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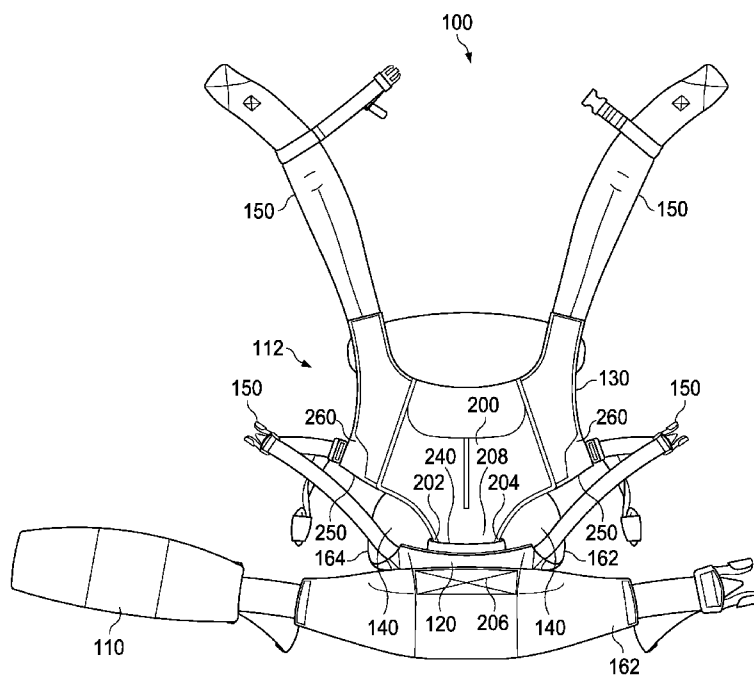


FIG. 2B

(57) Abstract: A child carrier having a waist belt, an upper torso support, a hammock coupled to the waist belt and to the upper torso support, and a thigh support strap extending to each side of the hammock. Each thigh support strap has an inward end portion proximate to the hammock and an outward end portion configured for selective coupling to the upper torso support in multiple positions. When the thigh support straps are coupled to the upper torso support, the hammock and the thigh support straps form a seat to support a child in an ergonomic spread-squat position in inward and outward facing orientations. The shape of the seat adjusts depending on the positions in which the outward end portions of the thigh support straps are coupled to the upper torso support.

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CHILD CARRIER

RELATED APPLICATIONS

- [0001] This application claims the benefit of priority under 35 USC §119(e) of U.S. Provisional Patent Application No. 61/780,161, entitled "Infant Carrier," by Gotel et al., filed March 13, 2013, which is hereby fully incorporated by reference herein.

TECHNICAL FIELD

- [0002] The present disclosure relates to child carriers. Even more particularly, the present disclosure relates to systems for ergonomically carrying a child in multiple orientations.

BACKGROUND

- [0003] Wearable child carriers afford the wearer freedom of hand and arm movement while transporting a child secured in the carrier. Many carriers do not ergonomically support the child, allowing the child's legs to dangle. Furthermore, many carriers provide limited flexibility, only allowing the child to be properly oriented in a single orientation either facing the wearer or looking away from the wearer.

SUMMARY OF THE DISCLOSURE

- [0004] Embodiments disclosed herein may be directed to a child carrier having a waist belt configured for circumventing the waist of a user, one or more panels forming an upper torso support and a hammock, and a thigh support strap extending to each side of the hammock. Each thigh support strap may have an inward end portion proximate to the hammock and an outward end portion configured for selective coupling to the upper torso support in multiple positions. When the thigh support straps are coupled to the upper torso support, the hammock and the thigh support straps form an adjustable bucket seat to support a child in an ergonomic spread-squat position. The shape of the seat adjusts and depends on the positions in which the outward end portions of the thigh support straps are coupled to the upper torso support. The carrier can be configurable to support the child in an ergonomic spread-squat position in multiple positions, including a back carry position, front carry position and side carry position and multiple orientations including inward facing and outward facing.

- [0005] In some embodiments, each thigh support strap is sized to wrap around a portion of a child's pelvis, bottom and thigh when the outward end is coupled to the upper torso support. Each thigh support strap can angle laterally outward from the inward end portion to an outward end portion when the outward end portion is not coupled to the upper torso support.
- [0006] The upper torso support can comprise a plurality of attachment points for each of the thigh support straps. By way of example, but not limitation, the child carrier may include a first plurality of buttons to a first side of a lateral centerline of the upper torso support to which a first of the thigh support straps can selectively couple, and a second plurality of buttons to a second side of the lateral centerline of the upper torso support to which a second of the thigh support straps can selectively couple. The outward end of each thigh support strap can include an opening for receiving a mechanical fastener, such as button, or other fastener on the upper torso support.
- [0007] In some embodiments, the child carrier may further include a set of shoulder straps, each shoulder strap having a first end coupled to the upper torso support and a second end coupled to the upper torso support. The shoulder straps and waist belt can form a harness that distributes the child's weight evenly to the wearer. In some cases, weight can be distributed so a majority of the child's weight is distributed to the wearer's hips through the waist belt. The carrier can be configurable to be worn by a user in front of, in back of or to the side of the wearer with the child's weight carried near the wearer's center of gravity and close to the wearer's front, back or side in a front, back or side position, respectively.
- [0008] In another broad aspect, embodiments may be directed to a method of positioning a child in a child carrier. The method may include fastening a waist belt around a waist of a user, positioning a child in a hammock having an inward end portion coupled to the belt and an outward end portion coupled to an upper torso support, wrapping a first thigh support strap under a first thigh of the child and a second thigh support strap under a second thigh of the child, fastening an outward end of the first thigh strap to the upper torso support and an outward end of the second thigh support strap to the upper torso support at selected attachment points from a plurality of attachment points to adjust the shape of the seat formed by the hammock. The first thigh support strap, the second thigh support strap and hammock may form an adjustable bucket seat that supports the child in an ergonomic spread-squat position.

In some embodiments, each thigh support strap has a first end coupled to a side of the hammock.

[0009] In some embodiments, the method may further include inserting at least one arm into a set of shoulder straps, each shoulder strap having a first end coupled to the upper torso support and a second end coupled to the waist belt the upper torso support. In some embodiments, the child carrier is positioned on a front of the user. In some embodiments, the child is positioned outward facing or inward facing. The carrier seat can be adapted to position the child in an ergonomic “spread-squat-position” that correctly positions the femur in the hip joint, or acetabulum, so that all areas of the acetabulum are strained equally.

[0010] The disclosure and various features and advantageous details thereof are explained more fully with reference to the exemplary, and therefore non-limiting, embodiments illustrated in the accompanying drawings and detailed in the following description. Descriptions of known starting materials and processes may be omitted so as not to unnecessarily obscure the disclosure in detail. It should be understood, however, that the detailed description and the specific examples, while indicating the preferred embodiments, are given by way of illustration only and not by way of limitation. Various substitutions, modifications, additions and/or rearrangements within the spirit and/or scope of the underlying inventive concept will become apparent to those skilled in the art from this disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

- [0011] The drawings accompanying and forming part of this specification are included to depict certain aspects of the invention. A clearer impression of the invention will become more readily apparent by referring to the exemplary, and therefore nonlimiting, embodiments illustrated in the drawings, wherein identical reference numerals designate the same components. Note that the features illustrated in the drawings are not necessarily drawn to scale.
- [0012] FIGURES 1A, 1B and 1C are diagrammatic representations illustrating one embodiment of a child carried in a child carrier;
- [0013] FIGURES 2A, 2B and 2C are diagrammatic representations of one embodiment of a child carrier;
- [0014] FIGURE 3 is a diagrammatic representation of another embodiment of a child carrier;
- [0015] FIGURES 4A and 4B are diagrammatic representations of one embodiment of a portion of a child carrier;
- [0016] FIGURES 5A, 5B and 5C are diagrammatic representations illustrating an embodiment of wearing a child carrier;
- [0017] FIGURE 6 is a diagrammatic representation of one embodiment of a child carrier in a side carry position; and
- [0018] FIGURE 7 is a diagrammatic representation of one embodiment of a child carrier in a back carry position.

DETAILED DESCRIPTION

- [0019] Child carriers and related methods and the various features and advantageous details thereof are explained more fully with reference to the nonlimiting embodiments that are illustrated in the accompanying drawings and detailed in the following description. Descriptions of well-known starting materials, processing techniques, components and equipment are omitted so as not to unnecessarily obscure the invention in detail. It should be understood, however, that the detailed description and the specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only and not by way of limitation. Various substitutions, modifications, additions and/or rearrangements within the spirit and/or scope of the underlying inventive concept will become apparent to those skilled in the art from this disclosure.
- [0020] The present disclosure relates to child carriers that allow a child, including an infant, to be carried in a manner that supports the child and maintains the child's pelvis and thighs in a preferred ergonomic position. Embodiments described herein also allow a child to be carried in an outward facing orientation (i.e., facing away from the person carrying the child) or an inward facing orientation (i.e., facing toward the person carrying the child), and further allow the child to be carried on the front or back or to the side of the person carrying the child. In particular, embodiments described herein provide carriers that support the child's bottom, pelvis and thighs in a desired position in both an outward facing orientation and an inward facing orientation. The carrier can be worn by a user in front of, in back of or to the side the wearer with the child's weight carried near the wearer's center of gravity and close to the wearer's front, back or side in a front, back or side position, respectively.
- [0021] According to one embodiment, an upper torso support ergonomically supports a child's back or front torso when being carried. In addition, the hammock center and supportive thigh straps can cooperate to create an adjustable thigh support bucket seat. Multiple position attachments located on the upper torso support, allow for the supportive thigh straps to move and mold to the child's thighs when carried in the ergonomic spread-squat position. The thigh straps can attach via buttons or other attachment mechanism to the upper torso panel. The adjustable bucket seat can support the child's hips, pelvis, bottom and both upper thighs when the child is being carried in various orientations. This can allow for a wider range of movement for the

child in the inward, forward facing and hip position. The adjustable bucket seat can be attached to the waist band and, in some embodiments, the shoulder straps.

