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(19) **United States**(12) **Patent Application Publication**
BODDIE(10) **Pub. No.: US 2025/0256014 A1**(43) **Pub. Date: Aug. 14, 2025**(54) **ERGONOMIC FORWARD LEANING BREAST
PUMPING CHAIR SYSTEMS AND DEVICES
THEREOF**(71) Applicant: **Restful Pump, Inc.**, Pembroke, MA
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filed on May 13, 2024, provisional application No.
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2205/36 (2013.01); **A61M 2209/084** (2013.01)

(57)

ABSTRACT

Breast pumping chair systems are disclosed that include a chair assembly including a seat frame coupled to a base frame, feet coupled to opposing ends of the base frame, a seat support coupled to the seat frame, and an angle adjustment mechanism. The systems further include a breast pumping assembly including a chest frame coupled to the seat frame, a chest support coupled to the chest frame, a chest cushion angled to engage a sternum of a user in a forward leaning position, and a headrest post removably attached to the chest frame. The breast pumping assembly includes a milk collection system including bottle holders rotatably coupled to opposing sides of the chest frame. The systems also include a height adjustment mechanism to alter a height of the breast pumping assembly and a table rotatably coupled to the chair assembly and/or the breast pumping assembly via a table hinge.

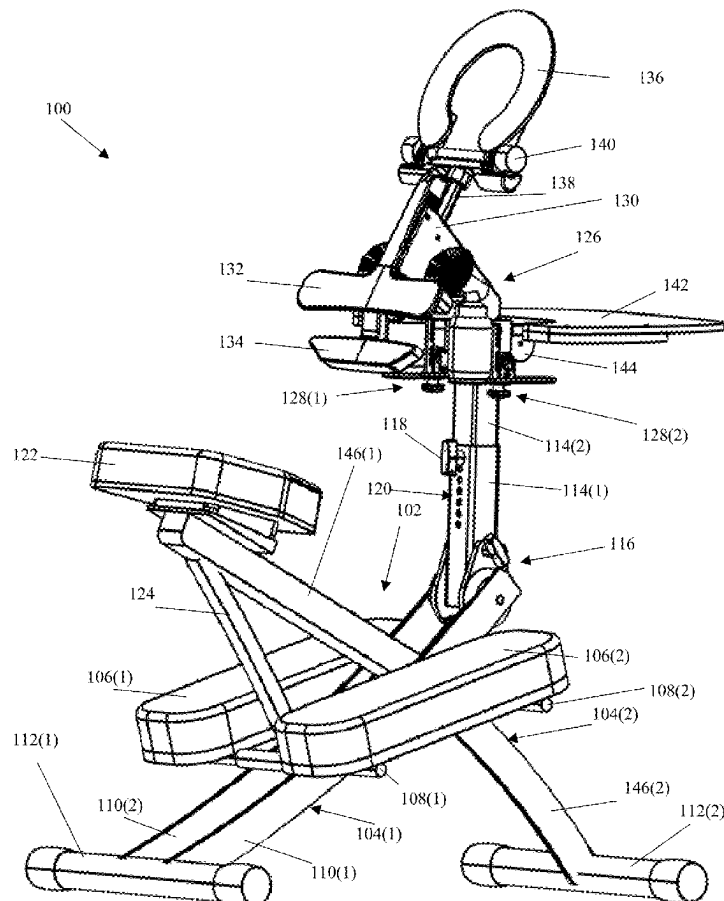


FIG. 1

