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(54) **ERGONOMIC FORWARD LEANING BREAST PUMPING CHAIR SYSTEMS AND DEVICES THEREOF**

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| ***A61H 23/00*** | (2006.01) |

(52) **U.S. Cl.**

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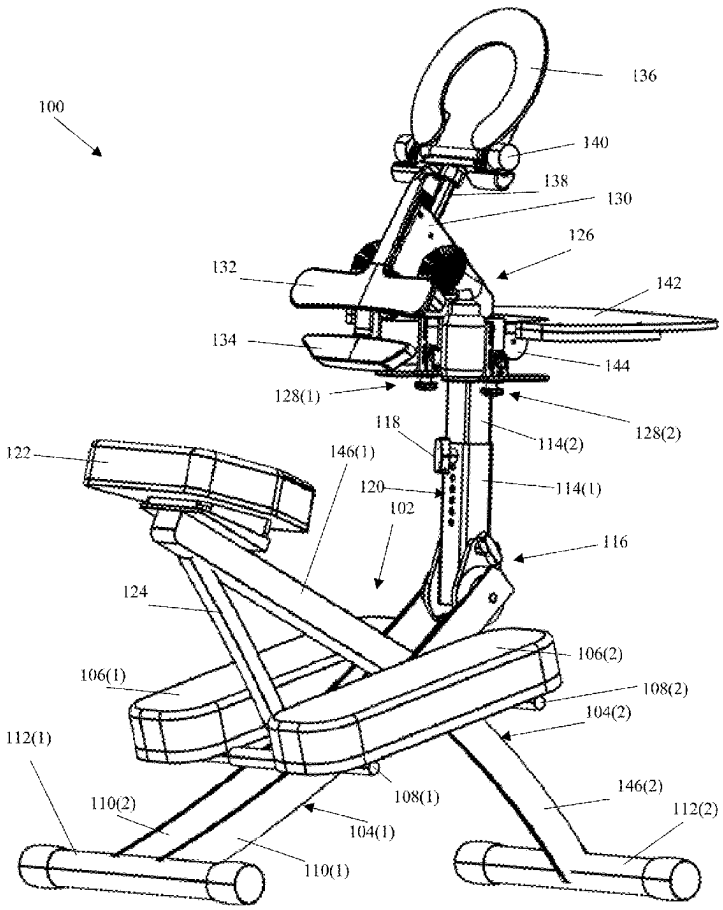
(57) **ABSTRACT**

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.