- [0022] The carrier can be ergonomic for the wearer as well. A padded waist belt and shoulder straps can form a configurable harness that can position the carrier in a front, side or back carry position while distributing the weight evenly to the wearer. The harness may be adjusted such that the upper torso panel and supportive and adjustable bucket seat position the child close to the wearer's center of gravity which distributes the child's weight evenly.
- [0023] FIGURE 1A is a diagrammatic representation of one embodiment of a child carried in an inward facing orientation in a child carrier 100 worn by an adult wearer. FIGURE 1B is a diagrammatic representation of another view of one embodiment of the child carried in child carrier 100 in the inward facing orientation. FIGURE 1C is a diagrammatic representation of one embodiment of a child carried in an outward facing orientation in child carrier 100.
- [0024] Carrier 100 comprises a waist belt 110, a main body 112 having an upper torso support portion 130 and a hammock portion 120, thigh support straps 140 and shoulder straps 150. A child can be supported in a child carrying area created by the main body 112 in cooperation with the wearer's torso. Upper torso support portion 130 ergonomically supports the child's back or front torso while hammock portion 120 cooperates with thigh support straps 140 to form a supportive and adjustable bucket seat 160. Waist belt 110 and shoulder straps 150 provide a harness that distributes the child's weight to the wearer.
- [0025] Hammock portion 120 and thigh support straps 140 can pass from the inward side of the child carrying area (the side closer to the wearer's torso) to an outward side to form the seat 160. The supportive and adjustable seat 160 can be a bucket seat with a generally concave inner profile from the inward side to the outward side and from left to right. Seat side edges 162, 164 can be higher than the center of the seat and can be spaced such that the side edges pass under and around the child's thighs at a distance from the child's hips such that the child's legs do not dangle down. In some embodiments, padding on thigh support straps 140 may provide additional support.
- [0026] The adjustable bucket seat 160 can be continuous from the seat first side edge 162 to the seat second side edge 164. To this end, the inner side edges 148 of the thigh

support straps 140 may overlap hammock portion 120 along all or a substantial portion of lengths of straps 140. However, in some cases, the weight of a child may cause some spread between the thigh support straps 140 and hammock portion 120. To minimize gaps, elastic material or other biasing mechanism may be provided to draw thigh support straps 140 together or to cover gaps.

[0027] The seat side edges 162, 164 may be formed by the outer edges of the thigh support straps 140 (e.g., such that the leftmost edge of the seat is formed by an edge of a thigh support strap 140 and the rightmost edge of the seat is formed by an edge of another thigh support strap 140). The angle or separation of side edges 162 and 164 may be adjusted to adjust the shape of seat 160. The outward end portions of each thigh support strap 140 may couple to upper torso support portion 130 at multiple locations, allowing the shape of seat 160 to be adjusted. For example, a first seat shape may be more comfortable for a child in an inward facing position while a second seat shape may be more comfortable for the child in an outward facing position.

[0028] The adjustable bucket seat is constructed to support the child in an ergonomic spread squat position with the child's pelvis, bottom and thighs all being supported. The child's weight can be supported so that the child is squatting in the seat rather than sitting rather than sitting with the child's weight primarily on the sacrum. The child can be supported with the knees higher than the bottom, in some cases higher than 90 degrees. The bucket seat can form a sling or pouch that is wider than the child's hips in which the child's bottom is supported. The side edges pass under and around the child's thighs at a distance from the child's hips where the portion of the side edges that pass under and around the child's thighs is higher than the child's bottom to lift the child's knees. The thigh support straps 140 can have sufficient stiffness such that in an outward facing orientation (*see e.g.*, FIGURE 1C), a portion of the side edges that wraps to the inside of the child's thighs can encourage the child's legs to spread. In an inward facing orientation (*see e.g.*, FIGURE 1B, the child's thighs may be encouraged to spread by the thigh support straps or wearer's torso).

[0029] In the ergonomic spread squat position (also known as the "frog leg", "frog" or "squat spread" position) the flexion at the hip joint is at least 90° and in some cases is 110° to 120° from the coronal plane, and the spreading angle can average at approximately 45-55° from the median plane. The angle of the hips and spread can

depend on the form factor of the carrier and developmental stage of the child. In one embodiment, the carrier can be adapted to support the child in a position with the child's femur approximately 90° to 110° (or other elevated position) from the coronal plane and to position with the child's knees with an amount of spreading. The amount of spreading may depend on the developmental stage of the child and orientation with a newborn having less than 30°, then approximately 30°, then approximately 35°-40° and so on so, such that the final spread is approximately 40°-45°, though other amounts of spreading may be achieved including (e.g., for example approximately 55°). In one embodiment, the spreading may be at least 20° degrees from the median plane. The child's weight can be distributed across the child's bottom, thighs and back so that the sacrum does not bear too much weight and the child can rest with a more naturally curved "C" spine in a spread squat position that is believed to be better for pelvic development. In some cases, the knees are not spread. It can be noted, however, that the child can be positioned in any comfortable position, preferably emphasizing a supportive posture rather than a posture where the child is primarily sitting on his or her sacrum.

- [0030] Carrier 100 may be shaped to provide side leg openings for seat 160 between carrier 100 and the wearer's torso. For example, if upper torso portion 130 is sufficiently wide to wrap around the sides of the child, carrier 100 may be shaped so that seat 160 is narrower than upper torso support portion 130 to provide side openings for the child's legs to pass out of the child carrying area.
- [0031] Shoulder straps 150 can be configured to form a loop on either side of the lateral centerline of carrier 100. Each shoulder strap 150 may connect to upper torso support portion 130 at multiple locations to pull upper torso support portion 130 toward the wearer. A shoulder strap may also couple to a thigh support strap or other portion of carrier 100. Shoulder straps 150 may be adjustable and, in some cases, can be re-configured to support multiple carrier positions, such as a side carry position or back carry position.
- [0032] Waist belt 110 may be padded and configured to rest on the wearer's hips. Preferably, the harness is configured so that the child's weight is evenly distributed to the wearer's hips and shoulders and even more preferably such that the child's weight is distributed evenly to the wearer's hips and shoulders and in some cases primarily to the wearer's hips rather than shoulders. In some cases, 70 percent or

more of the child's weight can be distributed to the wearer's hips through waist belt 110, thereby promoting wearer comfort and diminishing wearer fatigue.

- [0033] A child may be positioned in carrier 100 by positioning the child's bottom in hammock portion 120 and wrapping thigh support straps 140 under and around the child's legs, and coupling thigh support straps 140 upper torso support portion 130. Positioning a child in carrier 100 may include securing the child in carrier 100, for example coupling upper torso support portion 130 to shoulder straps 150.
- [0034] Carrier 100 can include an adjustable collar 170 that can extend upper torso support portion 130. When extended, adjustable collar 170 can provide additional support for taller children seated in an inward facing orientation, but can fold back so that a child's face is not obstructed when the child is seated in the outward facing orientation. In the non-extended position, adjustable collar 170 can provide additional neck support for smaller children.
- [0035] Complementary extended position securing mechanisms and complementary non-extended position securing mechanisms such as, but not limited to, but not limited to, buttons, snaps, d-rings and clips or hooks, patches of hook and loop material or other securing mechanism, can be provided so that adjustable collar 170 can be secured in an extended position or folded back and secured in a non-extended position. In the embodiment illustrated, for example, adjustable collar 170 can include button holes to receive buttons 174 of shoulder straps 150 to secure in an extended position and receive buttons 172 on the outer side of upper torso support portion 130 to secure in a folded back position.
- [0036] FIGURE 2A is a diagrammatic representation of the inner side of one embodiment of carrier 100 with thigh support straps uncoupled from upper torso support portion 130. In FIGURE 2A, waist band 110 folded back to show additional features of one embodiment of carrier 100. FIGURE 2B is a diagrammatic representation of an outer side one embodiment of carrier 100 with waist belt 110 in its down (ready to wear) position and with thigh support straps 140 coupled to the upper torso support portion 130.
- [0037] Upper torso support portion 130 may include one or more panels formed from a single piece of material or multiple pieces of material, multiple layers of materials, or multiple materials. For example, in some embodiments, upper torso support may be formed with an inner layer selected for comfort against a child's skin and an outer

layer selected for breathability, fashion, stain resistance, etc. Upper torso support may have straight edges, tapered edges for an area of increased width or decreased width, or otherwise configured for comfort or security of a child or a user.

- [0038] Hammock portion 120 may be formed between waist belt 110 or other structure and upper torso support portion 130. Hammock portion 120 may comprise lateral edges 202, 204, a first end portion 206 coupled to waist belt 110 or other portion of carrier 100, a second end portion 208 coupled to upper torso support portion 130 and a center hammock portion that extends between the lateral edges 202, 204, first end portion 206 and second end portion 208. Lateral edges 202 and 204 of hammock portion 120 may be straight, curved or laterally tapered.
- [0039] Hammock portion 120 may be formed from a single piece of material, or may be formed from multiple pieces of material, multiple layers of materials, or multiple materials. The junction between upper torso support portion 130 and hammock portion 120 may be a substantially seamless transition. For example, in one embodiment, hammock portion 120 and an upper torso support panel 200 may comprise a unitary construction of one or more layers of material. In other embodiments, the junction may include seams, edges or other features delineating between upper torso support portion 130 and hammock portion 120.
- [0040] Thigh support straps 140 can be provided that extend to either side of the hammock center portion. Each thigh support strap can include a first end portion 212 and a second end portion 214. Each thigh support strap can include a seat outer edge 162, 164 and a second thigh support strap inner edge 148 that can extend from the first end portion 212 to the second end 214. A first end portion 212 of each thigh support strap 140 can be coupled to waist belt 110 or other structure and a second end portion 214 can be coupled to the upper torso support portion 130 or other structure such that the first end portion 212 is more inward (closer to the wearer) than the second end portion 214 when the carrier is worn. Thigh support straps 140 may be configured to pass under and around thighs of a child when in use.
- [0041] At least one of the end portions of each thigh support strap 140 may be selectively coupled. Accordingly, carrier 100 can include a securing mechanism to secure first end portions 212 or second end portions 214. The securing mechanism can include any suitable mechanism such as, but not limited to, buttons, snaps, d-rings and clips

or hooks, patches of hook and loop material or other securing mechanism. In some cases, an end portion can be secured in multiple locations.

[0042] In the embodiment of FIGURE 2A, the first end portions 212 of thigh support straps 140 are stitched, glued, formed as a unitary piece with or otherwise fixedly joined to hammock portion 120, waist belt 110 or other portion of carrier 100 that is to the inward side of the child carrying area when carrier 100 is worn. The first end portion 212 may be coupled in a manner that forms a flexible hinge 230 that allows thigh support strap 140, to swing outward (away from the wearer).

