

LATCH AND ADJUSTMENT SYSTEM FOR INFANT CHILD SEATS

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Application No. 63/483,989, filed on February 9, 2023, and U.S. Application No. 63/492,889, filed on March 29, 2023, which is incorporated herein by reference in its entirety.

BACKGROUND

[0001] Automobiles, busses, airplanes, boats, trains, and the like are common forms of transportation (hereinafter “vehicle”) for many parents, guardians, and caregivers (hereinafter “caregiver”) of children worldwide. Many conventional vehicles, often include restraints (e.g., seat belts) that are designed to protect adults and/or children of a certain age (e.g., at least 9 years old) and/or size (e.g., at least 57 inches in height). For relatively younger and/or smaller children and particularly infants, however, the restraints in various vehicles do not generally provide adequate protection. In view of the foregoing, to provide adequate protection for children during travel, caregivers often utilize a child safety seat or infant car seat when transporting a child in a vehicle.

[0002] Because children grow and experience substantial physical development during their first five years of life, different types of child safety seats are used to ensure that the child remains sufficiently restrained and protected during transport in a vehicle. More specifically, a given child safety seat generally is selected, and installed in the vehicle in a certain manner, based on the size, weight, and/or age of the child. An “infant car seat” is a type of child safety seat tailored specifically for infants being transported in a vehicle. An “infant” generally refers to a child who has not yet learned how to walk and typically corresponds to children who are 0 to about 12 months in age and/or weigh up to about 20 to 30 pounds. The infant car seat may be used more generally to carry and hold an infant beyond a vehicle or stroller. Once a child outgrows the infant car seat, the infant car seat system in the vehicle is generally replaced by a “convertible” car seat. In contrast to the infant car seat system, the convertible car seat is larger in size and generally supports both rear-facing and forward-facing configurations to accommodate the physical development of the child. Additionally, unlike the infant car seat, the convertible car seat is typically not portable and rather is a stationary device that remains within the vehicle, i.e., the child is placed into and/or taken out of the convertible car seat at the beginning and end of a vehicle journey. Because it is not intended to carry a child outside of a vehicle, a conventional convertible car seat does not include a carrying handle as found on

infant car seats; similarly, the convertible car seat would not include a curved rocker bottom for rocking an infant. Once the child outgrows the convertible car seat, the convertible car seat may then be replaced by an even larger seat, or ultimately a booster seat. The child may continue to use the booster seat until they are able to safely use the vehicle's seats and restraints without the aid of the booster seat.

[0003] With respect to installation in a vehicle, child safety seats may utilize existing seat belts in a vehicle to secure the child safety seat in the vehicle. To this end, various child safety seats include a vehicle belt path through which the vehicle's existing seat belt can pass to hold the child safety seat to the vehicle's seat. Alternatives to using existing vehicle seat belts include, for example, "vehicle lower anchors" located in the bight of vehicle seats in passenger cars and/or other vehicle attachment points.

[0004] National Child Passenger Safety (CPS) Certification program provides a standard for child passenger safety certification. According to the CPS, a child safety seat when properly installed in a vehicle should pass an "inch test," i.e., a properly installed child safety seat should not move more than one inch front to back or side to side when pulled at the seat belt path. This rule applies for forward-facing child safety seats and rear-facing child safety seats, such as an infant car seat, and when the child safety seat is secured to the vehicle seat using either an existing vehicle seat belt or a standardized anchor system including vehicle lower anchors.

SUMMARY

[0005] According to some embodiments, infant car seat systems for use with vehicle seats are provided. The infant car seat systems include an infant car seat shell configured to support an infant and an adjustable anchor system including at least one anchor releasably engageable with the vehicle seat. The adjustable anchor system is coupled to the seat shell such that the at least one anchor is movable between a retracted state and an extended state. In the retracted state, the at least one anchor of the adjustable anchor system is retracted and secured to the infant car seat shell. In the extended state, the at least one anchor of the adjustable anchor system is extended and fixed in position relative to the infant car seat shell for securing the infant car seat to the vehicle seat.

[0006] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the seat shell comprises a retraction slot to receive at least a portion of the adjustable anchor system in the retracted state.

[0007] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the at least one anchor comprises two anchors and the adjustable anchor system includes an adjustable frame arranged within the seat shell and configured to slidably move relative thereto, wherein the two anchors are arranged at a forward end of the adjustable frame and a cross member extending between the two anchors.

[0008] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include a pivot member pivotably connected between a part of the seat shell and the cross member.

[0009] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include a releasable locking connection configured to selectively and releasably fix a position of the adjustable frame relative to the seat shell.

[0010] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the seat shell comprises two seat shell rails, and a portion of the adjustable frame extends through each of the two seat shell rails.

[0011] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the adjustable anchor system comprises a releasable locking connection configured to selectively and releasably fix a position of the at least one anchor relative to the seat shell.

[0012] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the at least one anchor is connected to a cross member and wherein the releasable locking connection comprises an element having a fixed connection at the cross member and a releasable locking connection arranged on the seat shell and configured to selectively lock a length of the releasable locking connection.

[0013] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the releasable locking connection comprises a webbing, a belt, or a strap.

[0014] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the at least one anchor comprises two anchors and wherein the adjustable anchor system includes a cross member extending between the two anchors, an adjustable anchor connector associated with each of the

two anchors, wherein the adjustable anchor connector is wound about a portion of the cross member, and an adjustable locking member wound about a portion of the cross member.

[0015] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that a winding direction of the adjustable anchor connectors is opposite to a winding direction of the adjustable locking member.

[0016] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include a crank handle configured for manual rotation of the cross member.

[0017] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the at least one anchor comprises two anchors and wherein the adjustable anchor system includes a cross member extending between the two anchors and a pivot member pivotably arranged between the seat shell and the cross member.

[0018] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the adjustable anchor system further includes a link assembly arranged in pivotable connection between at least one of the cross member and the pivot member and the seat shell.

[0019] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the adjustable anchor system includes a rigid frame member fixedly positioned on or in the seat shell and a movable frame member movably arranged with respect to the rigid frame member, wherein the at least one anchor is arranged at an end of the moveable frame member.

[0020] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the adjustable anchor system further includes a releasable locking connection configured to selectively fix a relative position between the rigid frame member and the movable frame member.

[0021] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that adjustable anchor system is configured to be secured to the vehicle seat in each of the retracted state and the extended state.

[0022] According to some embodiments, infant car seat systems for use with vehicle seats are provided. The infant car seat systems include an infant car seat shell having a front and a back and an adjustable anchor system associated with the infant car seat shell. The

adjustable anchor system includes at least one anchor configured to releasably engage with a part of a vehicle seat, and a frame comprising at least a movable portion, wherein the at least one anchor is coupled to the movable portion of the frame and wherein the movable portion of the frame is movable relative to the infant car seat shell between a retracted state and an extended state. In the extended state, the moveable portion of the frame is unlocked and movable with the at least one anchor with respect to at least one of an axial distance from the front of the infant car seat shell and an angle of orientation relative to the infant car seat shell.

[0023] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the adjustable anchor system is configured to have a locked state, wherein the movable portion of the frame is locked relative to the seat shell.

[0024] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the seat shell comprises a retraction slot to receive at least a portion of the adjustable anchor system in the retracted state.

[0025] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the at least one anchor comprises two anchors and the adjustable anchor system include an adjustable frame arranged within the seat shell and configured to slidingly move relative thereto, wherein the two anchors are arranged at a forward end of the adjustable frame and a cross member extending between the two anchors.

[0026] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the adjustable anchor system comprises a releasable locking connection configured to selectively and releasably fix a position of the at least one anchor relative to the seat shell.

[0027] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the at least one anchor comprises two anchors and wherein the adjustable anchor system includes a cross member extending between the two anchors, an adjustable anchor connector associated with each of the two anchors, wherein the adjustable anchor connector is wound about a portion of the cross member, and an adjustable locking member wound about a portion of the cross member.

[0028] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the at least one anchor comprises two anchors and wherein the adjustable anchor system includes a cross member

extending between the two anchors and a pivot member pivotably arranged between the seat shell and the cross member.

[0029] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the adjustable anchor system includes a rigid frame member fixedly positioned on or in the seat shell and a movable frame member movably arranged with respect to the rigid frame member, wherein the at least one anchor is arranged at an end of the moveable frame member.

[0030] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that adjustable anchor system is configured to be secured to the vehicle seat in each of the retracted state and the extended state.

[0031] According to some embodiments, infant car seat systems for use with vehicle seats are provided. The infant car seat systems include an infant car seat shell having a front and a back and an adjustable anchor system associated with the infant car seat shell. The adjustable anchor system includes a pivot member coupled to the infant car seat shell, at least one anchor configured to releasably engage with a part of the vehicle seat, the at least one anchor attached to the pivot member and being movable between a retracted state and an extended state, and an adjustable locking member that interacts with the pivot member to move the at least one anchor toward the retracted state.

[0032] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include a cross member arranged between the pivot member and the at least one anchor.

[0033] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the adjustable locking member is coupled to at least one of the pivot member and the cross member at a first end and selectively attachable to the seat shell at a releasable locking connection at a second end.

[0034] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that adjustable anchor system is configured to be secured to the vehicle seat in each of the retracted state and the extended state.

[0035] According to some embodiments, infant car seat systems for use with vehicle seats are provided. The infant car seat systems include an infant car seat shell having a front and a back, a carry handle rotationally attached to the seat shell at an attachment mechanism,

and an adjustable anchor system including at least one anchor mounted to the carry handle, the at least one anchor configured to releasably engage with a part of the vehicle seat.

[0036] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the carry handle comprises a carry portion and a support portion, wherein the at least one anchor is attached to the support portion.

[0037] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the support portion is configured to rotate 360 degrees about the attachment mechanism.

[0038] In addition to one or more of the features described herein, or as an alternative, further embodiments of the infant car seat systems may include that the support portion is configured to be positioned in at least a carry position, an installation position, and a support position.

[0039] According to an embodiment, a child seat mountable to a vehicle seat including a vehicle belt includes a seat shell couplable to the vehicle seat via the vehicle belt and a tensioning assembly operable to apply a force to a portion of the vehicle belt associable with the seat shell.

[0040] In addition to one or more of the features described above, or as an alternative, in further embodiments the tensioning assembly includes at least one lock-off member. The at least one lock-off member is transformable between a retracted position and an extended position. In the extended position the at least one lock-off member applies the force to the portion of the vehicle belt associated with the seat shell.

[0041] In addition to one or more of the features described above, or as an alternative, in further embodiments the at least one lock-off member includes a first lock-off member arranged adjacent to a first side of the seat shell and a second lock-off member arranged adjacent to a second side of the seat shell.

[0042] In addition to one or more of the features described above, or as an alternative, in further embodiments the seat shell includes a seat side member and the at least one lock-off member is rotatably mounted to the seat side member.

[0043] In addition to one or more of the features described above, or as an alternative, in further embodiments the seat shell includes a bottom and the at least one lock-off member is rotatably mounted to the bottom.

[0044] In addition to one or more of the features described above, or as an alternative, in further embodiments including an actuator operable to transform the at least one lock-off member between the retracted position and the extended position.

[0045] In addition to one or more of the features described above, or as an alternative, in further embodiments including a linkage operably coupling the actuator to the at least one lock-off member.

[0046] In addition to one or more of the features described above, or as an alternative, in further embodiments including a movement assembly mounted to the seat shell and operably coupled to the at least one lock-off member and a flexible member operably coupled to the actuator and the movement assembly.

[0047] In addition to one or more of the features described above, or as an alternative, in further embodiments including a carrying handle movably coupled to the seat shell. The carrying handle is transformable between a plurality of positions including a carrying position and a forward position.

[0048] In addition to one or more of the features described above, or as an alternative, in further embodiments the carrying handle is operably coupled to the at least one lock-off member. The carrying handle is movable to transform the at least one lock-off member between the retracted position and the extended position.

[0049] In addition to one or more of the features described above, or as an alternative, in further embodiments the at least one lock-off member includes a plurality of lock-off members. The carrying handle is movable to simultaneously transform the plurality of lock-off members between the retracted position and the extended position.

[0050] In addition to one or more of the features described above, or as an alternative, in further embodiments the at least one lock-off member is in the retracted position when the carrying handle is in the carrying position and the at least one lock-off member is at the extended position when the carrying handle is at the forward position.

[0051] In addition to one or more of the features described above, or as an alternative, in further embodiments the carrying handle is a rebound bar when the carrying handle is at the forward position.

[0052] In addition to one or more of the features described above, or as an alternative, in further embodiments the carry handle includes a catch. The catch is engageable with the at least one lock-off member during movement of the carrying handle.

[0053] In addition to one or more of the features described above, or as an alternative, in further embodiments the tensioning assembly includes at least one tensioning mechanism

including a lever movably mounted to the seat shell between an open position and a closed position. The portion of the vehicle belt is receivable between the lever and the seat shell.

[0054] In addition to one or more of the features described above, or as an alternative, in further embodiments the force is applied to the portion of the vehicle belt when the lever is in the closed position.

[0055] In addition to one or more of the features described above, or as an alternative, in further embodiments the seat shell is positionable in direct contact with a surface of the vehicle seat.

[0056] According to an embodiment, a child seat mountable to a vehicle seat including a vehicle belt includes a seat shell couplable to the vehicle seat, a carrying handle movably coupled to the seat shell and at least one lock-off member disposed with the seat shell. The carrying handle is operably coupled to the at least one lock-off member. The carrying handle is movable to transform the at least one lock-off member between a retracted position and an extended position.

[0057] In addition to one or more of the features described above, or as an alternative, in further embodiments the carrying handle is movable between a carrying position and a forward position.

[0058] In addition to one or more of the features described above, or as an alternative, in further embodiments at the forward position, a distance between the carrying handle and a portion of the vehicle seat is minimized.

[0059] In addition to one or more of the features described above, or as an alternative, in further embodiments the carrying handle applies a tension to the vehicle belt when the carrying handle is at the forward position.