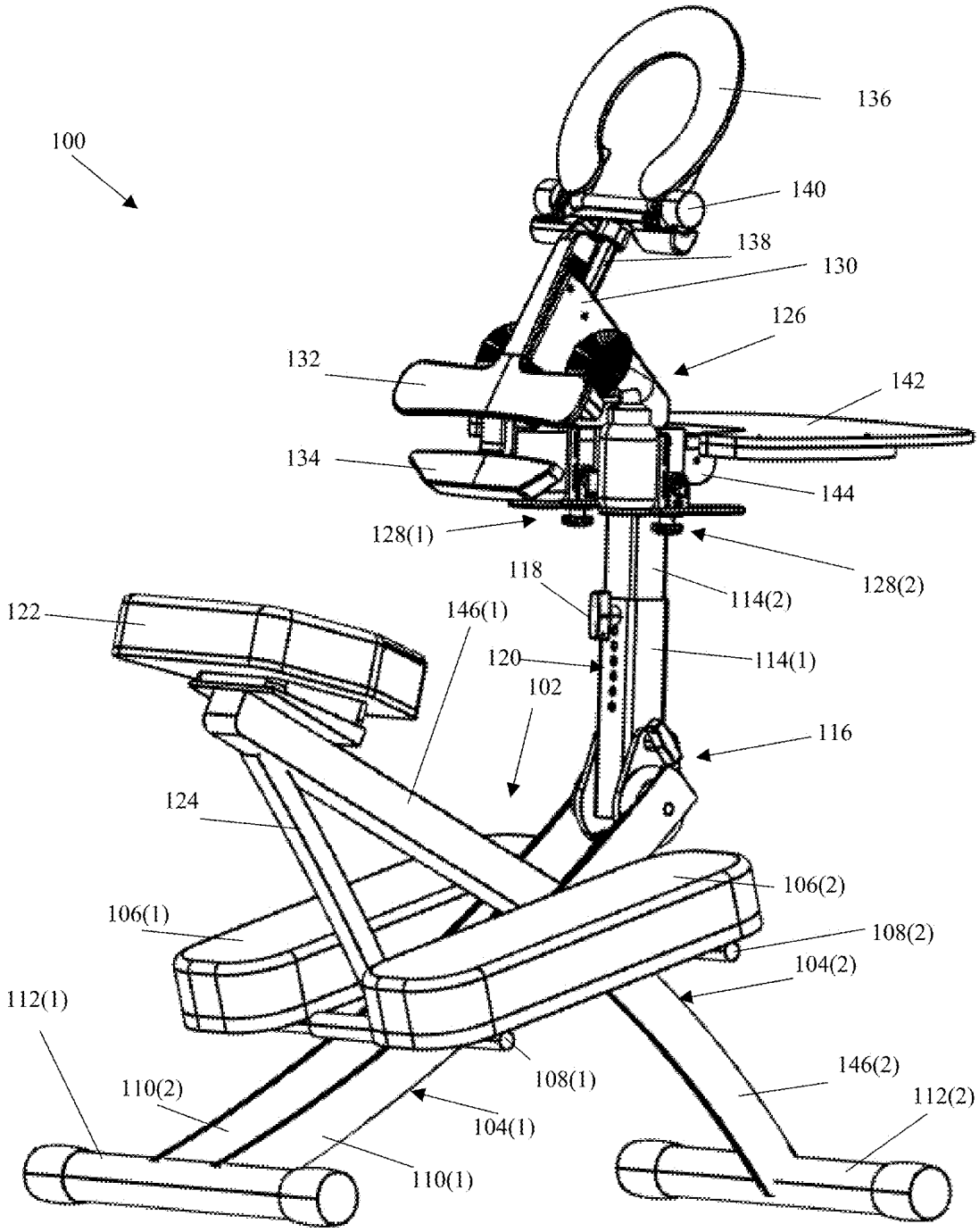

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FIG. 1

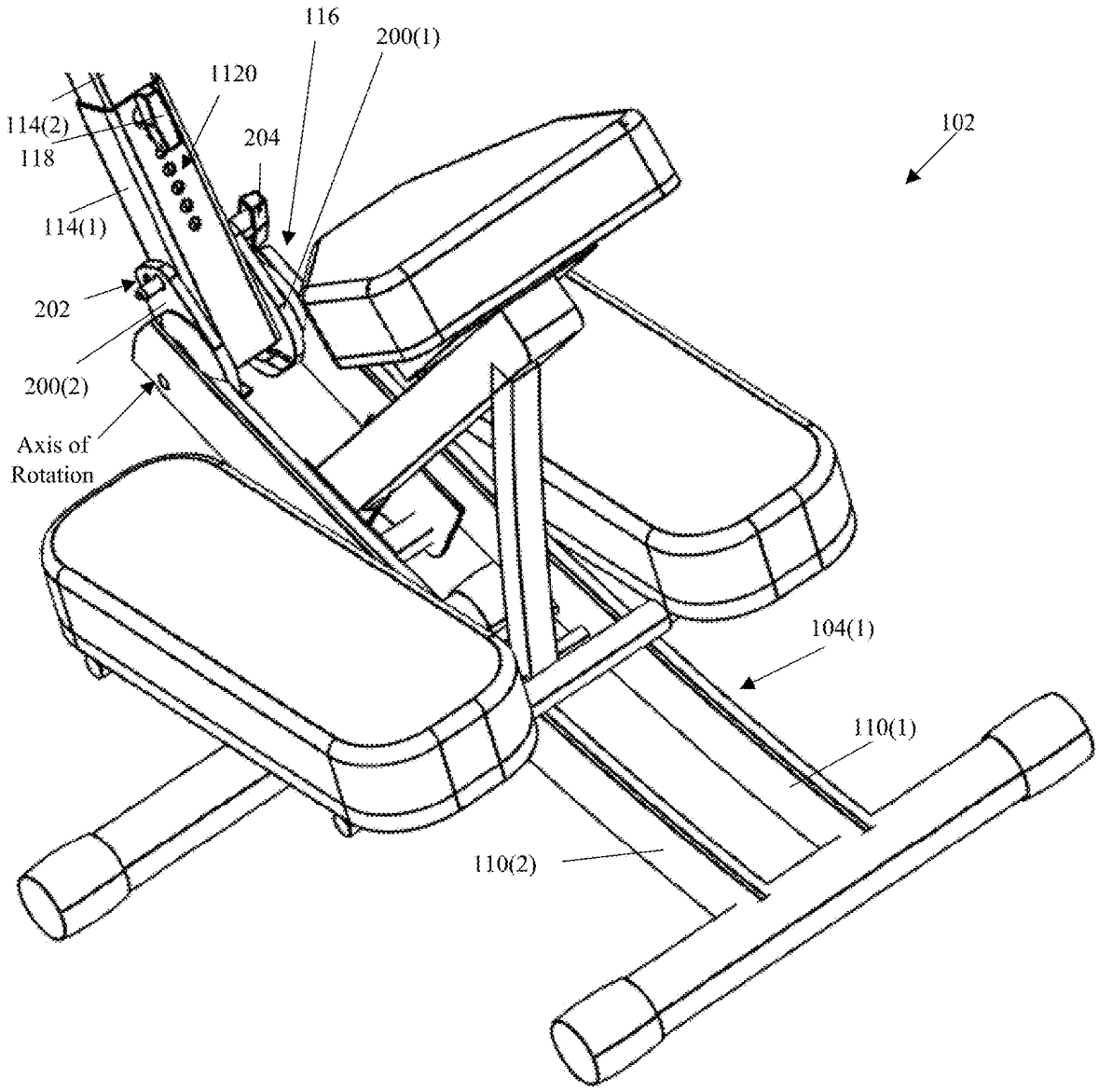
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FIG. 2