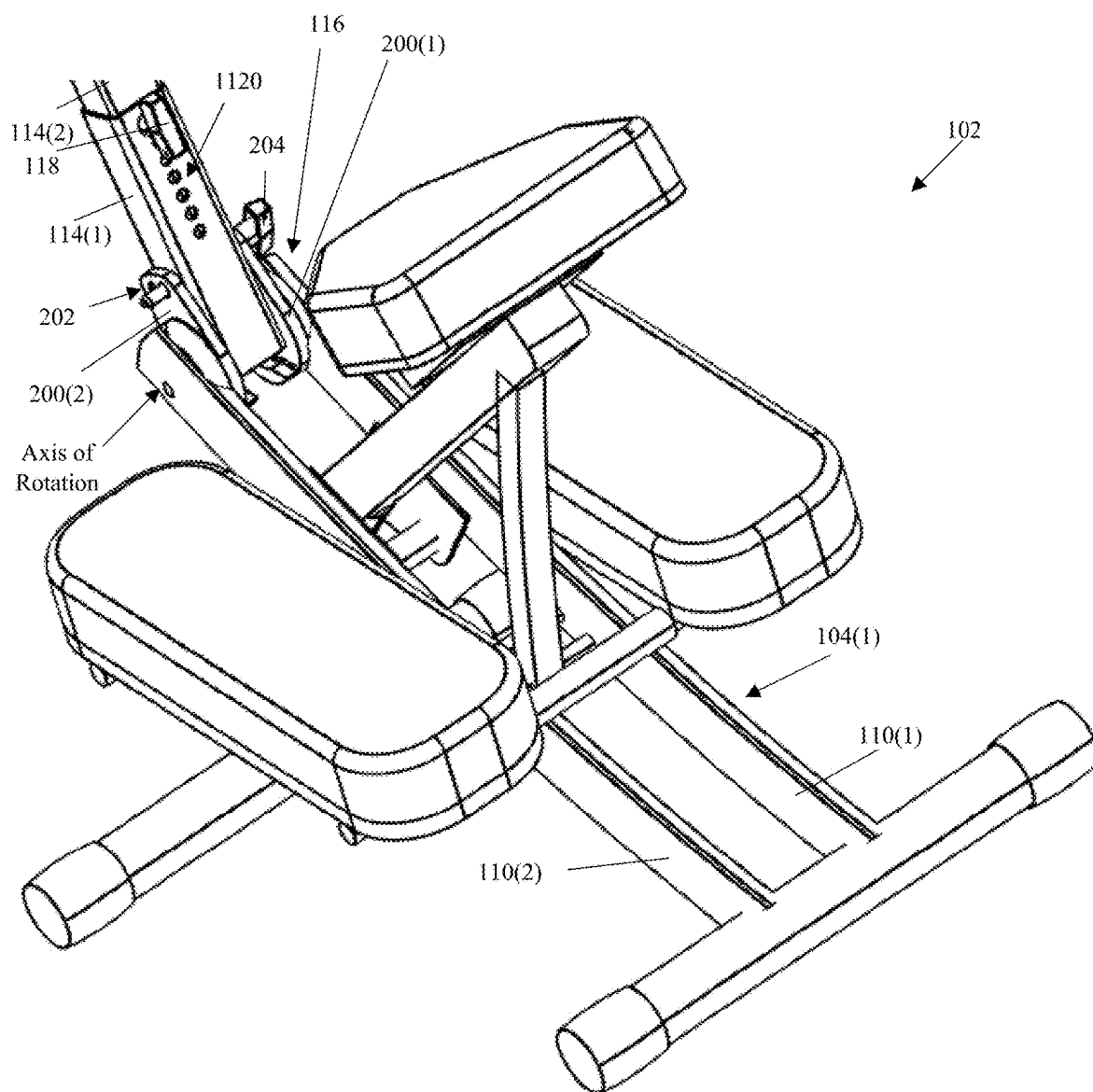


FIG. 2

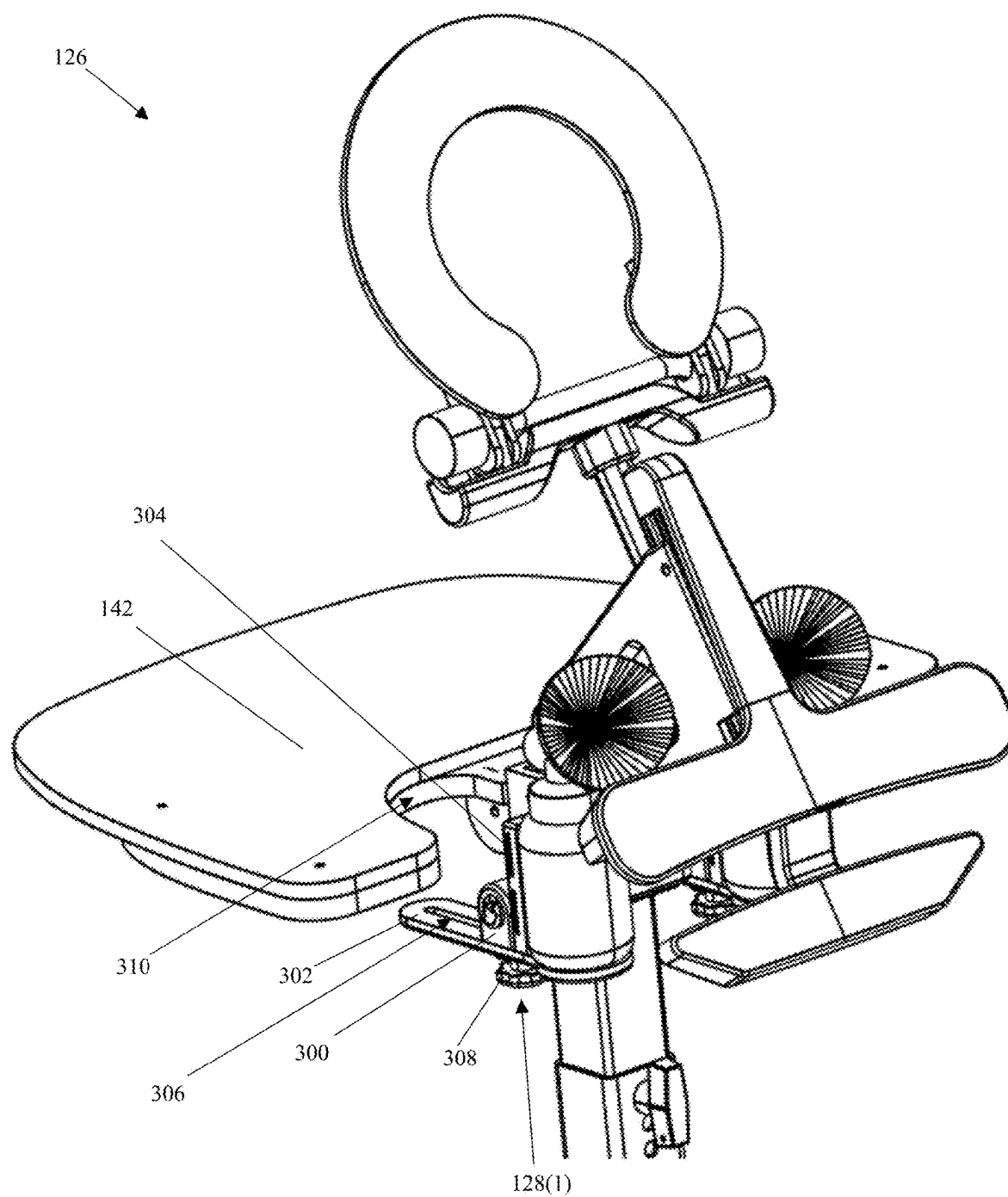


FIG. 3

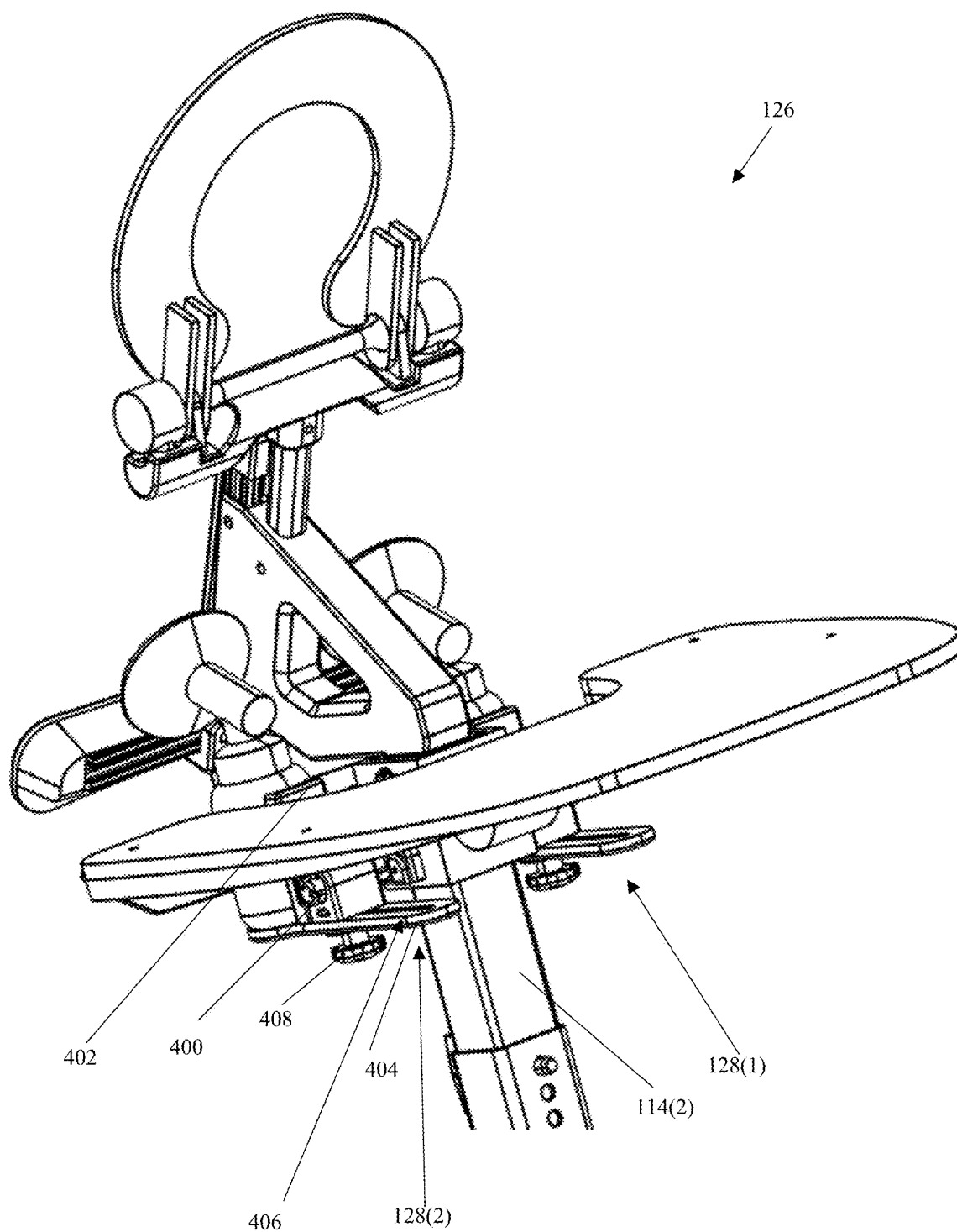


FIG. 4

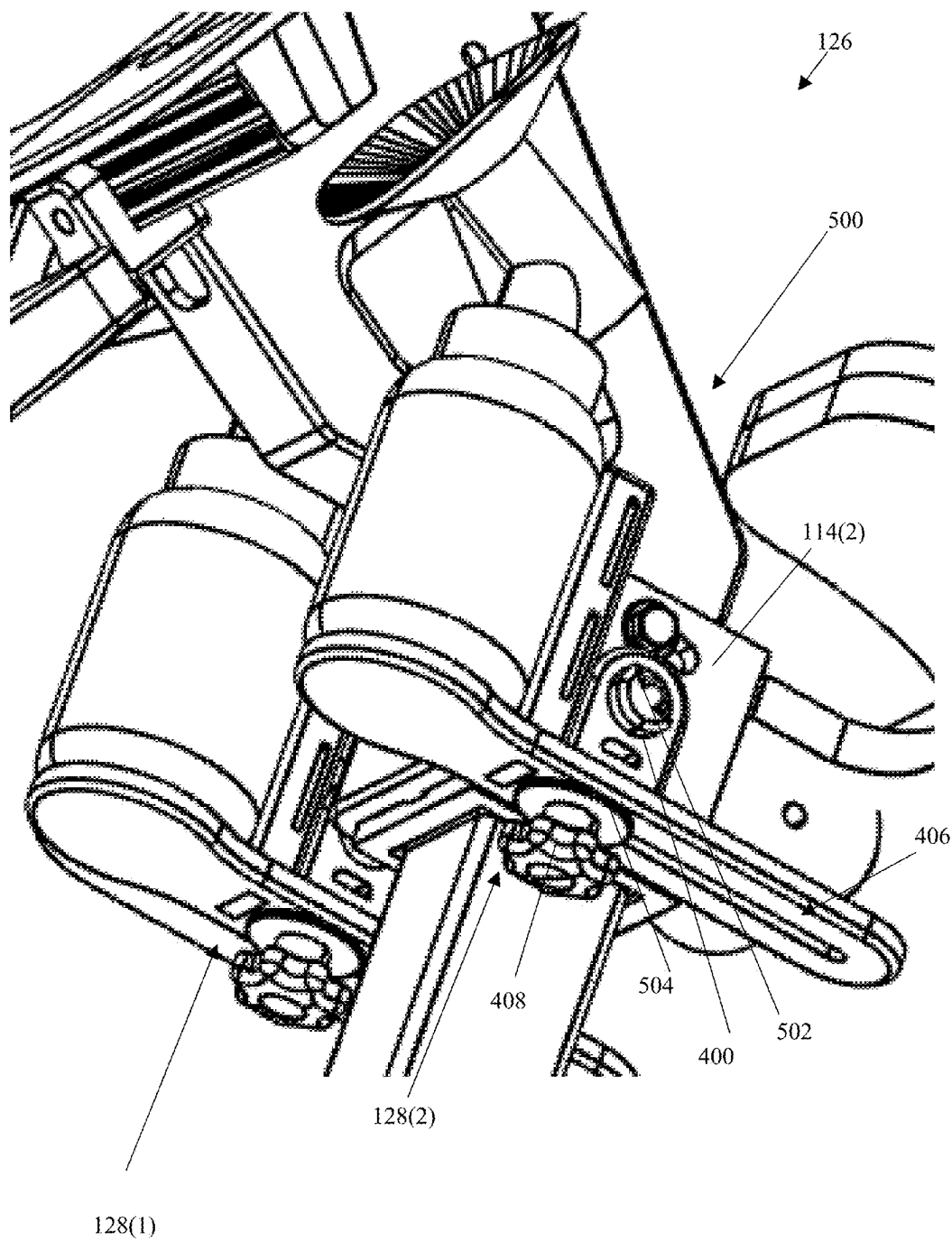


FIG. 5

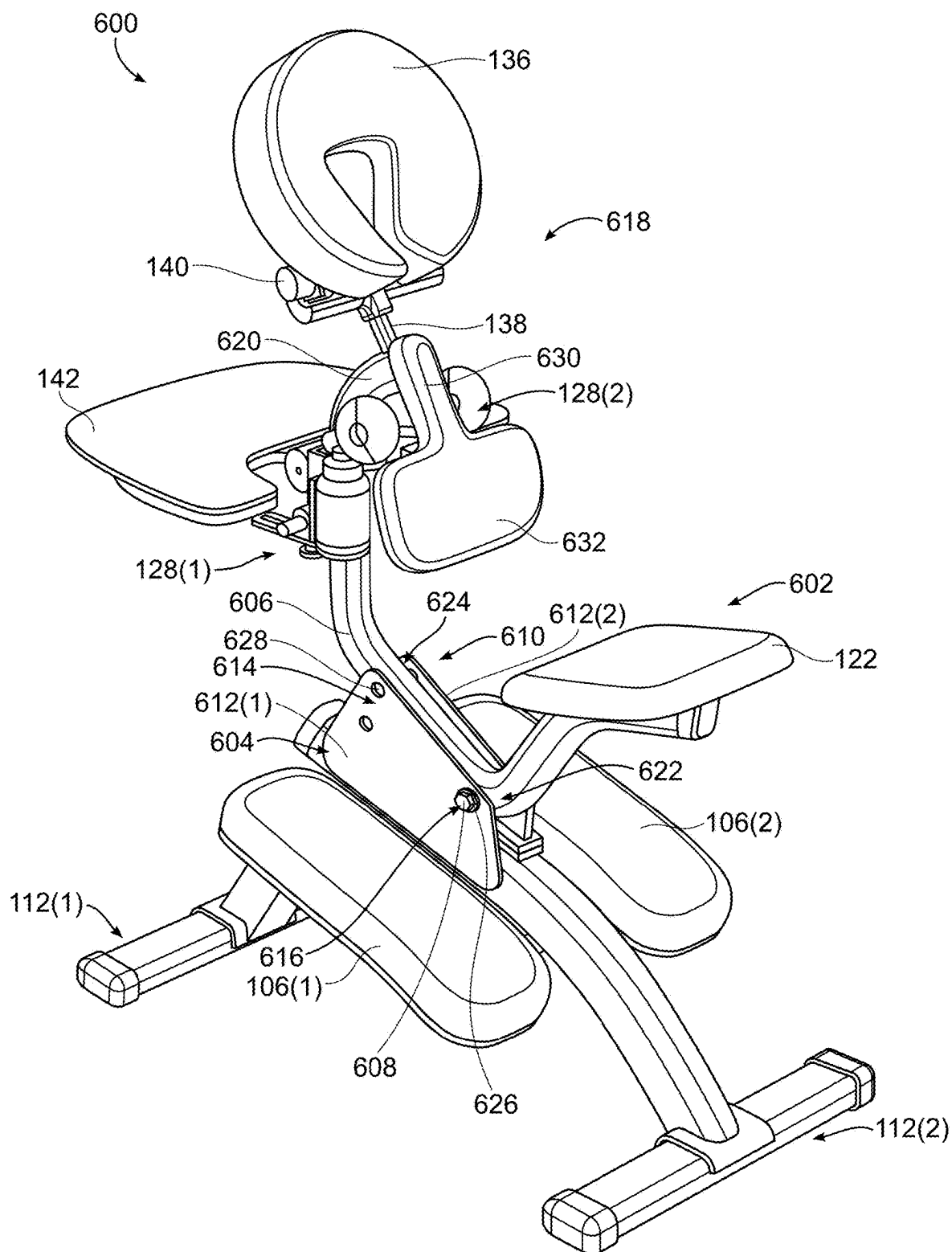


FIG. 6

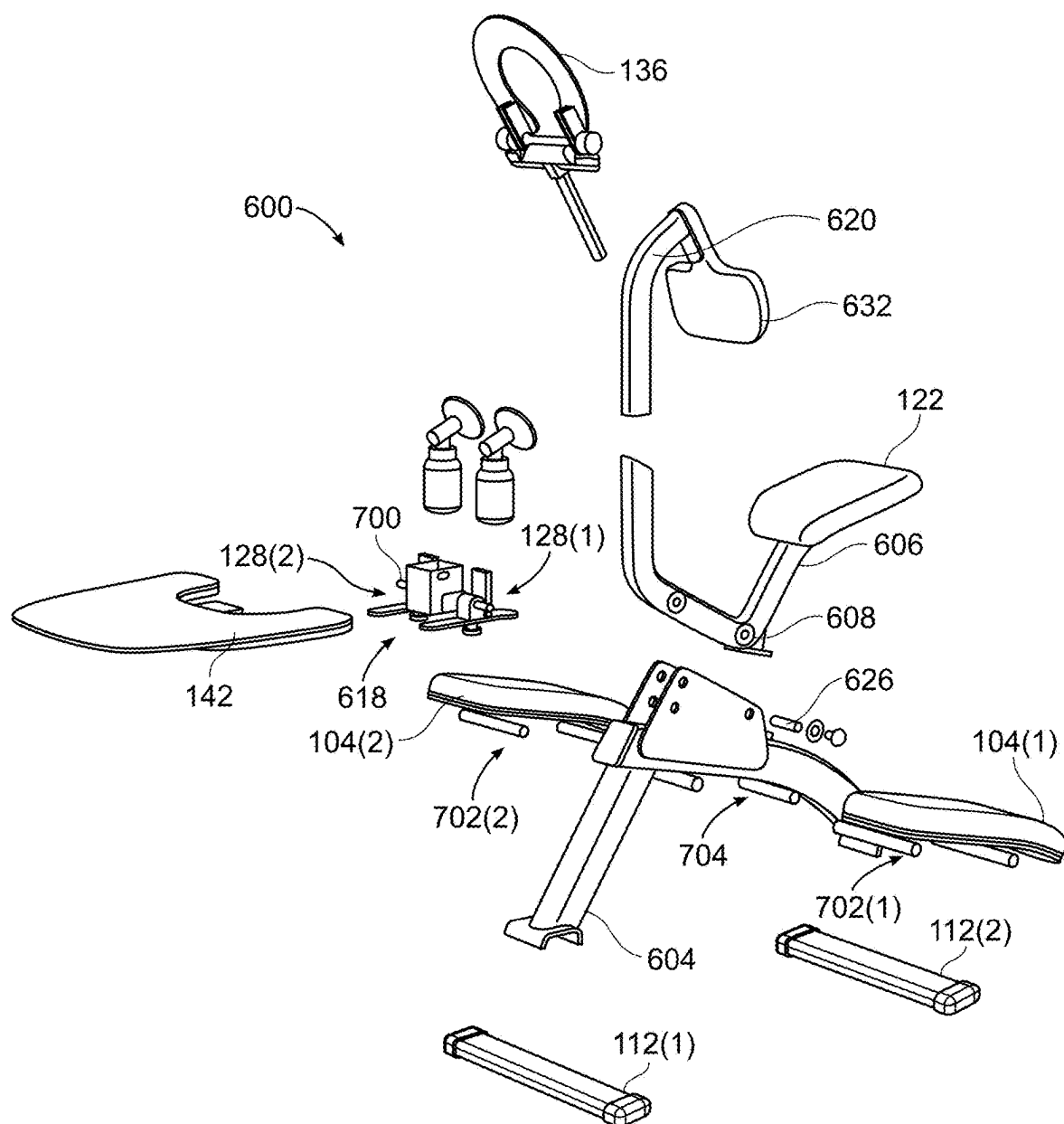


FIG. 7

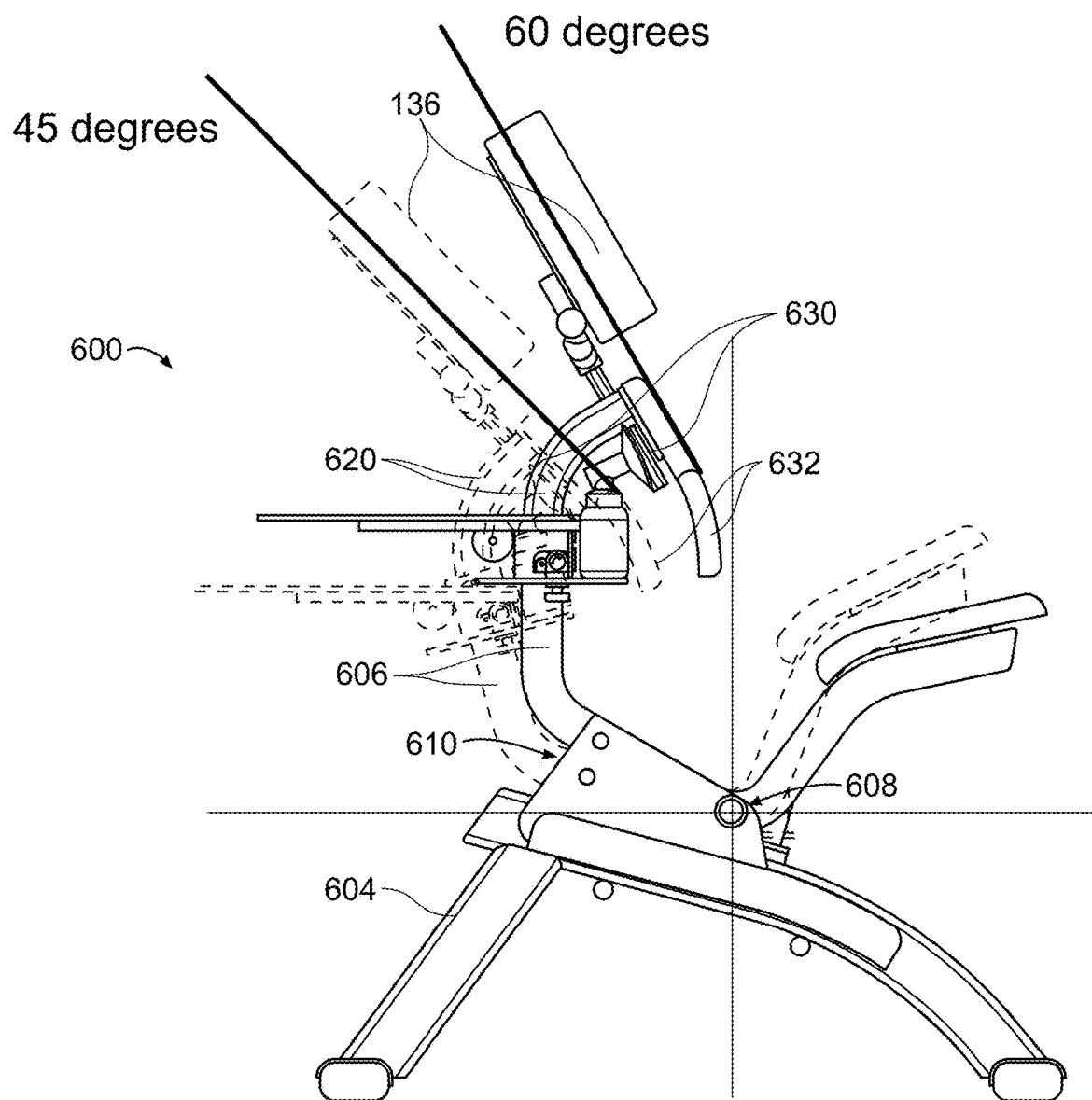


FIG. 8

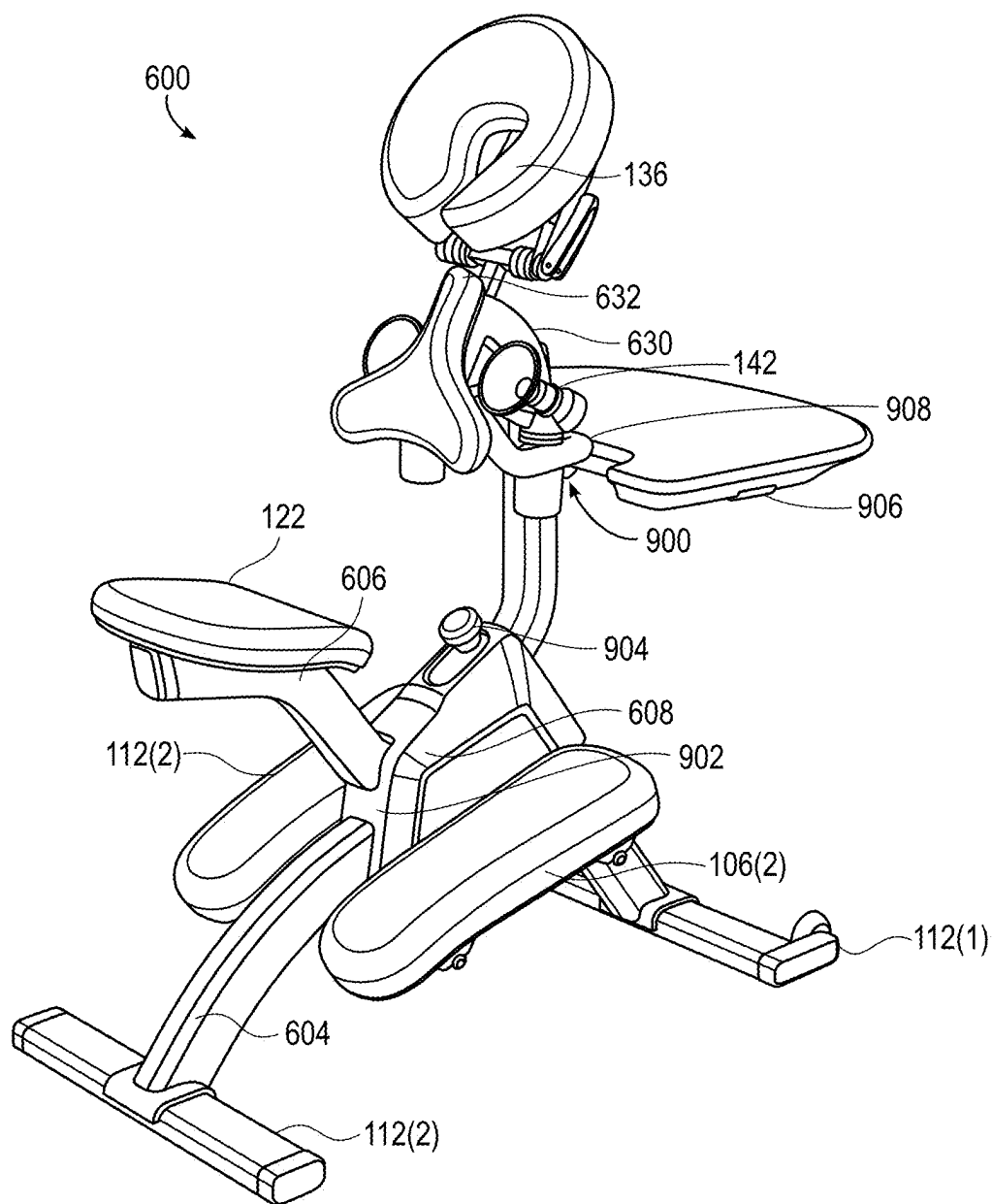


FIG. 9

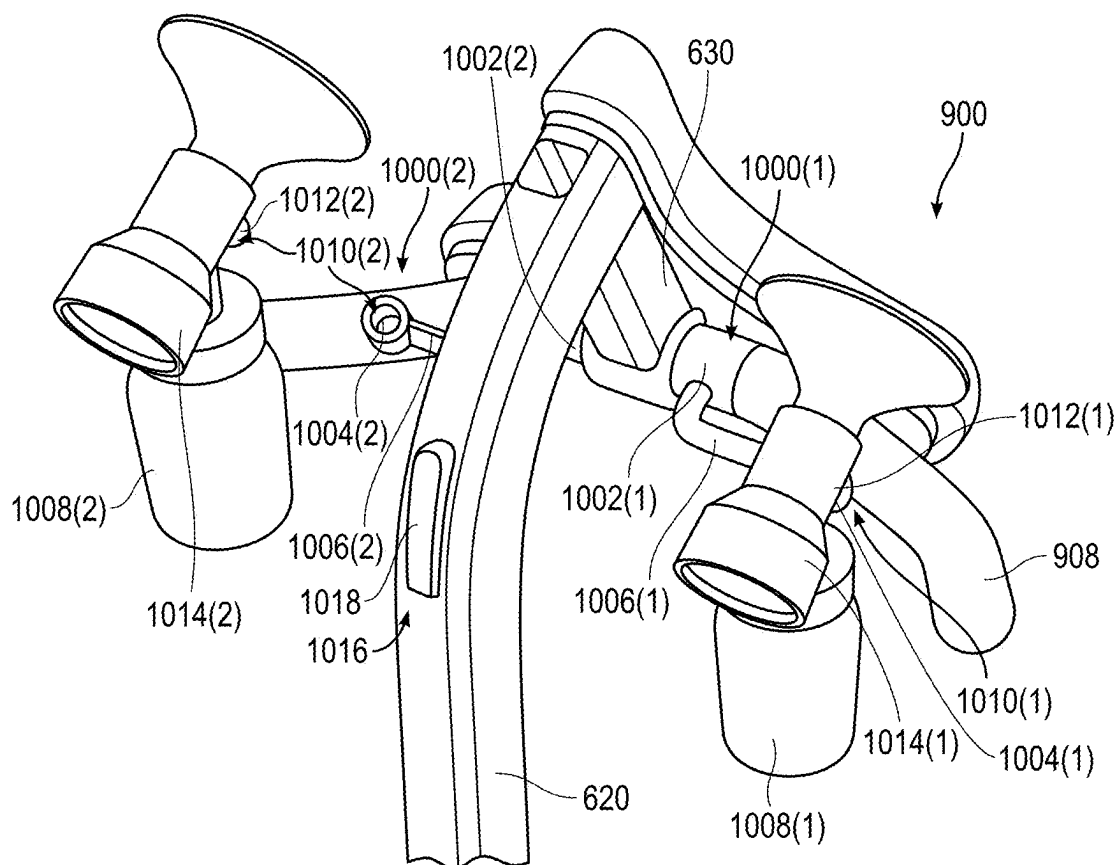


FIG. 10A

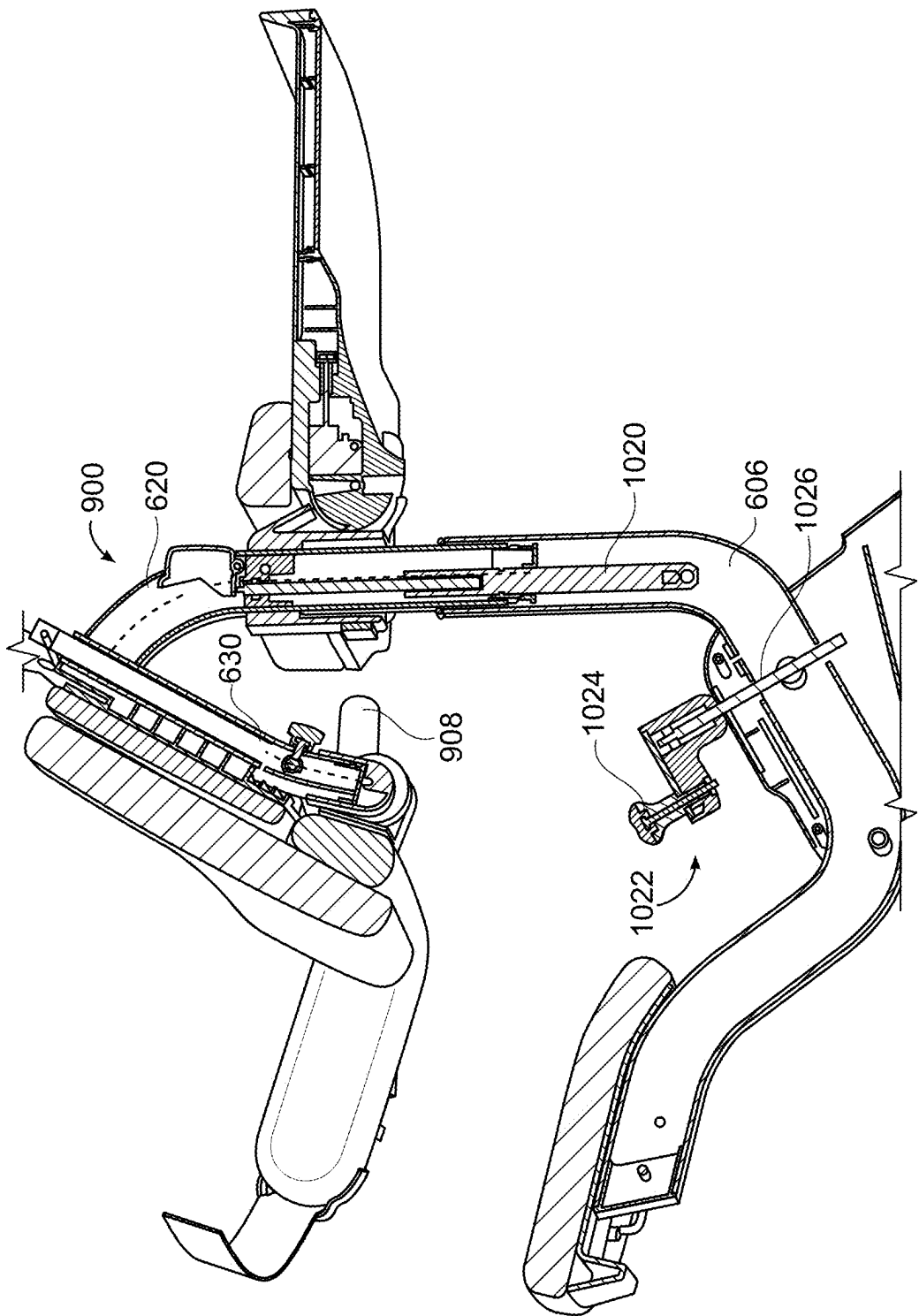


FIG. 10B

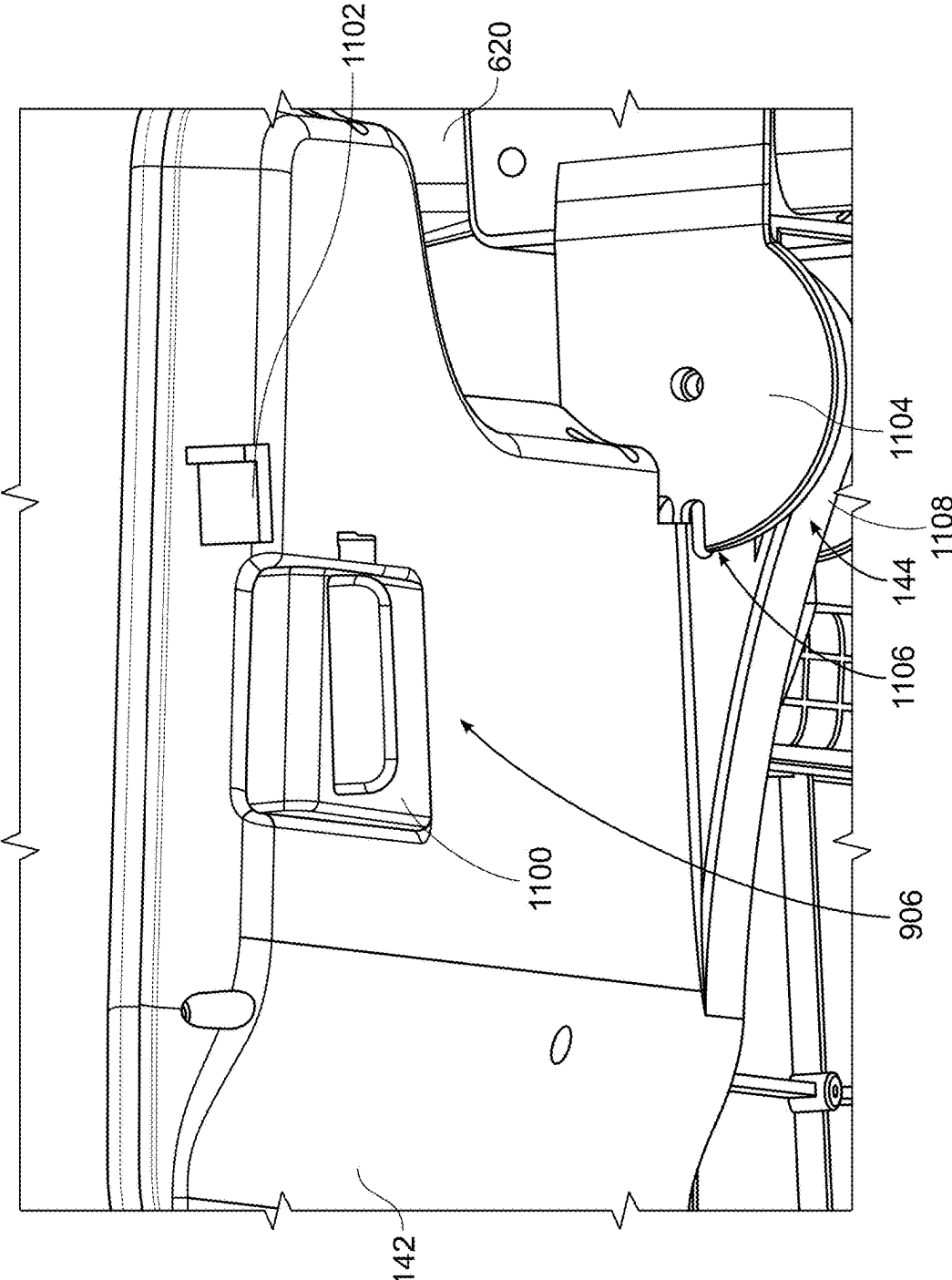


FIG. 11

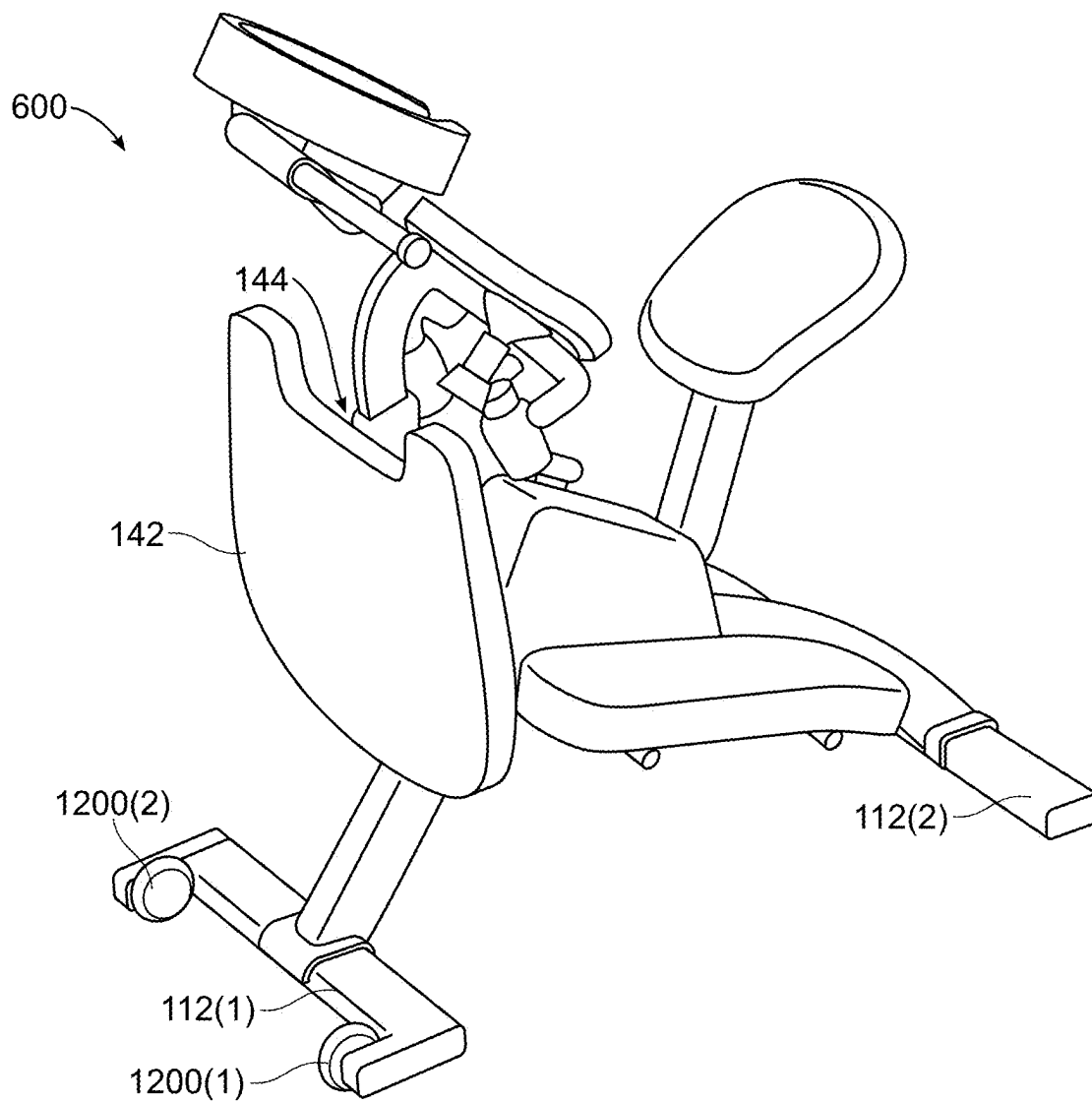


FIG. 12

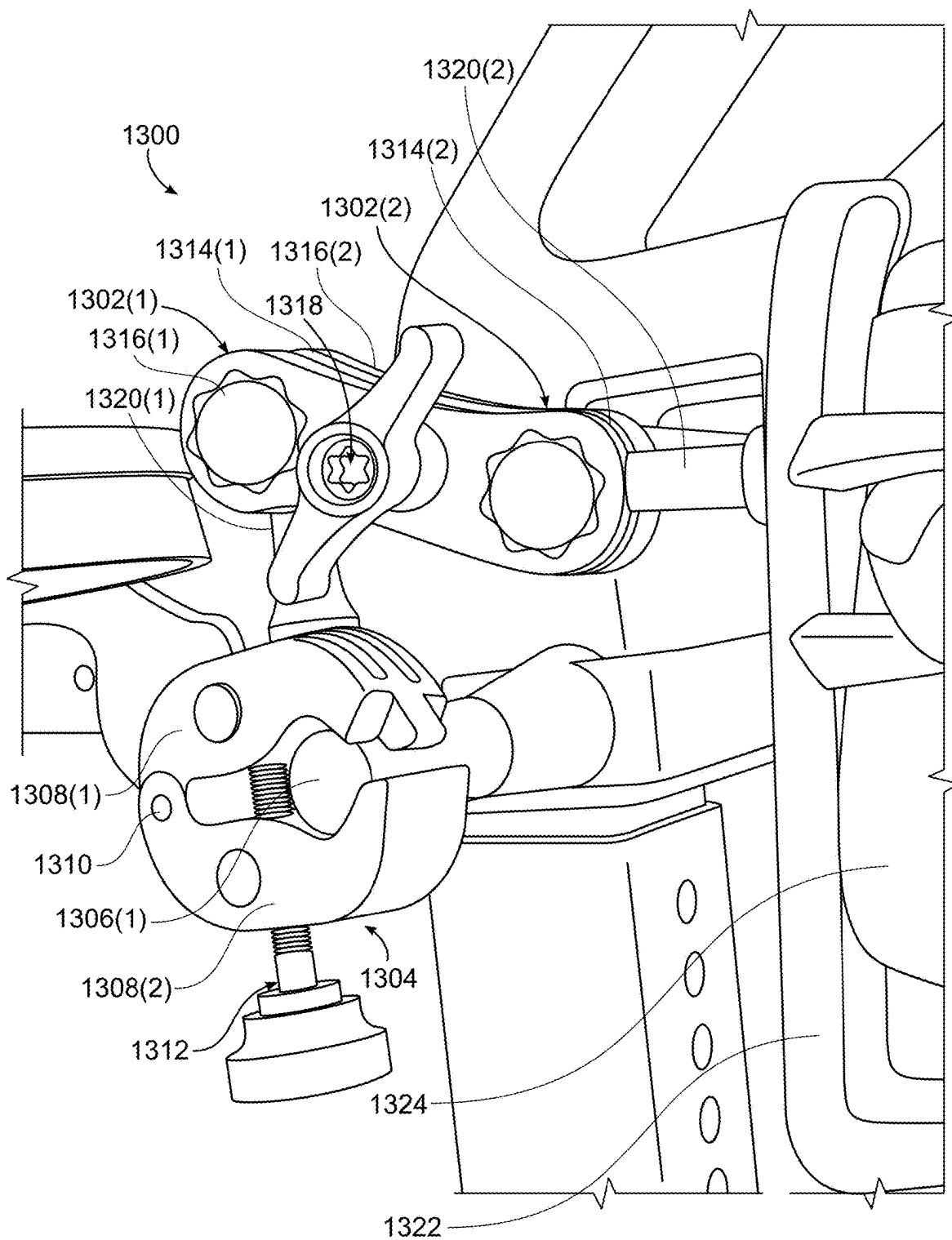


FIG. 13

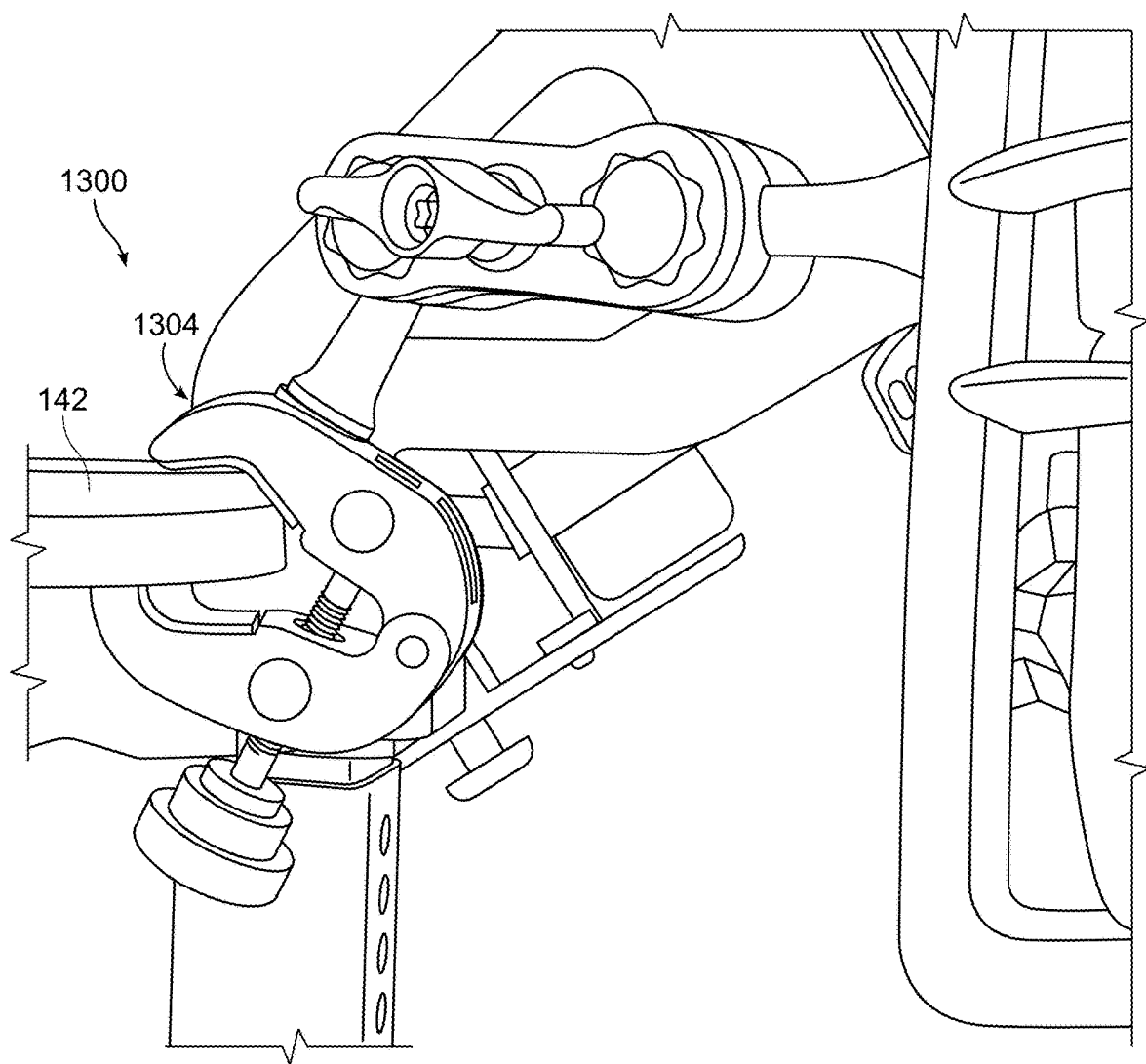


FIG. 14

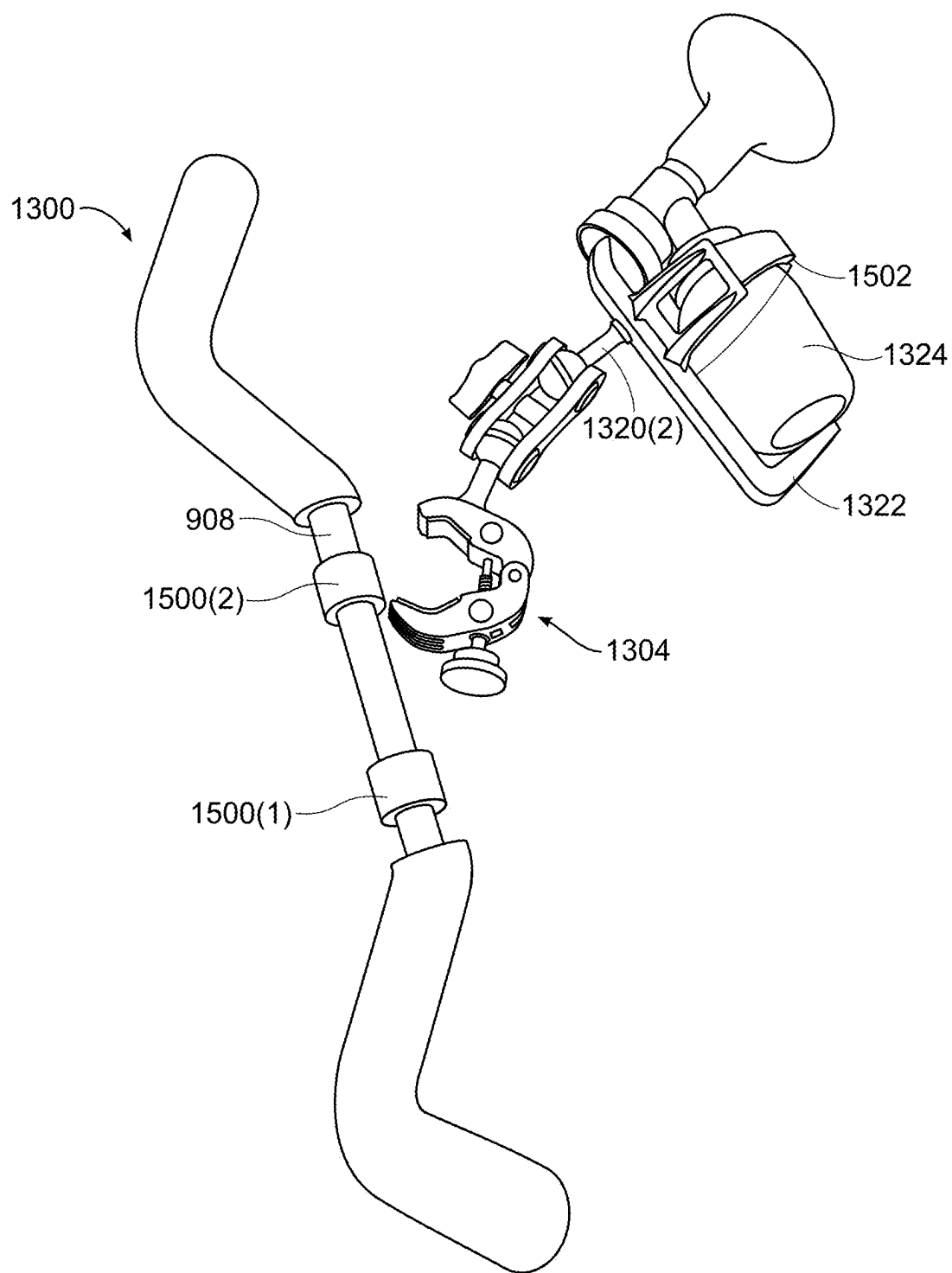