[0043] Hinge 230 may be formed by any suitable mechanism including, but not limited to, stitching or otherwise joining a first end edge of a thigh support strap 140 to a lateral edge 202 or 204 of hammock portion 120 or other structure. The axis of rotation of each hinge 230 can be selected to be parallel to the lateral centerline (indicated at 234) of carrier 100 or at another angle when carrier 100 is in a flat configuration. According to one embodiment, hinge 230 is oriented so that the axis of rotation slopes out laterally from a first end of the hinge 230 to a second end of the hinge 230 where the first end is an end more proximate to upper torso support portion 130. The hinge axis may slope out at a desired angle relative to the lateral centerline, but preferably slopes outward less than 45 degrees and even more preferably less than 25 degrees. In some embodiments, the hinge axis slopes outward relative to the lateral centerline at an angle from 10 degrees to 25 degrees when the carrier is in a flat configuration.

[0044] Second end portions 214 can be selectively coupled to carrier 100. For example, upper torso portion 130 may include multiple buttons or other securing mechanisms on each side of the lateral centerline 234 so that each thigh support strap 140 can be selectively secured at multiple locations (e.g., using button holes 203 or other securing mechanism). The second end portions 144 may couple to upper torso portion 130 such that the portions edges 162 and 164 that pass under the child's thighs is higher than the child's bottom and pelvis to lift the child's knees. In some embodiments, the second end 144 (the end further from the wearer) of each thigh support strap 140 is higher than the first end when carrier 100 is worn. Second end portions 214 may also secure to carrier 100 at other locations.

[0045] Thigh support straps 140 may be configured to pass under and around thighs of a child when in use. When second ends 214 of thigh support straps 140 are coupled to

upper torso support portion 130, thigh support straps 140 and hammock portion 120 form a supportive bucket seat extending from a set first side edge 162 to a seat second side edge 164. The seat first side edge 162 is formed by a laterally outer side edge of a first thigh support strap 140 and the seat second side edge 164 is formed by the laterally outer side edge of a second thigh support strap 140. In some embodiments, padding on thigh support straps 140 may provide additional support to lift a child's thighs.

[0046] A fabric bridge 240 can provide a biasing mechanism to help pull inner edges 148 of thigh support straps 140 toward each other to prevent gaps. Fabric bridge 240 may also help cover gaps between hammock portion 120 and thigh support straps 140. In one embodiment, fabric bridge 240 may be coupled to hammock portion 120.

[0047] In some cases, the width of the seat may be less than the width of upper torso support portion 130. In one embodiment, the width of the seat may be narrower than the width of upper torso support portion 130 where the bottom ends of shoulder straps 150 couple to upper torso support portion 130 (e.g., indicated at area 260 of FIGURE 2B for one embodiment). To this end, the lateral edges of upper torso support portion 130 may taper inward to transition to lateral edges 202 and 204 of hammock portion 120 (FIGURE 2A) forming a horizontal, sloped or curved transition edge portion 250 that can act as the top edge of a side leg opening. When carrier 100 is worn, upper torso support portion 130 may wrap around to the sides of the child (e.g., as illustrated in FIGURE 1A and 1C), while leaving an opening formed by transition edges 250 and seat edges 162 and 164. The child's legs and arms may pass out of the child carrying area under the transition edge 250.

[0048] With reference to FIGURE 2C, in some embodiments, adjustable collar 170 may support a child's head and/or neck. Adjustable collar 170 may be positioned according to the direction the child is facing (i.e., inward or outward), the size of the child, or other criteria. Adjustable collar 170 may be formed from a separate piece of material or a separate material and joined to upper torso support portion 130, or adjustable collar 170 and upper torso support portion 130 may be formed from the same material or piece of material such adjustable collar 170 is rotatable relative to upper torso support portion 130 such that adjustable collar 170 may be extended or folded back.

- [0049] FIGURE 3 is a diagrammatic representation of another embodiment of a child carrier 300, similar to child carrier 100, comprising a waist belt 310, a main body 312 having a hammock portion 320 and an upper torso support portion 330, thigh support straps 340 and shoulder straps 350. A child can be supported in a child carrying area created by the main body 312 in cooperation with the wearer's torso. Upper torso support portion 330 ergonomically supports the child's back or front torso when being carried while hammock portion 320 cooperates with thigh support straps 340 to form a supportive bucket seat.
- [0050] Waist belt 310 and shoulder straps 350 provide a harness that distributes the child's weight to the wearer. Shoulder straps 350 and waist belt 310 can be adjustable so that the harness evenly distributes the child's weight to the wearer. In some cases, the harness can be adjustable to distribute a majority of the child's weight to the wearer through waist belt 310 as discussed above.
- [0051] A first end of a shoulder strap 350 and a second end of a shoulder strap 350 may couple to upper torso support portion 330 to form a loop that pulls the upper torso support portion 330 toward the wearer thereby supporting the child's torso. Shoulder straps 350 may be reconfigurable so that the carrier can be worn in a front carry position, back carry position or side carry position.
- [0052] According to one embodiment, waist belt 310 comprises an adjustable waistband. A first end portion 314 of the waist belt may be sufficiently long to wrap substantially around the wearer and may include areas of hook and loop material on an outer side. In some cases, the areas of hook and loop material may be sufficiently long to substantially wrap around the wearer. A second end portion 316 may include areas of hook and loop material on an inner side. The hook and loop material on first portion 314 and second portion 316 can be used adjust waist belt 310 to a broad range of sizes, (e.g., 26-55 in/66-140 cm or other range of sizes) and be worn high or low to maximize comfort, especially in the event of a C-section, and provide low back support. Other securing mechanisms may also be used. Furthermore, any suitable waist belt may be used.
- [0053] Upper torso support portion 330 may include a main upper torso support panel 332. Upper torso support panel 332 may be formed from a single piece of material, or may be formed from multiple pieces of material, multiple layers of materials, or multiple materials. For example, in some embodiments, upper torso support panel 332 may

be formed with an inner layer selected for comfort against a child's skin and an outer layer selected for breathability, fashion, stain resistance, etc. In some embodiments, upper torso support panel 332 may be formed with a central portion selected for comfort and lateral portions selected for breathability, security, etc. Upper torso support panel 332 may have straight edges, tapered edges for an area of increased width or decreased width, or otherwise be configured for comfort or security of a child or a user. Upper torso support portion 330 may also include harness panels 333. A first end of a shoulder strap 350 may join to a top portion of a harness panel and a second end of a shoulder strap may join to a lower portion of a harness panel 333.

[0054] Hammock portion 320 may be formed between waist belt 310 or other structure and upper torso support portion 330. Hammock portion 320 may comprise lateral edges 322, 324, a first end portion 326 coupled to waist belt 310 or other portion of carrier 300, a second end portion 328 coupled to upper torso support portion 330 and a center hammock portion 325 that extends between the lateral edges 322, 324, first end portion 326 and second end portion 328. Lateral edges 322 and 324 of hammock portion 320 may be straight, curved or laterally tapered.

[0055] Hammock portion 320 may be formed from a single piece of material, or may be formed from multiple pieces of material, multiple layers of materials, or multiple materials. The junction between upper torso support portion 330 and hammock portion 320 may be a substantially seamless transition. For example, in one embodiment, hammock portion 320 and an upper support panel 332 may comprise a unitary construction of one or more layers of material. In other embodiments, the junction may include seams, edges or other features delineating between upper torso support portion 330 and hammock portion 320.

[0056] The lateral edges of upper torso support portion 330 may taper inward to transition to lateral edges 322 and 324 of hammock portion 120 (FIGURE 2A) forming a horizontal, sloped or curved transition edge portion that can act as the top edge of a side leg opening. When carrier 300 is worn, upper torso support portion 330 may wrap around to the sides of the child (e.g., as illustrated in FIGURE 1A and 1C), while leaving an opening formed by the transition edges and seat edges. The child's legs and arms may pass out of the child carrying area under the transition edges.

[0057] Thigh support straps 340 can be provided that extend to either side of hammock center portion 325. Each thigh support strap can include a first end portion 342 and

a second end portion 344. A first thigh strap side edge and a second thigh strap side edge can extend from the first end portion to the second end. A first end portion 342 of each thigh support strap 340 can be coupled to waist belt 310, hammock portion 320 or other structure and a second end portion 344 can be coupled to the upper torso support portion 330 or other structure such that the first end portion is more inward (closer to the wearer) than the second end portion when the carrier is worn. Thigh support straps 340 may be configured to pass under and around thighs of a child when in use.

[0058] At least one of the end portions of each thigh support strap 340 may be selectively coupled. Accordingly, carrier 300 can include a securing mechanism to secure first end portions 342 or second end portions 344. The securing mechanism can include any suitable mechanism such as, but not limited to, buttons, snaps, d-rings and clips or hooks, patches of hook and loop material or other securing mechanism. In some cases, an end portion can be secured in multiple locations.

[0059] In the embodiment of FIGURE 3, the first end portions 342 of thigh support straps 340 are stitched, glued, formed as a unitary piece with or otherwise fixedly joined to hammock portion 320, waist belt 310 or other portion of carrier 300 that is to the outward side of the child carrying area when carrier 300 is worn. The first end portion 342 may be coupled to another portion of carrier 300 in a manner that forms a flexible hinge that allows thigh support strap 340, to swing outward (away from the wearer). The hinge 360 may be formed by any suitable mechanism including, but not limited to, stitching or otherwise joining the first end edge of a thigh support strap 340 to a lateral edge 322 or 324 of hammock portion 320 or other structure. The axis of rotation of each hinge can be selected to be parallel to the lateral centerline of carrier 300 or at another angle when carrier 300 is in a flat configuration. According to one embodiment, each hinge is oriented so that the axis of rotation slopes out laterally from a first end of the hinge to a second end of the hinge, where the first end is an end more proximate to upper torso support portion 330. The hinge axis may slope out at a desired angle relative to the lateral centerline, but preferably slopes outward less than 45 degrees and even more preferably less than 25 degrees. In some embodiments, the hinge axis slopes outward relative to the lateral centerline at an angle from 10 degrees to 25 degrees when the carrier is in a flat configuration.