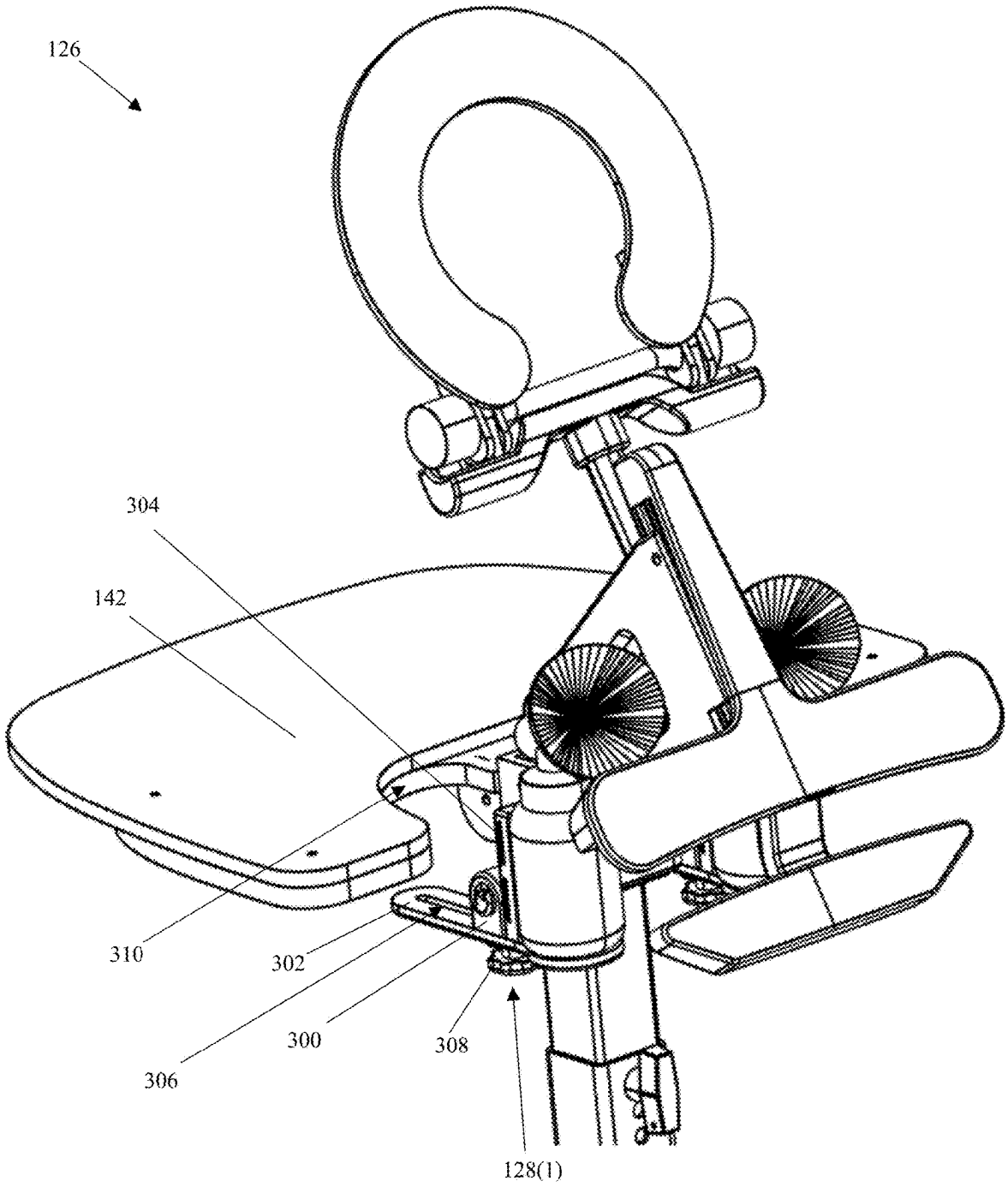


FIG. 3

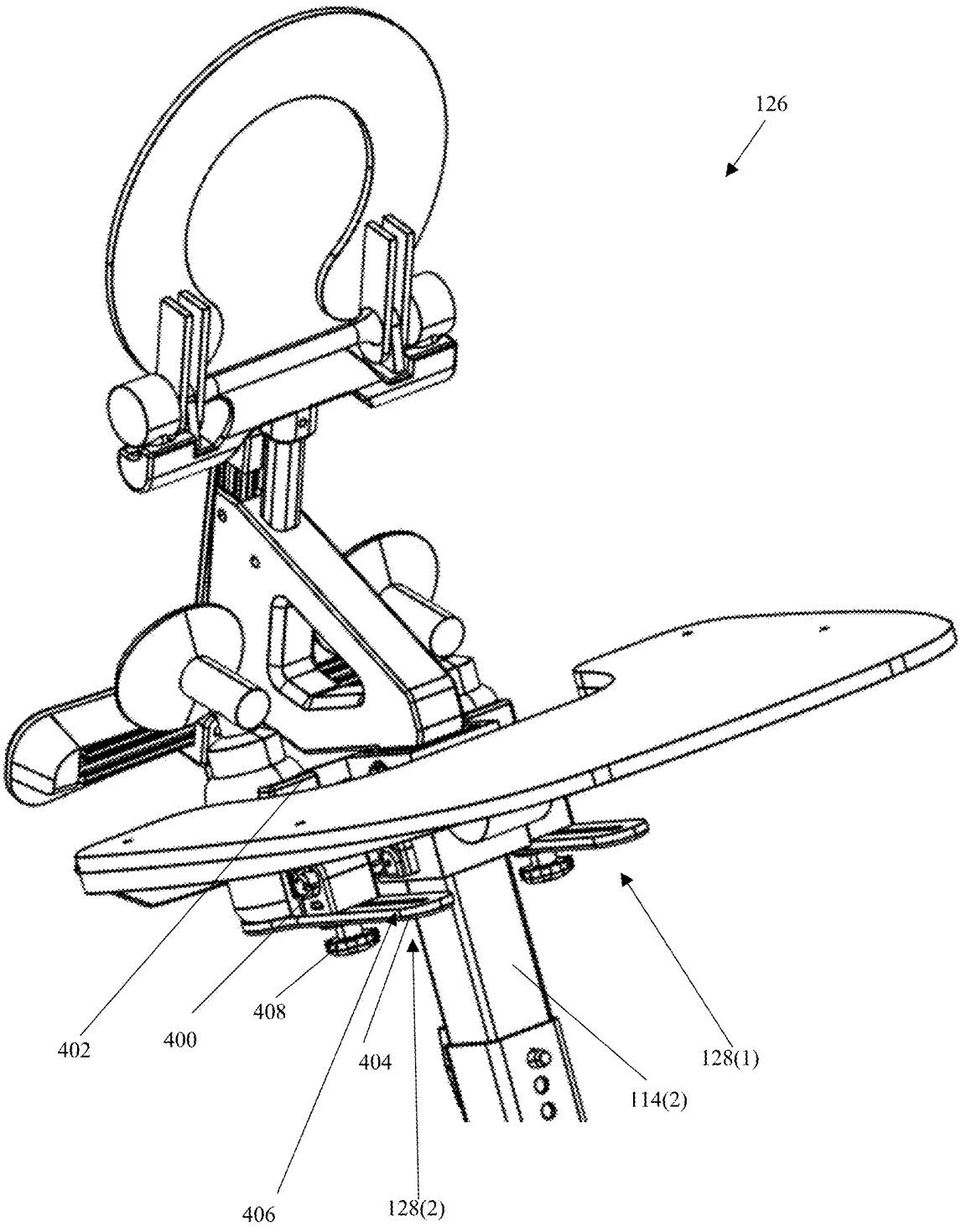


FIG. 4

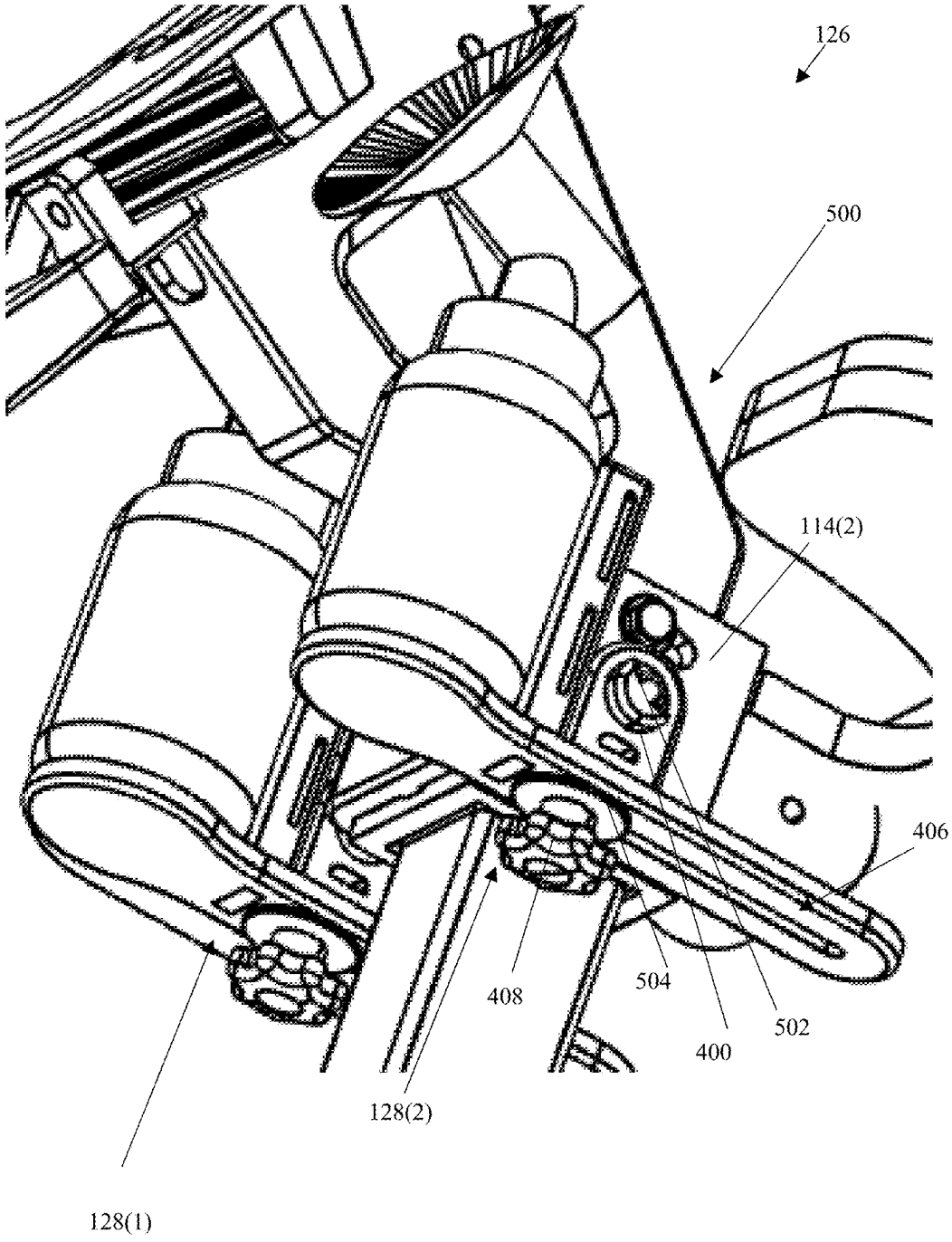


FIG. 5

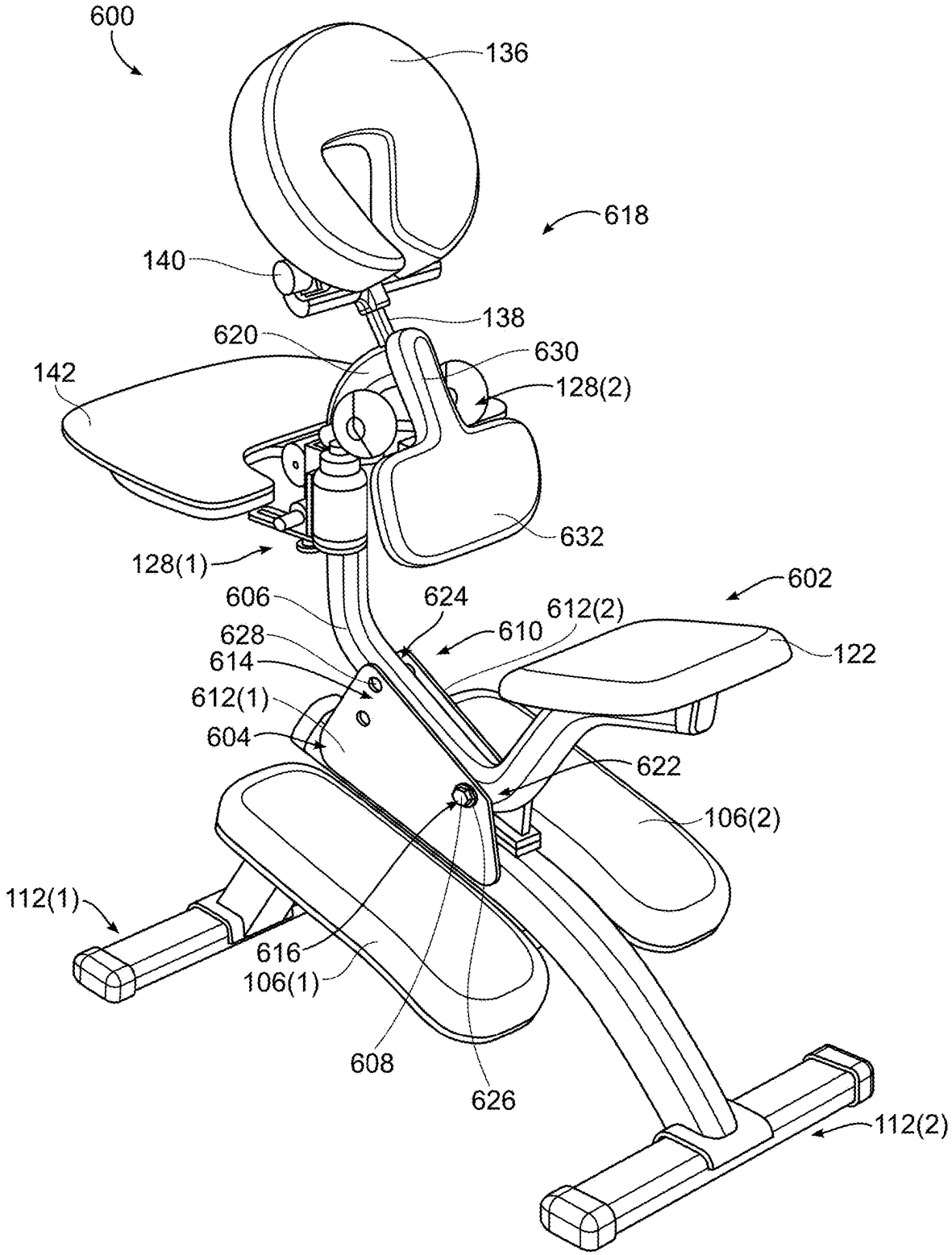