[0060] In addition to one or more of the features described above, or as an alternative, in further embodiments the carrying handle is a rebound bar when the carrying handle is at the forward position.

[0061] In addition to one or more of the features described above, or as an alternative, in further embodiments the at least one lock-off member is at the retracted position when the carrying handle is at the carrying position and the at least one lock-off member is at the extended position when the carrying handle is at the forward position.

[0062] In addition to one or more of the features described above, or as an alternative, in further embodiments the carrying handle is rotatably coupled to the seat shell.

[0063] In addition to one or more of the features described above, or as an alternative, in further embodiments the seat shell includes at least one lock-off slot, the vehicle belt is receivable within the at least one lock-off slot.

[0064] In addition to one or more of the features described above, or as an alternative, in further embodiments the at least one lock-off member is positioned adjacent to the at least one lock-off slot.

[0065] In addition to one or more of the features described above, or as an alternative, in further embodiments the at least one lock-off member is located remotely from the at least one lock-off slot.

[0066] In addition to one or more of the features described above, or as an alternative, in further embodiments the carrying handle is operably coupled to the at least one lock-off member by a linkage.

[0067] In addition to one or more of the features described above, or as an alternative, in further embodiments including a movement assembly operably coupled to the at least one lock-off member and a flexible member operably coupled to the carrying handle.

[0068] In addition to one or more of the features described above, or as an alternative, in further embodiments at least one lock-off member includes a first lock-off member arranged adjacent to a first side of the seat shell and a second lock-off member arranged adjacent to a second, opposite side of the seat shell.

[0069] In addition to one or more of the features described above, or as an alternative, in further embodiments the at least one lock-off member includes a plurality of lock-off members. The carrying handle is operable to simultaneously transform the plurality of lock-off members between the retracted position and the extended position.

[0070] According to an embodiment, a child seat mountable to a vehicle seat including a vehicle belt includes a seat shell couplable to the vehicle seat, at least one lever movably coupled to the seat shell, and a vehicle belt path disposed between the seat shell and the at least one lever. The at least one lever is movable between a closed position and an open position relative to the vehicle belt path.

[0071] In addition to one or more of the features described above, or as an alternative, in further embodiments the at least one lever is manually movable between the closed position and the open position.

[0072] In addition to one or more of the features described above, or as an alternative, in further embodiments the at least one lever is rotatable between the closed position and the open position.

[0073] In addition to one or more of the features described above, or as an alternative, in further embodiments including at least one groove. The at least one lever is receivable within the at least one groove when the at least one lever is in the closed position.

[0074] In addition to one or more of the features described above, or as an alternative, in further embodiments the at least one groove is formed into the seat shell, the vehicle belt path extending between the at least one groove and the at least one lever.

[0075] In addition to one or more of the features described above, or as an alternative, in further embodiments the at least one lever includes a cam surface configured to cooperate with the at least one groove to clamp the vehicle belt.

[0076] In addition to one or more of the features described above, or as an alternative, in further embodiments including a carrying handle movably coupled to the seat shell. The carrying handle is movable between a carrying position and a forward position.

[0077] In addition to one or more of the features described above, or as an alternative, in further embodiments at the forward position, a distance between the carrying handle and a portion of the vehicle seat is minimized.

[0078] In addition to one or more of the features described above, or as an alternative, in further embodiments the carrying handle is a rebound bar when the carrying handle is at the forward position.

[0079] In addition to one or more of the features described above, or as an alternative, in further embodiments the at least one lever includes a first lever and a second lever. The first lever is arranged at a first side of the seat shell and the second lever is arranged at a second side of the seat shell. The vehicle belt path extends between the seat shell and the first lever and between the seat shell and the second lever. Each of the first lever and the second lever is movable between the open position and the closed position relative to the vehicle belt path.

[0080] The foregoing features and elements may be combined in various combinations without exclusivity, unless expressly indicated otherwise. Features which are described in the context of separate aspects and embodiments may be used together and/or be interchangeable. Similarly, features described in the context of a single embodiment may also be provided separately or in any suitable subcombination. These features and elements as well as the operation thereof will become more apparent in light of the following description and the accompanying drawings. It should be understood, however, that the following description and drawings are intended to be illustrative and explanatory in nature and non-limiting.

BRIEF DESCRIPTION OF THE DRAWINGS

[0081] The subject matter is particularly pointed out and distinctly claimed at the conclusion of the specification. The foregoing and other features, and advantages of the present disclosure are apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

[0082] FIG. 1A is an illustrative schematic of a vehicle in which an infant car seat system according to embodiments of the present disclosure may be installed;

[0083] FIG. 1B is a schematic illustration of an infant car seat system coupled to the vehicle seat of the vehicle of FIG. 1A;

[0084] FIG. 2A is a schematic diagram of a typical vehicle seat and vehicle lower anchors to which an infant car seat system in accordance with the present disclosure may be installed;

[0085] FIG. 2B shows a diagram of a typical vehicle seat lower anchor in the vehicle seat of FIG. 2A;

[0086] FIG. 3 is a schematic illustration of an infant car seat system as installed on a vehicle seat that may incorporate embodiments of the present disclosure;

[0087] FIG. 4A is a schematic illustration of an infant car seat system in accordance with an embodiment of the present disclosure;

[0088] FIG. 4B is a side elevation view of the infant car seat system of FIG. 4A shown in an extended state;

[0089] FIG. 4C is a side elevation view of the infant car seat system of FIG. 4A shown in a retracted state;

[0090] FIG. 4D is a bottom view of the infant car seat system of FIG. 4A;

[0091] FIG. 5A is a bottom view of an infant car seat system in accordance with an embodiment of the present disclosure;

[0092] FIG. 5B is a rear view of the infant car seat system of FIG. 5A;

[0093] FIG. 6A is a bottom view of an infant car seat system in accordance with an embodiment of the present disclosure;

[0094] FIG. 6B is a cross-sectional illustration of the infant car seat system of FIG. 6A, as viewed along the line B-B;

[0095] FIG. 7A is a front view of an infant car seat system in accordance with an embodiment of the present disclosure;

[0096] FIG. 7B is a bottom view of the infant car seat system of FIG. 7A;

[0097] FIG. 7C is a cross-sectional view of the infant car seat system of FIG. 7A as viewed along the line C-C shown in FIG. 7B;

[0098] FIG. 7D is a cross-sectional view of the infant car seat system of FIG. 7A as viewed along the line D-D shown in FIG. 7B;

[0099] FIG. 8A is a bottom view of an infant car seat system in accordance with an embodiment of the present disclosure;

[0100] FIG. 8B is a cross-sectional illustration of the infant car seat system of FIG. 8A as viewed along the line B-B shown in FIG. 8A;

[0101] FIG. 8C is a cross-sectional illustration of the infant car seat system of FIG. 8A as viewed along the line C-C shown in FIG. 8A;

[0102] FIG. 9A is a schematic illustration of an infant car seat system in accordance with an embodiment of the present disclosure;

[0103] FIG. 9B is an enlarged illustration of a portion of an adjustable anchor system of the infant car seat system of FIG. 9A;

[0104] FIG. 9C is a schematic illustration of the infant car seat system of FIG. 9A shown in a retracted state;

[0105] FIG. 9D is a schematic illustration of the infant car seat system of FIG. 9A shown in an extended state;

[0106] FIG. 10A is a schematic illustration of an infant car seat system in accordance with an embodiment of the present disclosure as installed on a vehicle seat and in an extended state;

[0107] FIG. 10B is a schematic illustration of the infant car seat system of FIG. 10A as installed on the vehicle seat and in a tightened extended state;

[0108] FIG. 11A is a schematic illustration of an infant car seat system in accordance with an embodiment of the present disclosure;

[0109] FIG. 11B is a schematic illustration of the infant car seat system of FIG. 11A as installed on a vehicle seat;

[0110] FIG. 12 is a schematic illustration of an infant car seat system in accordance with an embodiment of the present disclosure;

[0111] FIG. 13 is a perspective view of a child seat installed about a vehicle seat and having a carrying handle in a carrying position in accordance with an embodiment of the present disclosure;

[0112] FIG. 14 is a side view of a side of a child seat including a tensioning assembly when the carrying handle is in a carrying position in accordance with an embodiment of the present disclosure;

[0113] FIG. 15 is a detailed side view of the child seat of FIG. 14 in accordance with an embodiment of the present disclosure;

[0114] FIG. 16 is a perspective view of a tensioning assembly of the child seat when the carrying handle is in the carrying position in accordance with an embodiment of the present disclosure;

[0115] FIG. 17 is a perspective view of a child seat installed about a vehicle seat and having a carrying handle rotated from a carrying position in accordance with an embodiment of the present disclosure;

[0116] FIG. 18 is a perspective view of a child seat installed about a vehicle seat and having a carrying handle in a forward position in accordance with an embodiment of the present disclosure;

[0117] FIG. 19 is a detailed side view of the child seat of FIG. 18 in accordance with an embodiment of the present disclosure;

[0118] FIG. 20 is a perspective view of a tensioning assembly of the child seat when the carrying handle is in the forward position in accordance with an embodiment of the present disclosure;

[0119] FIG. 21 is a side view of another tensioning assembly of the child seat when the carrying handle is in a carrying position in accordance with an embodiment of the present disclosure;

[0120] FIG. 22 is a side view of another tensioning assembly of the child seat when the carrying handle is in an intermediate position in accordance with an embodiment of the present disclosure;

[0121] FIG. 23 is a side view of another tensioning assembly of the child seat when the carrying handle is in a forward position in accordance with an embodiment of the present disclosure;

[0122] FIG. 24 is a side view of yet another tensioning assembly of the child seat when the carrying handle is in a carrying position in accordance with an embodiment of the present disclosure;

[0123] FIG. 25 is a side view of another tensioning assembly of the child seat when the carrying handle is in an intermediate position in accordance with an embodiment of the present disclosure;

[0124] FIG. 26 is a side view of another tensioning assembly of the child seat when the carrying handle is in a forward position in accordance with an embodiment of the present disclosure;

[0125] FIG. 27 is a perspective view of a child seat installed about a vehicle seat and having a tensioning assembly in an open configuration in accordance with an embodiment of the present disclosure;

[0126] FIG. 28 is a detailed perspective view of a tensioning assembly in an open configuration in accordance with an embodiment of the present disclosure;

[0127] FIG. 29 is a perspective view of a child seat installed about a vehicle seat and having a tensioning assembly in a closed configuration in accordance with an embodiment of the present disclosure; and

[0128] FIG. 30 is a detailed perspective view of a tensioning assembly in a closed configuration in accordance with an embodiment of the present disclosure.

DETAILED DESCRIPTION

[0129] Referring to FIGS. 1A-1B, schematic illustrations of a vehicle 100 and infant car seat 104 that may incorporate embodiments of the present disclosure are shown. FIG. 1A illustrates the vehicle 100 (e.g., a personal vehicle, a ride-hail or rideshare vehicle, or the like) including a vehicle seat 102 to which an infant car seat system 104 according to various embodiments disclosed herein is installed. FIG. 1A also shows a magnified view of the infant car seat system 104 as installed on the vehicle seat 102 of the vehicle 100, as an inset. FIG. 1B illustrates enlarged detail of the infant car seat system 104 as installed on the vehicle seat 102 of the vehicle 100.

[0130] The infant car seat system 104 includes an infant car seat 106 that is secured, via an integrated anchor system 108, to the vehicle seat 102 of the vehicle 100. The vehicle seat 102 has a vehicle seat back 110, a vehicle seat pan 112, and a seat bight 114 (i.e., the region of intersection of the vehicle seat back 110 and the vehicle seat pan 112). The anchor system 108 is configured to secure the infant car seat 106 to the vehicle seat 102 without using a detachable vehicle installation base and without using a vehicle seat belt (e.g., passing over the top of the legs, lap, or pelvis of the infant when the infant is in the infant car seat for transport in the vehicle). The anchor system 108 may help ensure that installation of the infant car seat 106 (e.g., without using a detachable base and/or without using a vehicle seat belt) provides a tight fit to the vehicle seat 102 such that when installed, the infant car seat system 104 will pass

the CPS “inch test.” The anchor system 108 may be arranged to facilitate alignment with standard arrangements of vehicle lower anchors (e.g., as shown in FIG. 1B).

[0131] As shown in FIGS. 1A-1B, the infant car seat 106 is secured to the vehicle seat 102 in a rear-facing orientation, in which a front 116 of the infant car seat 106 faces the vehicle seat back 110 and a back 118 of the infant car seat 106 faces away from the vehicle seat back 110. As such, when a child is seated in the infant car seat 106, the child’s feet will be at the front 116 of the infant car seat 106 and the child’s head will be at the back 118 of the infant car seat 106. Accordingly, the infant car seat 106 is a rear-facing child car seat.

[0132] As shown, the infant car seat 106 includes a seat shell 120 and a seat shell rim 122 that together define a child seat back 124 and a child seat pan 126. A seat pad, cushion, or the like (not shown) may be disposed on the child seat back 124 and the child seat pan 126 to support an infant that is placed in the infant car seat 106. In some embodiments, the seat shell 120 may be a single, substantially solid or partially hollow structure defining the child seat back 124 and child seat pan 126 and supporting a seat pad for the infant. In some embodiments, and as shown in FIG. 1B, the seat shell 120 may include a first seat shell rail 128 and a second seat shell rail 130 on respective opposing sides of the infant car seat 106. The seat shell rails 128, 130 may be placed in contact with the vehicle seat pan 112 when the infant car seat system 104 is installed to the vehicle seat 102 (e.g., as shown in FIG. 1B). In some configurations, the seat shell rails 128, 130 may have respective curved rocker bottoms to enable a rocking motion to comfort an infant when the infant car seat system 104 is used outside of a vehicle (e.g., in a home environment, restaurant, etc.).

