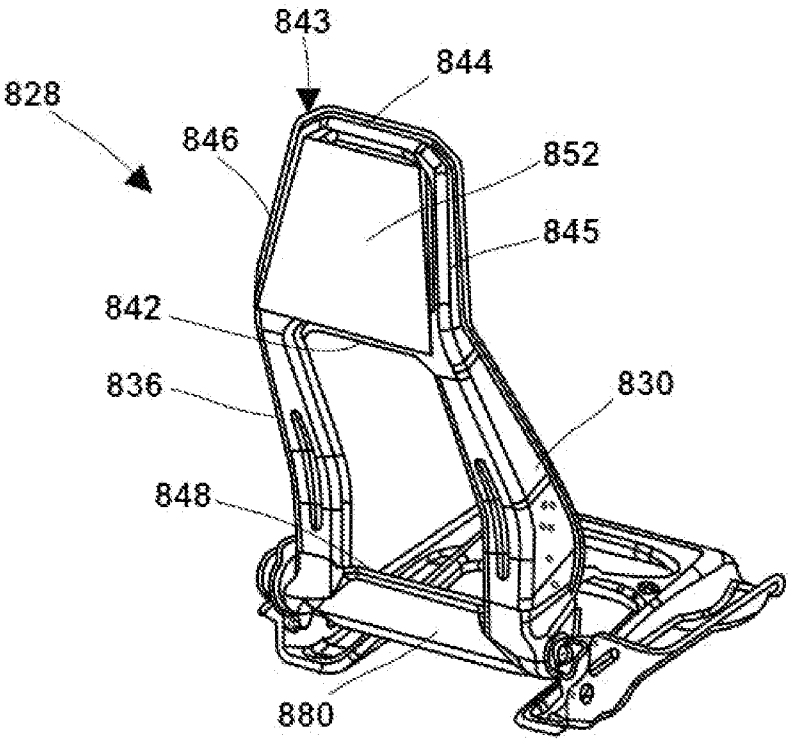
FIG.25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880

FIG.26

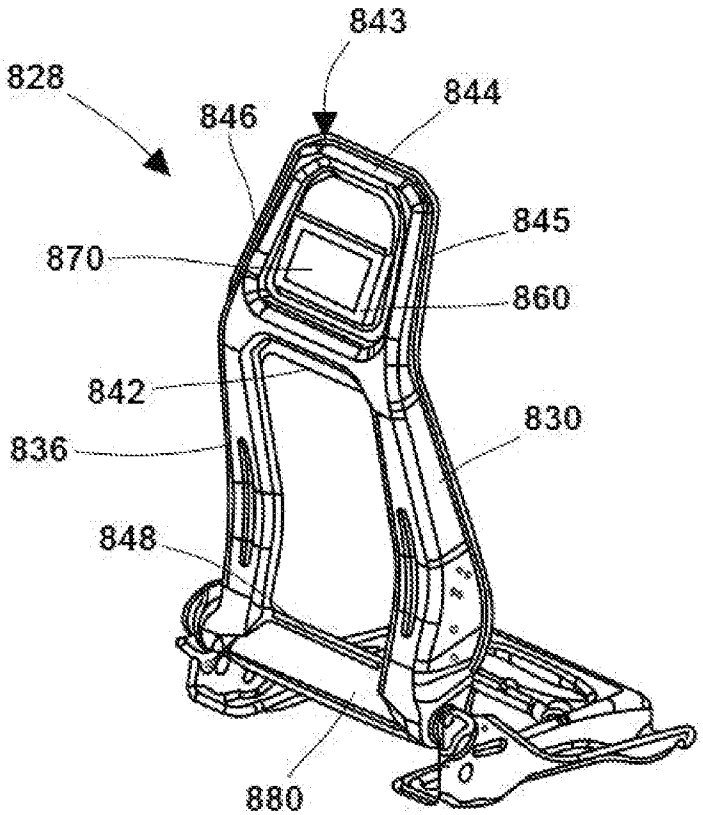

FIG.27

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2011/031587

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - B60N 2/68 (2011.01)
USPC - 297/452.18
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - B60N 2/68 (2011.01)
USPC - 297/452.1, 452.18, 452.2, 452.65

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	US 2005/0168041 A1 (GLANCE et al) 04 August 2005 (04.08.2005) entire document	1, 8 -------- 2-7, 9-13, 15
X -- Y	US 5,810,446 A (TADOKORO) 22 September 1998 (22.09.1998) entire document	14 -------- 2, 13
Y	US 2008/0129097 A1 (KOWAL et al) 05 June 2008 (05.06.2008) entire document	3-6, 13
Y	US 6,913,318 B2 (HIGLEY et al) 05 July 2005 (05.07.2005) entire document	7
Y	US 6,378,946 B1 (COPE et al) 30 April 2002 (30.04.2002) entire document	9
Y	US 7,252,340 B2 (JOHNSON) 07 August 2007 (07.08.2007) entire document	10-12
Y	US 6,682,146 B2 (MINAI) 27 January 2004 (27.01.2004) entire document	15

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 May 2011	02 JUN 2011
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

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