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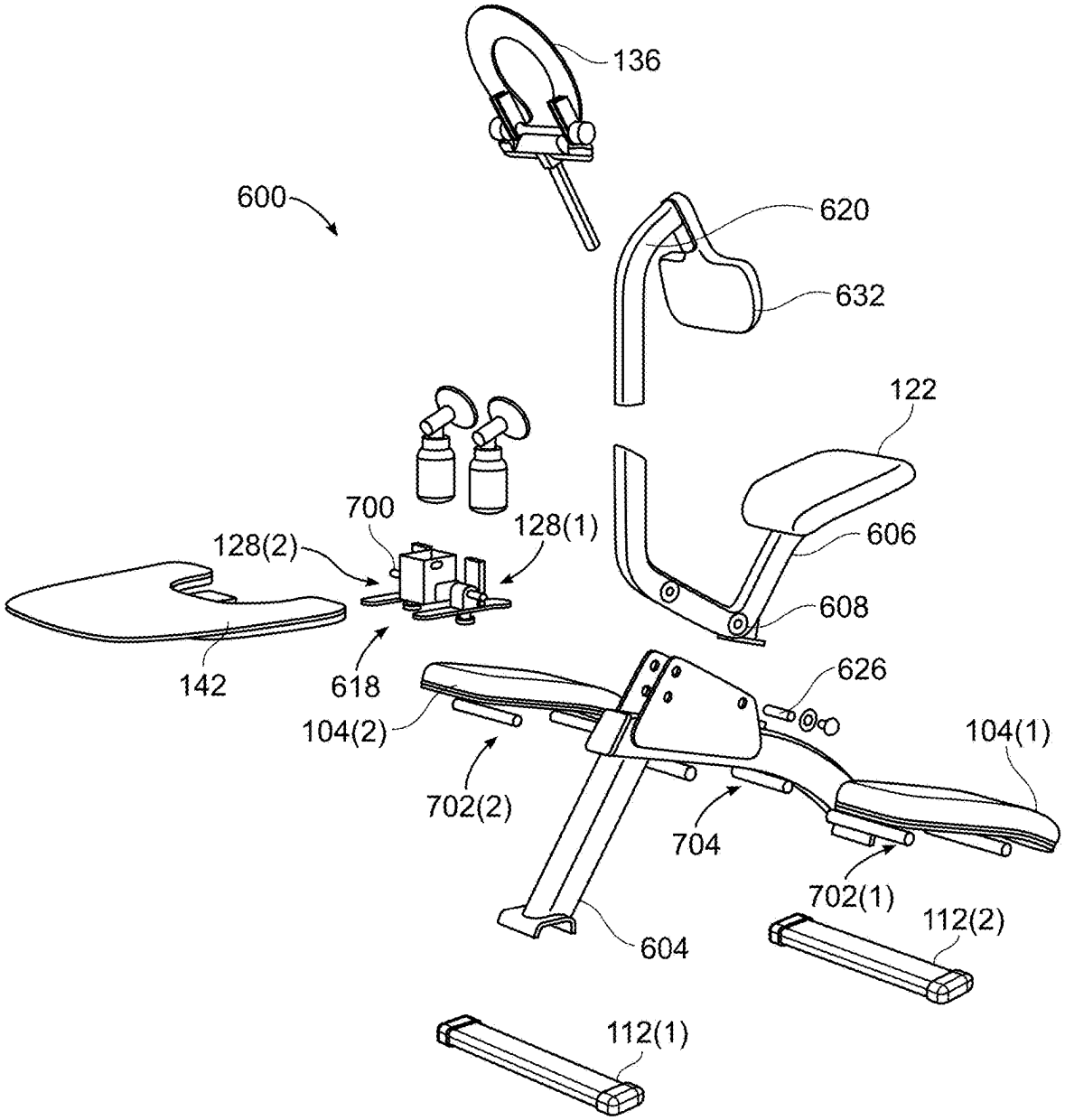
FIG. 6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604
112(1)