FIG. 15

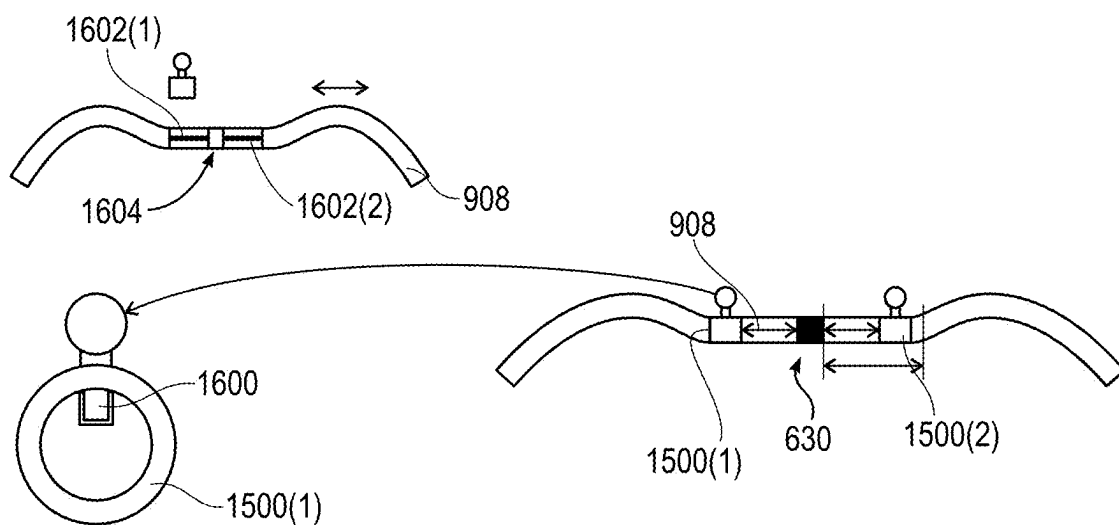


FIG. 16

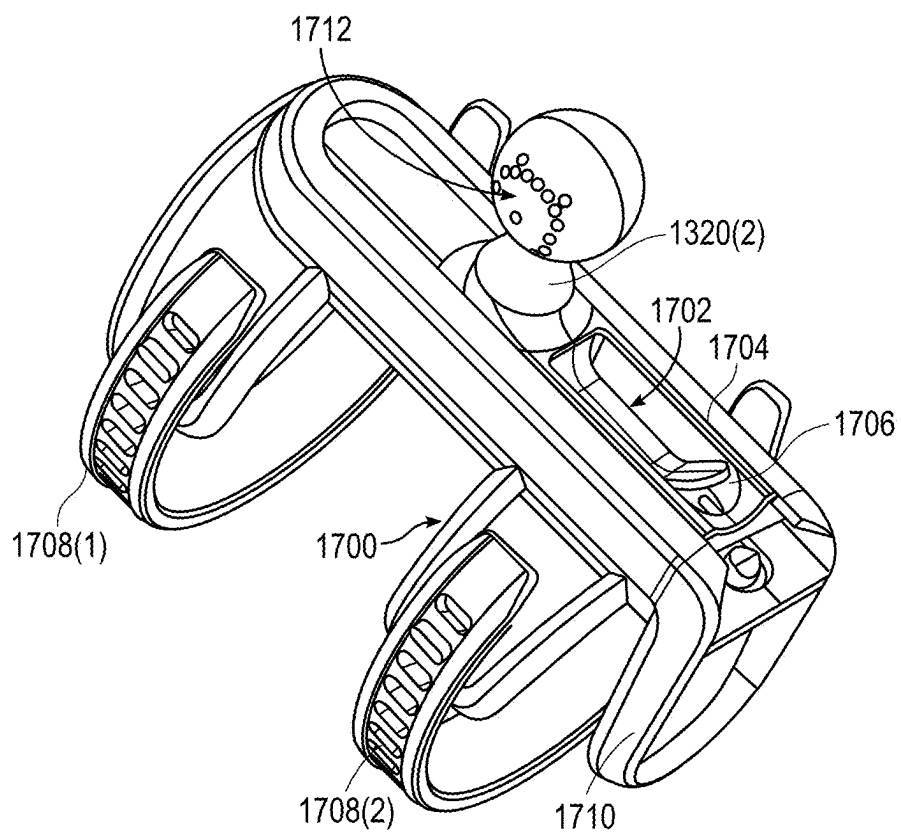


FIG. 17

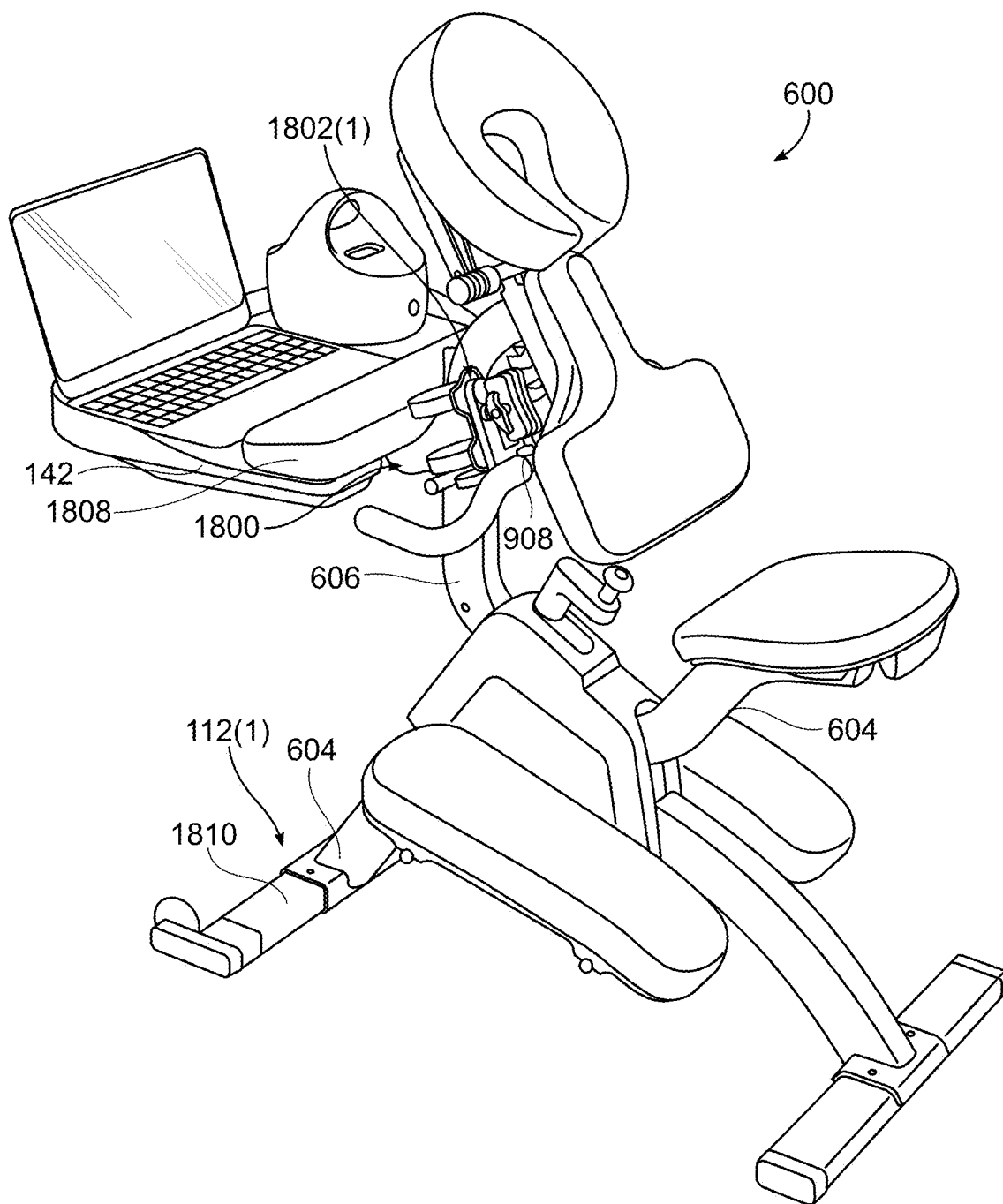


FIG. 18

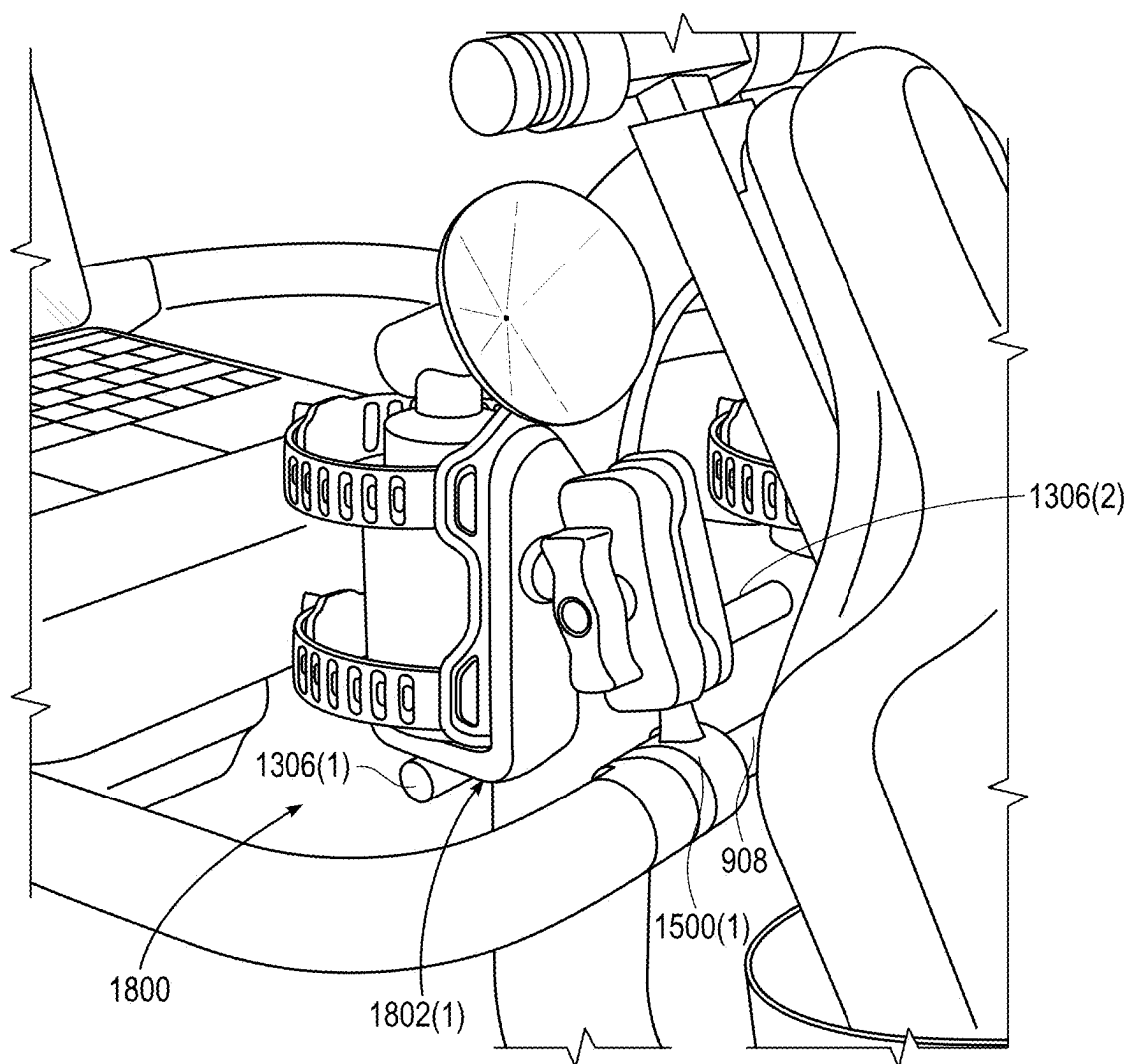


FIG. 19

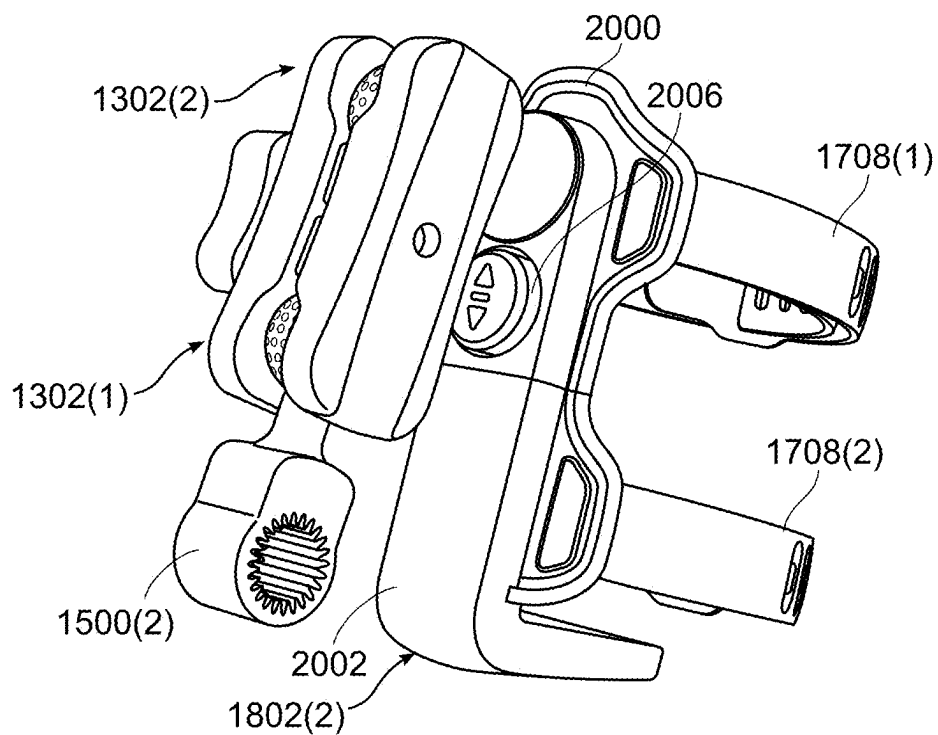


FIG. 20A

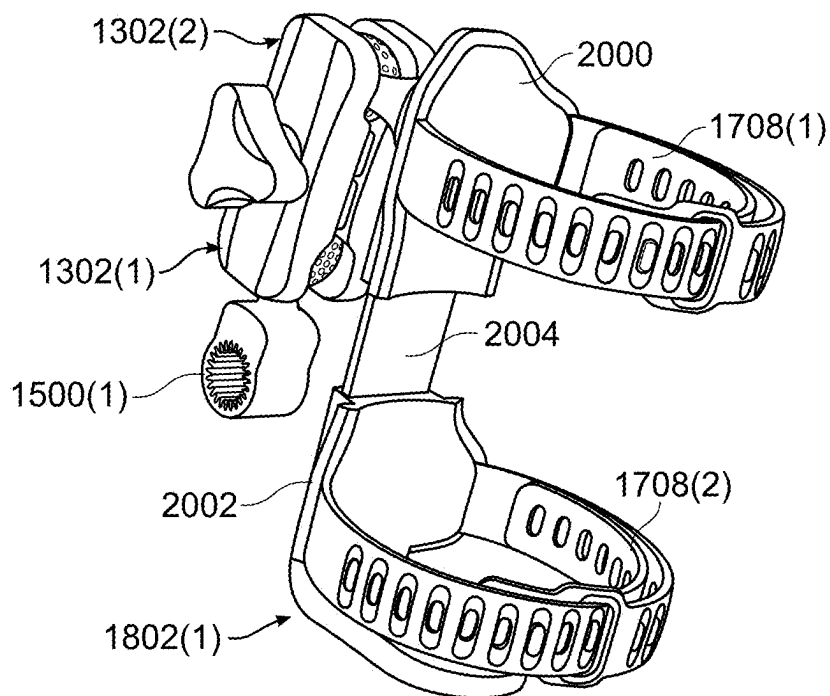


FIG. 20B

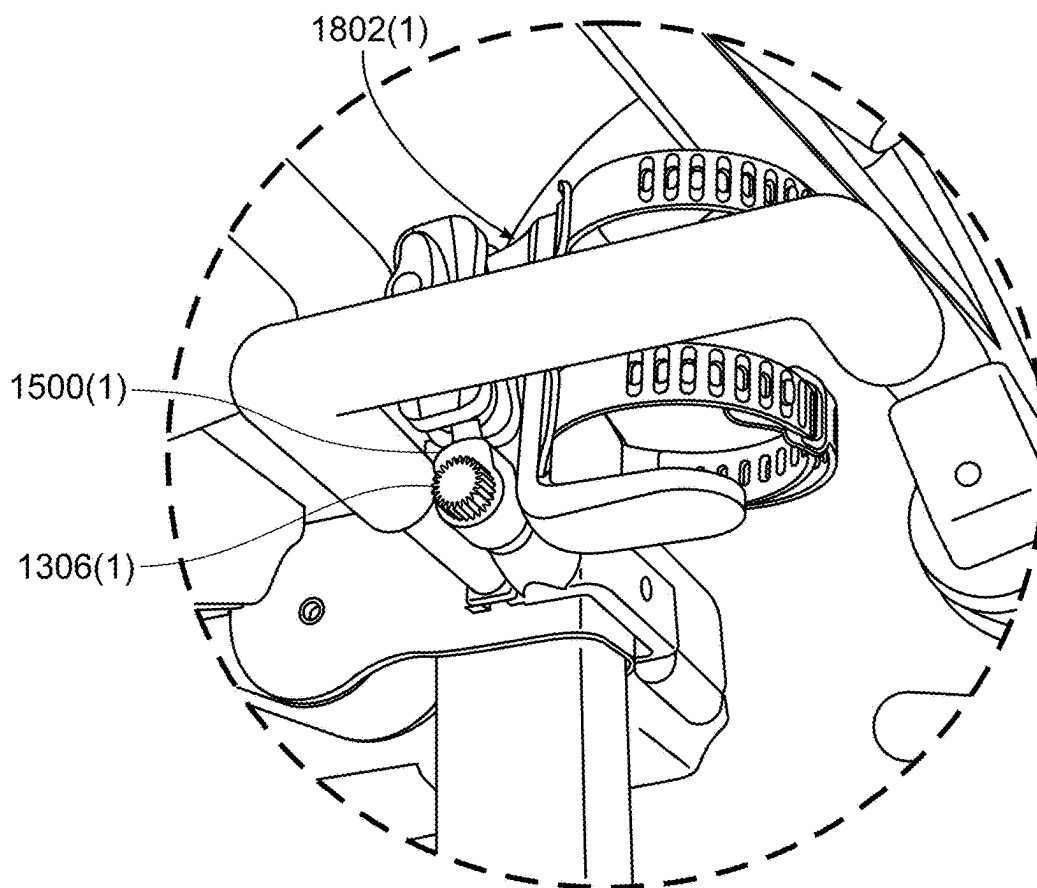


FIG. 21

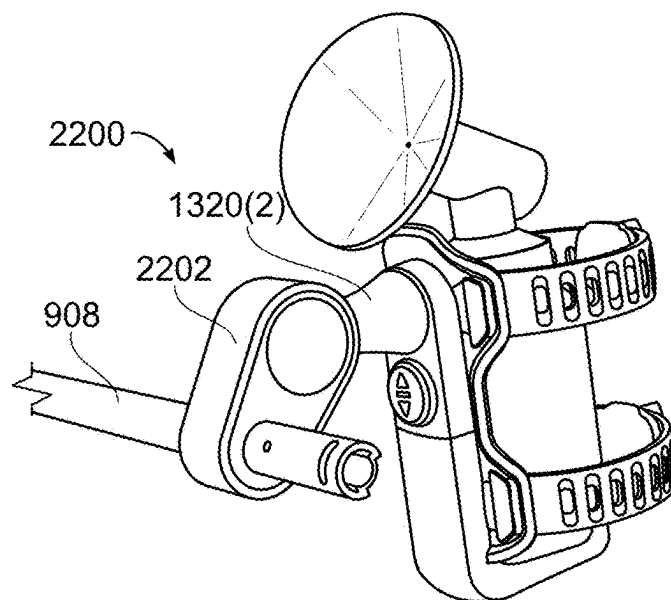


FIG. 22

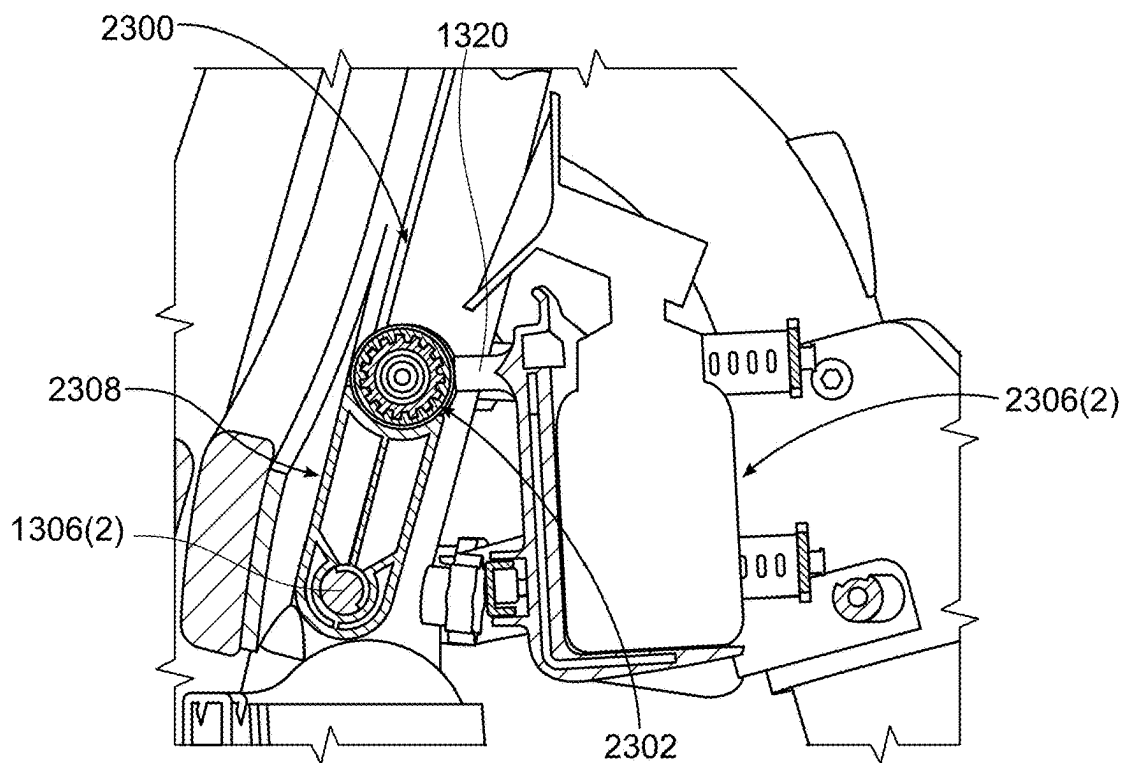


FIG. 23A

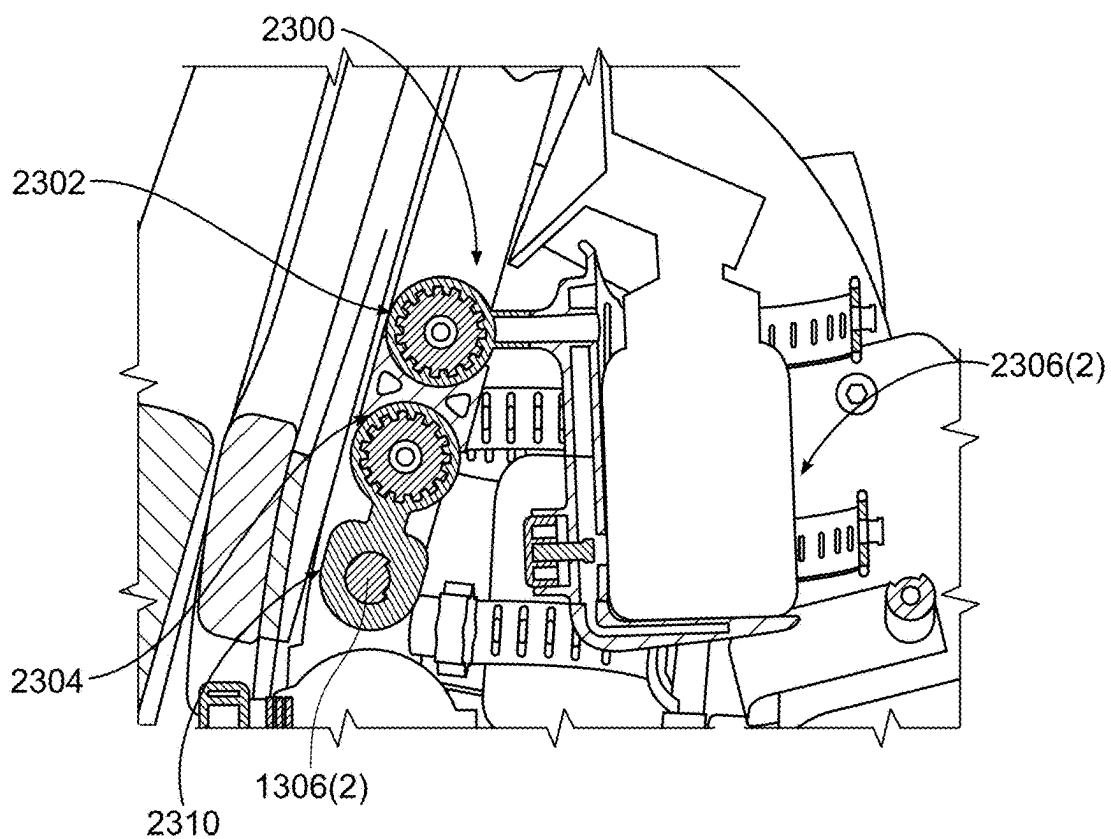


FIG. 23B

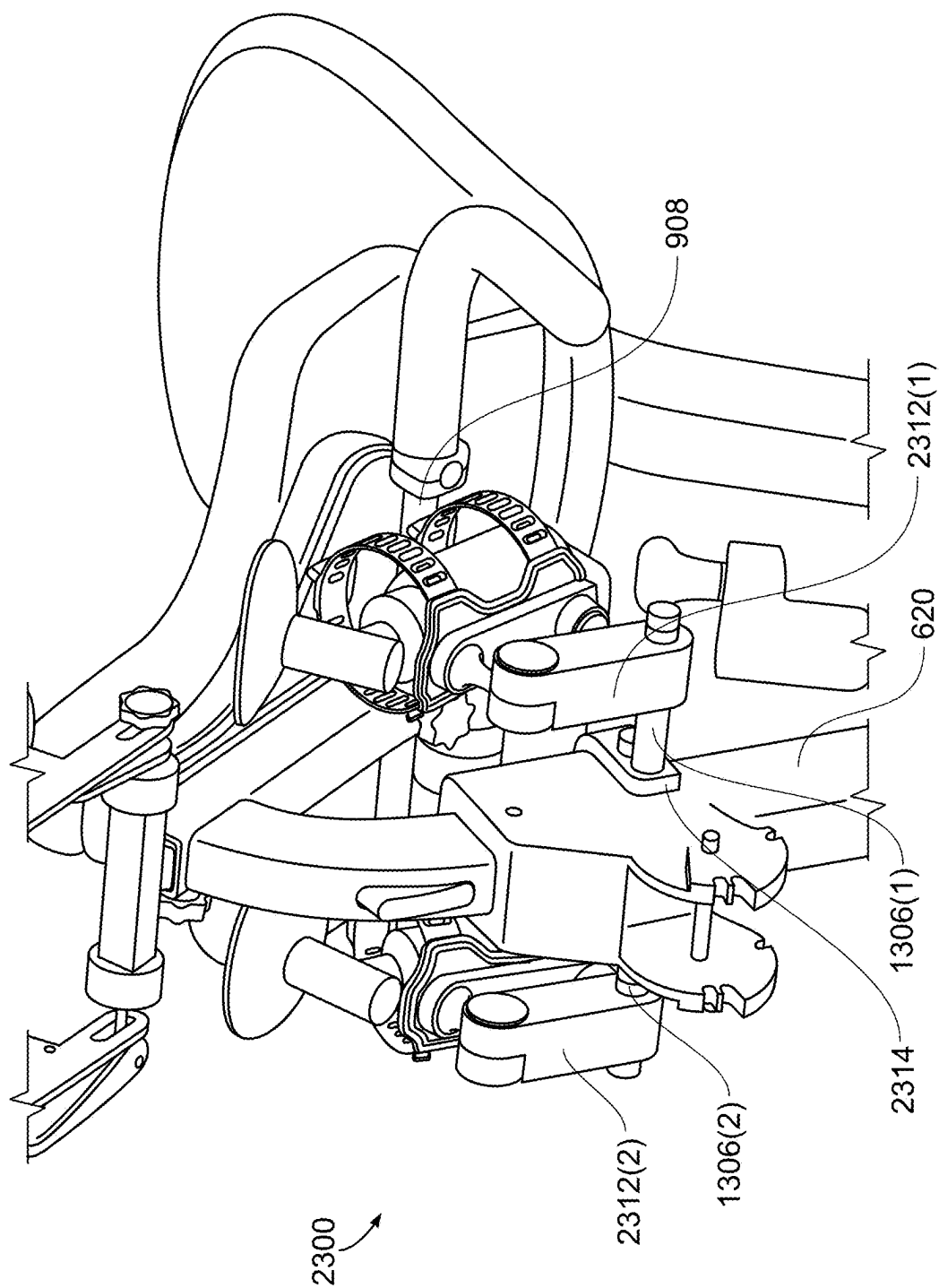


FIG. 23C

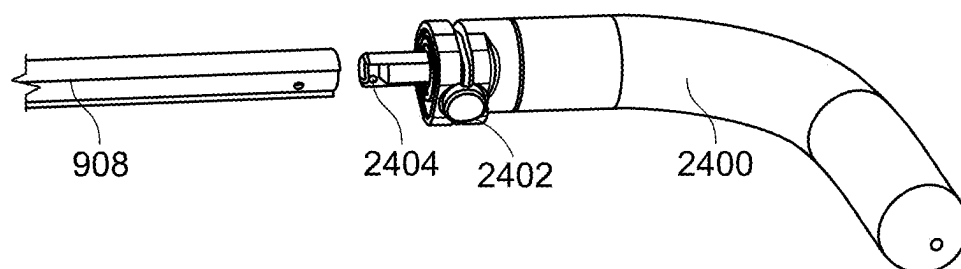


FIG. 24A

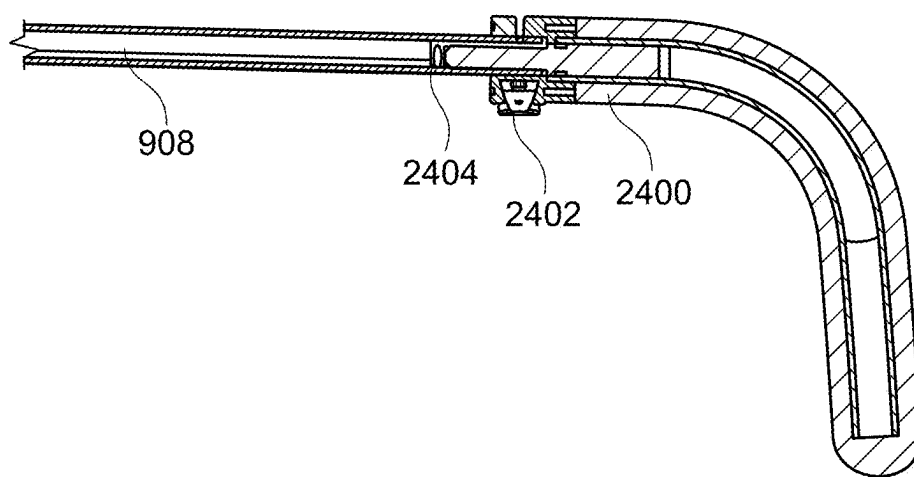


FIG. 24B

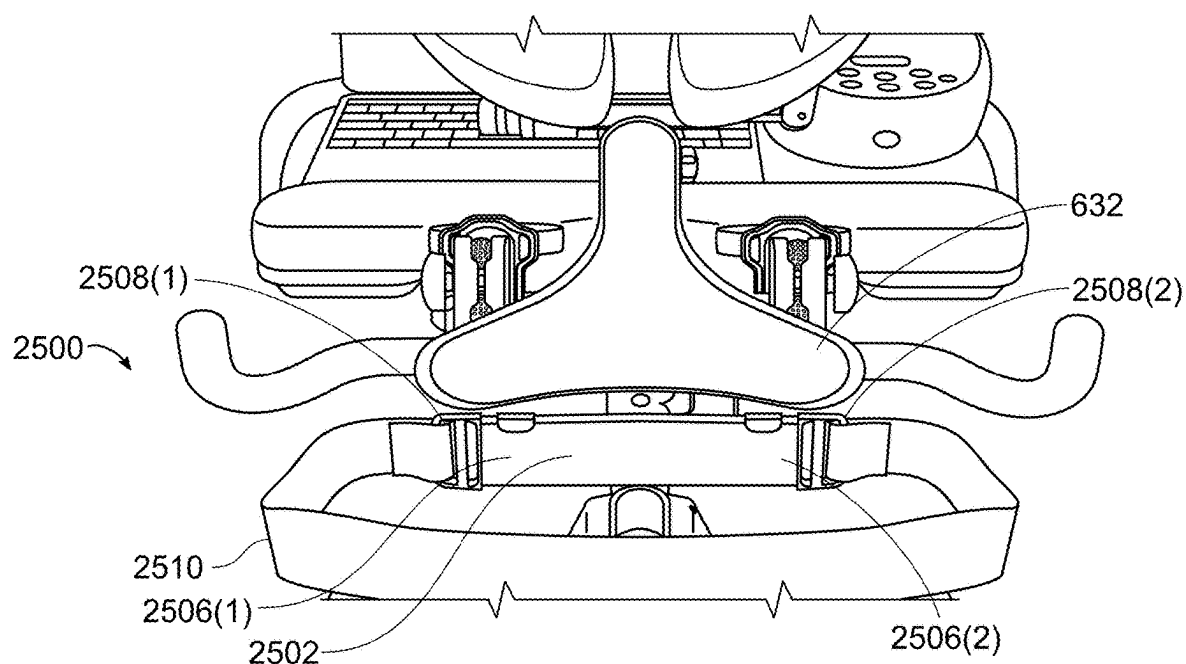