[0133] The infant car seat 106, as shown in FIG. 1B, includes a carrying handle 136 coupled to opposing sides of the seat shell 120 (e.g., to the seat shell rails 128, 130) via respective attachment mechanisms 138, 140. In some configurations, the attachment mechanisms 138, 140 may allow the carrying handle 136 to rotate with respect to the seat shell 120 to provide for access to the infant and/or to adjust an angle of the carrying handle 136 and/or for storage thereof. In some embodiments, the attachment mechanisms 138, 140 may include integrated locking mechanisms to maintain the carrying handle 136 at a desired orientation with respect to the seat shell 120.

[0134] As shown, the anchor system 108 of the infant car seat system 104 is mounted generally to a front lower portion of the seat shell 120. That is, the anchor system 108 is arranged at a forward end or side of the infant car seat system 104. In the illustrated example, the anchor system 108 is an adjustable anchor system which may be formed of various rigid components that are adjustable relative to the seat shell 120. In other configurations, one or

more components of the anchor system 108 may be fixed to and/or in position relative to the seat shell 120. This is in contrast to other embodiments, where the anchor system may be a belted or flexible anchor system and/or a combination of both rigid and belted/flexible anchor systems. As shown in the non-limiting embodiment of FIG. 1B, the anchor system 108 includes a pair of child seat anchors 142, 144 that are part of the infant car seat 106. Each child seat anchor 142, 144 is pivotably coupled to respective mechanical constraining points 146, 148 on the seat shell rails 128, 130 of the seat shell 120 or on a frame supporting the seat anchors 142, 144, with the frame supported on and/or in the seat shell 120. Although two mechanical constraining points 146, 148 are shown on respective sides of the infant car seat 106, in other example implementations, the anchor system more generally may be coupled to the infant car seat at one or more mechanical constraining points that are not necessarily positioned on the side(s) of the infant car seat, and the illustrative configuration is only provided for illustrative and explanatory purposes.

[0135] The child seat anchors 142, 144 of the anchor system 108 may have an elongated shape (e.g., an oblong rectangle) and include a locking mechanism (e.g., a latch) that engages with corresponding vehicle lower anchors 150, 152 in or proximate to the seat bight 114 of the vehicle seat 102 at anchor points 154, 156, respectively. In this manner, the anchor system 108 may directly couple the infant car seat 106 to the vehicle seat 102 without using a detachable vehicle installation base and without using a vehicle seat belt. Additionally, the child anchors 142, 144 may include (or be coupled to) a release mechanism (e.g., a button, a knob, a slidable tab) to unlatch the child seat anchors 142, 144 from the vehicle seat anchors 150, 152 for removal of the infant car seat system 104 from the vehicle 100. In various implementations, the child seat anchors 142, 144 and the vehicle lower anchors 150, 152 may be configured to meet well-established safety standards and/or regulations, examples of which include, but not limited to, LATCH, ISOFIX, LUAS, and UCSS standards.

[0136] In accordance with some embodiments of the present disclosure, the child seat anchors 142, 144 may be configured and arranged, and the mechanical constraining point(s) 146, 148 for the anchor system 108 may be positioned for relatively easy engagement with the vehicle seat anchors 150, 152 located in or proximate to the seat bight 114 so as to facilitate installation of the infant car seat system 104 in the vehicle 100. Furthermore, the child seat anchors 142, 144 may be configured and arranged, and the mechanical constraining point(s) 146, 148 may be positioned, such that upon engagement of the child seat anchors 142, 144 with the vehicle lower anchors 150, 152, there is a tight fit between the infant car seat system 104 and the vehicle seat 102 (e.g., the installed infant car seat system passes the CPS “inch test”).

[0137] As shown in FIG. 1B, a center of gravity of the infant car seat 106 is located near an intersection of the child seat back 124 and the child seat pan 126 of the infant car seat 106. The center of gravity of the infant car seat 106 approximately coincides with an axis 160 passing through the respective attachment mechanisms 138, 140 of the carry handle 136. As would be readily appreciated by one of skill in the art, the center of gravity of an object is a point from which the weight of a body or system may be considered to act (in uniform gravity, the center of gravity is the same as the center of mass of an object/system). In FIG. 1B, the axis 160 is taken to suitably approximate a projection of the center of gravity toward the respective sides of the infant car seat 106.

[0138] As shown in FIG. 1B, the first constraining point 146 for the first seat anchor 142 and the second constraining point 148 for the second seat anchor 144 are positioned closer to the front 116 of the infant car seat 106 than to the backside 118 of the infant car seat 106. In some embodiments, and as shown, the first constraining point 146 is positioned between the front 116 of the infant car seat 106 and the position of the first carrying handle attachment mechanism 138. Similarly, the second constraining point 148 is positioned between the front 116 of the infant car seat 106 and a position of the second carrying handle attachment mechanism 140. As shown, the first infant car seat anchor 142 has the first connection end 154 that is configured to mechanically engage with the first vehicle lower anchor 150 and defines a first anchor point when the infant car seat system 104 is installed in the vehicle 100, and the second infant car seat anchor 144 has a second connection end 156 that is configured to mechanically engage with the second vehicle lower anchor 152 and defines a second anchor point when the infant car seat system 104 is installed in the vehicle 100.

[0139] As shown in FIG. 1B, a line 162 is drawn to extend from the second carrying handle attachment mechanism 140, passing through the axis 160, and the second connection end 156 of the second seat anchor 144, to the vehicle lower anchor 156. In accordance with some embodiments, the second constraining point 148 is positioned above the line 162. While not visible in the perspective view of FIG. 1B, a similar line may be drawn on the opposite side of the infant car seat 106 (i.e., to extend from the first carrying handle attachment mechanism 138, passing through the axis 160, and the first connection end 154 of the first seat anchor 142, to the vehicle lower anchor 150), and the first constraining point 146 may be positioned above this line. The placement of the mechanical constraining points 146, 148 above these lines is based in part on improving crash performance and reducing injury criteria in consideration of the center of gravity 158, as well as ensuring a tight fit between the infant car seat system 104 and the vehicle seat 102.

[0140] As shown in FIG. 1B, the child seat anchors 142, 144 are operably coupled together by a rigid cross-member. This connection and coupling allows for the child seat anchors 142, 144 to be operated together, such that a rotation of the rigid cross-member may cause a rotation of both child seat anchors 142, 144. In other embodiments, the two child seat anchors 142, 144 may be connected by a rigid cross-member but may be independently rotatable relative to an axis passes through the rigid cross-member. These child seat anchors 142, 144 may be considered substantially rigid anchors, as they are not arranged on a webbing or belt. Rigid connections may provide relatively simple and strong connections between the infant car seat system 104 and the vehicle seat 102. Further, as shown in FIG. 1B, the anchor system 108 is integrated into and/or attached directly to the infant car seat 106, rather than using a separate base, as may be present in other configurations.

[0141] As noted, the seat anchors of an infant car seat system may be arranged to facilitate alignment with standard arrangements of vehicle lower anchors. For example, referring now to FIGS. 2A-2B, schematic illustrations of a vehicle seat 200 for receiving a child seat (e.g., infant child seat, convertible child seat) are shown. The vehicle seat 200 includes multiple vehicle lower anchors 202a-f. Although six vehicle lower anchors 202a-f are shown in this illustrative example, various other configurations can include more or fewer vehicle lower anchors without departing from the scope of the present disclosure.

[0142] In this illustrative example, the vehicle seat 200 includes three sets (pairs) of vehicle lower anchors 202a-b, 202c-d, and 202e-f. As shown, the respective pairs of vehicle lower anchors 202a-f are disposed in or proximate to a seat bight 204 of the vehicle seat 200 between a vehicle seat back 206 and a vehicle seat pan 208. Because the location of the vehicle lower anchors 202a-f is in or proximate to the seat bight 204 of the vehicle seat 200, an anchor system of an infant car seat system may be positioned on a front lower portion of the seat shell to facilitate a convenient connection with a pair of the vehicle lower anchors 202a-f.

[0143] In FIG. 2A, each pair of vehicle lower anchors 202a-b, 202c-d, and 202e-f corresponds to a particular seating position on the vehicle seat 200 (i.e., left (202a-b), center (202c-d), and right (202e-f) seating positions relative to a forward direction of a vehicle). The relative positions of the respective vehicle lower anchors 202a-f may be defined with respect to a centerline 210 of the vehicle seat 200. The centerline 210 may be defined as a seating reference point (SgRP) according to 49 CFR §571.3. As shown, a nominal center-to-center distance D_0 between a pair of vehicle lower anchors left (202a-b), center (202c-d), and right (202e-f), at a given seating position is about 280 mm (i.e., $D_0 \approx 280$ mm). Thus, the seat anchors

in the anchor system of the infant child seat may be similarly arranged to have a center-to-center distance of about 280 mm.

[0144] FIG. 2B illustrates a magnified view of an individual vehicle lower anchor 202. As shown, the vehicle lower anchor 202 may be a U-shaped rail with a nominal width that ranges between about 25 mm and about 60 mm. The seat anchors of the anchor system of the infant child seat may be configured to attach to the smallest-sized vehicle seat anchor 202 to ensure compatibility across different vehicle seats 200 for different makes and/or models of vehicles.

[0145] In accordance with embodiments of the present disclosure, infant child seats and related systems are provided with improved anchoring mechanisms for securing the infant child seat to a vehicle seat. In accordance with some embodiments of the present disclosure, a rigid anchor system is integrated to an infant car seat and is integrated in a way that allows the infant child seat to be tightly secured to the vehicle seat.

[0146] Referring now to FIG. 3, a schematic illustration of an infant car seat system 300 as installed on a vehicle seat 302 of a vehicle is shown. The infant car seat system 300 includes an infant car seat 304 having a seat shell 306, a carry handle 308, and an anchor system 310. The infant car seat 304 has a front 312 and a back 314 arranged such that the infant car seat 304 is a rear-facing car seat. The seat shell 306 includes a seat shell rail 316 having a curved bottom with a second seat shell rail having a curved bottom being arranged opposite from the illustrated seat shell rail 316. The anchor system 310 includes a latch arm 318 with a latching or anchoring mechanism at a distal end for engagement with a vehicle lower anchor 320. The vehicle lower anchor 320 is arranged in a seat bight 322 of the vehicle seat 302. The seat bight 322 is defined at an intersection or connection between a vehicle seat pan 324 and a vehicle seat back 326.

[0147] When a latch of the latch arm 318 is connected to the vehicle lower anchor 320, the latch arm 318 becomes fixed in place, but may be pivotable about the connection with the vehicle lower anchor 320. When a latch attachment mechanism 328 is fixed at a particular angle (e.g., locked), the infant car seat 304 may be locked and secured to the vehicle seat 302. That is, when the anchors of the latch arm 318 lock in position with the vehicle lower anchor 320, the infant car seat 304 is held and supported by the latch 318 and the vehicle lower anchor 320, in the various incline and recline positions. Stated another way, by locking the latch attachment mechanisms 328 at a desired angle, the infant car seat 304 may be secured in such a desired angle when installed to the vehicle seat 302 and held in such place due to the latch arm 318 be fixed in angular position relative to the seat shell 316. Even with such features, it

may be advantageous to be able to secure the infant car seat 304 in a tight or contact manner such that the front 312 of the infant car seat 304 contacts the vehicle seat back 326 (e.g., a tight fit to the vehicle seat 302 such that when installed, the infant car seat 304 will pass the CPS “inch test”).

[0148] Referring now to FIGS. 4A-4D, schematic illustrations of an infant car seat system 400 in accordance with an embodiment of the present disclosure are shown. The infant car seat system 400 includes a seat shell 402, an optional carry handle 404, and an adjustable anchor system 406. FIG. 4A is a perspective illustration of the infant car seat system 400, FIG. 4B is a side view thereof with the adjustable anchor system 406 in an extended state, FIG. 4C is a side view thereof with the adjustable anchor system 406 in a retracted state, and FIG. 4D is a bottom view of the infant car seat system 400. The seat shell 402 includes seat shell rails 408 that extend in a general direction between a front 410 and a back 412 of the seat shell 402. The seat shell 402 may be configured to receive a seat or other support structure (e.g., cushion or the like) to receive a child within the infant car seat system 400. As shown, the seat shell rails 408 may have curved bottoms, which may permit angular/incline adjustment and/or a rocker functionality to the infant car seat system 400.

[0149] The adjustable anchor system 406 includes, in this illustrative configuration, two anchors 414 that are configured to selectively engage with a vehicle lower anchor or the like that are part of a vehicle seat. The anchors 414 may include a latching functionality to selectively engage and disengage with the vehicle lower anchors. The adjustable anchor system 406 is configured to allow for adjustment of the relative position of the anchors 414 relative to the seat shell 402. In this illustrative configuration, the anchors 414 are attached at the end of an adjustable frame 416. The adjustable frame 416 is slidably positioned and mounted within the seat shell 402 such that moving the adjustable frame 416 in the forward-backward direction (i.e., direction from the front 410 to the back 412) will cause the anchors 414 to move similarly relative to the seat shell 402. In this configuration, the adjustable frame 416 includes a first portion that extends through one of the seat shell rails 408 and a second portion that extends through the other of the seat shell rails 408. At the back end of the adjustable frame 416 is a handle 418 for manual operation of the adjustable anchor system 406. At the forward end of the adjustable frame 416, the anchors 414 are pivotably attached to a cross member 420 that extends between the two anchors 414. In some embodiments, the anchors 414 may be independently pivotable about an axis through the cross member 420. In other embodiments, the anchors may be pivotably coupled together such that moving one anchor 414 causes the other anchor 414 to similarly move. In some such embodiments, a connecting member (not

shown) may be arranged within the cross member 420 to couple the anchors together. As such, in accordance with various embodiments of the present disclosure, the anchors 414 may be configured to rotate independent from the cross member 420, and in other configurations, the anchors 414 may be configured to be rotationally-fixedly connected to the cross member 420, and thus will rotate based on a rotation of the cross member 420.