FIG. 7

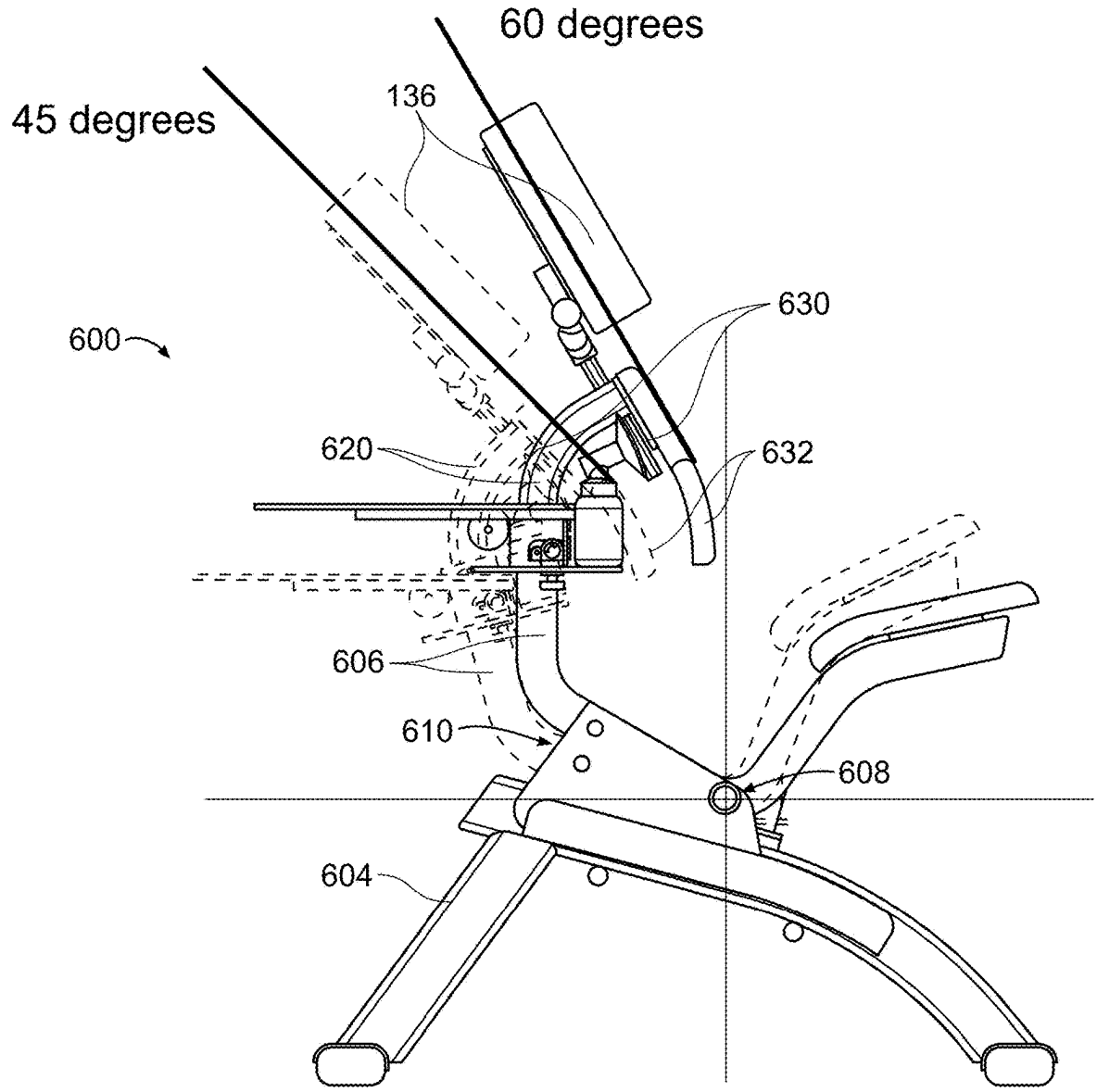


FIG. 8

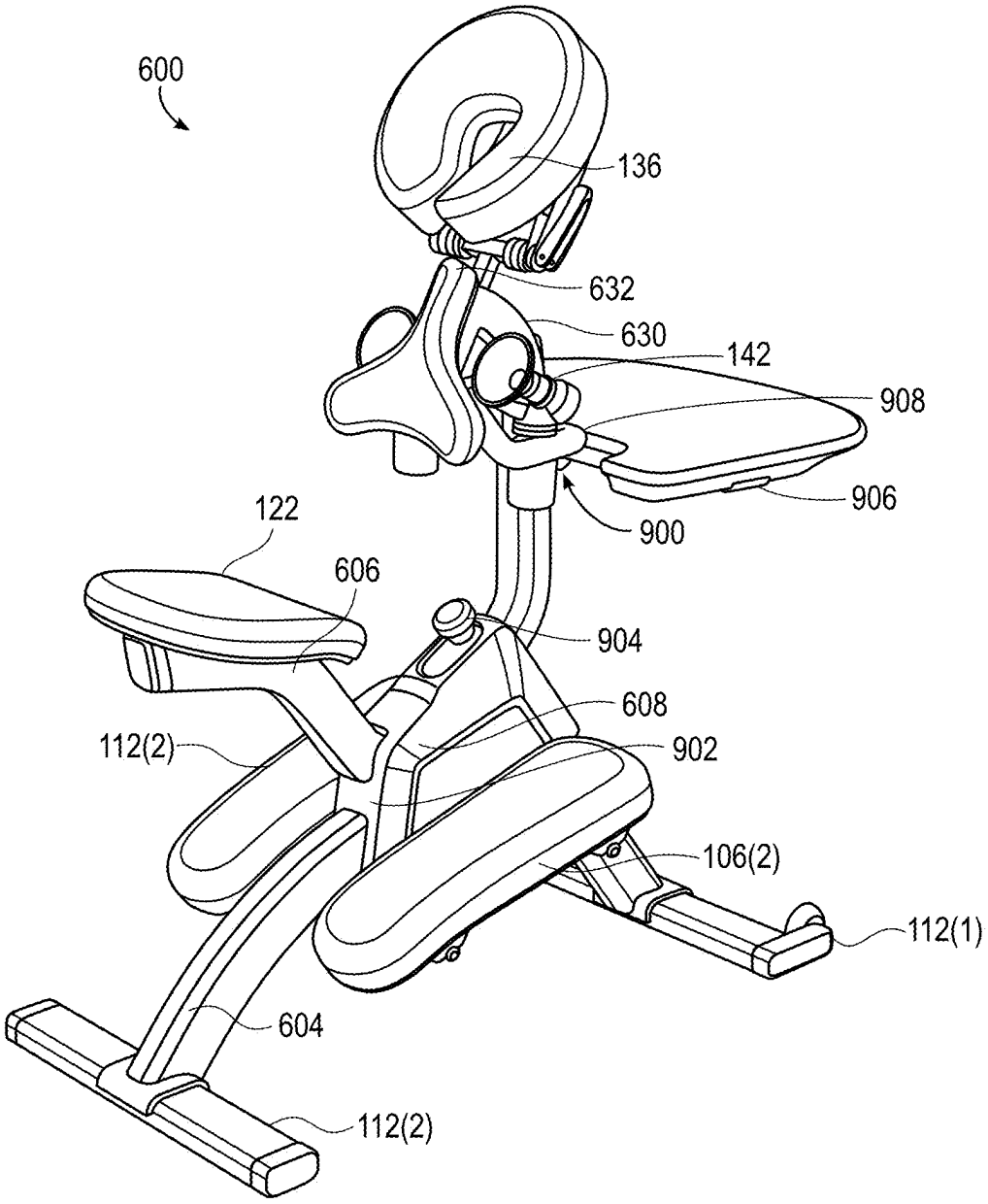
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FIG. 9