FIG. 25A

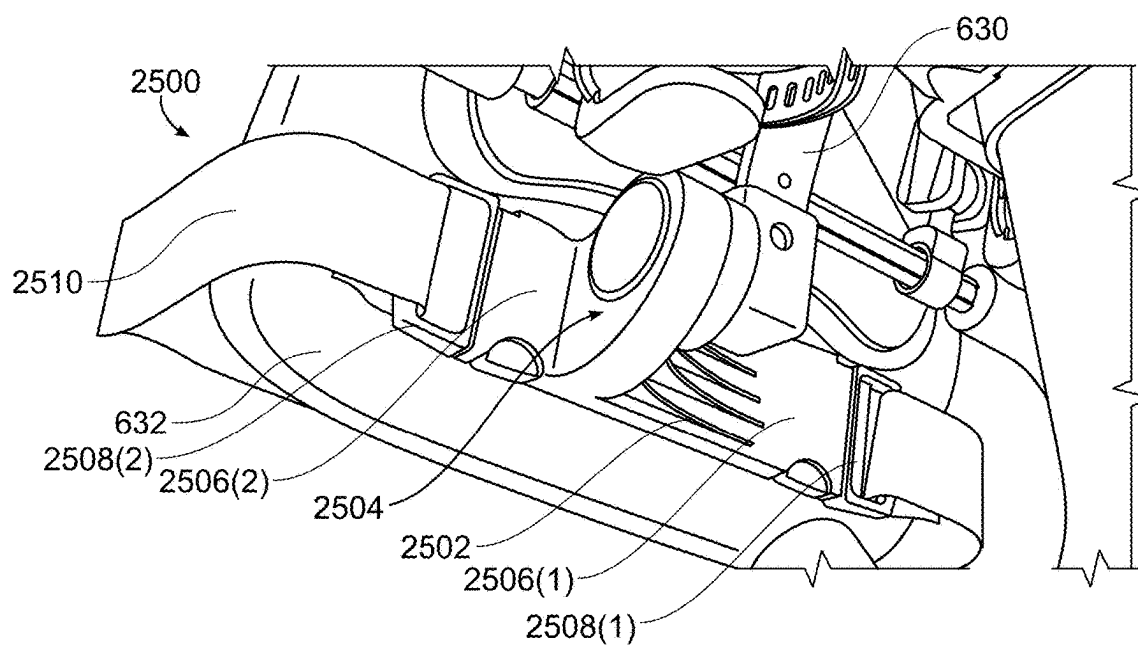


FIG. 25B

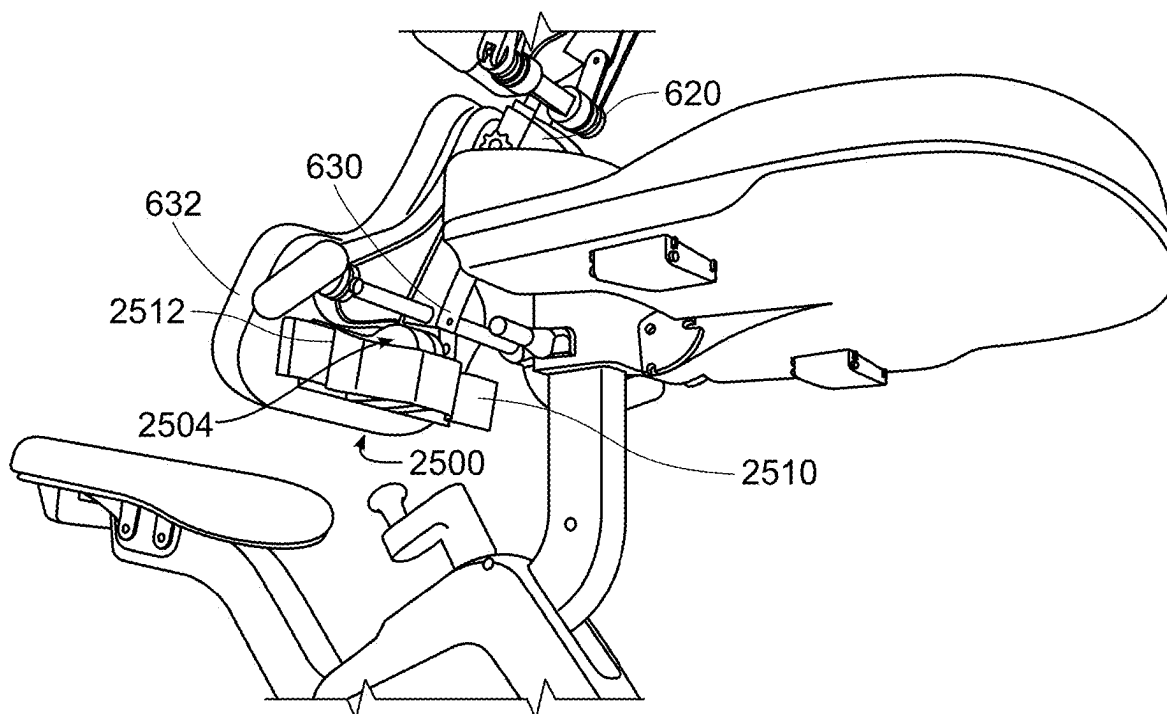


FIG. 25C

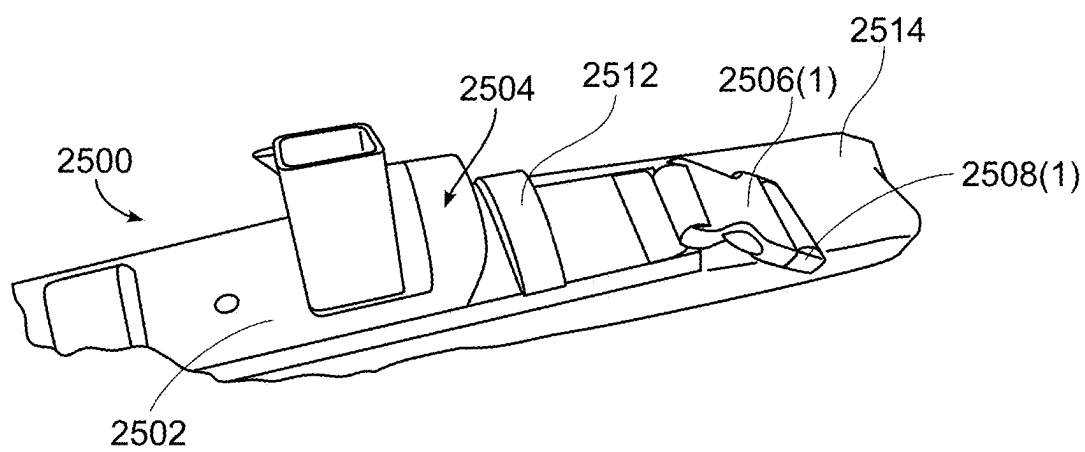


FIG. 25D

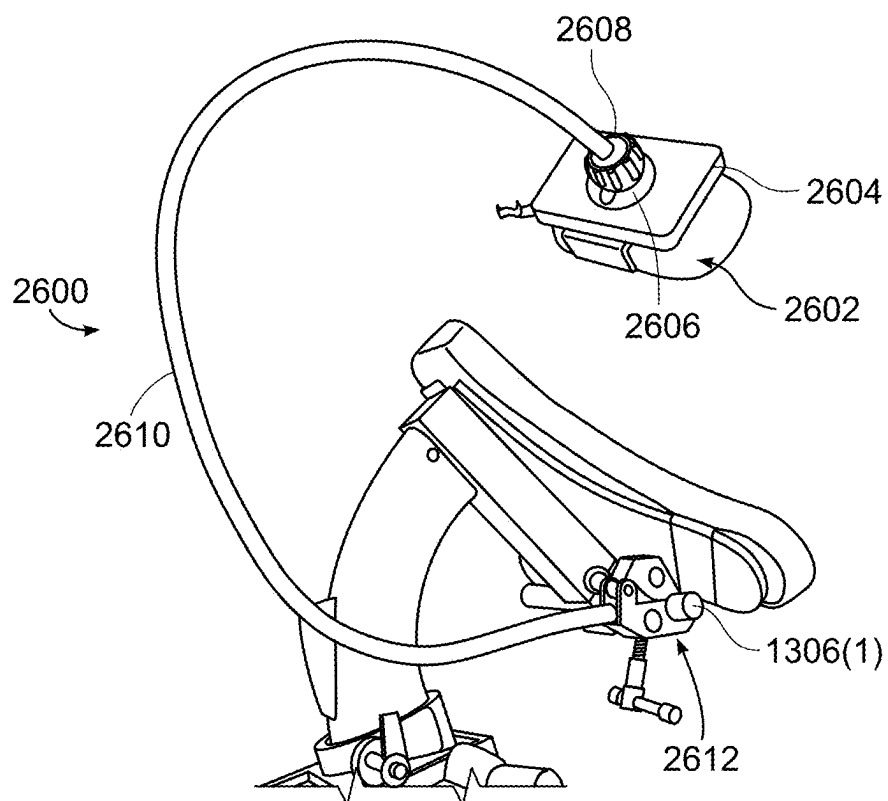


FIG. 26A

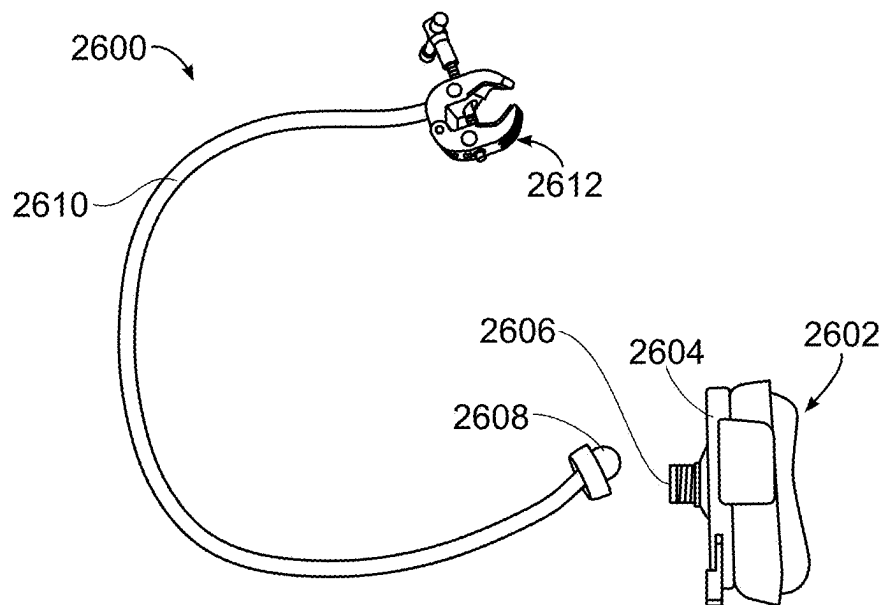
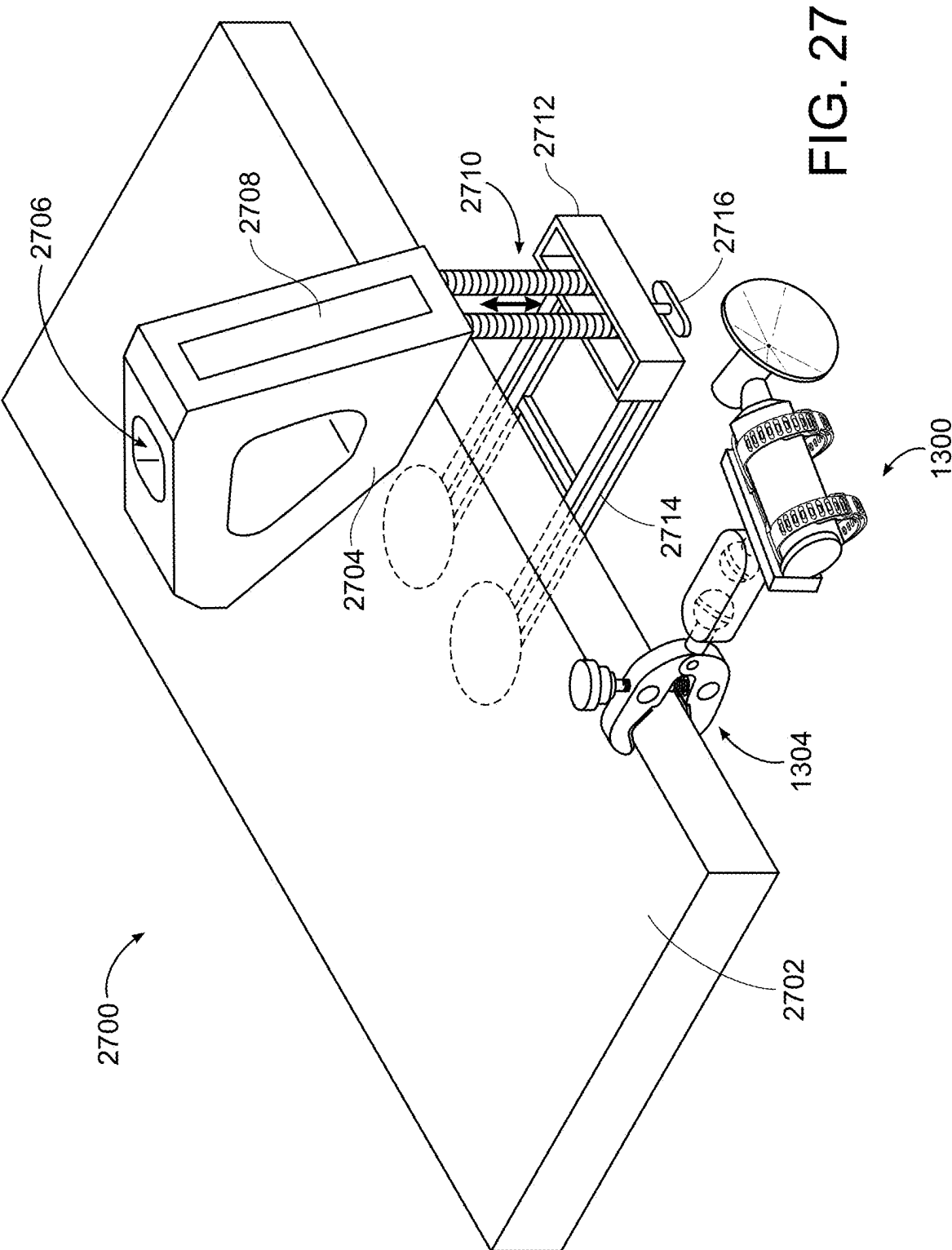


FIG. 26B



ERGONOMIC FORWARD LEANING BREAST PUMPING CHAIR SYSTEMS AND DEVICES THEREOF

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Patent Application Ser. No. 63/691,144, filed Sep. 5, 2024, U.S. Provisional Patent Application Ser. No. 63/646,346, filed May 13, 2024, and U.S. Provisional Patent Application Ser. No. 63/623,649, filed Jan. 22, 2024, each of which is hereby incorporated by reference herein in its entirety.