[0150] The adjustable anchor system 406, in this configuration, includes an optional pivot member 422. The pivot member 422 is pivotably coupled to the seat shell 402 at one end of the pivot member 422 and to the cross member 420 of the adjustable frame 416 at an opposite end of the pivot member 422. The pivot member 422 can ensure that a pivot location of the seat shell 402 is moved to the pivot point at the connection between the pivot member 422 and the seat shell 402 from the pivot axis through the cross member 420 to which the anchors 414 are pivotably connected. As such, the amount of rotation that the infant car seat system 400 experiences (e.g., during a vehicle collision) may be limited.

[0151] As shown in FIGS. 4B-4C, the adjustable anchor system 406 is shown in an extended state (FIG. 4B) and a retracted state (FIG. 4C). The extended state (FIG. 4B) may be set fixedly by locking the adjustable anchor system 406 and thus a locked state and an extended state may be substantially similar, except for adjustability of the seat shell 402 relative to the adjustable anchor system 406. In the extended state, the anchors 414 may be attached to a vehicle lower anchor and thus arranged in a fixed orientation, or the anchors 414 may be rotatable about a pivot axis through the cross member 420. That is, in the extended state, the anchors 414 may be adjusted in angular orientation relative to the seat shell 402 and the seat shell 402 may be adjusted in position relative to the adjustable anchor system 406. In contrast, in a fixed state, the anchors 414 may be fixed relative to the cross member 420 (and/or the seat shell 402) and the seat shell 402 may be fixed relative to the adjustable anchor system 406. Accordingly, in accordance with embodiments of the present disclosure, the adjustable anchor systems may be arranged in at least three states. A retracted state is a state in which the anchors 414 are able to be stowed or are pulled as close to or into the seat shell 402. An extended state is a state in which the anchors 414 are extended from the seat shell 402 and the seat shell 402 is adjustable relative to the adjustable anchor system 406 (e.g., the seat shell 402 is unlocked relative to the adjustable anchor system 406). In such an unlocked state (extended state), the anchors 414 may be freely adjustable between the retracted state and the extended state and the position and/or orientation of the seat shell 402 may be adjusted by a user. A third state of the adjustable anchor system 406 is a locked state. In the locked state, the anchors 414 are attached to a vehicle seat anchor and thus fixed in position. In the locked state, the seat shell 402 may

be fixed in relationship to the adjustable frame 416, such as to put the seat shell 402 into close contact or tight fit with a vehicle seat. It will be appreciated that in each of the retracted state and the extended state, the anchors 414 may be configured to secure to a vehicle seat. As such, the adjustable anchor system 406 may be in an installed state (i.e., attached to a vehicle) in each of the retracted state and the extended state.

[0152] In some embodiments, the adjustable anchor system 406 may include an angular locking mechanism to lock the angular position or orientation of the anchors 414 relative to the seat shell 402. When the angular locking mechanism is active and locking the orientation of the anchors 414, this may also refer to a locked state of the adjustable anchor system 406. Further, when the anchors 414 are attached and/or connected to a vehicle seat, the adjustable anchor system 406 may be referred to as in an installed state.

[0153] The seat shell 402, and particularly the seat shell rails 408 of this illustrative configuration, may include a retraction slot 424 for receiving the cross member 420 when the adjustable anchor system 406 is transitioned to the retracted state (FIG. 4C). In the retracted state, the anchors 414 are pulled close to or into the seat shell 402. As shown, the retraction slot 424 may be angled upward from a bottom of the seat shell 402 toward a top of the seat shell 402, thus vertically adjusting the position of the cross member 420 and the pivot points of the anchors 414. When the anchors 414 are engaged with vehicle lower anchors, and the handle 418 is pulled in a direction away from a vehicle seat or the seat shell 402 is pushed along the adjustable frame 416, the front 410 of the seat shell 402 will be urged in a direction of a vehicle seat back, thus the seat shell 402 may be pushed into tight engagement against the vehicle seat back.

[0154] In some embodiments, and as shown in this illustrative embodiment, an optional releasable locking connection 430 may be provided to secure the relative position of the adjustable frame 416 relative to the seat shell 402. The releasable locking connection 430 may be a detent or pin mechanism that can engage and disengage with the adjustable frame 416 to secure the adjustable frame 416 and prevent relative movement of the adjustable frame 416 relative to the seat shell 402 when locked. It will be appreciated that other types of locking mechanisms may be used without departing from the scope of the present disclosure. As such, the releasable locking connection 430 may be provided to secure the state of the adjustable anchor system 406 in a specific and set extended state, and the fixed extended state becomes a locked state, where the seat shell 402 is not adjustable relative to the adjustable anchor system 406.

[0155] Referring now to FIGS. 5A-5B, schematic illustrations of an infant car seat system 500 in accordance with an embodiment of the present disclosure are shown. The infant car seat system 500 includes a seat shell 502, an optional carry handle 504, and an adjustable anchor system 506. The infant car seat system 500 of FIGS. 5A-5B is substantially similar to the infant car seat system 400 of FIGS. 4A-4D, and provides similar functionality and operation, and thus like features may not be labeled or described in detail again. FIG. 5A is a view of the bottom of the infant car seat system 500 and FIG. 5B is a back side or rear view thereof. The seat shell 502 includes seat shell rails 508 that extend in a general direction between a front 510 and a back 512 of the seat shell 502.

[0156] The adjustable anchor system 506 includes is similar to the configuration in FIGS. 5A-5C, having anchors 514 that are configured to selectively engage with a vehicle lower anchor or the like that are part of a vehicle seat. The anchors 514 are attached at the end of an adjustable frame 516 which includes a handle 518 at a back end thereof. The adjustable frame 516 is slidably positioned and mounted within the seat shell 502 such that moving the adjustable frame 516 in the forward-backward direction (i.e., direction from the front 510 to the back 512) will cause the anchors 514 to move similarly relative to the seat shell 502. At the forward end of the adjustable frame 516, the anchors 514 are pivotably attached to a cross member 520 that is supported on the seat shell 502 by a pivot member 522.

[0157] In this configuration, a frame locking mechanism 524 is provided to secure the adjustable frame 516 in position relative to the seat shell 502. At a front end, the frame locking mechanism 524 includes a fixed connection 526 that connects to at least one of the cross member 520 and the pivot member 522. At a back end, the frame locking mechanism 524 includes a releasable locking connection 528 that is fixedly connected on a back surface of the seat shell 502. Extending between the fixed connection 526 and the releasable locking connection 528 is an adjustable locking member 530. In this illustrative embodiment, the adjustable locking member 530 is a belt, webbing, or strap. The adjustable locking member 530 is fixedly connected to the cross member 520 and/or the pivot member 522 at the fixed connection. The adjustable locking member 530 is adjustably coupled to and connected to the seat shell 502 at the releasable locking connection 528. The releasable locking connection 528 may be a releasable ratchet connection, a buckle (e.g., snap or prong-frame), or the like.

[0158] In operation, the adjustable locking member 530 may be unlocked or loosened such that the position of the anchors 514 may be adjustable (e.g., between an extended state and a retracted state and/or pivotably adjustable). If a user wishes to stow the anchors (e.g., as shown in FIG. 4C), the user may pull on the adjustable locking member 530 to urge the cross

member 520 to be pulled toward the back 512 of the seat shell 502 (retracted state). The releasable locking connection 528 may then be secured to lock the adjustable locking member 530 and prevent forward motion of the anchors 514. That is, the length of the adjustable locking member 530 may be set in the locked state and thus prevent movement in a direction that requires additional length of the adjustable locking member 530.

[0159] When a user is installing the infant car seat system 500 to a vehicle seat, the anchors 514 may be adjustable from the retracted state to an extended state to permit the user to have access to the anchors 514 and the position the seat shell 502 as desired on a vehicle seat. The user may then engage the anchors 514 with vehicle lower anchors and the anchors 514 will become fixed in position. When the anchors 514 are fixed in position (e.g., engages with vehicle lower anchors), if the user pulls on the adjustable locking member 530, the seat shell 502 will be moved in a direction toward the anchors 514, and thus pull the front 510 of the seat shell 502 toward a vehicle seat back, and potentially into contact therewith to create a tight fit between the seat shell 502 and the vehicle seat back. When the seat shell 502 is in a desired position (e.g., contact with a vehicle seat, desired inclination/recline, or the like), the releasable locking connection 528 may be locked to set the position of the seat shell 502 and to prevent further movement thereof, thus putting the adjustable anchor system 506 in a locked state. The handle 518 may also be used to adjust the relative positional relationship of the seat shell 502 to the anchors 514 when the frame locking mechanism 524 is unlocked or disengaged, and then the frame locking mechanism 524 may be locked or engaged to secure the position of the adjustable frame 516 relative to the seat shell 502. As such, by locking the frame locking mechanism 524, an extended state (when the seat shell 502 is adjustable relative to the adjustable anchor system 506) becomes a locked state, securing the relative position and orientation of the seat shell 502 relative to the adjustable anchor system 506. It will be appreciated that in each of the retracted state and the extended state, the anchors 514 may be configured to secure to a vehicle seat. As such, the adjustable anchor system 506 may be in an installed state (i.e., attached to a vehicle) in each of the retracted state and the extended state.

[0160] Referring now to FIGS. 6A-6B, schematic illustrations of an infant car seat system 600 in accordance with an embodiment of the present disclosure are shown. The infant car seat system 600 includes a seat shell 602, an optional carry handle 604, and an adjustable anchor system 606. The infant car seat system 600 of FIGS. 6A-6B may be substantially similar to the infant car seat systems shown and described above, and provides similar functionality and operation, and thus like features may not be labeled or described in detail again. FIG. 6A is view of the bottom of the infant car seat system 600 and FIG. 6B is a side, sectional view

along the line B-B shown in FIG. 6A. The seat shell 602 includes seat shell rails 608 that extend in a general direction between a front 610 and a back 612 of the seat shell 602.

[0161] The adjustable anchor system 606 of this embodiment includes anchors 614 that are configured to selectively engage with a vehicle lower anchor or the like that are part of a vehicle seat. In this configuration, the anchors 614 are pivotably attached to a cross member 616 or may be fixed to the cross member 616 in a manner such that rotation of the cross member 616 causes rotation of the anchors 614. The cross member 616 is supported and pivotably attached to the seat shell 602 by a pivot member 618. In this configuration, rather than including a frame or the like, the pivot member 618 and the cross member 616 are operably coupled to an adjustable locking member 620 (e.g., belts, strap, webbing, chord, etc.). As shown, at a front end, the adjustable locking member 620 includes a fixed connection 622 that connects to at least one of the cross member 616 and the pivot member 618. At a back end, the adjustable locking member 620 includes a releasable locking connection 624 that is fixedly connected on a back surface of the seat shell 602.

[0162] As shown in FIG. 6B, the seat shell 602 may include a retraction slot 626, similar to that shown and described above. When the adjustable locking member 620 is pulled backward (i.e., a direction away from the front 610 of the seat shell 602), the cross member 616 may be pulled backward and slide into the retraction slot 626. When fully retracted, and not installed on a vehicle seat with the anchors 614, the adjustable anchor system 606 may be arranged in a stowed state. However, when the infant car seat system 600 is installed on a vehicle seat with the anchors 614, by retracting the cross member 616 into the retraction slot 626, the seat shell 602 may be pulled into tight fit or contact with the vehicle seat (tight or secured extended state). Thus, the adjustable anchor system 606 may provide for improved safety and installation of the infant car seat system 600 in a vehicle. When the desired retraction or tightness is achieved, the adjustable locking member 620 may be locked or secured by the releasable locking connection 624 (e.g., buckle, clasp, tie, etc.) (locked state). That is, in the extended state, the relative position and orientation of the seat shell 602 relative to the adjustable anchor system 606 may be adjusted, and when a desired position is set, the releasable locking connection 624 may secure the adjustable anchor system 606 into a locked state and fix the relationship between the seat shell 602 and the adjustable anchor system 606. It will be appreciated that in each of the retracted state and the extended state, the anchors 614 may be configured to secure to a vehicle seat. As such, the adjustable anchor system 606 may be in an installed state (i.e., attached to a vehicle) in each of the retracted state and the extended state.

[0163] Referring now to FIGS. 7A-7D, schematic illustrations of an infant car seat system 700 in accordance with an embodiment of the present disclosure are shown. The infant car seat system 700 includes a seat shell 702, an optional carry handle 704, and an adjustable anchor system 706. The infant car seat system 700 of FIGS. 7A-7D may be substantially similar to the infant car seat systems shown and described above, and provides similar functionality and operation, and thus like features may not be labeled or described in detail again. FIG. 7A is a front elevation view of the infant car seat system 700 and FIG. 7B is a bottom view thereof. FIG. 7C is a cross-sectional view along the line C-C shown in FIG. 7B and FIG. 7D is a cross-sectional view along the line D-D shown in FIG. 7B. The seat shell 702 includes seat shell rails 708 that extend in a general direction between a front 710 and a back 712 of the seat shell 702.

[0164] The adjustable anchor system 706 of this embodiment includes anchors 714 that are configured to selectively engage with a vehicle lower anchor or the like that are part of a vehicle seat. In this configuration, the anchors 714 are attached to a cross member 716 by adjustable anchor connectors 718. The adjustable anchor connectors 718 may be straps, belts, webbings, coils, chords, roping, or the like. As shown, the adjustable anchor connectors 718 may be wound about the cross member 716. As such, the adjustable anchor connectors 718 may be spooled or in a spool-like configuration relative to the cross member 716. The anchors 714 may be adjustable in separation distance from the seat shell 702 by pulling the anchors 714 outward from the front 710 of the seat shell 702 and unwinding or unspooling the adjustable anchor connectors 718 from the cross member 716.

[0165] The adjustable anchor system 706 also includes an adjustable locking member 720. The adjustable locking member 720 is also wound or spooled about the cross member 716. The winding of the adjustable locking member 720 about the cross member 716 may be in a winding direction opposite of a winding direction of the adjustable anchor connectors 718. In this configuration, the adjustable locking member 720 is arranged to extend outward from the front 710 of the seat shell 702. As such, a releasable locking connection 722 is arranged at the front 710 of the seat shell 702. The releasable locking connection 722 may be a ratchet-style mechanism. The releasable locking connection 722 may be unlocked in an extended state, thus permitting the adjustment of the position/orientation of the she shell 702 on, for example, a vehicle seat. The releasable locking connection 722 may then be secured to lock the relative position/orientation of the seat shell and the adjustable anchor system 706 in a locked state.