[0060] Second end portions 344 can be selectively coupled to carrier 300. Upper torso portion 330 may include multiple buttons or other securing mechanisms on each side

of the lateral centerline so that each thigh support strap 340 can be selectively secured at multiple locations. The second end portions 344 may couple to upper torso portion 330 such that the portions of edges 334 and 336 that pass under the child's thighs is higher than the child's bottom and pelvis to lift the child's knees. Additionally, the construction of thigh support straps 340 can be selected so that the portion of the side edges 334 and 336 that wraps to the inside of the child's thighs can encourage the child's legs to spread. The second end portions 344 may couple to upper torso portion 330 such that the second end (the end further from the wearer) of each thigh support strap 340 is higher than the first end when carrier 300 is worn. Second end portions 344 may also secure to carrier 300 at other locations.

- [0061] Thigh support straps 340 may be configured to pass under and around thighs of a child when in use. When second ends 344 of thigh support straps 340 are coupled to upper torso support portion 330, thigh support straps 340 and hammock center portion 325 and upper torso support portion 330 form a supportive bucket seat extending from a first side edge to a seat second side edge. The seat first side edge is formed by a laterally outer side edge of a first thigh support strap 340 (e.g., side edge 334 of a first thigh support strap 340) and the seat second side edge is formed by the laterally outer side edge of a second thigh support strap 340 (e.g., side edge 336 of a second thigh support strap 340).
- [0062] The embodiment of FIGURE 3 can support a child in a similar manner as discussed above. In the embodiment of FIGURE 3, however, the biasing mechanism can comprise gussets 390 that extend between the edges of thigh support straps 340 and edges of hammock portion 320.
- [0063] Carrier 300 can include an adjustable collar 370 to support a child's head and/or neck. Adjustable collar 370 may be positioned according to the direction the child is facing (i.e., inward or outward), the size of the child, or other criteria. Adjustable collar 370 may be formed from a separate piece of material or a separate material and joined to upper torso support portion 330, or adjustable collar 370 and upper torso support portion 330 may be formed from the same material or piece of material such adjustable collar 370 is foldable (e.g., rotated about flexible hinge 375) to upper torso support portion 330 such that adjustable collar 370 may be extended. As discussed above, the adjustable collar 370 may secure in multiple positions using securing mechanism.

- [0064] Child carrier 300 can carry a child in an inward facing orientation or an outward facing orientation and in front carry, back carry, side carry positions. The child may be seated in an inward facing orientation or an outward facing orientation. The child may be carried with the child's weight near the wearer's center of gravity with the child's thighs and knees ergonomically angled such that the child is supported in a spread squat position.
- [0065] FIGURE 4A and FIGURE 4B are diagrammatic representations of one embodiment of securing a thigh support strap 402 (e.g., such as a thigh support strap 140 of FIGURES 2A-2C, or a thigh support strap 340 of FIGURE 3). According to one embodiment, thigh support strap 402 and an upper torso support portion 406 (e.g., such as an upper torso support portion 130 of FIGURES 2A-2C, or upper torso support portion 330 of FIGURE 3) can include corresponding securing mechanisms. The securing mechanisms can include any suitable mechanism such as, but not limited to, buttons, snaps, d-rings and clips or hooks, patches of hook and loop material or other securing mechanism. Upper torso support portion 406 may include multiple attachment points. By way of example, but not limitation, the outward end portion of each thigh support strap 402 can include a button hole 408 and upper torso support portion 406 can include multiple buttons 410 so that each thigh support strap 402 can be secured in multiple locations, allowing the shape of a seat to be adjusted. Buttons 410 (or other securing mechanism) may be concealed under a panel or exposed. Thigh support straps 402 may be secured and unsecured as needed when the carrier is worn.
- [0066] A carrier can also include a biasing mechanism 412 coupled to each thigh support strap 402. The biasing mechanism(s) can be formed of an elastic material or other material and can act to pull thigh support straps 402 laterally toward the lateral centerline of carrier 100 to prevent gaps in the seat as needed. Additionally, biasing mechanism 412 can act to cover gaps between hammock portion 420 and thigh support straps 402. According to some embodiments, fabric bridge 240 (FIGURES 2A, 2B) or gussets 390 (FIGURE 3) can act as biasing mechanism 412.
- [0067] FIGURE 5A and FIGURE 5B are diagrammatic representations of one embodiment of a child carrier 100 carrying a child. FIGURE 5A and FIGURE 5B illustrate that the shoulder straps and waist belt can form a harness to evenly distribute weight evenly to the wearer. The child can be carried proximate to the wearer's center of gravity 502. Furthermore, in both the outward facing position (FIGURE 5A) and inward

facing position (FIGURE 5B), the child's lower torso, pelvis and bottom area are ergonomically supported by the hammock and thigh support straps so that the child's thighs and knees are ergonomically angled higher than the child's hips (as indicated by line 504) to support the child in an ergonomic spread-squat position. FIGURE 5C is a diagrammatic representation of one embodiment of child carrier 100 worn by a wearer showing an example position of a center of gravity 502.

[0068] FIGURE 6 is a diagrammatic representation illustrating that a child may be carried in carrier, such as carrier 100, in a side carry position. In some cases, a child in the side carry position may be supported by the wearer's hip. The shoulder straps can be reconfigured to accommodate a side carry position by connecting each upper shoulder strap portion to the lower shoulder strap portion on the other side of the lateral centerline of the carrier with one strap forming a generally horizontal loop around the wearer's torso and the other strap looping over the wearers shoulder opposite the carrier. FIGURE 7 is a diagrammatic representation illustrating that a child may be carried in a child carrier, such as carrier 100, in a back carry position. Thus, embodiments of child carriers described herein can be positioned in front, back and side positions while supporting the child in an ergonomic spread squat position. In addition, a child can be oriented in an inward facing orientation or an outward facing orientation while supported in an ergonomic spread squat position.

[0069] According to some embodiments a carrier can be a soft carrier having a main body, thigh support wraps and waist belt primarily formed of one or more pieces of natural or synthetic fiber without a rigid frame. In other embodiments, a carrier can incorporate frame elements. For example, a supportive carrier seat as discussed above can be utilized with an upper torso support that incorporates a frame.

[0070] As used herein, the terms "comprises," "comprising," "includes," "including," "has," "having" or any other variation thereof, are intended to cover a non-exclusive inclusion. For example, a process, article, or apparatus that comprises a list of elements is not necessarily limited to only those elements but may include other elements not expressly listed or inherent to such process, article, or apparatus. Further, unless expressly stated to the contrary, "or" refers to an inclusive or and not to an exclusive or. For example, a condition A or B is satisfied by any one of the following: A is true (or present) and B is false (or not present), A is false (or not present) and B is true (or present), and both A and B are true (or present). As used herein, including the claims that follow, a term preceded by "a" or "an" (and

“the” when antecedent basis is “a” or “an”) includes both singular and plural of such term, unless clearly indicated within the claim otherwise (i.e., that the reference “a” or “an” clearly indicates only the singular or only the plural). Also, as used in the description herein and throughout the claims that follow, the meaning of “in” includes “in” and “on” unless the context clearly dictates otherwise.

- [0071] Additionally, any examples or illustrations given herein are not to be regarded in any way as restrictions on, limits to, or express definitions of, any term or terms with which they are utilized. Instead, these examples or illustrations are to be regarded as being described with respect to one particular embodiment and as illustrative only. Those of ordinary skill in the art will appreciate that any term or terms with which these examples or illustrations are utilized will encompass other embodiments which may or may not be given therewith or elsewhere in the specification and all such embodiments are intended to be included within the scope of that term or terms. Language designating such nonlimiting examples and illustrations include, but is not limited to: “for example,” “for instance,” “e.g.,” “in one embodiment.”
- [0072] Reference throughout this specification to “one embodiment”, “an embodiment”, or “a specific embodiment” or similar terminology means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment and may not necessarily be present in all embodiments. Thus, respective appearances of the phrases “in one embodiment”, “in an embodiment”, or “in a specific embodiment” or similar terminology in various places throughout this specification are not necessarily referring to the same embodiment. Furthermore, the particular features, structures, or characteristics of any particular embodiment may be combined in any suitable manner with one or more other embodiments. It is to be understood that other variations and modifications of the embodiments described and illustrated herein are possible in light of the teachings herein and are to be considered as part of the spirit and scope of the invention.
- [0073] In the description herein, numerous specific details are provided, such as examples of components and/or methods, to provide a thorough understanding of embodiments of the invention. One skilled in the relevant art will recognize, however, that an embodiment may be able to be practiced without one or more of the specific details, or with other apparatus, systems, assemblies, methods, components, materials, parts, and/or the like. In other instances, well-known structures, components, systems, materials, or operations are not specifically shown or

described in detail to avoid obscuring aspects of embodiments of the invention. While the invention may be illustrated by using a particular embodiment, this is not and does not limit the invention to any particular embodiment and a person of ordinary skill in the art will recognize that additional embodiments are readily understandable and are a part of this invention.

[0074] It will also be appreciated that one or more of the elements depicted in the drawings/figures can also be implemented in a more separated or integrated manner, or even removed or rendered as inoperable in certain cases, as is useful in accordance with a particular application. Additionally, any signal arrows in the drawings/Figures should be considered only as exemplary, and not limiting, unless otherwise specifically noted.

[0075] Although the invention has been described with respect to specific embodiments thereof, these embodiments are merely illustrative, and not restrictive of the invention. The description herein of illustrated embodiments of the invention, including the description in the Abstract and Summary, is not intended to be exhaustive or to limit the invention to the precise forms disclosed herein (and in particular, the inclusion of any particular embodiment, feature or function within the Abstract or Summary is not intended to limit the scope of the invention to such embodiment, feature or function). Rather, the description is intended to describe illustrative embodiments, features and functions in order to provide a person of ordinary skill in the art context to understand the invention without limiting the invention to any particularly described embodiment, feature or function, including any such embodiment feature or function described in the Abstract or Summary. While specific embodiments of, and examples for, the invention are described herein for illustrative purposes only, various equivalent modifications are possible within the spirit and scope of the invention, as those skilled in the relevant art will recognize and appreciate. As indicated, these modifications may be made to the invention in light of the foregoing description of illustrated embodiments of the invention and are to be included within the spirit and scope of the invention. Thus, while the invention has been described herein with reference to particular embodiments thereof, a latitude of modification, various changes and substitutions are intended in the foregoing disclosures, and it will be appreciated that in some instances some features of embodiments of the invention will be employed without a corresponding use of other features without departing from the scope and spirit of the invention as set forth.