FIELD

[0002] This technology generally relates to breast pumping systems and, more particularly, to ergonomic forward leaning breast pumping chair systems that facilitate improved positioning and reduced medical complications for breast pumping women.

BACKGROUND

[0003] Feeding infant children using breastmilk has several advantages including increased infant health, increased protection against infections, diseases, and viruses, improved digestion relative to other forms of nutrition, and healthier weight as infants grow. To build a store of milk for feeding an infant, mothers often pump breastmilk for later consumption. Mothers that choose to pump breastmilk may enjoy several benefits. For example, pumping after breastfeeding sessions may increase milk supply and/or provide nipple stimulation to increase and maintain milk supply.

[0004] Additionally, breast pumping provides convenience for mothers and family members by facilitating subsequent bottle feeding by family members that can thereby improve their bond with the baby. Further, mothers can return to the workplace, perform tasks, and/or rest, for example, while other caregivers bottle feed. Even further, some mothers choose to sell breastmilk, or donate extra breastmilk to a milk bank, and surrogates may breast pump and donate breastmilk after a baby is born and living with their parents.

[0005] Pumping breastmilk may also be medically beneficial or even necessary in some instances. For example, mothers may pump breastmilk for infants that have generally poor latch, suck difficulties, or other medical issues. Other mild to severe medical complications that may require a mother to pump breastmilk include infant prematurity, weakness, low muscle tone, ankyloglossia, necrotizing enterocolitis, (NEC) or other illnesses, disabilities, or difficulties. Pumping breastmilk is advantageous for the nursing mother if she has flat or inverted nipples or cannot nurse her infant due to post-surgical complications, mild to severe postpartum diagnoses or conditions, other life-threatening issues, or simply has an upper extremity disability (e.g., an amputee or another shoulder, elbow, or wrist diagnosis), back pain or other orthopedic diagnosis or co-morbidity.

[0006] However, many mothers struggle with milk production via breast pumping for many reasons, including stress and anxiety of caring for an infant, return to work, discomfort caused by breast pumping, and discomfort from the various body positions that must be maintained for extended periods of time during a breast pumping session. Additionally, nursing or pump bras introduce compression

that may contribute to breast tissue complications, and/or obstructions that limit breast tissue massage, and may increase stress. Often, during a breast pumping session, a woman is seated with poor posture, leading to inefficient pumping, less milk extraction, and/or reduced milk production.

[0007] In addition to reduced milk expression, sub-optimal positioning during breast pumping can also lead to significant medical issues for women including neck, shoulder, and/or back pain or discomfort or other similar diagnoses, headaches or migraines, or exhaustion. Mothers that use current breast pumping devices in sub-optimal environments and positions may also have an increased susceptibility of developing clogged ducts. Current breast pumping devices also require mothers to hold bottles coupled to flanges, eliminating the ability to perform self-guided, therapeutic breast massage during breast pumping sessions to ensure efficient milk expression of the breasts and reducing the risk of medical complications of the breast tissue.

[0008] While the negative medical implications of current breast pumping systems and environments are significant, women that currently choose to breast pump also cannot productively rest or multitask, thereby increasing stress. Thus, current breast pumping systems and devices unfortunately have significant drawbacks.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a perspective view of an exemplary breast pumping chair system;

[0010] FIG. 2 is a perspective view of an exemplary chair assembly of the breast pumping chair system of FIG. 1;

[0011] FIG. 3 is a rear perspective view of an exemplary breast pumping assembly of the breast pumping chair system of FIG. 1;

[0012] FIG. 4 is a front perspective view of an exemplary breast pumping assembly of the breast pumping chair system of FIG. 1;

[0013] FIG. 5 is a perspective view of an exemplary bottle adjustment system of the breast pumping assembly of FIGS. 3-4;

[0014] FIG. 6 is a perspective view of another exemplary breast pumping chair system;

[0015] FIG. 7 is an exploded view of the breast pumping chair system of FIG. 6;

[0016] FIG. 8 is a side plan view of the breast pumping chair system of FIG. 6 in two positions facilitated by the base frame;

[0017] FIG. 9 is a perspective view of the breast pumping chair system of FIG. 6 with exemplary bottle attachment devices;

[0018] FIGS. 10A-B are perspective views of another exemplary breast pumping assembly of the breast pumping chair system of FIG. 9 with angle and height adjustment mechanisms;

[0019] FIG. 11 is a perspective view of the table adjustment mechanism 906 of the breast pumping chair system 600 of FIG. 9.

[0020] FIG. 12 is a perspective view of the breast pumping chair system of FIG. 9 with the table in a collapsed position;

[0021] FIG. 13 is a perspective view of an exemplary milk collection system with two ball joints coupled to a clamp attached to a collection system post;

[0022] FIG. 14 is a perspective view of the exemplary milk collection system of FIG. 12 with the clamp coupled to a table;

[0023] FIG. 15 is a side plan view of the milk collection system of FIG. 12 with the clamp disposed proximate a slider attachment of the milk collection system, which is coupled to a grab bar;

[0024] FIG. 16 is a side plan view of the milk collection system of FIG. 14 illustrating the attachment of the slider attachment;

[0025] FIG. 17 is a perspective view of another exemplary bottle holder;

[0026] FIG. 18 is a perspective view of the breast pumping chair system of FIGS. 9 and 11 with another exemplary milk collection system including another exemplary bottle holder;

[0027] FIG. 19 is a perspective view of the milk collection system of FIG. 18 attached to the grab bar;

[0028] FIGS. 20A-B are rear and front perspective views, respectively, of the bottle holder of the milk collection system of FIG. 18;

[0029] FIG. 21 is a perspective view of the milk collection system of FIG. 18 coupled to the collection system post;

[0030] FIG. 22 is a perspective view of another exemplary milk collection system with a ball joint housing;

[0031] FIGS. 23A-C are perspective views of another exemplary milk collection system with gears;

[0032] FIGS. 24A-B are perspective and plan views of an exemplary handle detached from and attached to, respectively, the grab bar;

[0033] FIGS. 25A-D illustrate an exemplary seatbelt system;

[0034] FIGS. 26A-B illustrate an exemplary tissue warming system; and

[0035] FIG. 27 illustrates a portable breast pumping positioning system.

DETAILED DESCRIPTION

[0036] The disclosed technology generally relates to supportive, ergonomic breast pumping chair systems, breast pumping assemblies, and bottle adjustment systems that advantageously allow users to productively pump breastmilk while they restore their bodies, care for their physical and mental health, and decrease the risk of breast tissue complications and use as an ergonomic workstation, with or without the bottle holders. The systems, assemblies, and devices of the disclosed technology facilitate pressure avoidance on the lower pelvic region for a user (e.g., a user following a postpartum c-section or having diastasis recti or other medical complications) while plush and adjustable components lock into place for each unique user to ensure personalized, improved suction with each breast pump session. Supportive ergonomics of the exemplary breast pumping chair systems promote relaxation while facilitating gravity and provide comfort while breast pumping to reduce pain and exhaustion, and to extend breast pumping sessions to help mothers reach their breast milk production goals.

[0037] The breast pumping chair systems of this technology include a chair assembly and a breast pumping assembly that collectively provide multiple forward leaning positions for a user. For example, the breast pump chair systems can allow a user to be positioned 30 degrees into a forward leaning position to work, read, use a portable electronic device (e.g., a laptop), or multitask on a table coupled to the

breast pumping assembly while breast pumping hands-free. Hands-free breast pumping allows users to perform self-breast tissue massage for greater breastmilk output and less susceptibility for clogged milk ducts. This position may also be used with or without the headrest. In another example, a position at 45 degrees (forward leaning) from prone is provided with a headrest coupled to the breast pumping assembly of the breast pumping chair system to allow a user to rest or sleep in a more forward leaning position for dangle breast pumping. Leveraging gravity while leaning forward ensures efficient milk expression and may reduce the risk of breast tissue complications, such as clogged milk ducts, breast abscess, mastitis, or other breast infections. Any forward leaning position may be achieved with the disclosed breast pumping chair systems.

[0038] Referring now to FIG. 1, a perspective view of an exemplary breast pumping chair system 100 is illustrated. The breast pumping chair system 100 in this example includes a chair assembly 102 that includes first and second base supports 104(1) and 104(2) and first and second leg supports 106(1) and 106(2) coupled to the first and second base supports 104(1) and 104(2) although other arrangements of those components can also be provided. The first and second leg supports 106(1) and 104(2) can be cushioned and located on opposing sides of the second base support 104(2). Optionally, first and second cross-braces 108(1) and 108(2), respectively, can be attached to the second base support 104(2) and the first base support 104(1) although the first and second leg supports 106(1) and 106(2) can be attached in other ways in other examples. The first and second leg supports 106(1) and 104(2) and/or the first and second cross-braces 108(1) and 108(2), can be removed to allow a user to stand or sit, for example.

[0039] The first base support 104(1) in this example includes opposing first and second rails 110(1) and 110(2) coupled at one end to a first foot 112(1) extending substantially perpendicular to the first and second rails 110(1) and 110(2), respectively. However, the first base support 104(1), or one or more portions thereof, can be a tubular or monolithic structure in other examples. In this example in which the first base support 104(1) includes the opposing first and second rails 110(1) and 110(2) the chair assembly 102 includes a first support post 114(1) disposed between the first and second rails 110(1) and 110(2) toward another end of the first and second rails 110(1) and 110(2), respectively. The first support post 114(1) is rotatably coupled to the first base support 104(1) via a post locking mechanism 116.

[0040] In some examples, the post locking mechanism 116 allows rotation of the first support post 114(1) into at least two locked positions that facilitate positioning of a user at 30 degrees forward leaning and at 45 degrees from prone. However, in other examples, any number of forward leaning angled positions can be facilitated by the post locking mechanism 116 based on a rotation or other adjustment to the first support post 114(1) or other means. The post locking mechanism 116 can include a first pin 118 and through holes 120 on the first support post 114(1), for example, although other methods for rotating and/or retaining the first support post 114(1) in place at a desired angle of rotation relative to the first base support 104(1) can also be used in other examples.

[0041] The chair assembly 102 in this example further includes a seat 122, optionally cushioned, coupled to the second base support 104(2). The second base support 104(2)

is coupled at one end to the seat **122** and at another end to a second foot **112(2)** extending substantially perpendicular to the second base support **104(2)**. The second foot **112(2)** can be substantially the same as, or different than, the first foot **112(1)**. One or more of the first or second feet **112(1)** and **112(2)** (e.g., only the second foot **112(2)**) can include one or more wheels or casters to facilitate portability of the breast pumping chair system **100**.

[0042] The breast pumping chair system **100** further includes a seat support **124** coupled between the first and second base supports **104(1)** and **104(2)** via which a height of the seat **122** can be locked and/or adjustable. In this example, the seat support **124** is coupled at one end to the second base support **104(2)** proximate the seat **122**, optionally via a hinged coupling that allows for movement of another end of the seat support **124** toward the second base support **104(2)** and/or between the first and second rails **110(1)** and **110(2)**, respectively. In other examples, the seat height is fixed and/or locked in place by engagement of the second end of the seat support **124** with the cross bracing of the first and second leg supports **106(1)** and **106(2)** and/or a portion of the first base support **104(1)**, and the seat **122** can be configured and/or supported in other ways in other examples. The breast pumping chair system **100** may also be disassembled (e.g., as a flat pack) for travel.

[0043] The breast pumping chair system **100** further includes the breast pumping assembly **126** that is configured to attach to, or be integral with, the chair assembly **102**. More specifically, in this example, the breast pumping assembly **126** includes a second support post **114(2)** that is configured to attach to the first support post **114(1)** of the chair assembly **102** at one of a plurality of positions along a length of the first support post **114(1)**. The first support post **114(1)** is sized to receive the second support post **114(2)** in this example, although the opposite configuration can also be used in other examples along with other types of connections between the first and second support posts **114(1)** and **114(2)**, respectively.

[0044] The positions along the length of the first support post **114(1)** may correspond to a height of the breast pumping assembly **126**, which is therefore adjustable to a height desired by a user. The attachment of the first support post **114(1)** to the second support post **114(2)** can be by way of first pin **118** and through holes **120** aligned on both the first and second support posts **114(1)** and **114(2)** although other methods for attaching the first and second support posts **114(1)** and **114(2)** and/or adjusting the height of the breast pumping assembly **126** can also be used.

[0045] The breast pumping assembly **126** in this example includes first and second bottle slider devices **128(1)** and **128(2)** which are rotatably and/or removably coupled to opposing sides of the second support post **114(2)**, as explained in more detail below. The first and second bottle slider devices **128(1)** and **128(2)** are adjustable in multiple dimensions for alignment in a comfortable position with respect to the breasts of a user. Additionally, the first and second bottle slider devices **128(1)** and **128(2)** are generally configured to hold a bottle or other breastmilk container or receptacle capable of receiving and retaining breastmilk expressed by a user of the breast pumping assembly **126**, as also explained in more detail below.

[0046] The breast pumping assembly **126** may also include a rest support **130** coupled to the second support post **114(2)** and including a sternum support **132** angled to

engage a sternum of the user in a forward leaning position and an optional abdomen support **134** coupled to the rest support **130** below the sternum support **132**. One or both of the sternum support **132** or abdomen support **134** can be cushioned. Additionally, the sternum support **132** may be adjustable longitudinally with respect to the rest support **130**, such as within a track of the rest support **130** with lockable positions for the sternum support **132**, for example. Also optionally, the abdomen support **134** may be adjustable longitudinally toward or away from the sternum support **132** or the rest support **130**, for example, and other adjustments in other dimensions or directions for the sternum support **132** and/or abdomen support **134** may or may not be used in other examples.

[0047] The breast pumping assembly **126** also includes an optional headrest **136** that includes a headrest post **138**, which may engage with the rest support **130** and thereby couple the headrest **136** to the rest support **130**. Optionally, the headrest post **138** can be received by an aperture in the rest support **130** at any number of lockable positions along a length of the headrest post **138** to thereby facilitate locking the headrest **136** at a desired height or depth for a user. The headrest **136** can also be removable via the headrest post **138** from the rest support **130**, if desired by a user. The headrest post **138** is coupled to an adjustable headrest support **140** to which the headrest **136**, optionally cushioned, is attached. In this example, the headrest **136** is coupled to the headrest support **140** such that the headrest **136** is rotatable relative to the headrest support **140** and, optionally, adjustable toward and away from a user, although other types of headrests and/or methods of attaching and/or adjusting the headrest **136** can also be used in other examples.

[0048] The breast pumping assembly **126** also includes a table **142** in this example, which is substantially perpendicular to the second support post **114(2)**, and/or substantially parallel to a floor or other flat surface on which the breast pumping chair system **100** is disposed, when in use. In some examples, the table **142** is coupled to the rest support **130** and/or the second support post **114(2)** by a table hinge **144** configured to retain the table **142** in an open position substantially perpendicular to the second support post **114(2)**. The table hinge **144** also allows the table **142** to rotate downward to a closed position in which the table **142** is substantially parallel to the second support post **114(2)**. Thus, the table **142** is shaped (e.g., with cutouts (as described and illustrated below with reference to FIG. 3)) to prevent engagement with the first and second bottle slider devices **128(1)** and **128(2)** when the table is moved from the open position to the closed position. Additionally, any shape of the table **142** can be used.

[0049] In the open position, the table **142** can be an arm rest for a user in a forward leaning position and/or support a breast pump, laptop computer, book, notepad, portable electronic device, or any other items to facilitate multitasking for a user. A user that may desire to rest or sleep without the table **142** in an open position or transport the breast pumping chair system **100** may rotate the table **142** about the table hinge **144** to the closed position. Other positions can also be facilitated by the table hinge **144** and/or other methods for attaching the table **142** to the second support post **114(2)** can also be used in other examples.

[0050] Accordingly, as illustrated in FIG. 1, to support a user in an ergonomic, comfortable, healthier, forward leaning position, the seat **122** is angled, the first and second leg

supports **106(1)** and **106(2)** are angled partially opposite the seat **122**, and the sternum support **132** is angled. The optional abdomen support **134** and headrest support **140** are also angled in substantial alignment with the sternum support **132** to further support the user in the forward leaning position.

[0051] Advantageously, the breast pumping chair system **100** in this example is highly portable and can be manipulated to a highly compact configuration. For example, the breast pumping assembly **126** can be removed from the chair assembly **102** by decoupling the first and second support posts **114(1)** and **114(2)**, respectively. The first support post **114(1)** can be configured to then rotate toward the seat **122** and the second base support **104(2)** to facilitate a collapsed position of the breast pumping chair system **100**. In some examples, the second base support **104(2)** includes a first base support portion **146(1)** rotatably coupled to a second base support portion **146(2)**, the seat **122** is coupled to the first base support portion **146(1)**, and the second base support portion **146(2)** is configured to rotate relative to the first base support portion **146(1)** to facilitate the collapsed position.

[0052] More specifically, the second base support portion **146(2)** can have a hinged connection to the first base support portion **146(1)** such that the second foot **112(2)** can rotate toward the bottom of the first and second rails **110(1)** and **110(2)** and under the first and second leg supports **106(1)** and **106(2)**, respectively. In combination, the seat support **124** can be detached from the first base support **104(1)** such that the first base support portion **146(1)** with the seat **122** can rotate downward toward the first base support **104(1)** and between the first and second leg supports **106(1)** and **106(2)**, respectively. With the table **142** and/or the headrest **136** optionally folded and/or detached, the breast pumping chair system **100** can be positioned or folded for maneuverability, optionally facilitated by wheels or castors coupled to one or both of the first foot **112(1)** or the second foot **112(2)**, as explained above.

[0053] Optionally, the breast pumping chair system **100** and/or one more portions thereof can be placed in a container or travel case to facilitate transport. Also optionally, the travel case can have a cooler compartment for pumped breastmilk as well as any number of other compartments for a breast pump and/or associated accessories. In yet other examples, the breast pumping chair system **100** can be used for purposes other than breast pumping, such as a medical chair that satisfies particular medical positioning requirements for a patient. In these examples, one or more portions or components of the breast pumping chair system **100** can be made of a radiolucent material to allow a patient to receive chemotherapy, radiotherapy, surgical breast (or other) related medical imaging, and/or in support of any number of other medical procedures and/or patient diagnoses or positioning for spinal taps or other procedures encompassing open posterior spine and patient comfort in any prone or partially prone position.

[0054] Referring now to FIG. 2, a perspective view of the chair assembly **102** of the breast pumping chair system **100** is illustrated. The chair assembly **102** includes the first support post **114(1)** that is coupled to the first base support **104(1)** via the post locking mechanism **116**. The post locking mechanism **116** includes first and second support plates **200(1)** and **100(2)** on opposing sides of the first support post **114(1)**, each of which includes lower apertures

(not shown) that facilitate attachment (e.g., via a pin or rod) to the first base support **104(1)** to form an axis of rotation of the first support post **114(1)** relative to the first base support **104(1)**.

[0055] Each of the first and second support plates **200(1)** and **200(2)** also includes upper apertures **202** configured to align with side apertures on opposing sides of the first support post **114(1)** such that the upper apertures **202** and side apertures are configured to receive a second pin **204** and thereby retain the first support post **114(1)** at a desired angle about the axis of rotation. While two upper apertures **202** are illustrated in FIG. 2 to facilitate 45 degrees from prone and 30 degrees forward leaning for a user, any number of upper apertures **202** can be used and/or any number of angles can be facilitated via the post locking mechanism **116** in other examples. With the second pin **204** removed, the first support post **114(1)** can rotate between the first and second rails **110(1)** and **110(2)** of the first base support **104(1)** in this example.

[0056] As explained above, the first support post **114(1)** also has a plurality of through holes **120** configured to retain the second support post **114(2)** at a desired height with respect to the first support post **114(1)** when the first pin **118** is inserted into one of the through holes **120**. Thus, user selection of a particular one of the through holes **120** for insertion of the first pin **118** establishes a comfortable, personalized height of the breast pumping assembly **126** for the user. Other types of retention mechanisms for the angle of the first support post **114(1)** and/or the height of the second support post **114(2)** can also be used as well as other mechanisms for establishing an angle of rotation for the first support post **114(1)**.