[0166] The rotation of the cross member 716, and thus the winding/unwinding of the adjustable locking member 720 and/or the adjustable anchor connectors 718 about the cross member 716, may be achieved through directly pulling on the anchors 714 and/or the adjustable

locking member 720. In other embodiments, an optional crank handle 724 or the like, may be provided for rotating the cross member 716 and/or for winding/unwinding the adjustable locking member 720 and/or the adjustable anchor connectors 718.

[0167] Referring now to FIGS. 8A-8C, schematic illustrations of an infant car seat system 800 in accordance with an embodiment of the present disclosure are shown. The infant car seat system 800 includes a seat shell 802, an optional carry handle 804, and an adjustable anchor system 806. The infant car seat system 800 of FIGS. 8A-8C may be substantially similar to the infant car seat systems shown and described above, and provides similar functionality and operation, and thus like features may not be labeled or described in detail again. FIG. 8A is a bottom view of the infant car seat system 800, FIG. 8B is a side section view thereof, and FIG. 8C is an enlarged cross-sectional view of the infant car seat system 800 as viewed along the line C-C of FIG. 8A. The seat shell 802 includes seat shell rails 808 that extend in a general direction between a front 810 and a back 812 of the seat shell 802.

[0168] The adjustable anchor system 806 of this embodiment includes anchors 814 that are configured to selectively engage with a vehicle lower anchor or the like that are part of a vehicle seat. The anchors 814 are pivotably attached to or fixedly attached to a cross member 816. That is, in some configurations, the anchors 814 may be configured to rotate independent from the cross member 816, and in other configurations, the anchors 814 are configured to be rotationally-fixedly connected to the cross member 816, and thus will rotate based on a rotation of the cross member 816. The cross member 816 is pivotably supported on the seat shell 802 by a pivot member 818. The pivot member 818 and the cross member 816 are movably supported on the seat shell 802 by a link assembly 820. The link assembly 820 provides a pivoting movement to the anchors 814 and the pivot member 818 such that the cross member 816 may be pulled into a retraction slot 822, as described above, and may be extended therefrom into an installation for installation to a vehicle, as described above. As shown, the link assembly 820 may include a first link 824 and a second link 826 that are pivotably connected to each other. For example, the first link 824 may be pivotably coupled between the seat shell 802 and the second link 826 and the second link is pivotably coupled between the first link 824 and at least one of the cross member 816 and the pivot member 818.

[0169] Referring now to FIGS. 9A-9D, schematic illustrations of an infant car seat system 900 in accordance with an embodiment of the present disclosure are shown. The infant car seat system 900 includes a seat shell 902 and an adjustable anchor system 904 (an optional carry handle is not shown). The infant car seat system 900 of FIGS. 9A-9D may be substantially similar to the infant car seat systems shown and described above, and provides similar

functionality and operation, and thus like features may not be labeled or described in detail again. FIG. 9A an isometric schematic illustration of the infant car seat system 900, FIG. 9B is an enlarged illustration of a portion of the adjustable anchor system 904, FIG. 9C is a side of the infant car seat system 900 in a retracted state, and FIG. 9D is a side of the infant car seat system 900 in an extended state, which may be secured or locked into a locked state of the infant car seat system 900.

[0170] In this configuration, the adjustable anchor system 904 includes anchors 906 that are configured to selectively engage with a vehicle lower anchor or the like that are part of a vehicle seat. In this configuration, the anchors 906 are attached to an adjustable frame 908. The adjustable frame 908 comprises a cross member 910 extending between the anchors 906. The adjustable frame 908 further includes a rigid frame member 912 and a movable frame member 914. The rigid frame member 912 is fixedly installed within or to the seat shell 902 and the movable frame member 914 is configured to slidably move within and/or relative to the rigid frame member 912. In some configurations, and as shown, the rigid frame member 912 may define a track, slot, or the like along which the movable frame member 914 (e.g., a rail) may travel. This configuration, there are two sets of rigid frame members 912 and associated movable frame members 914, with the cross member 910 extending between the two movable frame members 914.

[0171] The movable frame member 914 is slidably positioned and mounted within the seat shell 902 (e.g., within or along the rigid frame member 912) such that moving the movable frame member 914 in the forward-backward direction will cause the anchors 906 to move similarly relative to the seat shell 902. The rigid frame members 912 and the movable frame members 914 may be housed within seat shell rails of the seat shell 902. The adjustable anchor system 904 includes a releasable locking connection 916 that is associated with at least one of the sets of rigid frame members 912 and movable frame members 914. The releasable locking connection 916 is configured to selectively lock the relative movement between the rigid frame member 912 and movable frame member 914. In an unlocked state of the releasable locking connection 916, the adjustable anchor system 904 is in an extended state, where the seat shell 902 is adjustable about the adjustable anchor system 904 (e.g., relative to the movable frame members 914). When a desired orientation or position is set, the releasable locking connection 916 may be actuated or set to lock the seat shell 902 relative to the adjustable anchor system 904, and thus enter a locked state. As shown in FIG. 9B, the releasable locking connection 916 may include a locking lever 918 that is fixedly connected to the rigid frame member 912 and rotationally mounted thereto. The locking lever 918 can be selectively operated to engage and

disengage with locking recesses 920 that are arranged on the movable frame member 914. The locking recesses 920 may be arranged along the movable frame member 914 such that different lengths of extension of the anchors 906 may be provided. Further, when installing the infant car seat system 900 to a vehicle, the locking recesses 920 may provide a ratcheting-type function to pull the seat shell 902 into close contact with a vehicle seat.

[0172] In accordance with a non-limiting embodiment of the present disclosure, the releasable locking connection 916 is connected to the rigid frame member 912 and engages with the movable frame member 914, thus locking the movable frame member 914 to the rigid frame member 912 in different positions (e.g., based on the locking recesses 920). The releasable locking connection 916 is configured in a way that allows the moveable frame member 914 to freely slide in a retracting direction but is locked rigidly an extension direction. To install the infant car seat system 900 in a vehicle, a user may unlock the releasable locking connection 916 using an actuator (e.g., on a front of the movable frame member 914) and slides the movable frame member 914 to a fully extended use position (e.g., FIG. 9D). The user may then connect the anchors 906 to the vehicle seat. The user then ratchets the seat shell 902 along the moveable frame member 914 until the seat shell 902 is tight against the vehicle seat creating a snug install.

[0173] Referring now to FIGS. 10A-10B, schematic illustrations of an infant car seat system 1000 in accordance with an embodiment of the present disclosure are shown. The infant car seat system 1000 includes a seat shell 1002 and an adjustable anchor system 1004 (an optional carry handle is not shown). The infant car seat system 1000 and the adjustable anchor system 1004 may be substantially similar any of the above-described configurations, and such illustrations are provided to describe the tightening functionality provided by the adjustable anchor systems described herein. FIG. 10A illustrates the infant car seat system 1000 with the seat shell 1002 placed on a vehicle seat 1006 and the adjustable anchor system 1004 is installed to the vehicle seat 1006. As shown in FIG. 10A, there is a gap 1008 between a front 1010 of the seat shell 1002 and a vehicle seat back 1012 of the vehicle seat 1006. FIG. 10A illustrates the adjustable anchor system 1004 in an extended state when the anchors thereof are not attached to the vehicle seat 1106. When the anchors are connected to a vehicle seat anchor and the adjustable anchor system 1004 is in the extended state, the seat shell 1002 may be adjustable about the adjustable anchor system 1004, and then secured in place or relationship and enter a locked state, where further adjustment is not permitted (e.g., the position of the infant car seat system 1000 may be set and fixed securely).

[0174] However, as shown in FIG. 10B, as the adjustable anchor system 1004 is operated, in accordance with any of the above-described configurations, the front 1010 of the seat shell 1002 is pulled into contact with the vehicle seat back 1012 of the vehicle seat 1006 and the gap is eliminated. When in this state or position, the adjustable anchor system 1004 may be secured or locked to tightly and securely install the infant car seat system 1000 to the vehicle seat 1006.

[0175] Referring now to FIGS. 11A-11B, schematic illustrations of an infant car seat system 1100 in accordance with an embodiment of the present disclosure are shown. In this configuration, the infant car seat system 1100 includes a seat shell 1102 having a carry handle 1104 rotationally attached to the seat shell 1102 at an attachment mechanism 1106. The carry handle 1104 is configured to rotate relative to the seat shell 1102 about the attachment mechanism 1106. In this configuration, the infant car seat system 1100 comprises an adjustable anchor system 1101 having anchors 1108 that are mounted to the carry handle 1104 and may be extended and stowable thereto. As shown in FIGS. 11A-11B, the carry handle 1104 is oriented in an installation position for installation on a vehicle seat 1110, as shown in FIG. 11B. The carry handle 1104 may be rotatable to a carry position, such as shown, for example, in FIG. 1B, and may be rotatable into the installation position (FIGS. 11A-11B) for installing onto the vehicle seat 1110.

[0176] Once the anchors 1108 are engaged with a vehicle lower anchor or similar attachment mechanism on the vehicle seat 1110, the carry handle 1104 may be further rotated to pull or urge the seat shell 1102 into contact with the vehicle seat 1110 such that the seat shell 1102 is secured or locked to tightly and securely install the infant car seat system 1100 to the vehicle seat 1110. In some embodiments, the attachment mechanism 1106 may include a ratcheting mechanism or other rotationally locking mechanism to secure the carry handle 1104 into a desired position (e.g., carry position or installation position). In a non-limiting example of operation, a user may place the infant car seat system 1100 onto the vehicle seat 1110 and rotate the carry handle 1104 from the carry position to the installation position and secure or latch the anchors 1108 to the vehicle seat 1110. With the anchors 1108 engaged with the vehicle seat 1110, a fixed pivot point will be defined. The seat shell 1102 may then be urged to move and/or rotate at the attachment mechanism 1106 to pull the seat shell 1102 into close contact or a tight fit with the vehicle seat 1110. In some embodiments, the attachment mechanism 1106 may include a release or actuatable element to lock and unlock the carry handle 1104 in various angular positions relative to the seat shell 1102.

[0177] Referring now to FIG. 12, a schematic illustration of an infant car seat system 1200 in accordance with an embodiment of the present disclosure is shown. In this configuration, the infant car seat system 1200 includes a seat shell 1202 having a carry handle 1204 rotationally attached to the seat shell 1202 at an attachment mechanism 1206. The carry handle 1104 is configured to rotate relative to the seat shell 1202 about the attachment mechanism 1206. In this configuration, the carry handle 1204 is arranged as part of an adjustable anchor system 1201. For example, as shown, the carry handle 1204 is arranged with a two-part structure, having a carry portion 1208 and a support portion 1210, with at least the support portion 1210 defining a part of the adjustable anchor system 1201. Each of the carry portion 1208 and the support portion 1210 may be configured to rotate about the attachment mechanism 1206. In some embodiments, the support portion 1210 may be configured to independently rotate about the attachment mechanism 1206 whereas the carry portion 1208 may be configured to cause rotation of the support portion 1210 when the carry portion 1208 is rotated. In other embodiments, each of the carry portion 1208 and the support portion 1210 may each be independently rotatable about the attachment mechanism 1206. In some embodiments, the support portion 1210 may be configured to nest within a slot or groove on a surface of the carry portion 1208. In some configurations, the infant car seat system 1200 may include a single carry portion 1208 that attaches to two sides of the seat shell 1202 at respective attachment mechanisms 1206 (e.g., as shown in FIG. 1B). In some such embodiments, the infant car seat system 1200 may be configured with two support portions 1210, one on each side of the carry portion 1208.

[0178] As shown, the support portion 1210 includes an anchor 1212 at an end of the support portion 1210. The support portion 1210 may be an arm-like structure that is rotationally attached at one end at the attachment mechanism 1206 and the other end is free and includes the anchor 1212. The anchor 1212 may be configured to selectively and/or releasably engage with a vehicle seat anchor, such as described above. The carry portion 1208 may be rotatable in a manner similar to that shown with respect to FIGS. 11A-11B. Further, the support portion 1210 may be similarly rotatable, and/or may be fully rotatable in a complete 360 degrees about the attachment mechanism 1206. As shown in FIG. 12, the support portion 1210 may be arranged in a carry position 1214, an installation position 1216, and a support position 1218. In the carry position 1214, in some embodiments, the support portion 1210 may be optionally secured to the carry portion 1208. The support portion 1210 is rotatable from the carry position 1214 about the attachment mechanism 1206 to the installation position 1216 or the support position 1218 (and may be rotated clockwise or counterclockwise to reach either position).

[0179] In the installation position 1216, the anchor 1212 of the support portion 1210 may be secured to a vehicle seat anchor. Once engaged, the support portion 1210 may provide a ratcheting function to tightly secure the infant car seat system 1200 to the vehicle seat. In some configurations, once the anchor 1212 of the support portion 1210 is secured to a vehicle seat anchor, the carry portion 1208 may provide a ratcheting functionality to pull the seat shell 1202 into close or tight contact with the vehicle seat. The support portion 1210 is also configured to be arranged in the support position 1218. In the support position 1218, the support portion 1210 (and the anchor 1212) may provide stability support to the seat shell 1202, such as a brace or support position to prevent rocking or tipping of the seat shell 1202. In some embodiments, the support portion 1210 may be selectively lockable using a locking mechanism 1220, which may be arranged on or as part of the attachment mechanism 1206.