Therefore, many modifications may be made to adapt a particular situation or material to the essential scope and spirit of the invention.

CLAIMS

1. A child carrier comprising:
 - a waist belt;
 - one or more panels forming an upper torso support and a hammock, the hammock having a first end portion coupled to the waist belt and a second end portion coupled to the upper torso support;
 - a thigh support strap extending to each side of the hammock, each thigh support strap having an inward end portion proximate to the hammock and an outward end portion, the outward end portion configured for selective coupling to the upper torso support in multiple positions, the hammock and the thigh support straps adapted to form an adjustable seat to support a child in an ergonomic spread-squat position in an inward facing orientation and an outward facing orientation, wherein the shape of the seat adjusts depending on the positions in which the outward end portions of the thigh support straps are coupled to the upper torso support; and
 - a set of shoulder straps, each shoulder strap having a first end coupled to the upper torso support and a second end coupled to the upper torso support.
2. The child carrier of claim 1, wherein the upper torso support comprises a plurality of attachment points for each of the thigh support straps.
3. The child carrier of any one of claim 1 or claim 2, wherein the outward end of each thigh support strap comprises an opening for receiving a mechanical fastener on the upper torso support.
4. The child carrier of any one claim 1 to claim 3, wherein each thigh support strap is padded.
5. The child carrier of any one of claim 1 to claim 4, wherein each thigh support strap is sized to wrap around a portion of a child's pelvis, bottom and thigh when the outward end is coupled to the upper torso support.
6. The child carrier of any one of claim 1 to claim 5, wherein the carrier is adapted to be alternatively worn by a wearer in a front carry, back carry and side carry position.

7. The child carrier of any one of claim 1 to claim 6, wherein the carrier is adapted to support the child in the ergonomic spread-squat position in each of a front outward facing and front inward facing orientations.
8. The child carrier of any one of claim 1 to claim 7, wherein the child carrier is adapted to distribute the child's weight evenly to the wearer.
9. The child carrier of any one of claim 1 to claim 8, further comprising:
 - a first plurality of buttons to a first side of a lateral centerline of the upper torso support to which a first of the thigh support straps can selectively couple; and
 - a second plurality of buttons to a second side of the lateral centerline of the upper torso support to which a second of the thigh support straps can selectively couple.
10. The child carrier of any one of claim 1 to claim 9, wherein each thigh support strap angles laterally outward from the inward end portion to the outward end portion when the outward end portion is not coupled to the upper torso support.
11. The child carrier of any one of claim 1 to claim 10, further comprising an adjustable collar coupled to the upper torso portion, the adjustable collar securable in an extended position and a non-extended position.
12. The child carrier of any one of claim 1 to claim 11, wherein the waist belt comprises an adjustable waist belt.
13. A method of positioning a child in a child carrier, comprising:
 - fastening a waist belt around a waist of a user;
 - positioning a child in a hammock having an inward end portion coupled to the belt and an outward end portion coupled to an upper torso support;
 - wrapping a first thigh support strap under a first thigh of the child and a second thigh support strap under a second thigh of the child, each thigh support strap having an inward end and an outward end;
 - fastening an outward end of the first thigh strap to the upper torso support and an outward end of the second thigh support strap to the upper torso support at selected attachment points from a plurality of attachment points to adjust the shape of a seat formed by the hammock, the first thigh support strap and the second thigh support strap, the seat

adapted to support the child in an ergonomic spread-squat position in an inward facing orientation and an outward facing orientation; and

inserting at least one arm into a set of shoulder straps, each shoulder strap having a first end coupled to the upper torso support and a second end coupled to the waist belt the upper torso support.

14. The method of claim 13, further comprising orienting the child in an inward facing orientation, wherein the seat supports the child in the ergonomic spread squat position in the inward facing orientation.

15. The method of any one of claim 13 or claim 14, further comprising:
readjusting the shape of the seat using the first thigh support strap and second thigh support; and
reorienting the child in an outward facing orientation, wherein the seat supports the child in the ergonomic spread squat position in the outward facing orientation.

16. The method of any one of claim 13 to claim 15, wherein the child carrier is adapted to be worn in a front carry position, a side carry position and a back carry position.

17. The method of any one of claim 13 to claim 15, further comprising securing an adjustable collar in an extended or non-extended position.

18. The method of any one of claim 13 to claim 17, wherein fastening the waist belt further comprises securing the waist belt.

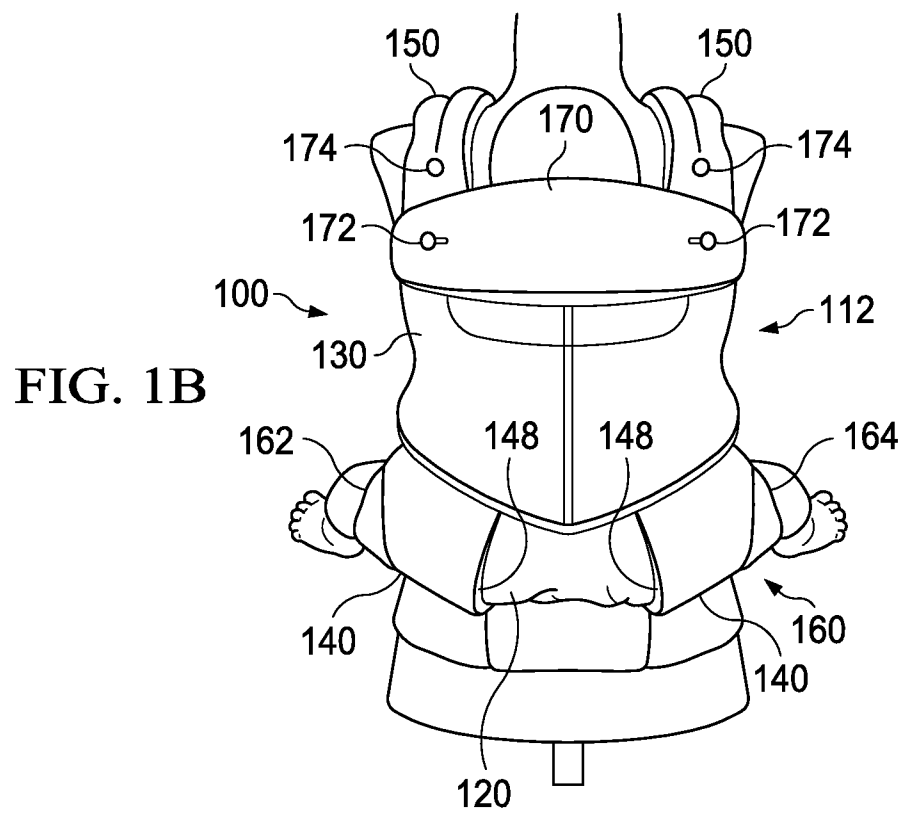
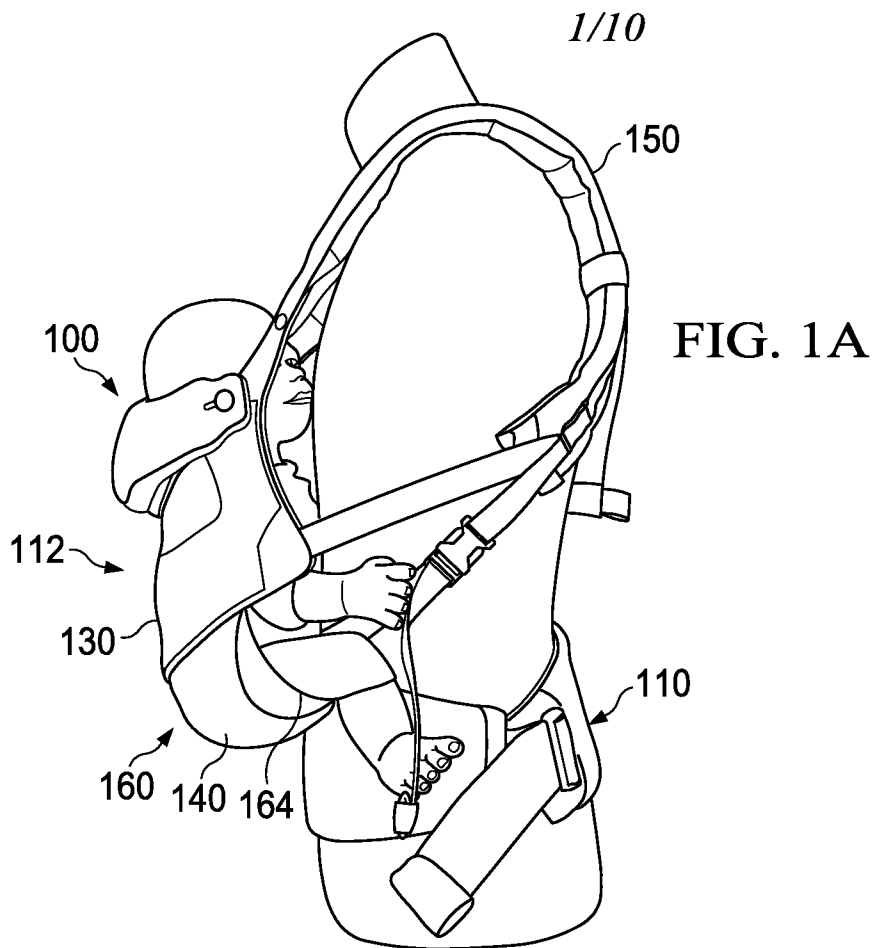
19. The method of any one of claim 11 to claim 18, further comprising securing the set of shoulder straps whereby a center of gravity of the child's weight is supported nearer to the user.

20. The method of any one of claim 11 to claim 19, wherein the child carrier further comprises:

a first plurality of buttons to a first side of a lateral centerline of the upper torso support to which a first of the thigh support straps can selectively couple; and

a second plurality of buttons to a second side of the lateral centerline of the upper torso support to which a second of the thigh support straps can selectively couple.