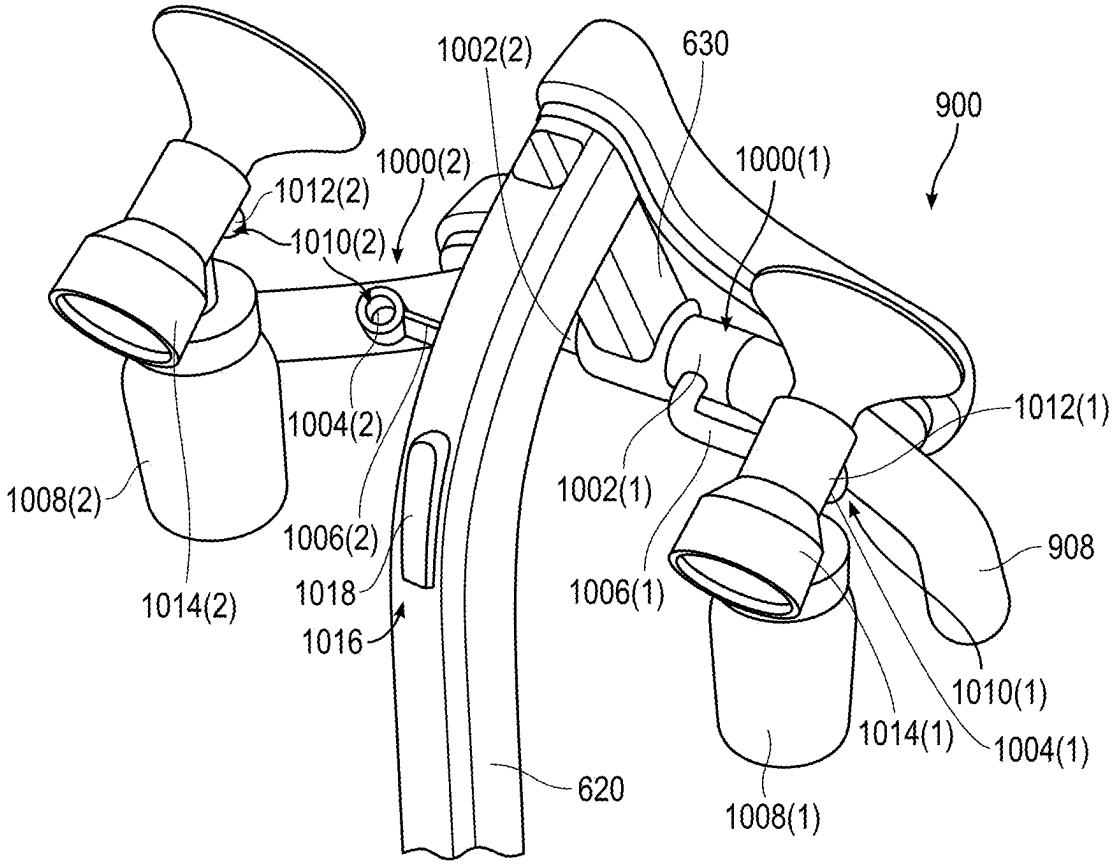
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FIG. 10A