[0180] With reference to FIGS. 13-20, a child seat 1302, such as an infant car seat for example, securable to a vehicle seat 1304 in a rear-facing orientation according to another embodiment is illustrated. The infant car seat 1302 includes a seat shell 1306 and a seat shell rim 1308 that together define a child seat back 1310 and a child seat pan 1312. A seat pad, cushion, or the like (not shown) may be disposed on the child seat back 1310 and/or the child seat pan 1312 to support an infant that is placed in the infant car seat 1302. In some embodiments, the seat shell 1306 may be a single, substantially solid or partially hollow structure defining the child seat back 1310 and child seat pan 1312 and supporting a seat pad for the infant. In some embodiments, the seat shell 1306 may include a first seat shell rail 1314 and a second seat shell rail 1316 (FIG. 13) on respective opposing sides of the infant car seat 1302. The seat shell rails 1314, 1316 may be placed in contact with the vehicle seat pan 1303 when the infant car seat 1302 is installed to the vehicle seat 1304. In some configurations, the seat shell rails 1314, 1316 may have respective curved rocker bottoms to enable a rocking motion to comfort an infant when the infant car seat 1302 is used outside of a vehicle (e.g., in a home environment, restaurant, etc.).

[0181] As shown, the child seat back 1310 of the seat shell 1306 includes an upright support surface 1318 generally facing forward. A first upright side member 1320 may be arranged at a first side of the upright support surface 1318 and a second upright side member 1322 may be arranged at a second, opposite side of the upright support surface 1318. The first and second upright side members 1320, 1322 therefore form the left side and the right side of the child seat back 1310, respectively. As shown, the first and second upright side members 1320, 1322 extend forward from the upright support surface 1318. The first and second upright side members 1320, 1322 may extend generally orthogonally to the upright support surface

1318, or alternatively, may extend therefrom at another angle, such as an angle greater than 90° for example. Accordingly, the upright support surface 1318 and the first and second upright side members 1320, 1322 define a backrest region or upright support cavity within which an upper body of a child is received.

[0182] In the illustrated, non-limiting embodiment, the child seat back 1310 of the seat shell 1306 includes a headrest 1324. The headrest 1324 may be attached to or integral with the child seat back 1310. The headrest 1324 may be stationary or in some embodiments, may be configured to move relative to the upright support surface 1318. For example, the headrest 1324 may be configured to translate relative to the upright support surface 1318 between a retracted position and an extended position, allowing for adjustment based on the size of the child positioned within the infant car seat 1302. In other embodiments, the infant car seat 1302 may not include a headrest.

[0183] The child seat pan 1312 includes a seat support surface 1326 facing generally upwardly and that extends from a first end adjacent to a front 1313 of the infant car seat 1302 to a second end or back (not shown) of the child seat pan 1312. A first seat side member 1328 may be arranged at a first side of the seat support surface 1326 and a second seat side member 1330 may be arranged at a second, opposite side 52 of the seat support surface 1326. The first seat side member 1328 and the second seat side member 1330 may extend generally upwardly from the seat support surface 1326 and form the left side and the right side of the child seat pan 1312. The seat support surface 1326 and the first and second seat side member 1328, 1330 in combination define a region within which at least part of a lower body of a child may be received.

[0184] As shown, the seat side members 1328, 1330 extend at an angle from the seat support surface 1326. The angle of the first seat side member 1328 relative to the seat support surface 1326 may but need not be the same as the angle of the first upright side member 1320 relative to the upright support surface 1318. Similarly, the angle of the second seat side member 1330 relative to the seat support surface 1326 may but need not be the same as the angle of the second upright side member 1322 relative to the upright support surface 1318. In an embodiment, the first upright side member 1320 and the first seat side member 1328 are integrally formed and the second upright side member 1322 and the second seat side member 1330 are integrally formed. It should be appreciated that the infant car seat 1302 as illustrated and described herein is intended as an example only and that a child seat having any suitable configuration is within the scope of the disclosure.

[0185] The infant car seat 1302 may include a carrying handle 1332 having ends 1334, 1336 coupled to opposing sides of the seat shell 1306 (e.g., to the seat shell rails 1314, 1316) via respective attachment mechanisms (not shown). In some embodiments, the carrying handle 1332 is movably connected with the seat shell 1306. Accordingly, the carrying handle 1332 may be transformable, for example rotatable, between a plurality of positions or angles relative to the seat shell 1306, such as to more easily access the child positioned within the child seat 20 or for storage purposes for example. Examples of the angular positions include when the carrying handle 1332 extends within a vertically oriented plane (FIGS. 13-16), also referred to herein as a "carrying position," when the carrying handle 1332 is reclined rearwardly, such as behind the child seat back 1310 for example, and when the carrying handle 1332 is rotated forward toward the front 1313 of the infant car seat 1302 (FIGS. 17-20), referred to herein as a "forward position." It should be understood that the carrying handle 1332 may also be arranged at other angular positions along the path of movement of the carrying handle 1332.

[0186] To mount the infant car seat 1302 directly to a vehicle seat 1304 without the use of a separate seat base, a portion of the vehicle belt 1305, such as the lap portion 1307 thereof for example, is wrapped about a portion of the infant car seat 1302. When wrapped about the infant car seat 1302, the vehicle belt 1305 may be arranged in contact with the rim 1308 of the seat shell 1306. In an embodiment, the lap portion 1307 of the vehicle belt 1305 is threaded through an opening or lock-off slot 1340 formed at at least one, and in some embodiments, at each side of the infant car seat 1302. As shown in FIGS. 15 and 16, the lock-off slot 1340 may, but need not be arranged at or adjacent to the upper surface or rim 1308 of the seat shell 1306, such as at first and second seat side members 1328, 1330 of the child seat pan 1312. In an embodiment, the lock-off slots 1340 are positioned forward of the ends 1334, 1336 of the carrying handle 1332, between the ends 1334, 1336 and the front 1313 of the child seat pan 1312. However, in other embodiments, the lock-off slots 1340 may be arranged at another suitable location about the seat portion or the seat shell 1306. Further, although the lock-off slots 1340 are illustrated as generally having an L-shape, embodiments where the lock-off slots 1340 have another shape or configuration are also contemplated herein. Once the free end (not shown) of the vehicle belt 1305 is inserted into a corresponding buckle, a retractor (not shown) acting on the vehicle belt 1305 applies a force thereto, causing the vehicle belt 1305 to tighten about the infant car seat 1302.

[0187] Additional tightening of the vehicle belt 1305 to further restrict movement of the infant car seat 1302 relative to the vehicle seat 1304 may be desired. Accordingly, in an embodiment, additional tension is applicable to the vehicle belt 1305 to further tighten the

vehicle belt 1305 about the infant car seat 1302. This additional tension may be applied via one or more tensioning assemblies integrated into the child seat 1302. With continued reference to FIGS. 13-20, in the illustrated, non-limiting embodiment, the tensioning assembly 1350 includes at least one lock-off member 1352, and in some embodiments includes a plurality of lock-off members 1352. In an embodiment, the at least one lock-off member 1352 of a tensioning assembly 1350 is positioned generally adjacent to a corresponding lock-off slot 1340. It should be appreciated that the lock-off member 1352 may be mounted at or near an exterior surface of the seat shell 1306, or alternatively or in addition, may be arranged at or near an interior surface of the seat shell 1306. In embodiments where the lock-off slot 1340 is arranged near the rim 1308 of at least one seat side member 1328, 1330, the ends 1334, 1336 of the carrying handle 1332 may be connected to the seat shell 1306 near a first side of a lock-off slot 1340 and the lock-off member 1352 may be connected to the seat shell 1306 at or near a second, opposite side of the lock-off slot 1340. However, embodiments where the lock-off member 1352 is arranged at the same side of the lock-off slot 1340 as the ends 1334, 1336 of the carrying handle 1332 are also within the scope of the disclosure.

[0188] In an embodiment, the lock-off member 1352 is pivotally or rotatably mounted to the infant car seat 1302. As shown, the lock-off member 1352 is movable about an axis A between a released position (FIGS. 13-16) and an engaged position (FIGS. 17-20). In the released position, the lock-off member 1352 is offset from the adjacent lock-off slot 1340, such that the lock-off member 1352 does not interfere with threading of the vehicle belt 1305 through the lock-off slot 1340. The lock-off member 1352 may be rotated from the released position to the engaged position, such as by rotating the free end 1354 of the lock-off member 1352 downwardly toward the bottom of the infant car seat 1302, in a direction indicated by arrow L, for example. In the engaged position, the lock-off member 1352 may be in at least partially overlapping arrangement with the lock-off slot 1340 or may be rotated from a first side of the lock-off slot 1340, such as vertically above the lock-off slot 1340 for example, to a second, opposite side of the lock-off slot 1340, such as below the lock-off slot 1340 for example.

[0189] As the at least one lock-off member 1352 transforms from the first released position to the second engaged position, the lock-off member 1352 contacts and applies a force to the portion of the vehicle belt 1305 associated with the lock-off slot 1340. This force applied to the vehicle belt 1305 increases the tension in the vehicle belt 1305 without drawing any additional length of vehicle belt 1305 from the retractor. A biasing mechanism (not shown) may be operably coupled to the lock-off member 1352. In such embodiments, a biasing force

of the biasing mechanism is configured to bias the lock-off member 1352 to the released position.

[0190] Movement of the lock-off member 1352 from the released position to the engaged position is driven by operation of an actuator. In an embodiment, the carrying handle 1332 is configured as the actuator. Accordingly, when the vehicle belt 1305 is threaded through the at least one lock-off slot 1340, rotation of the carrying handle 1332 about its axis from a first position to a second position is operable to increase the tension applied to the vehicle belt 1305. In an embodiment, the lock-off member 1352 is in the released position when the carrying handle 1332 is in the first, carrying position, and the rotation of the carrying handle 1332 toward the front 1313 of the seat shell 1306 or towards the forward position, transforms the lock-off member 1352 to the engaged position. However, it should be appreciated that any type of actuator located remotely from the carrying handle 1332 and operably coupled to the lock-off member 1352 is also contemplated herein.

[0191] With continued reference to FIGS. 13-20, in the illustrated, non-limiting embodiment, when the carrying handle 1332 is configured as the actuator, the tensioning assembly 1350 additionally includes at least one catch 1356 protruding from a surface of the carrying handle 1332, such as near the axis of rotation of the carrying handle 1332 for example. In the illustrated, non-limiting embodiment, the catch 1356 is arranged at an inwardly facing surface 1358; however, embodiments where the catch 1356 is arranged at another surface of the carrying handle 1332 are also within the scope of the disclosure. As the carrying handle 1332 is actuated or rotated from the carrying position toward the rotated position, the catch 1356 is configured to engage and apply a force to a distal end 1354 of the lock-off member 1352. This engagement between the catch 1356 and the lock-off member 1352 causes the lock-off member 1352 to pivot about its axis A from the released position to the extended position. The engagement between the catch 1356 and the lock-off member 1352 will retain the lock-off member 1352 in the engaged position, and therefore may maintain the resulting tension applied to the vehicle belt 1305, until the carrying handle 1332 is returned to the carrying position. In embodiments where a biasing mechanism is operably coupled to the lock-off member 1352, upon movement of the carrying handle 1332 from the rotated position toward the carrying position, and therefore movement of the catch 1356 out of engagement with the lock-off member 1352, the biasing mechanism will automatically bias the lock-off member 1352 from the engaged position to the released position.

[0192] With reference now to FIGS. 21-23, another embodiment of a child seat 1402, such as an infant car seat for example, connectable to a vehicle seat (not shown) using a vehicle

belt (not shown) is illustrated. Similar to the previous embodiment, a lock-off slot 1410 is formed in the infant car seat 1402, such as at or adjacent to a rim 1408 of a seat shell 1406 of the infant car seat 1402. The infant car seat may have another embodiment of a tensioning assembly 1420 operable to apply tension to a vehicle belt arranged within at least one lock-off slot 1410 of the infant car seat 1402.

[0193] Similar to the previous embodiment, the tensioning assembly 1420 includes at least one lock-off member 1422, and in some embodiments includes a plurality of lock-off members 1422, positioned generally adjacent to a corresponding lock-off slot 1410. The lock-off member 1422 may be pivotally or rotatably mounted to the infant car seat 1402 between a released position (FIG. 21) and an engaged position (FIG. 23). In the released position, the lock-off member 1422 is offset from the adjacent lock-off slot 1410 and in the engaged position, the lock-off member 1422 may be in at least partially overlapping arrangement with the lock-off slot 1410 or may be rotated from a first side of the lock-off slot 1410, such as vertically above the lock-off slot 1410 for example, to a second, opposite side of the lock-off slot 1410, such as below the lock-off slot 1410 for example. As the lock-off member 1422 rotates into engagement with the vehicle belt associated with the lock-off slot 1410, it increases the tension in the vehicle belt generally without drawing any additional length of vehicle belt from the retractor.

[0194] As previously described, operation of an actuator drives movement of the lock-off member 1422 from the released position to the engaged position. In an embodiment, the carrying handle 1412 movably mounted to the seat shell 1406 is configured as the actuator. In such embodiments, rotation of the carrying handle 1412 may directly or indirectly move the lock-off member 1422.

[0195] In the illustrated, non-limiting embodiment, the actuator, such as the carrying handle 1412 for example, is operably coupled to the lock-off member 1422 via a linkage 1430. As shown, the lock-off member 1422 may include a first portion 1424 and a second portion 1426 separated from one another by a clearance. In the illustrated, non-limiting embodiment, the first portion 1424 and the second portion 1426 are arranged such that the lock-off member 1422 has a generally V-shaped configuration. However, any suitable configuration is contemplated herein. The linkage 1430 is pivotally connected to a portion of the lock-off member 1422, such as the second portion 1426 thereof for example. When the lock-off member 1422 is in the released position (see FIG. 21), at least a portion of the lock-off member 1422 is offset from the lock-off slot 1410. For example, the first portion 1424 of the lock-off member 1422 may be disposed at a first side of the lock-off slot 1410, such as above the lock-off slot

1410, and the second portion 1426 of the lock-off member 1422 may be positioned adjacent to a second, opposite side of the lock-off slot 1410, such as beneath the lock-off slot 1410. However, embodiments where both portions 1424, 1426 of the lock-off member 1422 are positioned at the same side of the lock-off slot 1410 when in the released position are also contemplated herein.