21. The method of any one of claim 11 to claim 20, wherein the outward end of each thigh support strap comprises an opening for receiving a mechanical fastener on the upper torso support.
22. The method of any one of claim 11 to claim 21, wherein each thigh support strap is padded.
23. The method of any one of claim 11 to claim 22, wherein each thigh support strap angles laterally outward from the inward end portion to the outward end portion when the outward end portion is not coupled to the upper torso support.
24. The method of any one of claim 11 to claim 23, wherein the carrier further comprises an adjustable collar coupled to the upper torso portion, the adjustable collar securable in an extended position and a non-extended position.



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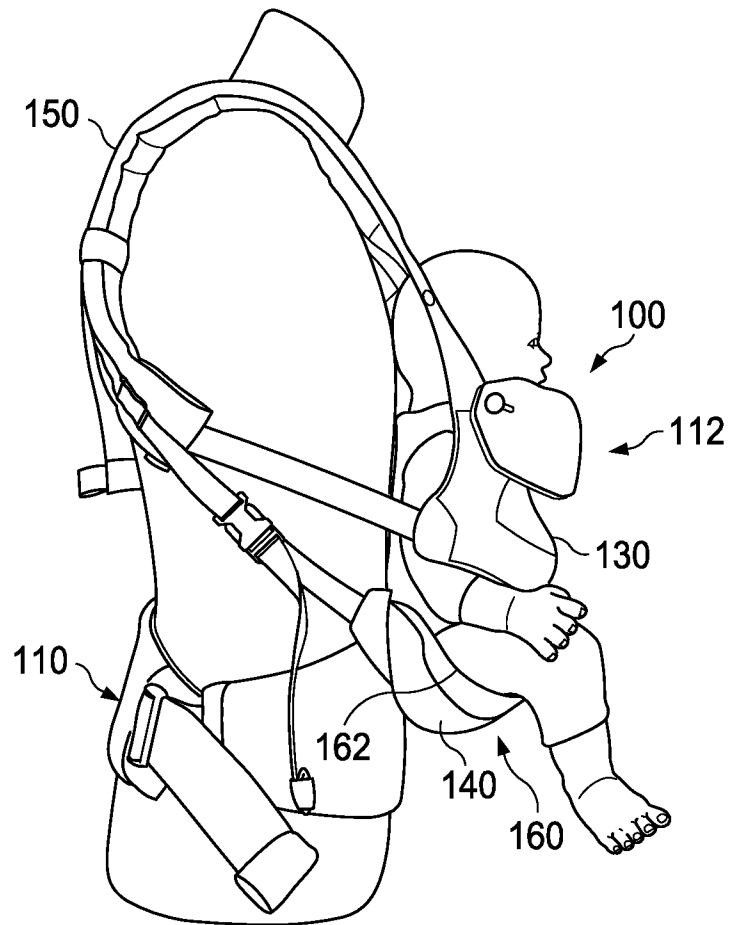