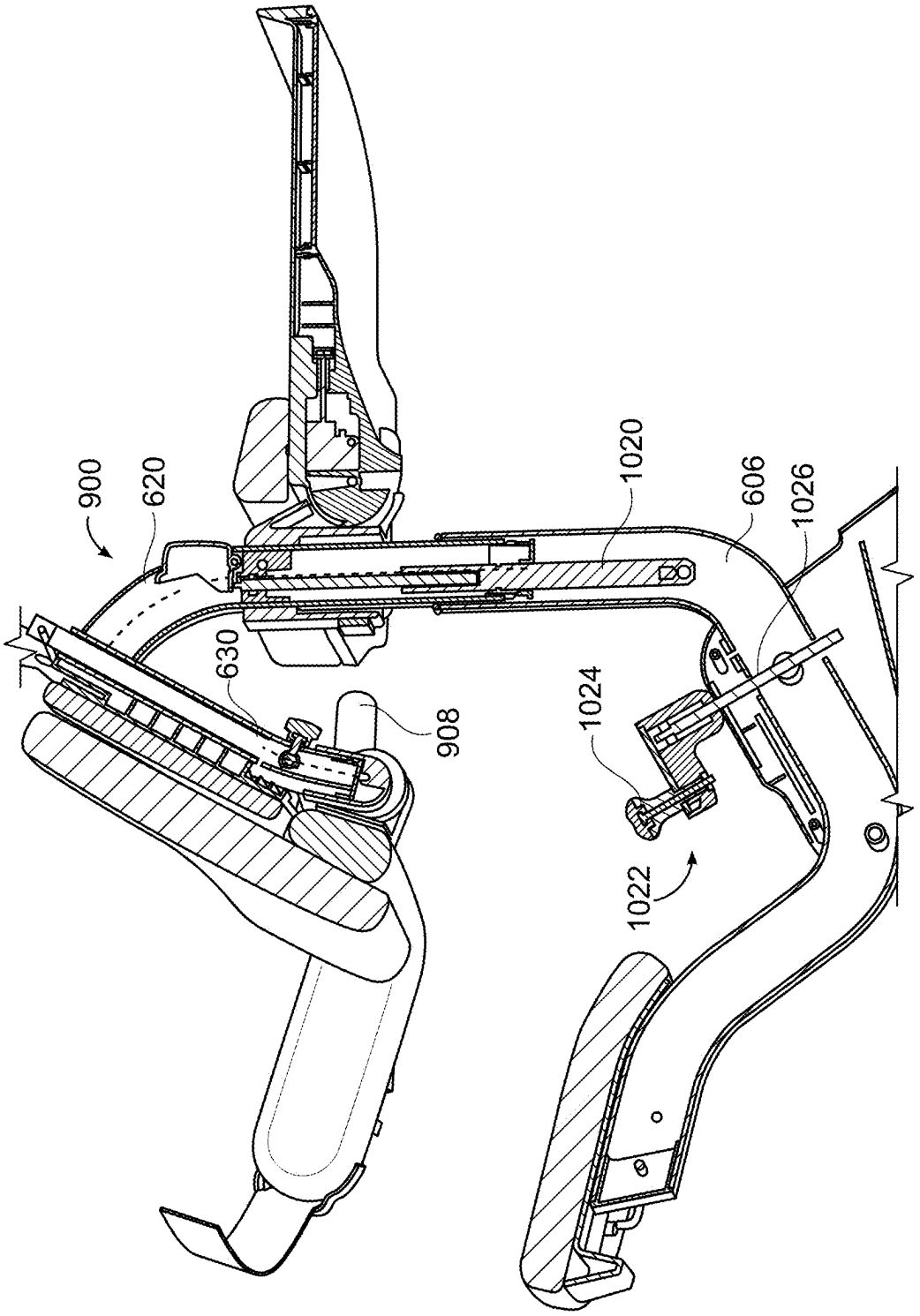


FIG. 10B

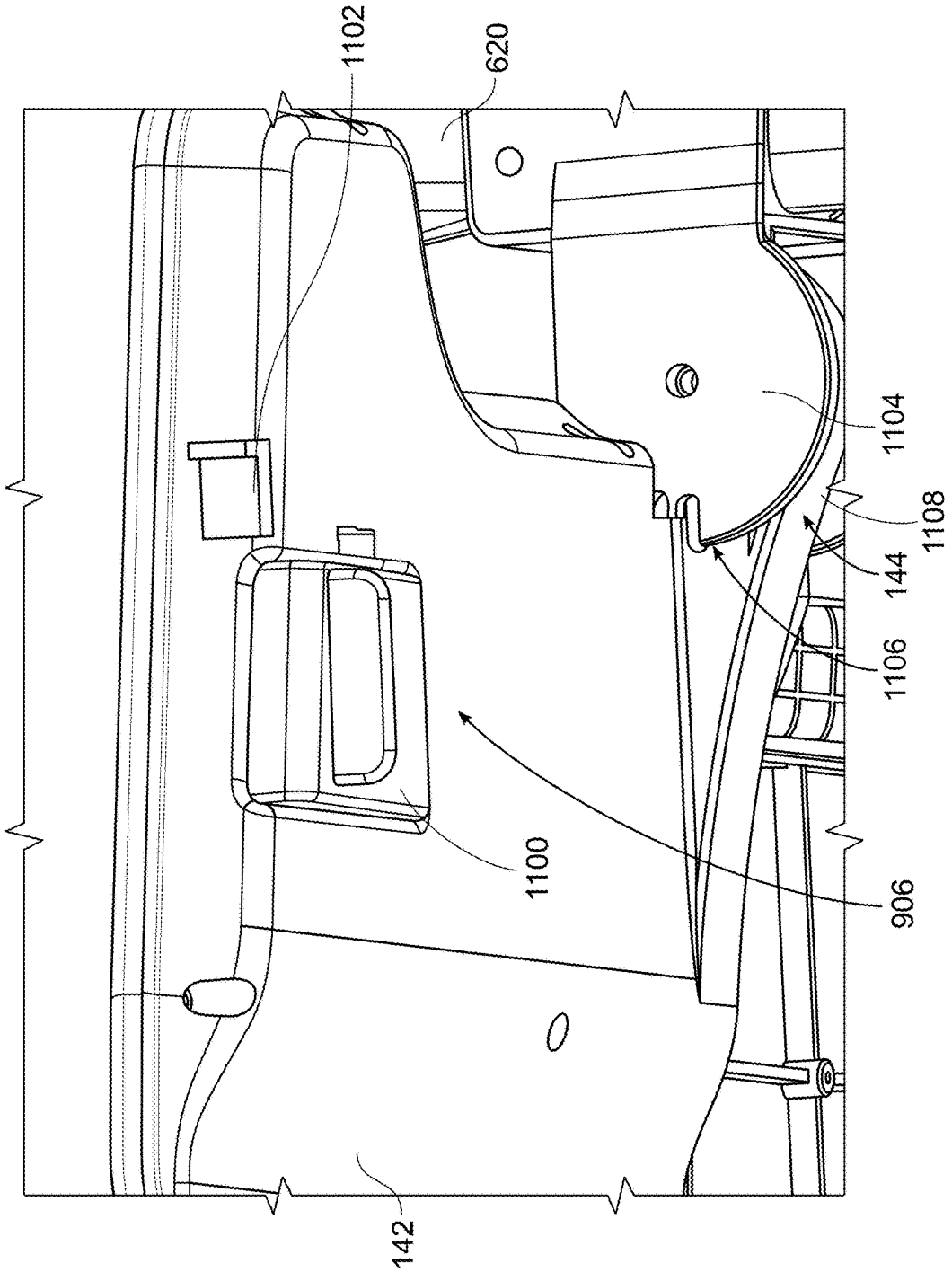


FIG. 11

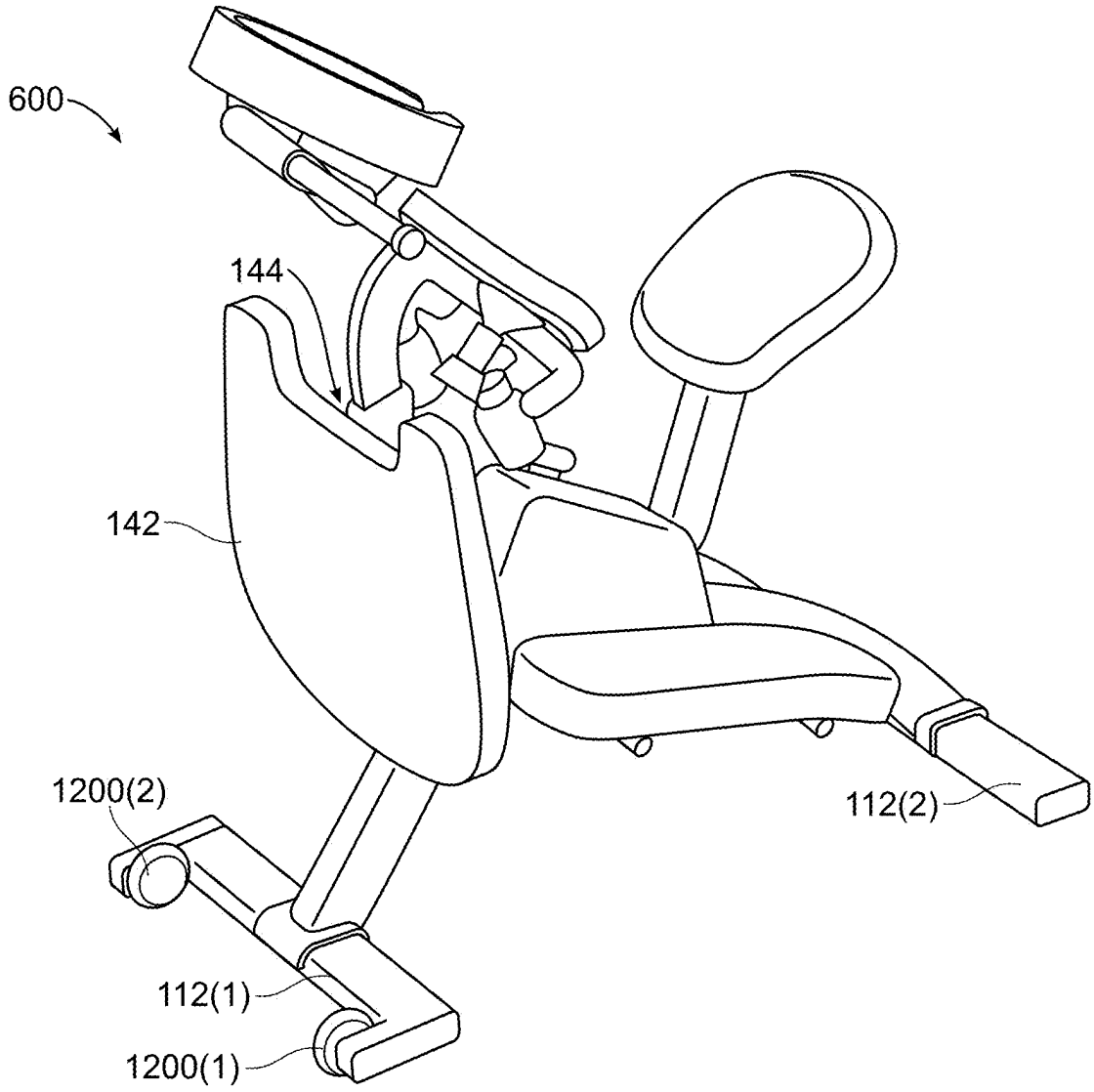


FIG. 12