[0196] As shown, a distal end 1432 of the linkage 1430 is pivotally coupled to a portion of the lock-off member, such as a free end 1428 of the second portion 1426 for example, via a pin 1434. Further, the pin 1434 may be slidably positioned within a slot 1436 formed in a seat side member, such as seat side member 1416 of the seat shell 1406. When the carrying handle 1412 is in the carrying position, the pin 1434 may be arranged in a first position, such as adjacent to a first end 1438 of the slot 1436, and the lock-off member 1422 is in the released position. As the carrying handle 1412 is pivoted forward towards the rotated position (see FIG. 22), the linkage 1430 will rotate relative to both the carrying handle 1412 and the lock-off member 1422. The movement of the linkage 1430 will cause the pin 1434 to translate within the slot 1436 to a second position, such as adjacent to a second, opposite end 1440 of the slot 1436 for example. As the pin 1434 translates within the slot 1436, the lock-off member 1422 is rotated about its axis B from the released position toward the engaged position and into contact with a surface of the vehicle belt (FIG. 23). The lock-off member 1422 will remain in this engaged position while the carrying handle 1412 is in the rotated position. To release the tension from the vehicle belt, the carrying handle 1412 is pivoted back towards the carrying position. This movement of the carrying handle 1412 towards the carrying position applies a force to a second end 1442 of the linkage 1430, causing the pin 1434 to translate within the slot 1436 and rotate the lock-off member 1422 back to the released position.

[0197] With reference now to FIGS. 24-26, another embodiment of a child seat 1502 connectable to a vehicle seat (not shown) using a vehicle belt (not shown) is illustrated. Similar to the previous embodiment, a lock-off slot 1510 is formed in the infant car seat 1502, such as at or adjacent to a rim 1508 of a seat shell 1506 of the infant car seat 1502. The infant car seat may have another embodiment of a tensioning assembly 1520 operable to apply tension to a vehicle belt (not shown) arranged within at least one lock-off slot 1510 of the infant car seat 1502.

[0198] Unlike the embodiments illustrated in FIGS. 13-23, a lock-off member 1522 of the tensioning assembly 1520 may be located remotely from the lock-off slot 1510. In the illustrated, non-limiting embodiment of FIGS. 24-26, the lock-off member 1522 is configured as a foot arranged adjacent to a bottom surface 1524 of the seat shell 1506. Similar to the

previous embodiments described herein, the lock-off member 1522 is rotatable about an axis C relative to the seat shell 1506 between a retracted position (FIG. 24) and an extended position (FIG. 26). The lock-off member 1522 is operably coupled to an actuator, such as the carrying handle 1512 for example, via a movement assembly 1530. In the illustrated, non-limiting embodiment, the movement assembly 1530 includes a first linkage 1532 rotatably mounted to the seat shell 1506, and a second linkage 1534 pivotally connected to both the first linkage 1532 and the lock-off member 1522. As the first linkage 1532 rotates about its axis X relative to the seat shell 1506 in a first direction, indicated by arrow R, the second linkage 1534 exerts a downward force on the lock-off member 1522, such as near a distal end thereof, thereby causing the lock-off member 1522 to rotate away from the bottom 1524 of the seat shell 1506 to the extended position. Similarly, as the first linkage 1532 rotates in an opposite direction about its axis X, an upward force is applied to the second linkage 1534 causing the lock-off member 1522 to rotate toward the bottom 1524 of the seat shell 1506 to the retracted position. It should be appreciated that the configuration of the movement assembly 1530 illustrated and described herein is intended as an example only and that a movement assembly having any suitable configuration for moving the lock-off member between the retracted and extended positions is within the scope of the disclosure.

[0199] With continued reference to FIGS. 24-26, an actuator operably coupled to the movement assembly 1530 may be located about the infant car seat 1502 at a position accessible by a user. In an embodiment, the carrying handle 1512 is configured as the actuator. In such embodiments, as the carrying handle 1512 rotates about its axis, a force F is transmitted to the movement assembly 1530, such as via a cable, linkage, or other flexible member 1536 for example. This force F causes the movement assembly 1530 to move the lock-off member 1522 away from the seat shell 1506 to the extended position. In an embodiment, the force F applied to the movement assembly 1530 causes the first linkage 1532 to rotate about its axis X relative to the seat shell 1506 in the first direction and the second linkage 1534 to push the lock-off member 1522 away from the bottom 1524 of the seat shell 1506 as previously described. Because the bottom surface 1538 of the lock-off member 1522 remains oriented generally parallel to and in contact with the upper surface (not shown) of the vehicle seat, the rotation of the lock-off member 1522 from the retracted position to the extended position results in an upward movement of the child seat pan 1514 of the seat shell 1506 relative to the lock-off member 1522. This upward movement of the seat shell 1506 applies a force on the portion of the vehicle belt (not shown) threaded through the at least one lock-off slot 1510.

[0200] Although each of the embodiments illustrated in FIGS. 13-26 is described with respect to a tensioning assembly 1350, 1420, 1520 including a lock-off member 1352, 1422, 1522, it should be appreciated that any of these tensioning assemblies 1350, 1420, 1520 may include a first lock-off member 1352, 1422, 1522 arranged adjacent to a first side of the infant car seat 1302, 1402, 1502 and a second lock-off member 1352, 1422, 1522 arranged adjacent to a second, opposite side of the infant car seat 1302, 1402, 1502. However, it should be appreciated that embodiments where multiple lock-off members 1352, 1422, 1522 of a tensioning assembly 1350, 1420, 1520 are arranged at different locations about the infant car seat 1302, 1402, 1502 are also within the scope of the disclosure. In such embodiments, each of the plurality of lock-off members 1352, 1422, 1522 of a tensioning assembly 1350, 1420, 1520 may be operated by the same actuator, such as the carrying handle 1332, 1412, 1512 for example. Accordingly, rotation of the carrying handle 1332, 1412, 1512 about its axis simultaneously actuates the plurality of lock-off members 1352, 1422, 1522, such as the first and second lock-off members arranged at opposite side of the child seat, to tighten the vehicle seat belt.

[0201] With reference now to FIGS. 27-30, an alternative tensioning assembly 1620 for applying tension to a vehicle belt 1605 associated with a child seat 1602 mounted on a vehicle seat 1604, such as an infant car seat for example, is illustrated. As shown, the tensioning assembly 1620 includes at least one tensioning mechanism 1622 arranged at an exterior surface of the seat shell 1606. For example, the tensioning assembly 1620 may include a first tensioning mechanism 1622 disposed at a first side of the seat shell 1606, such as the first seat side member 1614, and a second tensioning mechanism (not shown) disposed at a second side of the seat shell 1606, such as the second seat side member 1516. The first and second tensioning mechanisms 1622 may but need not be substantially identical. Embodiments including only a single tensioning mechanism, or alternatively, including multiple tensioning mechanisms arranged at one or both sides of the seat shell 1606 are also within the scope of the disclosure.

[0202] The at least one tensioning mechanism 1622 may be positioned to intersect a vehicle belt path of the vehicle belt 1605 when the vehicle belt is installed about the child seat 1602. The vehicle belt 1605 may be threaded through one or more lock-off slots 1610 formed in the seat shell 1606, or alternatively, may be arranged in contact with the upper surface 1608 of the seat shell 1606. In the illustrated, non-limiting embodiment, the tensioning mechanism 1622 is disposed vertically beneath a lock-off slot 1610, such as in general vertical alignment therewith. However, embodiments where the tensioning mechanism 1622 is arranged at another location about the seat shell 1606 are also contemplated herein.

[0203] As shown, the at least one tensioning mechanism 1622 includes a lever 1624 movably connected to the seat shell 1606. A corresponding groove 1626 for receiving at least a portion of the lever 1624 therein may be formed in the seat shell 1606. The groove 1626 may but need not be complementary to the size and shape of the lever 1624. The lever 1624 is transformable, for example rotatable, between an open position (FIGS. 27 and 28) and a closed position (FIGS. 29 and 30) relative to the seat shell 1606 and the vehicle belt path. In the open position, the lever 1624 is not arranged within the groove 1626 and does not intersect the vehicle belt path and in the closed position the lever 1624 is positioned within the groove 1626 and does intersect the vehicle belt path. In the illustrated, non-limiting embodiment, the lever 1624 is manually transformable between the open and closed positioned; however, embodiments where the lever 1624 is movable via operation of an actuator or other device are also contemplated herein.

[0204] The lever 1624 is in the open position during installation of the vehicle belt 1605 about the child seat 1602. The vehicle belt path of the vehicle belt 1605 extends between the seat shell 1606 and the lever 1624. As a result, when the vehicle belt 1605 is installed, a portion of the vehicle belt 1605, such as the lap portion 1607 for example, is positioned between the groove 1626 and the lever 1624. To operate the tensioning mechanism 1622 and increase the tightness of the vehicle belt 1605 about the seat shell 1606, the lever 1624 is rotated towards the groove 1626, to the closed position. In the closed position, the lap portion 1607 of the vehicle belt 1605 is clamped, such as between a surface 1628 of the groove 1626, such as formed by the seat shell 1606, and a surface 1630 of the lever 1624 facing toward surface of the groove 1626. In an embodiment, the surface 1630 of the lever 1624 is a cam surface such that as the lever 1624 rotates about its axis towards the closed position, the force applied to the portion of the vehicle belt 1605 arranged between the groove 1626 and the lever 1624 is gradually increased. It should be appreciated that each of the tensioning assemblies 1350, 1420, 1520, 1620 illustrated and described herein is intended as an example only and that other tensioning assemblies are also within the scope of the disclosure. By incorporating at least one tensioning assembly 1350, 1420, 1520, 1620 into a child seat such as an infant car seat 1302, 1402, 1502, 1602, a user is able to more securely install the child seat within a vehicle absent a corresponding seat base.

[0205] In embodiments where the child seat 1302, 1402, 1502, 1602 is an infant car seat, the child seat 1302, 1402, 1502, 1602 is typically installed within a vehicle in a rearwardly facing-configuration. In this rearwardly facing configuration, when the carrying handle 1332, 1412, 1512, 1632 is in the forward position (see FIGS. 17 and 18), the carrying handle 1332,

1412, 1512, 1632 is angled towards an upright portion of the vehicle seat 1304, 1504, 1604. Accordingly in such a configuration, the distance between the carrying handle 1332, 1412, 1512, 1632 in the forward position and the upright portion of the vehicle seat 1304, 1504, 1604 is reduced relative to the distance between the carrying handle 1332, 1412, 1512, 1632 in the carrying position and the upright portion of the vehicle seat 1304, 1504, 1604. In an embodiment, the distance between the carrying handle 1332, 1412, 1512, 1632 and the upright portion of the vehicle seat 1304, 1504, 1604 is minimized when the carrying handle 1332, 1412, 1512, 1632 is in the forward position. In some embodiments, when the carrying handle 1332, 1412, 1512, 1632 is in the forward position, a portion of the carrying handle 1332, 1412, 1512, 1632, such as a generally central portion thereof for example, may contact or even apply of force to the upright portion of the vehicle seat 1304, 1504, 1604.

[0206] By positioning the carrying handle 1332, 1412, 1512, 1632 in the forward position when the child seat 1302, 1402, 1502, 1602 is installed in a rearwardly-facing position in a vehicle, the carrying handle 1332, 1412, 1512, 1632 is operable as a rebound bar to limit rebounding motion of the child seat 1302, 1402, 1502, 1602 during a crash or other impact event. The engagement between the carrying handle 1332, 1412, 1512, 1632 and the upright portion of the vehicle seat 1304, 1504, 1604 in combination with the connection formed between the child seat 1302, 1402, 1502, 1602 and the vehicle seat 1304, 1504, 1604 (either by the vehicle belt 1305, 1505, 1605 or a seat base) will restrict movement of the child seat 1302, 1402, 1502, 1602 toward the upright portion of the vehicle seat 1304, 1504, 1604.

[0207] Advantageously, embodiments described herein provide for improved infant car seats having adjustable feature, and particularly the ability to adjust and set a tightness of installation of the infant car seat relative to a vehicle seat. In accordance with embodiments of the present disclosure, adjustable anchor systems are provided that are incorporated into the structure of the infant car seat, such as in the seat shell, and provide for adjustable anchors and a tight installation fit to a vehicle seat.

[0208] The use of the terms "a", "an", "the", and similar references in the context of description (especially in the context of the following claims) are to be construed to cover both the singular and the plural, unless otherwise indicated herein or specifically contradicted by context. The modifier "about" or "substantially" used in connection with a quantity is inclusive of the stated value and has the meaning dictated by the context (e.g., it includes the degree of error associated with measurement of the particular quantity). All ranges disclosed herein are inclusive of the endpoints, and the endpoints are independently combinable with each other. As used herein, the terms "about" and "substantially" are intended to include the degree of

error associated with measurement of the particular quantity based upon the equipment available at the time of filing the application. For example, the terms may include a range of $\pm 8\%$ of a given value or other percentage change as will be appreciated by those of skill in the art for the particular measurement and/or dimensions referred to herein. When used with respect to non-numerical descriptions, these terms include variations relative to the absolute term as would be understood by those of skill in the art. For example, a substantially flat plane may have some deviations from purely flat with no such variances, as such a flat plane may not be physically achievable, and thus the terms substantially and about are used to refer to a description being that of what one of ordinary skill in the art would understand the term to mean.

[0209] While the present disclosure has been described in detail in connection with only a limited number of embodiments, it should be readily understood that the present disclosure is not limited to such disclosed embodiments. Rather, the present disclosure can be modified to incorporate any number of variations, alterations, substitutions, combinations, sub-combinations, or equivalent arrangements not heretofore described, but which are commensurate with the scope of the present disclosure. Additionally, while various embodiments of the present disclosure have been described, it is to be understood that aspects of the present disclosure may include only some of the described embodiments.