FIG. 1C

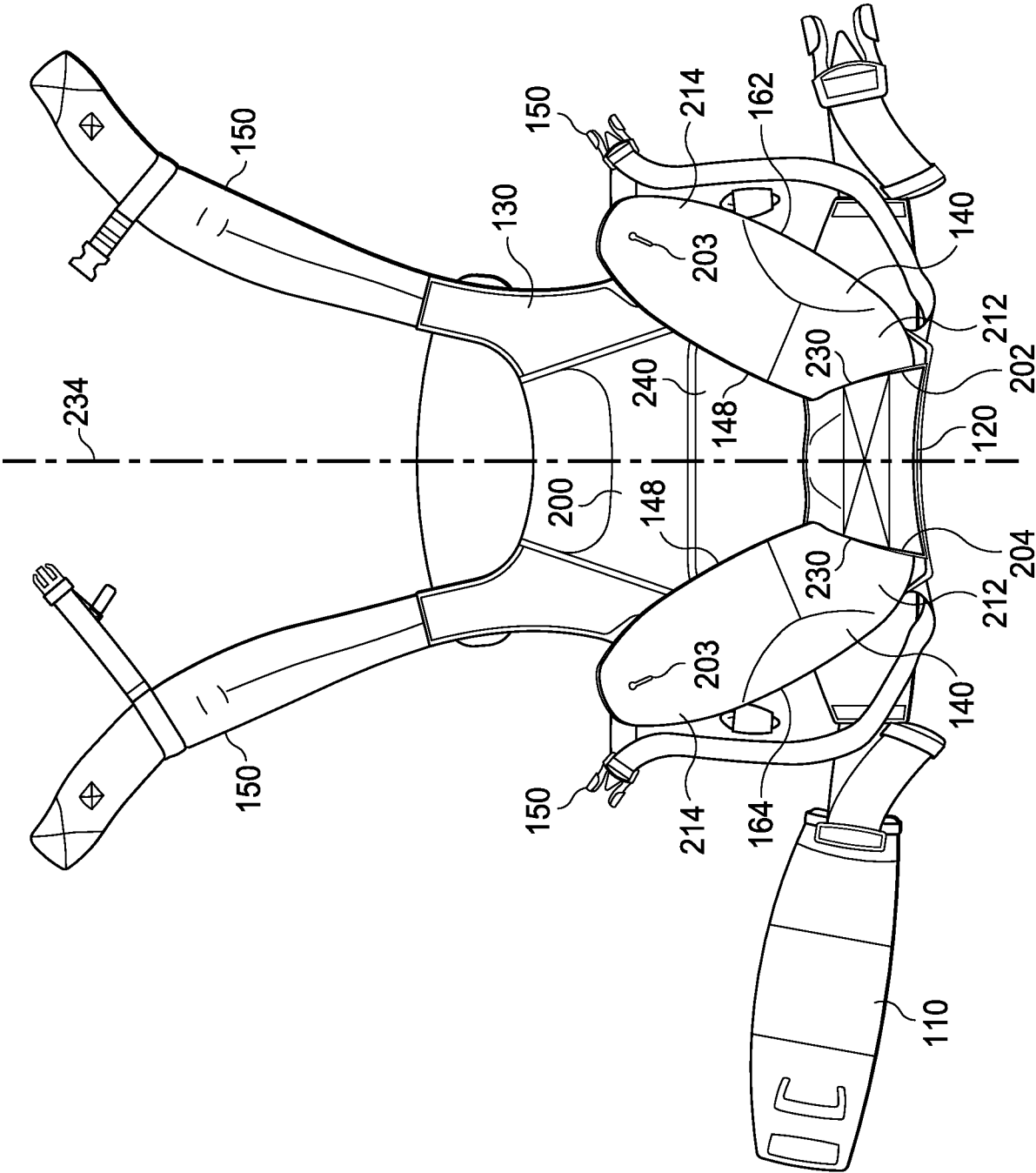


FIG. 2A

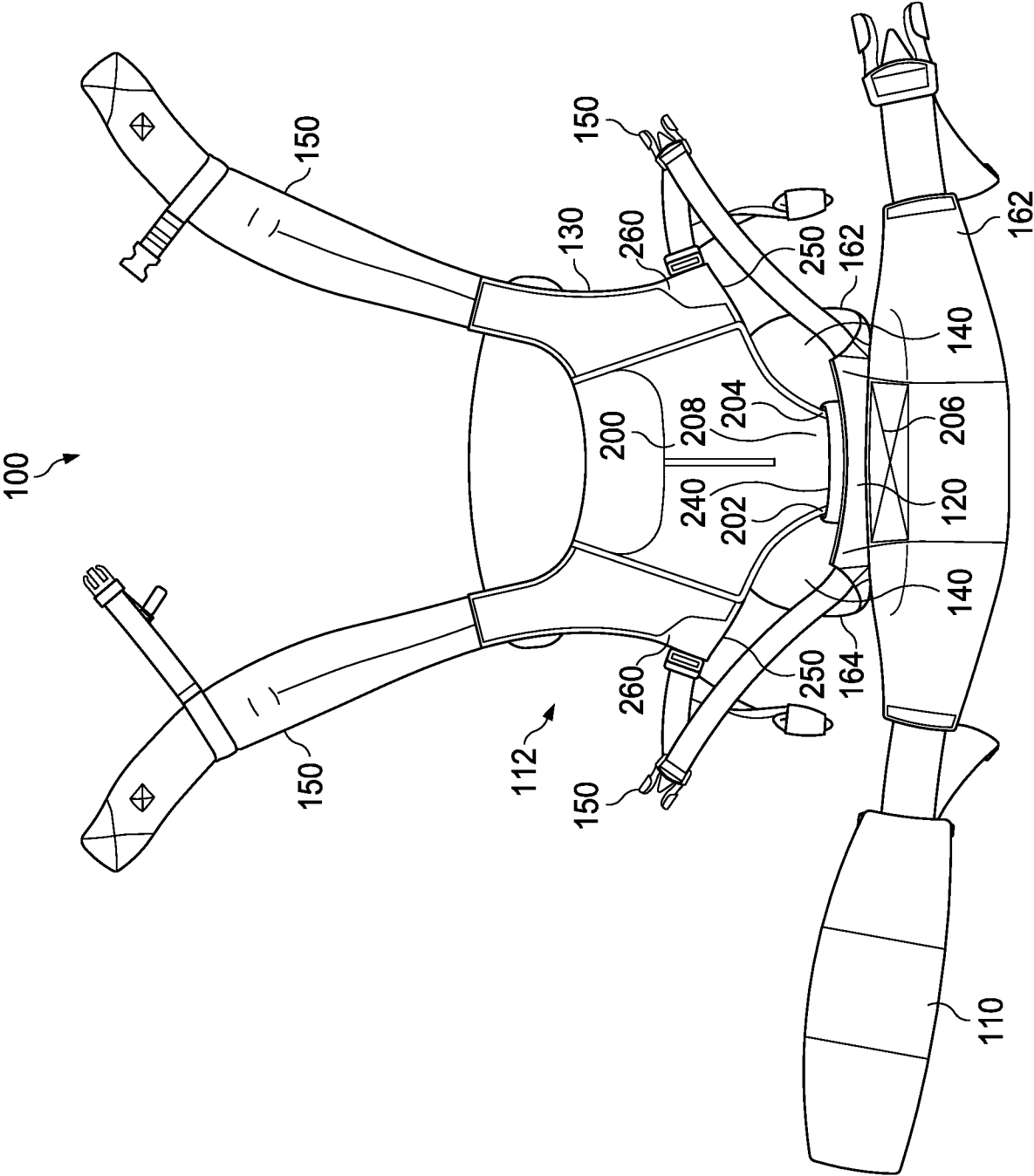


FIG. 2B

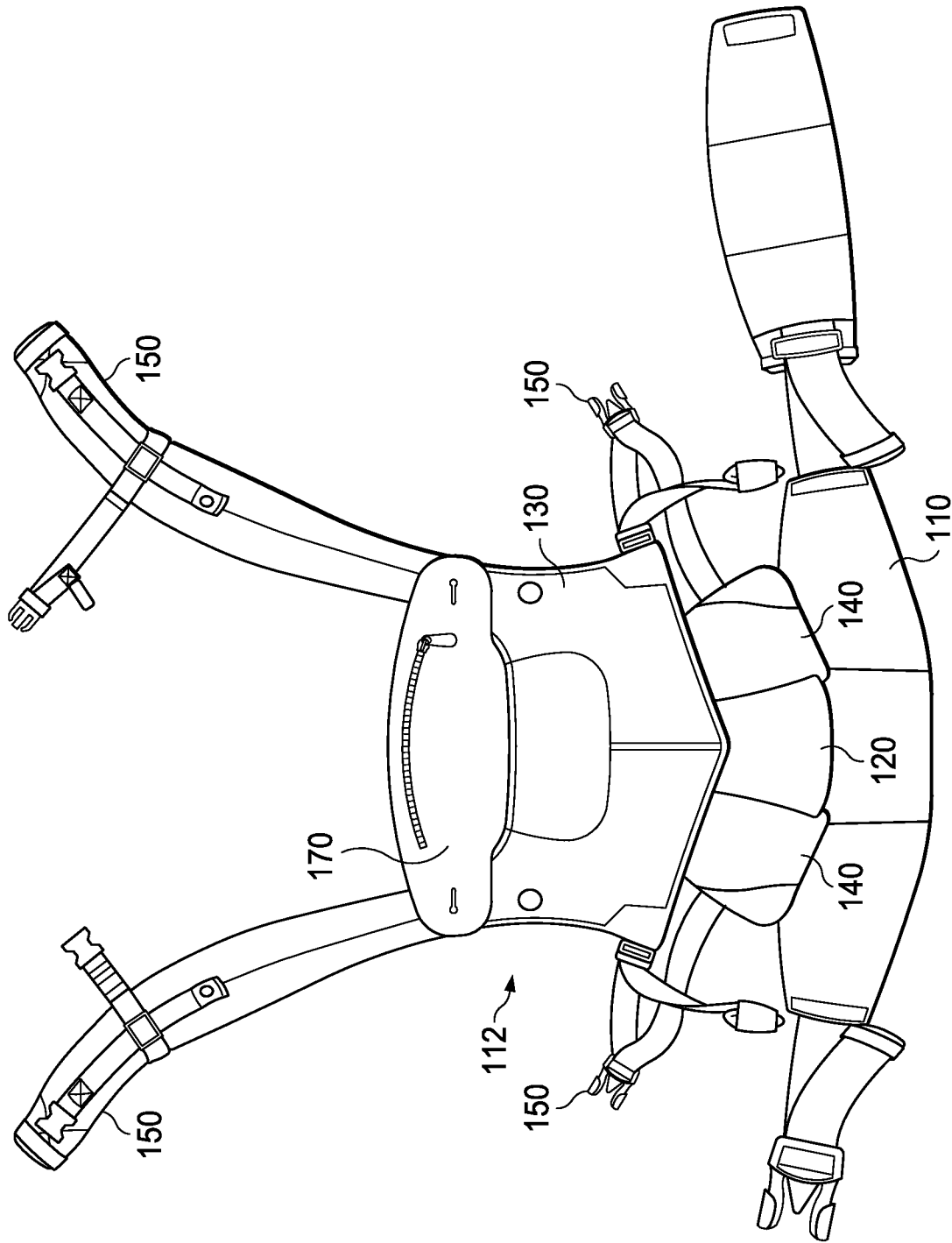


FIG. 2C

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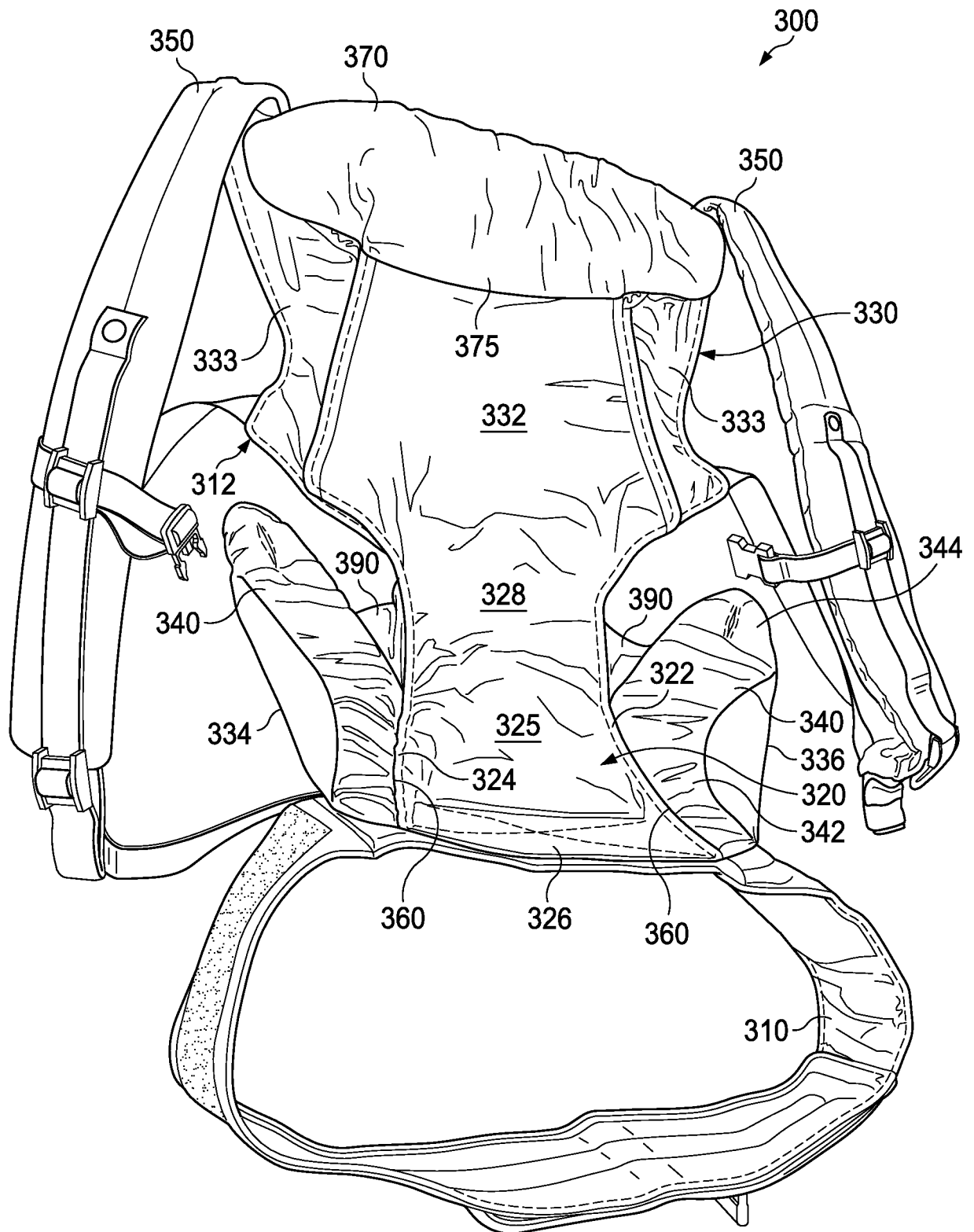


FIG. 3

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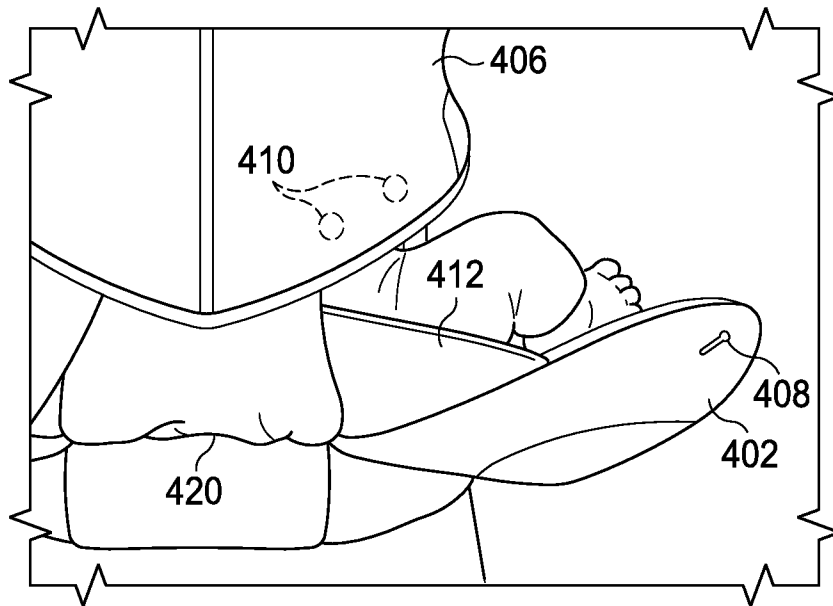