[0057] Referring now to FIG. 3, a rear perspective view of the breast pumping assembly **126** of the breast pumping chair system **100** is illustrated. The breast pumping assembly **126** in this example includes the first bottle slider device **128(1)** coupled to a side of the second support post **114(2)** via a first post extension **300**. In some examples, the first bottle slider device **128(1)** is the same as the second bottle slider device **128(2)** disposed on an opposing side of the second support post **114(2)**, which is described and illustrated in more detail below with reference to FIG. 4. The first post extension **300** optionally extends upward from a first holder base **302** and facilitates removable attachment to the second support post **114(2)** via a rotation guide (described and illustrated with reference to FIG. 5). Thus, the first bottle slider device **128(1)** is configured to rotate about the rotation guide to facilitate a desired alignment of a bottle and flange coupled to the first bottle slider device **128(1)** for a user. Any number of configurations are possible for successful hands-free breast pumping.

[0058] The first bottle slider device **128(1)** also includes a first bottle extension **304** that extends upward from the first holder base **302** and is configured to retain a bottle for receiving expressed breastmilk. For example, the bottle can be placed against the first bottle extension **304**, supported by the first holder base **302**, and straps (not shown) coupled on either end to the first bottle extension **304** can be placed around a portion of the bottle to retain the bottle in place. Other types of retention mechanisms utilizing other types of forces such as compression or magnetic forces, for example, can also be used by the first bottle slider device **128(1)** to retain the bottle or any other milk collection system.

[0059] The first bottle slider device 128(1) further includes a first track 306 disposed along a portion of a length of the first holder base 302 and through which a first tightening mechanism 308 extends that is configured to retain the first holder base 302 in place at a desired distance from a user and angle of rotation about the first tightening mechanism 308. Any number of tracks may also be used in other examples. The first tightening mechanism 308 can include a tightening nut coupled to a screw or bolt that extends through the first track 306 such that the first holder base 302 can rotate about the screw or bolt and move forward and rearward until reaching a desired location at which point the user can use the first tightening mechanism 308, which may be a pinch and slide or other mechanism, to compress the tightening nut against the first holder base 302 to maintain the first holder base 302 at the desired position. With the first track 306, first tightening mechanism 308, the first bottle extension 304, and the rotation guide, the first bottle slider device 128(1) advantageously facilitates six degrees of movement in three dimensions for individual positioning of the bottle at a desired location for a user.

[0060] Also illustrated in FIG. 3 is a cutout 310 in the table 142 that allows the table 142 to move unimpeded by the first bottle slider device 128(1) from an open position to a closed position. The table 142 can include another cutout of the same shape on an opposing side for the same purpose but with respect to the second bottle slider device 128(2). While an exemplary shape of the table 142 is illustrated in FIG. 3, the table 142 can be any shape not limited to oval or rectangular, and/or may have a lip or edge around a perimeter or a portion therefore, and/or can have another configuration in other examples.

[0061] Referring now to FIG. 4, a front perspective view of the breast pumping assembly 126 of the breast pumping chair system 100 of FIG. 1 is illustrated. As explained above, the breast pumping assembly 126 can include a second bottle slider device 128(2) that is a mirror image of the first bottle slider device 128(1) with the first and second bottle slider devices 128(1) and 128(2) collectively comprising a bottle adjustment system of the breast pumping assembly 126 of the breast pumping chair system 100. Thus, the second bottle slider device 128(2) is removably coupled to an opposing side of the second support post 114(2) in this example via a second post extension 400 configured to receive a second rotation guide of the second support post 114(2).

[0062] The second bottle slider device 128(2) also may include a second bottle extension 402, a second holder base 404, a second track 406, and a second tightening mechanism 408, which can be the same as the first bottle extension 304, first holder base 302, first track 306, and first tightening mechanism 308, although different components can also be used within the first and second bottle slider devices 128(1) and 128(2) in other examples. Thus, the second bottle slider device 128(2) also facilitates six degrees of movement in three dimensions for another bottle coupled thereto for positioning at a desired, comfortable position for a user. Any number of ranges or degrees of movement can be permitted in other examples.

[0063] Referring to FIG. 5, a perspective view of an exemplary bottle adjustment system 500 of the breast pumping assembly 126 of FIGS. 3-4 is illustrated. The bottle adjustment system 500 includes the first and second bottle slider devices 128(1) and 128(2) in this example. The second

bottle slider device 128(2) is coupled to the second support post 114(2) via the second post extension 400 and the rotation guide 502. Optionally, the rotation guide 502 is configured to extend through an aperture in the second post extension 400 and is shaped in combination with the aperture to allow rotation about only a portion of the circumference of the rotation guide 502 to thereby prevent excessive tipping of an attached bottle and associated spillage of the bottle contents. Any type of retention mechanism can be used to retain the second post extension 400 at a desired degree of rotation about the rotation guide 502 and the second post extension 400 can be engaged with and detached from the second support post 114(2) via any type of locking mechanism.

[0064] The second bottle slider device 128(2) also includes the second tightening mechanism 408, which in this example includes a knob attached to a bolt that extends through the second track 406 with a washer 504 on a bottom side of the second track 406 and a nut (not shown) on a top side of the second track 406. Thus, in this example, tightening of the knob within the nut compresses the washer 504 and the nut towards each other to thereby retain the second track 406 at a desired distance from a user and angle about the bolt. However, other types of tightening mechanisms can also be used to restrict movement of the second bottle slider device 128(2) in any number of directions in other examples.

[0065] Referring now to FIG. 6, a perspective view of another exemplary breast pumping chair system 600 is illustrated. The breast pumping chair system in this example includes a headrest 136, a headrest support 140, a headrest post 138, a table 142, first and second bottle slider devices 128(1) and 128(2) first and second feet 112(1) and 112(2) a seat 122, and first and second leg supports 106(1) and 106(2) one or more of which can be the same as or different than the corresponding element described and illustrated in more detail above with reference to the breast pumping chair system 100 of FIG. 1. However, the general support structure of the breast pumping chair system 600 illustrated in FIG. 6 is different than that of the breast pumping chair system 100 of FIG. 1.

[0066] More specifically, the breast pumping chair system 600 of FIG. 6 includes a chair assembly 602 that has a base frame 604 extending upward from each of the first foot 112(1) and the second foot 112(2) and configured to couple to a seat frame 606 of the chair assembly 602 via a frame hinge 608 and a frame locking mechanism 610. In this example, the base frame 604 includes opposing first and second frame plates 612(1) and 612(2) which can be coupled to the base frame 604 or integral with the base frame 604 when formed as a unitary structure. Each of the first and second frame plates 612(1) and 612(2) includes a plurality of opposing locking apertures 614 and at least one opposing frame plate hinge aperture 616.

[0067] The first and second frame plates 612(1) and 612(2) are spaced apart to receive a portion of the seat frame 606. The seat frame 606 is shaped to support the seat 122 at one end and to extend upward toward a breast pumping assembly 618 to receive or be integral with a chest frame 620 at another end. The seat frame 606 in this example includes at least one seat hinge aperture 622 and at least one seat frame locking aperture 624 disposed between the ends of the seat frame 606. The seat hinge aperture 622 and the frame plate hinge aperture 616 are configured to be aligned

and to receive a hinge post 626 therethrough to thereby retain the seat frame 606 rotatably coupled to the base frame 604 at the frame hinge 608.

[0068] The seat frame locking aperture 624 is configured to selectively align with a pair of the locking apertures 614 on opposing first and second frame plates 612(1) and 612(2) and to receive a locking post 628 therethrough to thereby retain the seat frame 606 in a desired angled position about the frame hinge 608 and with respect to the base frame 604. The locking apertures 614 and locking post 628 collectively form the frame locking mechanism 610 of the chair assembly 602. While two frame plate locking apertures 614 are illustrated in FIG. 6, any number of frame plate locking apertures 614 can be provided in other examples to accommodate any number of angles of the seat frame 606 with respect to the base frame 604. Additionally, washers, clips, ball and socket, and/or any other retaining mechanism(s) can be used to maintain the attachment of the seat frame 606 to the base frame 604 via the frame hinge 608 and frame locking mechanism 610.

[0069] The breast pumping assembly 618 of the breast pumping chair system 600 of FIG. 6 further includes the chest frame 620 that is configured to be attached to or integral with the end of the seat frame 606 that extends upward toward the breast pumping assembly 618. The chest frame 620 can be of a smaller diameter or other dimension to facilitate receipt of one end of the chest frame 620 by the seat frame 606, the chest frame 620 can be of a larger diameter or other dimension to facilitate receipt of one end of the seat frame 606 by the chest frame 620, or any other coupling mechanism can be used in other examples (e.g., a bottle holder support described in detail below with reference to FIG. 7). Optionally, the coupling mechanism for connection of the seat frame 606 and the chest frame 620 allows the breast pumping assembly 618 to move vertically or upward with respect to the chair assembly 602 and lock in place at a height desired by a user. In yet other examples, the seat frame 606 and the chest frame 620 can be formed as a unitary structure. Thus, the chest frame 620 has one end disposed toward the seat frame 606 and another end including a chest support 630 configured to attach to a chest cushion 632 to facilitate support of a user (e.g., in a forward-leaning position).

[0070] Referring to FIG. 7, an exploded view of the breast pumping chair system 600 of FIG. 6 is illustrated. In this example, the breast pumping assembly 618 includes a bottle holder support 700 that is sized and configured to receive the chest frame 620 at an upper end and the seat frame 606 at a lower end and to thereby couple those frames together. While a bottle holder support 700 is used to couple the seat frame 606 and the chest frame 620 together in this example, other coupling mechanisms can also be used, and the seat frame 606 and chest frame 620 can also be formed as a unitary structure.

[0071] In the example illustrated in FIG. 7, the first and second bottle slider devices 128(1) and 128(2) are coupled to opposing sides of the bottle holder support 700 in a manner the same or similar as discussed above with respect to the rotation guide 502 and first and second post extensions 300 and 400 for example, of the bottle adjustment system 500 of FIG. 5. In other examples, the first and/or second bottle slider device 128(1) or 128(2) can be coupled to the breast pumping chair system 600 in other ways (e.g., directly to the chest frame 620 or the seat frame 606).

[0072] Additionally, the first and second leg supports 106(1) and 106(2) in this example optionally include first and second post(s) 702(1) and 702(2) configured to be received by corresponding tubes 704 coupled to a bottom portion of the base frame 604. With the first and second post(s) 702(1) and 702(2) and tubes 704, the first and second leg supports 106(1) and 106(2) can be inserted and removed as desired by a user. Optionally, the first and second post(s) 702(1) and 702(2) can be coupled to the tubes 704 via a locking mechanism and other methods for connecting the first and second leg supports 106(1) and 106(2) to the base frame 604 can also be used, including as explained above with reference to FIG. 1.

[0073] Referring to FIG. 8, a side plan view of the breast pumping chair system 600 of FIG. 6 in two positions facilitated by the base frame 604 is illustrated. Specifically, the two positions illustrated in FIG. 8 correspond to 45 degrees and 30 degrees with respect to the horizontal and vertical axis defined by the frame hinge 608. In particular, at least the chest support 630 disposed proximate an end of the chest frame 620, and optionally one or more of the chest cushion 632 and/or the headrest 136, are substantially aligned at 45 degrees and 30 degrees in the two illustrated positions. The two positions are facilitated by the frame hinge 608 that allows rotation of the seat frame 606 with respect to the base frame 604 and the frame locking mechanism 610, which retains the seat frame 606 in a desired angled position with respect to the base frame 604. Other configurations accommodating any number of other positions and/or angles (e.g., any angle from 0 degrees to 90 degrees) can also be used in other examples.

[0074] Referring to FIG. 9, a perspective view of the breast pumping chair system 600 of FIG. 6 but with a different exemplary breast pumping assembly 900 is illustrated. In this example, the breast pumping chair system 600 includes a frame cover 902 (e.g., of a plastic material) covering a portion of the seat frame 606 and the base frame 604 proximate the frame hinge 608 and frame locking mechanism 610. A course angle adjustment mechanism 904 protrudes through a top portion of the frame cover 902. The course angle adjustment mechanism 904 can include a knob or other interface device coupled to the frame locking mechanism 610 such that pushing, pulling, or rotating the knob, for example, causes the frame locking mechanism 610 to adjust the seat frame 606 to different angled positions (e.g., the angled positions illustrated in FIG. 8).

[0075] The breast pumping chair system 600 illustrated in FIG. 9 also includes a table adjustment mechanism 906 that facilitates various positions including supported and collapsed or folded positions as explained in more detail below with reference to FIG. 11. In this example, the breast pumping chair system 600 further includes a grab bar 908 that is coupled to the chest support 630 and extends on either side of the chest support 630 to an angled end portion that allows a user to grab or hold as the user is entering, exiting, or using the breast pumping chair system 600. Optionally, the grab bar 908 can move laterally via an aperture in the chest support 630 in other examples. Bottle holder devices are coupled to the grab bar 908 on opposite sides of the chest support 630, as will now be described with reference to FIG. 10.

[0076] In FIGS. 10A-B, perspective views of another exemplary breast pumping assembly 900 of the breast pumping chair system 600 of FIG. 9 with angle and height

adjustment mechanisms are illustrated. The breast pumping assembly 900 in this example includes the first and second bottle attachment devices 1000(1) and 1000(2) including first and second pivot ends 1002(1) and 1002(2), first and second concave ends 1004(1) and 1004(2), and first and second extensions 1006(1) and 1006(2) disposed between the first and second pivot ends 1002(1) and 1002(2) and the first and second concave ends 1004(1) and 1004(2), respectively. The first and second pivot ends 1002(1) and 1002(2) are disposed around a portion of the grab bar 908 to allow rotational engagement with the grab bar 908.

[0077] Additionally, the first and second pivot ends 1002(1) and 1002(2) can move laterally along the grab bar 908 as desired by a user. Thus, the first and second pivot ends 1002(1) and 1002(2) can have a relative snug fit with the grab bar 908 so that the first and second pivot ends 1002(1) and 1002(2), respectively are retained in place during use, and locking and other mechanisms can also be used in other examples. The first and second extensions 1006(1) and 1006(2) can be relatively stiff or at least partially flexible to facilitate more granular adjustment and placement of the first and second bottles 1008(1) and 1008(2), respectively. Further, the first and second extensions 1006(1) and 1006(2) can be coupled to first and second pivot ends 1002(1) and 1002(2) via a mechanism (e.g., first and second ball joint 1010(1) and 1010(2)) that allows for movement in any number of degrees of freedom.

[0078] The first and second concave ends 1004(1) and 1004(2) of the first and second bottle attachment devices 1000(1) and 1000(2) are configured to engage with first and second spherical protrusions 1012(1) and 1012(2) of first and second bottle adapters 1014(1) and 1014(2) to thereby form the first and second ball joints 1010(1) and 1010(2) via which the first and second spherical protrusions 1012(1) and 1012(2) are rotatably engaged with first and second concave ends 1004(1) and 1004(2). Other types of ball joints, including with threaded nuts configured to retain the first and second bottle adapters 1014(1) and 1014(2) in a desired position, and other types of connection mechanisms can also be used. The first and second bottle adapters 1014(1) and 1014(2) are configured to be coupled to the first and second bottles 1008(1) and 1008(2) and can be sized to fit any number of breast pumping bottles that include flanges, and/or any other type of breast milk collection system, from any number of manufacturers or suppliers. Thus, any type of breast pump and/or accessories can be used with this technology.

[0079] In some examples, irrespective of other size or dimension, the first and second spherical protrusions 1012(1) and 1012(2) are consistent across bottle adapters such that any bottle adapter is configured to engage the first and second concave ends 1004(1) and 1004(2). Thus, the first and second bottle adapters 1014(1) and 1014(2) are configured to rotate within the first and second concave ends 1004(1) and 1004(2) of the first and second bottle attachment devices 1000(1) and 1000(2) to achieve a desired placement of the first and second bottles 1008(1) and 1008(2) and their flanges for a user. While the first and second bottle adapters 1014(1) and 1014(2) are illustrated in FIG. 10 for coupling the first and second bottles 1008(1) and 1008(2) to the first and second bottle attachment devices 1000(1) and 1000(2) clips, ball and socket, straps, and/or any other mechanism can also be used in other examples.

[0080] The breast pumping assembly 900 also includes a height adjustment mechanism 1016, which in this example includes an interface 1018 (e.g., a button) coupled to a linear pneumatic actuator 1020. The interface 1018 extends through an aperture of the chest frame 620 within which the linear pneumatic actuator 1020 is disposed. The linear pneumatic actuator 1020 can be coupled at a lower portion to the base frame 604 and, at an upper portion, to the chest frame 620. Thus, a user can engage the interface 1018 to cause the linear pneumatic actuator 1020 to move linearly thereby moving the chest frame 620 coupled thereto in an upward direction with respect to the base frame 604 (e.g., within the base frame 604). Once the user has achieved the desired height of the breast pumping assembly 900, disengagement of the interface 1018 causes the linear pneumatic actuator 1020 to retain its position. Other methods of facilitating linear (i.e., upward and downward) motion of the breast pumping assembly 900 can also be used in other examples.

[0081] Referring more specifically to FIG. 10B, a granular angle adjustment mechanism 1022 is illustrated that includes a crank handle 1024 coupled to an angle adjustment post 1024. The angle adjustment post 1026 can be threaded within one or both of the crank handle 1024 and/or seat frame 606 such that rotation of the crank handle 1022 alternately lowers or raises the angle adjustment post 1024 to thereby alter the angle of the breast pumping assembly 900 about the frame hinge 608, and retention of the seat frame 606 in place, as desired by a user. Other types of angle adjustment mechanisms can also be used in other examples.

[0082] Referring to FIG. 11, the table adjustment mechanism 906 of the breast pumping chair system 600 of FIG. 9 is illustrated. In this example, the table adjustment mechanism 906 includes the table hinge 144, a puller 1100, and a lock 1102. The table hinge 144 includes an external table bracket 1104 with a plurality of detents 1106, optionally or varying size (e.g., depth). The external table bracket 1104 is removably coupled to the chest frame 620 in this example. The table hinge 144 also includes an internal table bracket 1108 coupled to the table 142 at one end and rotatably coupled to the external table bracket 1104 at another end (e.g., via a rod or axle disposed proximate a central portion of one or more of the internal table bracket 1108 and the external table bracket 1104). Thus, the external table bracket 1104 can extend on both sides of the internal table bracket 1108 in some examples.

[0083] In use, the puller 1100 can be engaged by a user to release a support (not shown) coupled thereto, disposed within the table 142, and configured to engage one of the detents 1106 when released. Optionally, at least a lowermost one of the detents 1106 extends further away from the chest frame 620 to prevent an undesired drop of the table 142. The lock 1102 is coupled via another support (not shown) to the table hinge 144 such that rotation of the internal table bracket 1108 about the external table bracket 1104 is restricted beyond a predetermined angle when the lock 1102 is not engaged. Thus, a user with can pull the puller 1100 and push the lock 1102 rearward to allow the table 142 to fully rotate to a closed position. Other types of adjustment mechanisms can also be used in other examples.

[0084] Referring now to FIG. 12, a perspective view of the breast pumping chair system 600 of FIG. 9 with the table 142 in a collapsed position is illustrated. The table 142 can be rotated about the table hinge 144 (e.g., a locking hinge)

to a collapsed position as illustrated in FIG. 12 using the table adjustment mechanism 906, for example. In this example, the first foot 112(1) includes first and second wheels 1200(1) and 1200(2) that, along with the collapsible table 142, facilitate efficient maneuverability and/or storage of the breast pumping chair system 600. The first and second wheels 1200(1) and 1200(2) can be locking wheels and can be included on one or both of the first or second feet 112(1) or 112(2) in some examples.

[0085] Referring now to FIG. 13, a perspective view of an exemplary milk collection system 1300 with first and second ball joints 1302(1) and 1302(2) coupled to a clamp 1304 attached to a first collection system post 1306(1) is illustrated. While only one milk collection system 1300 is illustrated and described herein, two opposing milk collection systems can be provided in other examples. The clamp 1304 in this example is a vice-like component with upper and lower portions 1308(1) and 1308(2) coupled together at hinge 1310, although other types of clamps can also be used in other examples. The clamp 1304 is configured to attach to the first collection system post 1306(1), which can be the same as or different than the first and second post extensions 300 and 400 of FIGS. 3 and 4, for example. The clamp 1304 can be configured with a first tightening mechanism 1312 configured to reduce the inner diameter of the clamp 1304 when tightened for attachment to the first collection system post 1306(1).

[0086] The milk collection system 1300 includes first and second ball joints 1302(1) and 1302(2) with first and second balls 1314(1) and 1314(2) contained within a housing that has first and second opposing sides 1316(1) and 1316(2) and a second tightening mechanism 1318 coupled to the first and second opposing sides 1316(1) and 1316(2). The first ball joint 1302(1) is attached to the clamp 1304 via a first holder post 1320(1) coupled to the first ball 1314(1) and the second ball joint 1302(2) is attached to a bottle holder 1322 via a second holder post 1320(2) coupled to the second ball 1314(2).

[0087] In some examples, the second tightening mechanism 1318 is coupled to the first and second opposing sides 1316(1) and 1316(2) such that in a loose state, the first and second balls 1314(1) and 1314(2) may or may not be removed from within the ball joint housing. In a tightened state, the second tightening mechanism 1318 applies pressure from the first and second opposing sides 1316(1) and 1316(2) to the first and second balls 1314(1) and 1314(2) to thereby retain the first and second balls 1314(1) and 1314(2), as well as the bottle holder 1322 coupled to the second ball 1314(2) via the second holder post 1320(2), in a desired position. Each of the first and second ball joints 1302(1) and 1302(2) in this example advantageously has at least three degrees of rotational freedom for placement of the bottle holder 1322, and bottle 1324 attached thereto, in a desired location by a user.