CLAIMS:

What is claimed is:

1. An infant car seat system for use with a vehicle seat, the infant car seat system comprising:
 - an infant car seat shell configured to support an infant; and
 - an adjustable anchor system including at least one anchor releasably engageable with the vehicle seat;
 - wherein the adjustable anchor system is coupled to the infant car seat shell such that the at least one anchor is movable between a retracted state and an extended state,
 - wherein, in the retracted state, the at least one anchor of the adjustable anchor system is retracted and secured to the infant car seat shell, and
 - wherein, in the extended state, the at least one anchor of the adjustable anchor system is extended and fixed in position relative to the infant car seat shell for securing the infant car seat system to the vehicle seat.
2. The infant car seat system of claim 1, wherein the infant car seat shell comprises a retraction slot to receive at least a portion of the adjustable anchor system in the retracted state.
3. The infant car seat system of claim 1, wherein the at least one anchor comprises two anchors and the adjustable anchor system comprises:
 - an adjustable frame arranged within the infant car seat shell and configured to slidably move relative thereto, wherein the two anchors are arranged at a forward end of the adjustable frame; and
 - a cross member extending between the two anchors.
4. The infant car seat system of claim 3, further comprising a pivot member pivotably connected between a part of the infant car seat shell and the cross member.
5. The infant car seat system of claim 3, further comprising a releasable locking connection configured to selectively and releasably fix a position of the adjustable frame relative to the infant car seat shell.
6. The infant car seat system of claim 3, wherein the infant car seat shell comprises two seat shell rails, and a portion of the adjustable frame extends through each of the two seat shell rails.
7. The infant car seat system of claim 1, wherein the adjustable anchor system comprises a releasable locking connection configured to selectively and releasably fix a position of the at least one anchor relative to the infant car seat shell.

8. The infant car seat system of claim 7, wherein the at least one anchor is connected to a cross member and wherein the releasable locking connection comprises an element having a fixed connection at the cross member and a releasable locking connection arranged on the infant car seat shell and configured to selectively lock a length of the releasable locking connection.
9. The infant car seat system of claim 7, wherein the releasable locking connection comprises a webbing, a belt, or a strap.
10. The infant car seat system of claim 1, wherein the at least one anchor comprises two anchors and wherein the adjustable anchor system comprises:
- a cross member extending between the two anchors;
 - an adjustable anchor connector associated with each of the two anchors, wherein the adjustable anchor connector is wound about a portion of the cross member; and
 - an adjustable locking member, the adjustable locking member being wound about a portion of the cross member.
11. The infant car seat system of claim 10, wherein a winding direction of the adjustable anchor connector is opposite to the winding direction of the adjustable locking member.
12. The infant car seat system of claim 10, further comprising a crank handle configured for manual rotation of the cross member.
13. The infant car seat system of claim 1, wherein the at least one anchor comprises two anchors and wherein the adjustable anchor system comprises:
- a cross member extending between the two anchors; and
 - a pivot member pivotably arranged between the infant car seat shell and the cross member.
14. The infant car seat system of claim 13, wherein the adjustable anchor system further comprises:
- a link assembly arranged in pivotable connection between at least one of the cross member and the pivot member and the infant car seat shell.
15. The infant car seat system of claim 1, wherein the adjustable anchor system comprises:
- a rigid frame member fixedly positioned on or in the infant car seat shell; and
 - a movable frame member movably arranged with respect to the rigid frame member, wherein the at least one anchor is arranged at an end of the movable frame member.
16. The infant car seat system of claim 15, wherein the adjustable anchor system further comprises:

a releasable locking connection configured to selectively fix a relative position between the rigid frame member and the movable frame member.

17. The infant car seat system of claim 1, wherein the adjustable anchor system is configured to be secured to the vehicle seat in each of the retracted state and the extended state.

18. An infant car seat system for use with a vehicle seat, the infant car seat system comprising:

an infant car seat shell having a front and a back; and

an adjustable anchor system associated with the infant car seat shell, the adjustable anchor system including:

at least one anchor configured to releasably engage with a part of the vehicle seat;

a frame comprising at least a movable portion, wherein the at least one anchor is coupled to the movable portion of the frame and wherein the movable portion of the frame is movable relative to the infant car seat shell between a retracted state and an extended state,

wherein, in the extended state, the movable portion of the frame is unlocked and movable with the at least one anchor with respect to at least one of an axial distance from the front of the infant car seat shell and an angle of orientation relative to the infant car seat shell.

19. The infant car seat system of claim 18, wherein the adjustable anchor system is configured to have a locked state, wherein the movable portion of the frame is locked relative to the infant car seat shell.

20. The infant car seat system of claim 18, wherein the infant car seat shell comprises a retraction slot to receive at least a portion of the adjustable anchor system in the retracted state.

21. The infant car seat system of claim 18, wherein the at least one anchor comprises two anchors and the adjustable anchor system comprises:

an adjustable frame arranged within the infant car seat shell and configured to slidably move relative thereto, wherein the two anchors are arranged at a forward end of the adjustable frame; and

a cross member extending between the two anchors.

22. The infant car seat system of claim 18, wherein the adjustable anchor system comprises a releasable locking connection configured to selectively and releasably fix a position of the at least one anchor relative to the infant car seat shell.

23. The infant car seat system of claim 18, wherein the at least one anchor comprises two anchors and wherein the adjustable anchor system comprises:

- a cross member extending between the two anchors;
 - an adjustable anchor connector associated with each of the two anchors, wherein the adjustable anchor connector is wound about a portion of the cross member; and
 - an adjustable locking member wound about a portion of the cross member.
24. The infant car seat system of claim 18, wherein the at least one anchor comprises two anchors and wherein the adjustable anchor system comprises:
- a cross member extending between the two anchors; and
 - a pivot member pivotably arranged between the infant car seat shell and the cross member.
25. The infant car seat system of claim 18, wherein the adjustable anchor system comprises:
- a rigid frame member fixedly positioned on or in the infant car seat shell;
 - a movable frame member movably arranged with respect to the rigid frame member, wherein the at least one anchor is arranged at an end of the movable frame member.
26. The infant car seat system of claim 18, wherein the adjustable anchor system is configured to be secured to the vehicle seat in each of the retracted state and the extended state.
27. An infant car seat system for use with a vehicle seat, the infant car seat system comprising:
- an infant car seat shell having a front and a back; and
 - an adjustable anchor system associated with the infant car seat shell, the adjustable anchor system including:
 - a pivot member coupled to the infant car seat shell;
 - at least one anchor configured to releasably engage with a part of the vehicle seat, the at least one anchor attached to the pivot member and being movable between a retracted state and an extended state; and
 - an adjustable locking member that interacts with the pivot member to move the at least one anchor toward the retracted state.
28. The infant car seat system of claim 27, further comprising a cross member arranged between the pivot member and the at least one anchor.
29. The infant car seat system of claim 28, wherein the adjustable locking member is coupled to at least one of the pivot member and the cross member at a first end and selectively attachable to the infant car seat shell at a releasable locking connection at a second end.
30. The infant car seat system of claim 27, wherein the adjustable anchor system is configured to be secured to the vehicle seat in each of the retracted state and the extended state.

31. An infant car seat system for use with a vehicle seat, the infant car seat system comprising:
- an infant car seat shell having a front and a back;
 - a carry handle rotationally attached to the infant car seat shell at an attachment mechanism; and
 - an adjustable anchor system including at least one anchor mounted to the carry handle, the at least one anchor configured to releasably engage with a part of the vehicle seat.
32. The infant car seat system of claim 31, wherein the carry handle comprises a carry portion and a support portion, wherein the at least one anchor is attached to the support portion.
33. The infant car seat system of claim 32, wherein the support portion is configured to rotate 360 degrees about the attachment mechanism.
34. The infant car seat system of claim 32, wherein the support portion is configured to be positioned in at least a carry position, an installation position, and a support position.
35. A child seat mountable to a vehicle seat including a vehicle belt, the child seat comprising:
- a seat shell couplable to the vehicle seat via the vehicle belt; and
 - a tensioning assembly operable to apply a force to a portion of the vehicle belt associable with said seat shell.
36. The child seat of claim 35, wherein said tensioning assembly further comprises at least one lock-off member, said at least one lock-off member being transformable between a retracted position and an extended position, wherein in said extended position said at least one lock-off member applies said force to said portion of the vehicle belt associated with said seat shell.
37. The child seat of claim 36, wherein said at least one lock-off member includes a first lock-off member arranged adjacent to a first side of the seat shell and a second lock-off member arranged adjacent to a second side of the seat shell.
38. The child seat of claim 36, wherein said seat shell further comprises a seat side member and said at least one lock-off member is rotatably mounted to said seat side member.
39. The child seat of claim 36, wherein said seat shell further comprises a bottom and said at least one lock-off member is rotatably mounted to said bottom.
40. The child seat of claim 36, further comprising an actuator operable to transform said at least one lock-off member between said retracted position and said extended position.
41. The child seat of claim 40, further comprising a linkage operably coupling said actuator to said at least one lock-off member.

42. The child seat of claim 40, further comprising:
a movement assembly mounted to said seat shell and operably coupled to said at least one lock-off member; and
a flexible member operably coupled to said actuator and said movement assembly.
43. The child seat of claim 36, further comprising a carrying handle movably coupled to said seat shell, said carrying handle being transformable between a plurality of positions including a carrying position and a forward position.
44. The child seat of claim 43, wherein said carrying handle is operably coupled to said at least one lock-off member, said carrying handle being movable to transform said at least one lock-off member between said retracted position and said extended position.
45. The child seat of claim 44, wherein said at least one lock-off member includes a plurality of lock-off members, said carrying handle being movable to simultaneously transform said plurality of lock-off members between said retracted position and said extended position.
46. The child seat of claim 44, wherein said at least one lock-off member is in said retracted position when said carrying handle is in said carrying position and said at least one lock-off member is at said extended position when said carrying handle is at said forward position.
47. The child seat of claim 46, wherein said carrying handle is a rebound bar when said carrying handle is at said forward position.
48. The child seat of claim 44, wherein said carry handle further comprises a catch, said catch being engageable with said at least one lock-off member during movement of said carrying handle.
49. The child seat of claim 36, wherein said tensioning assembly includes at least one tensioning mechanism further comprising a lever movably mounted to said seat shell between an open position and a closed position, wherein said portion of the vehicle belt is receivable between said lever and said seat shell.
50. The child seat of claim 49, wherein said force is applied to said portion of the vehicle belt when said lever is in said closed position.
51. The child seat of claim 36, wherein said seat shell is positionable in direct contact with a surface of said vehicle seat.
52. A child seat mountable to a vehicle seat including a vehicle belt, the child seat comprising:
a seat shell couplable to the vehicle seat;
a carrying handle movably coupled to said seat shell; and
at least one lock-off member disposed with said seat shell;

wherein said carrying handle is operably coupled to said at least one lock-off member, said carrying handle being movable to transform said at least one lock-off member between a retracted position and an extended position.

53. The child seat of claim 52, wherein said carrying handle is in movable between a carrying position and a forward position.

54. The child seat of claim 53, wherein at said forward position, a distance between said carrying handle and a portion of the vehicle seat is minimized.

55. The child seat of claim 53, wherein said carrying handle applies a tension to the vehicle belt when said carrying handle is at said forward position.

56. The child seat of claim 53, wherein said carrying handle is a rebound bar when said carrying handle is at said forward position.

57. The child seat of claim 53, wherein said at least one lock-off member is at said retracted position when said carrying handle is at said carrying position and said at least one lock-off member being at said extended position when said carrying handle is at said forward position.

58. The child seat of claim 52, wherein said carrying handle is rotatably coupled to said seat shell.

59. The child seat of claim 52, wherein said seat shell further comprises at least one lock-off slot, the vehicle belt being receivable within said at least one lock-off slot.

60. The child seat of claim 59, wherein said at least one lock-off member is positioned adjacent to said at least one lock-off slot.

61. The child seat of claim 59, wherein said at least one lock-off member is located remotely from said at least one lock-off slot.

62. The child seat of claim 52, wherein said carrying handle is operably coupled to said at least one lock-off member by a linkage.

63. The child seat of claim 52, further comprising:

a movement assembly operably coupled to said at least one lock-off member; and
a flexible member operably coupled to said carrying handle.

64. The child seat of claim 52, wherein said at least one lock-off member further comprises a first lock-off member arranged adjacent to a first side of said seat shell and a second lock-off member arranged adjacent to a second, opposite side of said seat shell.

65. The child seat of claim 52, wherein said at least one lock-off member further comprises a plurality of lock-off members, said carrying handle being operable to simultaneously transform said plurality of lock-off members between said retracted position and said extended position.

66. A child seat mountable to a vehicle seat including a vehicle belt, the child seat comprising:

a seat shell couplable to the vehicle seat;

at least one lever movably coupled to said seat shell; and

a vehicle belt path disposed between said seat shell and said at least one lever;

wherein said at least one lever is movable between a closed position and an open position relative to said vehicle belt path.

67. The child seat of claim 66, wherein said at least one lever is manually movable between said closed position and said open position.

68. The child seat of claim 66, wherein said at least one lever is rotatable between said closed position and said open position.

69. The child seat of claim 66, further comprising at least one groove, said at least one lever being receivable within said at least one groove when said at least one lever is in said closed position.

70. The child seat of claim 69, wherein said at least one groove is formed into said seat shell, said vehicle belt path extending between said at least one groove and said at least one lever.

71. The child seat of claim 70, wherein said at least one lever includes a cam surface configured to cooperate with said at least one groove to clamp the vehicle belt.

72. The child seat of claim 66, further comprising a carrying handle movably coupled to said seat shell, said carrying handle being movable between a carrying position and a forward position.

73. The child seat of claim 72, wherein at said forward position, a distance between said carrying handle and a portion of the vehicle seat is minimized.

74. The child seat of claim 72, wherein said carrying handle is a rebound bar when said carrying handle is at said forward position.

75. The child seat of claim 66, wherein said at least one lever further comprises a first lever and a second lever, said first lever being arranged at a first side of said seat shell and said second lever being arranged at a second side of said seat shell, said vehicle belt path extending between said seat shell and said first lever and between said seat shell and said second lever, wherein each of said first lever and said second lever is movable between said open position and said closed position relative to said vehicle belt path.