FIG. 4A

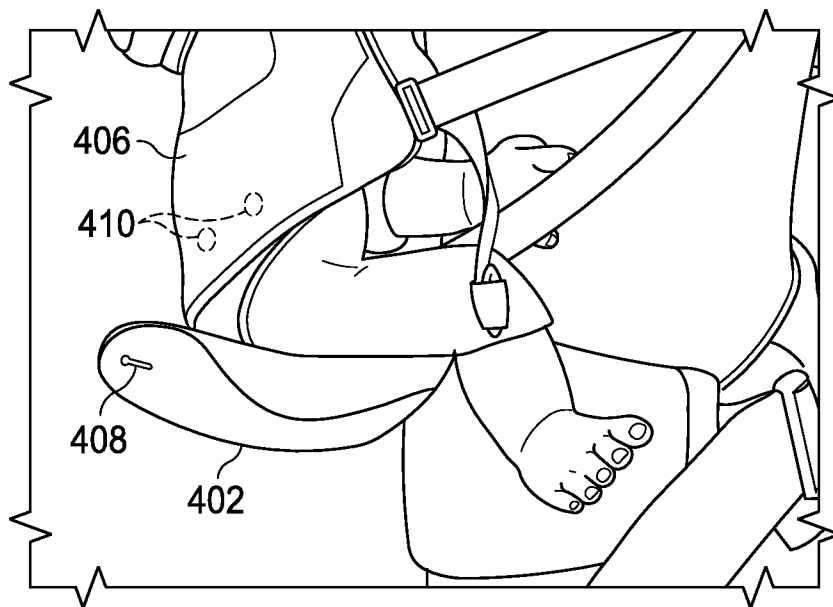


FIG. 4B

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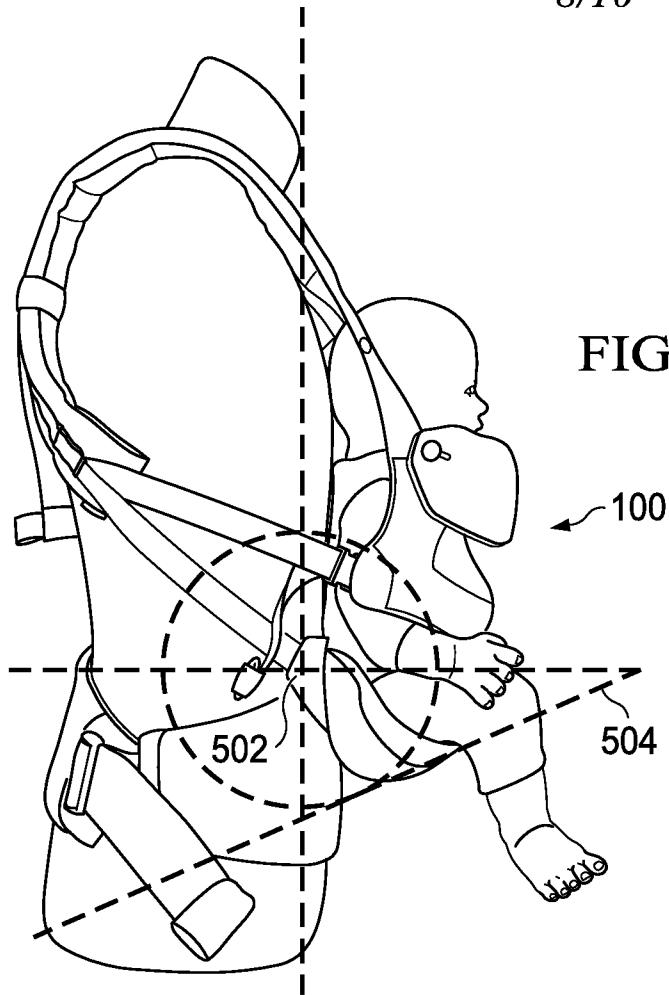
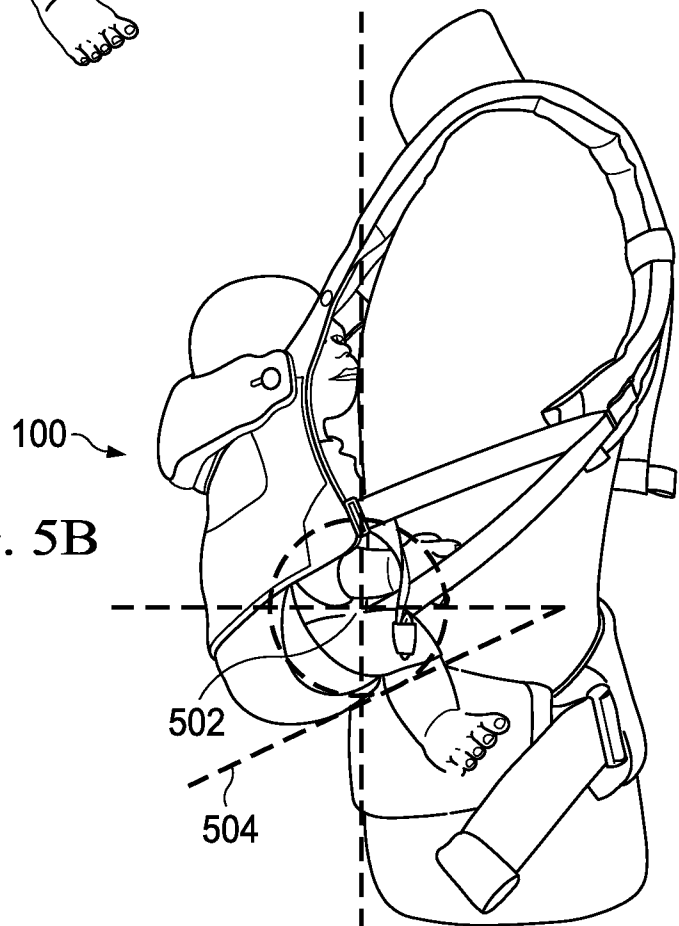


FIG. 5B



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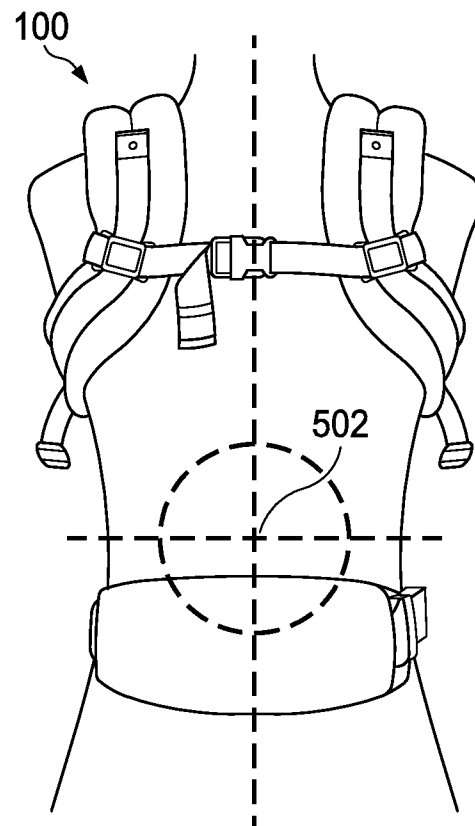
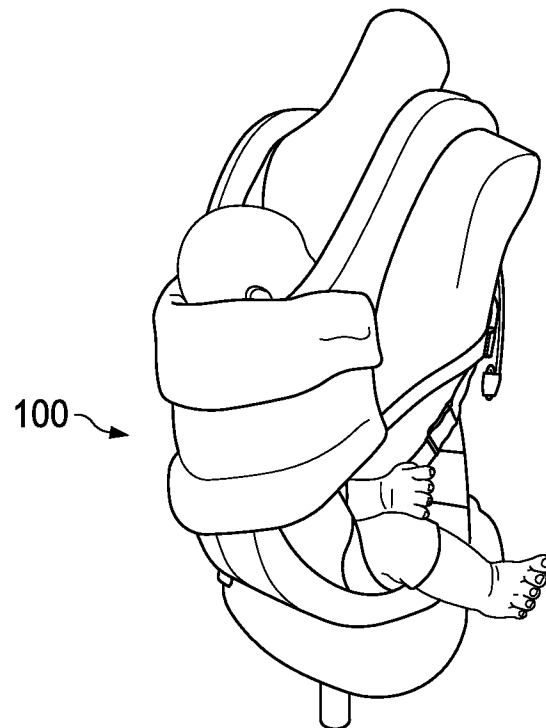
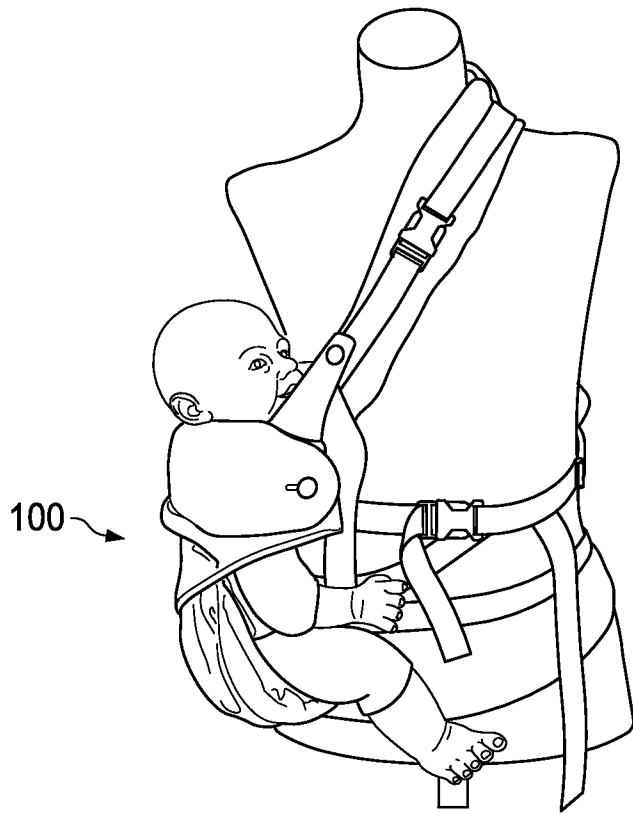


FIG. 5C

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2014/026378

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A47D 13/02 (2014.01)

USPC - 224/160

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8) - A47D 13/00, 13/02, 13/06, 13/07, 13/08 (2014.01)

USPC - 224/158, 159, 160

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

CPC - A47D 13/025 (2014.06)

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

Orbit, Google Patents, Google

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2011/0290831 A1 (WANG) 01 December 2011 (01.12.2011) entire document	1-3, 13-15
Y	US 2012/0205406 A1 (SCHACHTNER) 16 August 2012 (16.08.2012) entire document	1-3, 13-15
A	US 2012/0043359 A1 (BERGKVIST et al) 23 February 2012 (23.02.2012) entire document	1-3, 13-15

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

30 June 2014

Date of mailing of the international search report

21 JUL 2014

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3201

Authorized officer:

Blaine R. Copenheaver

PCT Helpdesk: 571-272-4300

PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2014/026378

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

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

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☒ Claims Nos.: 4-12, 16-24
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

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

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

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

Remark on Protest

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