[0088] Referring to FIG. 14, a perspective view of the exemplary milk collection system 1300 of FIG. 13 with the clamp 1304 coupled to the table 142 is illustrated. While the clamp 1304 can be shaped with an inner diameter to receive the first collection system post 1306(1), as illustrated in FIG. 13, in other examples, the clamp 1304 can be configured to attached to a counter, table, kitchen island, desk, or any other surface having an overhang, for example. Thus, the milk collection system 1300 described and illustrated by way of the examples herein could be used with a system that

includes a chest support 630 with a chest cushion 632 that accepts a headrest 136 or with another type of breast pumping system that attaches to a surface, for example.

[0089] Referring to FIG. 15, a side plan view of the milk collection system 1300 of FIG. 13 with the clamp 1304 disposed proximate first and second slider attachments 1500(1) and 1500(2) of the milk collection system 1300, which is coupled to the grab bar 908, is illustrated. The grab bar 908 can be the same as or different than the grab bar illustrated in FIG. 9, although another type of handle or other bar can also be used in other examples. In this example, the clamp 1304 is configured to attach to one of the first and second slider attachments 1500(1) and 1500(2), which can be via another ball joint, a snap, a clip, a strap, or any other type of connection. The first and second slider attachments 1500(1) and 1500(2) are slidably coupled to the grab bar 908 to allow at least lateral movement. Optionally, the first and second slider attachments 1500(1) and 1500(2) also facilitate rotational movement around at least a portion of the grab bar 908.

[0090] The bottle 1324 is illustrated in this example received by the bottle holder 1322. The bottle holder 1322 in this example includes an adjustable strap 1502 configured to securely hold bottles having varying size (e.g., between 4 ounces and 20 ounces) and varying thickness. Other types of bottle holders can also be coupled to the second holder post 1320(2) in other examples, including the bottle holders described in more detail above and below.

[0091] Referring to FIG. 16, a side plan view of the milk collection system 1300 of FIG. 15 illustrating the attachment of the first and second slider attachments 1500(1) and 1500(2) is illustrated. In this example, the first slider attachment 1500(1) includes a notch 1600 configured to be received by a first slot 1602(1), slide, or track of the grab bar 908. In this example, the grab bar 908 includes first and second slots 1602(1) and 1602(2) disposed on either side of a chest support 630 to which the chest cushion 632 is coupled. The notch 1600 and the first slot 1602(1) collectively restrict the rotational movement of the first slider attachment 1500(1) around the grab bar 908 as well as the lateral movement of the first slider attachment 1500(1) along a long axis of the first slot 1602(1). In other examples, the first slider attachment 1500(1) can have a clamp or other type of mechanism for selective coupling to the grab bar 908 in a fixed position.

[0092] Referring to FIG. 17, a perspective view of another exemplary bottle holder 1700 is illustrated. The bottle holder 1700 in this example includes the second holder post 1320(2) coupled to a vertical slider mechanism 1702 configured to slide vertically in a track 1704 disposed on a rear of the bottle holder 1700. The vertical slider mechanism 1702 includes a protrusion 1706 disposed at an end opposite the second holder post 1320(2) that can be engaged by a user to facilitate the movement of the vertical slider mechanism 1702 and the second holder post 1320(2) coupled thereto within the track 1704. Thus, when the vertical slider mechanism 1702 is moved within the track 1704, the bottle holder 1700 and bottle retained therein can be moved to a desired vertical position by a user.

[0093] In this example, the bottle holder includes upper and lower straps 1708(1) and 1708(2) with clasps to retain the bottle in place supported by a bottle floor 1710, although other methods for retaining the bottle in place can also be used. Additionally, the second ball 1314(2) includes a plu-

rality of indentations **1712** that, when engaged with mirrored protrusion(s) (not shown) (e.g., in one or both of first and second opposing sides **1316(1)** and **1316(2)** of the second ball joint **1302(2)**) allow a user to retain the bottle holder **1700** at a desired angle of rotation. The location of the protrusions and indentations **1712** can be reversed in other examples. Additionally, the productions and indentations **1712** can be provided on one or both of the first or second ball joints **1302(1)** and **1302(2)**. Other methods can also be provided to maintain the bottle holder **1700** at a desired vertical height and/or angle, including those described and illustrated herein with reference to other examples.

[0094] Referring now to FIG. **18**, a perspective view of the breast pumping chair system **600** of FIGS. **9** and **11** with another exemplary milk collection system **1800** including another exemplary first bottle holder **1802(1)** is illustrated. While only the first bottle holder **1802(1)** is illustrated in FIG. **18**, a second bottle holder **1802(2)** (not shown in FIG. **18**) could be coupled to the grab bar **908** in other examples explained in more detail below. In those examples, the second bottle holder **1802(2)** could be the same as, or a mirror image of, the first bottle holder **1802(1)**. Thus, the milk collection system **1800** in other examples can include both the first and second bottle holders **1802(1)** and **1802(2)**.

[0095] The breast pumping chair system **600** in the example illustrated in FIG. **18** includes additional optional components including an arm rest **1808** disposed on a top of the table **142**, which in this example includes a lip or rim to prevent materials (e.g., a breast pump) from sliding off. Optionally, one or more elastic bands can be used to retain the arm rest **1808** substantially in place when the table **142** is lowered to a closed position. Hook and loop fasteners and/or other types of retention systems can also be used to retain the arm rest **1808** in place in other examples. A pad **1810** (e.g., made of silicone) is also provided as a footrest on the first foot **112(1)**. While only one pad **1810** is illustrated in FIG. **18**, multiple pads can be provided on the first foot **112(1)** (e.g., on both sides of the intersection of the base frame **604** with the first foot **112(1)**).

[0096] Referring to FIG. **19**, a perspective view of the milk collection system **1800** of FIG. **18** attached to the grab bar **908** is illustrated. In this example, the first slider attachment **1500(1)** is coupled to the grab bar **908** and the first bottle holder **1802(1)**. Although the milk collection system **1800** is illustrated in FIGS. **18** and **19** as coupled to the grab bar **908**, the milk collection system **1800**, as well as any other of the milk collection systems described and illustrated herein, can also be coupled to the first and/or second collection system posts **1306(1)** and **1306(2)** in other examples.

[0097] Referring to FIGS. **20A-B**, rear and front perspective views of the second bottle holder **1802(2)** and the first bottle holder **1802(1)**, respectively, of the milk collection system **1800** of FIG. **18** are illustrated. In this example, the milk collection system **1800** is configured to operate similar to or the same as the milk collection system **1300** with respect to the first and second ball joints **1302(1)** and **1302(2)** but includes the first and second slider attachments **1500(1)** and **1500(2)**. Other permutations of the various components of any of the milk collection systems described and illustrated herein can also be used in other examples.

[0098] The first and second bottle holders **1802(1)** and **1802(2)** in this example also include upper and lower components **2000** and **2002** that are coupled together via a

holder bar **2004** that is configured to be received by the upper and lower components **2000** and **2002**. The holder bar **2004** is coupled to a holder button **2006** such that engagement with the holder button **2006** by a user allows free movement of the upper and lower components **2000** and **2002** about the holder bar **2004** and with respect to each other. Thus, disengagement of the holder button **2006** restricts movement of the upper and lower components **2000** and **2002** about the holder bar **2004** and with respect to each other. In this example, the upper strap **1708(1)** is coupled to the upper component **2000** and the lower strap **1708(2)** is coupled to the lower component **2002**. Thus, FIG. **20B** illustrates an extended position of the first bottle holder **1802(1)** as compared to that of FIG. **20A**, which accommodates and more effectively secures larger bottles and/or facilitates a desired vertical placement of a bottle held by the first bottle holder **1802(1)**.

[0099] Referring to FIG. **21**, a perspective view of the milk collection system **1800** of FIG. **18** coupled to the first collection system post **1306(1)** is illustrated. As explained above, any of the milk collection systems disclosed herein can be coupled to the first and/or second collection system posts **1306(1)** and **1306(2)** and/or the grab bar **908**. In the example illustrated in FIG. **21**, the first slider attachment **1500(1)** is configured to receive and be retained by the first collection system post **1306(1)**. Optionally, the first collection system post **1306(1)** includes the first slot **1602(1)**, for example, to prevent rotation and/or lateral movement that would otherwise disengage the first slider attachment **1500(1)** from the first collection system post **1306(1)**.

[0100] Referring to FIG. **22**, a perspective view of a portion of another exemplary milk collection system **2200** with a ball joint housing **2202** is illustrated. The milk collection system **2200** on this example can be the same as the milk collection system **1800** of FIG. **18** except that it includes the ball joint housing **2202** and excludes any slider attachments (e.g., first and second slider attachments **1500(1)** and **1500(2)**). The ball joint housing **2202** can include an aperture for receiving the grab bar **908** (or the first and/or second collection system posts **1306(1)** and **1306(2)** in other examples) and can surround the second holder post **1320(2)**. Optionally, the ball joint housing has a notch (e.g., notch **1600**) or shape on an internal portion to prevent rotation and/or lateral movement that would otherwise disengage the first slider attachment **1500(1)** from the grab bar **908**. Accordingly, the ball joint housing **2202** can move laterally along, and/or rotate about, the grab bar **908** in this example to achieve a location desired by a user.

[0101] Referring to FIGS. **23A-C**, perspective views of another exemplary milk collection system **2300** with first and/or second gears **2302** and **2304** are illustrated. The milk collection system **2300** in this example includes first and second bottle holders **2306(1)** and **2306(2)**, which can be the same as the first and second bottle holders **1802(1)** and **1802(2)** except that the first and second holder posts **1320(1)** and **1320(2)** are coupled to the first gear **2302**. Thus, while the first and second bottle holders **1802(1)** and **1802(2)** can be rotatably coupled to the grab bar **908** or the first and second collection system posts **1306(1)** and **1306(2)** via first and/or second ball joints **1302(1)** and **1302(2)**, as explained in detail above, in the examples illustrated in FIGS. **23A-C**, the first and second bottle holders **2306(1)** and **2306(2)** are

rotatably coupled to the first and second collection system posts **1306(1)** and **1306(2)** via first and/or second gears **2302** and **2304**.

[0102] Referring more specifically to FIG. 23A, the second bottle holder **2306(2)** includes the second holder post **1320(2)** coupled to the first gear **2302**, which is coupled to a single gear frame **2308**. The single gear frame **2308** is configured to receive the second collection system post **1306(2)** toward a first end and engage with the first gear **2302** toward a second end such that the first gear **2302** can rotate and lock the second bottle holder **2306(2)** at an angle and position desired by a user (as well as unlock to facilitate alternate rotation positions). Optionally, the second collection system post **1306(2)** and the single gear frame **2308** can be shaped so as to restrict rotation of the single gear frame **2308** about the second collection system post **1306(2)** when the single gear frame **2308** is attached to the second collection system post **1306(2)**.

[0103] Referring more specifically to FIG. 23B, the second bottle holder **2306(2)** in this example also includes the second holder post **1320(2)** coupled to the first gear **2302**, but the first gear **2302** is coupled to a double gear frame **2310**. The first gear **2302** engages the double gear frame **2310** in this example in the same manner as described above with respect to the single gear frame **2308**. However, the double gear frame **2310** is further configured to rotatably engage the second gear **2304** to facilitate additional rotational positions and degrees of freedom for users. The double gear frame **2310** can also be configured to attach to the second collection system post **1306(2)** in the same manner as described above with reference to the single gear frame **2308**. Additionally, any other number of gears can be used in other examples and other methods for rotatably attaching the first and/or second bottle holders **2306(1)** and **2306(2)** of the milk collection system **2300** to the grab bar **908** and/or first and/or second collection system posts **1306(1)** and **1306(2)** can also be used in other examples.

[0104] Referring more specifically to FIG. 23C, the milk collection system **2300** is illustrated with first and second gear housings **2312(1)** and **2312(2)** within which first and second single gear frames (not shown) and first and second first gears (not shown) are contained. The milk collection system **2300** also includes a collection system bracket **2314** configured to be removably attached to the chest frame **620** and coupled to, and/or integrally including, the first and second collection system posts **1306(1)** and **1306(2)**. Accordingly, a user can optionally remove the collection system bracket **2314** with attached first and second collection systems posts **1306(1)** and **1306(2)** as desired (e.g., when using the milk collection system **2300** as attached to the grab bar **908**).

[0105] Referring to FIGS. 24A-B, perspective and plan views of an exemplary handle **2400** detached from, and attached to, respectively, the grab bar **908** are illustrated. In some examples, the handle **2400** can be removed from the grab bar **908** (e.g., to facilitate attachment of a portion of milk collection system **2300**) and/or the grab bar **908** itself can be removed from the breast pumping chair system **600** (e.g., when the milk collection system **2300** is used with the first and second collection system posts **1306(1)** and **1306(2)**). While only one handle **2400** is illustrated in this example, another handle (not shown) can be disposed on an opposite end of the grab bar **908** and can be a mirror image of the handle **2400**.

[0106] In this example, the handle **2400** includes a handle button **2402** that is configured to engage a locking component **2404** to thereby disengage the locking component from the grab bar **908**, and thereby facilitate removal of the handle **2400** from the grab bar **908**. More specifically, the locking component **2404** is configured to engage with the grab bar **908** when the grab bar **908** is inserted into the handle **2400**. A user can then press the handle button **2402** to engage the locking component **2404** causing the locking component **2404** to disengage from the grab bar **908** and allowing the user to pull the handle **2400** out of and away from the grab bar **908**. Other methods for removably attaching the handle **2400** to the grab bar **908** can also be used in other examples.

[0107] Referring now to FIGS. 25A-D, an exemplary seatbelt system **2500** is illustrated. The seatbelt system **2500** in this example includes a pelvic support **2502** attached to the chest support **630** below or proximate a bottom portion of the chest cushion **632**, although the pelvic support can be coupled to other components (e.g., the chest frame **620**) and/or disposed in other locations. Optionally, the pelvic support **2502** is attached to the chest support **630** via a rotatable attachment mechanism **2504**. The pelvic support **2502** includes first and second female attachment mechanisms **2506(1)** and **2506(2)** (e.g., buckle, clip, or clasp) disposed at opposing ends and configured to engage male attachment mechanisms **2508(1)** and **2508(2)** that are coupled to opposing ends of a webbing **2510**.

[0108] Accordingly, the webbing **2510** can be extended around a user's body, tightened, and clasped at both ends to provide a more secure, relaxed engagement with the breast pumping chair system **600**. In some examples, a rear portion of the pelvic support **2502** includes one or more straps **2512** to retain a portion of the webbing when the seatbelt system **2500** is not in use. Also optionally, the pelvic support **2502** can include a pelvic cushion **2514** for more comfortable usage of the seatbelt system **2500**. Other types of straps, belts, and/or connections can also be used in other examples.

[0109] Referring to FIGS. 26A-B, an exemplary accessory system **2600** is illustrated. In this example, the accessory system **2600** includes a warming and/or vibrating device **2602**, which can generate heat and/or vibration to facilitate improved milk expression when in use. The accessory system **2600** is retained by an accessory bracket **2604** with a socket **2606** on a rear portion. The socket **2606** is configured to engage a ball **2608** to form a ball **2608** and socket **2606** joint that allows rotation of the warming and/or vibrating device **2602** to a desired position by a user. The ball **2608** is disposed at one end of a flexible, rigid, and/or adjustable arm **2610** that has a stiffness that allows the arm **2610** to retain its position after manipulation by a user. At another end of the arm **2610** opposite the ball, the arm **2610** is coupled to an arm connection mechanism **2612**, which can be the same or different as the clamp **1304**, for example. The arm connection mechanism **2612** facilitates attachment to the first connection system post **1306(1)** in this example, although the arm **2610** can be connected in other manners and/or to other components of the breast pumping chair system **600**. Additionally, different types of connections other than a ball and socket joint between the arm **2610** and the accessory bracket **2604** can also be used in other examples.

[0110] Referring to FIG. 27, a portable breast pumping positioning system **2700** is illustrated. In this example, the milk collection system **1300** can be used with the portable

breast pumping system positioning **2700** such that the clamp **1304** is attached to any flat surface **2702**, such as a table, counter, desk, or other furniture, for example, as explained in more detail above with reference to FIG. **14**. The portable breast pumping positioning system **2700** also includes an upper portable support **2704** with a headrest aperture **2706** for receiving a headrest post (not shown) (e.g., headrest post **138**), and a cushion attachment mechanism **2708** (e.g., hook and loop fastener) on a front angled portion for attaching a chest cushion (not shown) (e.g., chest cushion **638**) or other cushion. In this example, the upper portable support **2704** includes one or more threaded posts **2710** extending from a bottom portion and configured to receive a plate **2712** or other portion of a lower portable support **2714** that is coupled to a knob **2716**.

[0111] In use, the knob **2716** can be rotated by a user to move the plate **2712** and lower portable support **2714** upward along the threaded posts **2710** and toward a bottom of the flat surface **2702** to thereby act as a clamp or vice to retain the upper portable support **2704** and lower portable support **2714** in position with the flat surface **2702** disposed between those components. Optionally, the at least a portion of the bottom of the upper portable support **2704** and/or the top of the lower portable support **2714** can include rubber or another type of friction and/or compressible material to facilitate a tight fit capable of supporting a portion of a user's weight on the front angled portion of the upper portable support **2704**. In some examples, the upper portable support **2704** is configured to overhang the flat surface **2702** in use to provide a more comfortable access and use of the milk collection system **1300**.

[0112] Having described the basic concept of the technology, it should be apparent to those skilled in the art that the foregoing detailed disclosure is intended to be presented by way of example only and is not limiting. Various alterations, improvements, and modifications will occur and are intended to those skilled in the art, though not expressly stated herein. These alterations, improvements, and modifications are intended to be suggested hereby, and are within the spirit and scope of the invention.

What is claimed is:

1. A breast pumping chair system, comprising:

a chair assembly comprising a seat frame coupled to a base frame, a first foot and a second foot coupled to opposing ends of the base frame, a seat support coupled to the seat frame toward a first end of the seat frame, and an angle adjustment mechanism configured to alter an angle of the seat frame with respect to the base frame;

a breast pumping assembly comprising:

a chest frame coupled to the seat frame toward a second end of the seat frame, a chest support coupled to the chest frame, a chest cushion coupled to the chest support and angled to engage a sternum of a user in a forward leaning position, and a headrest post removably attached to the chest frame and coupled to a headrest support coupled to a headrest cushion; and

a milk collection system comprising first and second bottle holders rotatably coupled via first and second holder posts, respectively, to opposing sides of the chest frame, wherein each of the first and second bottle holders is configured to retain a bottle in place at a desired angle of rotation and distance from the user;

a height adjustment mechanism configured to alter a height of the breast pumping assembly with respect to the chair assembly; and

a table rotatably coupled to one or more of the chair assembly or the breast pumping assembly via a table hinge of a table adjustment mechanism configured to facilitate open and closed positions in which the table is substantially parallel and perpendicular to, respectively, a plane shared by the first and second feet.

2. The breast pumping chair system of claim 1, wherein the table is shaped to prevent engagement with the first and second bottle holders when the table is moved from the open position to the closed position.

3. The breast pumping chair system of claim 2, wherein the table adjustment mechanism further comprises a puller, a lock, an external table bracket removably coupled to the chest frame and comprising a plurality of detents, and an internal table bracket rotatably coupled to the external table bracket, wherein the puller is configured to disengage the table from one of the detents when engaged by the user and the lock is coupled to the table hinge to allow full rotation of the table to the closed position when engaged by the user.

4. The breast pumping chair system of claim 1, further comprising first and second cushioned leg supports coupled to opposing sides of the base frame.

5. The breast pumping chair system of claim 1, wherein the headrest post is adjustable along its length to vary a height of the headrest post with respect to the chest frame and the headrest support is rotatable to adjust an angle of the headrest cushion coupled thereto with respect to the headrest post.

6. The breast pumping chair system of claim 1, wherein the height adjustment mechanism comprises an interface disposed proximate the chest frame and configured to engage a pneumatic linear actuator disposed within and coupled between the chest frame and the seat frame, wherein the pneumatic linear actuator is configured to move the chest frame upward within the base frame.

7. The breast pumping chair system of claim 1, wherein the angle adjustment mechanism comprises a crank handle coupled to a threaded angle adjustment post disposed proximate the seat frame, wherein rotation of the crank handle and the threaded angle adjustment post is configured to raise and lower the seat frame with respect to the base frame.

8. The breast pumping chair system of claim 1, further comprising a grab bar coupled to the chest support and first and second handles removably coupled to opposing ends of the grab bar.

9. The breast pumping chair system of claim 8, further comprising a collection system bracket removably coupled to the chest frame and first and second collection system posts coupled to opposing sides of the collection system bracket.

10. The breast pumping chair system of claim 1, wherein at least one of the first or second bottle holders further comprises an upper component coupled to the first or second holder post, a lower component, and a holder bar configured to be received by the upper and lower components and coupled to a holder button configured to facilitate vertical movement of the lower component with respect to the upper component and about the holder bar, wherein the upper and lower components comprise first and second straps, respectively, which are configured to retain a bottle in place within the at least one of the first or second bottle holders.

11. The breast pumping chair system of claim 1, further comprising a seatbelt system comprising a pelvic support attached to the chest support, a pelvic cushion attached to the pelvic support, first and second female attachment mechanisms coupled to opposing ends of the pelvic support, and first and second male attachment mechanisms attached to opposing ends of a webbing and configured to engage with the first and second female attachment mechanisms, respectively.

12. The breast pumping chair system of claim 1, further comprising an adjustable arm configured to attach at a first end to an accessory bracket for a tissue warming or vibration device and at a second end to the breast pumping chair system via an arm connection mechanism.

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