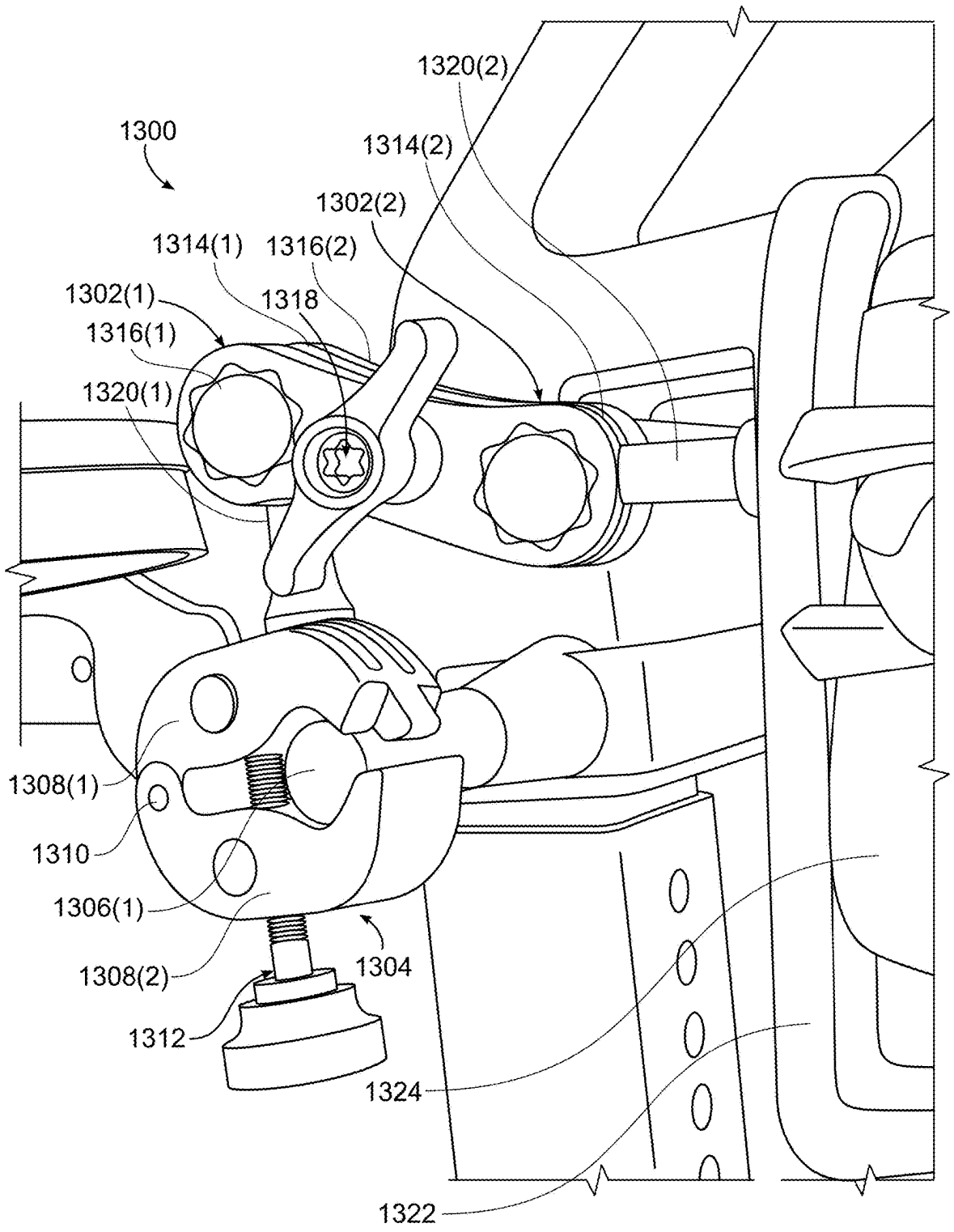
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FIG. 13

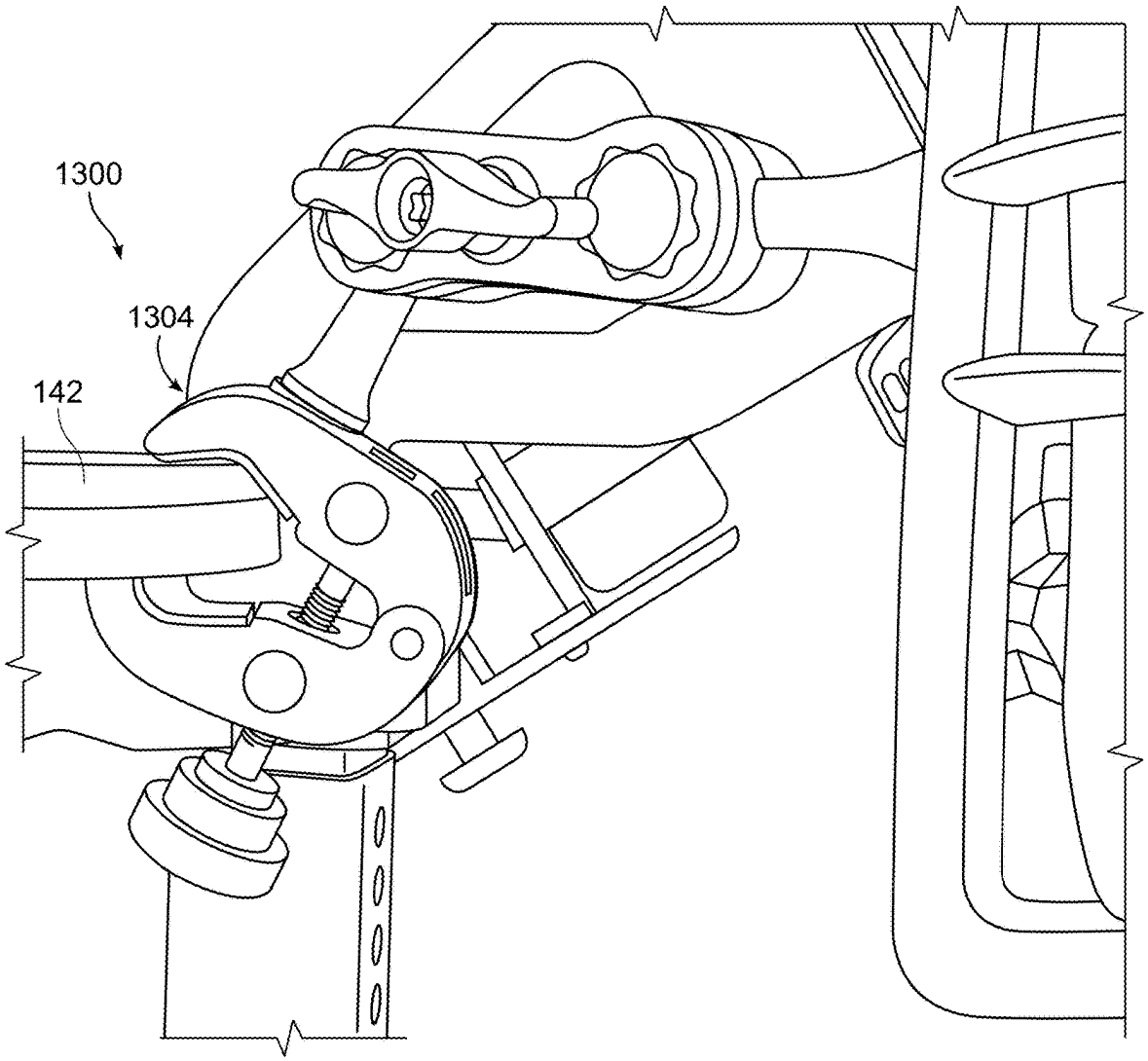


FIG. 14

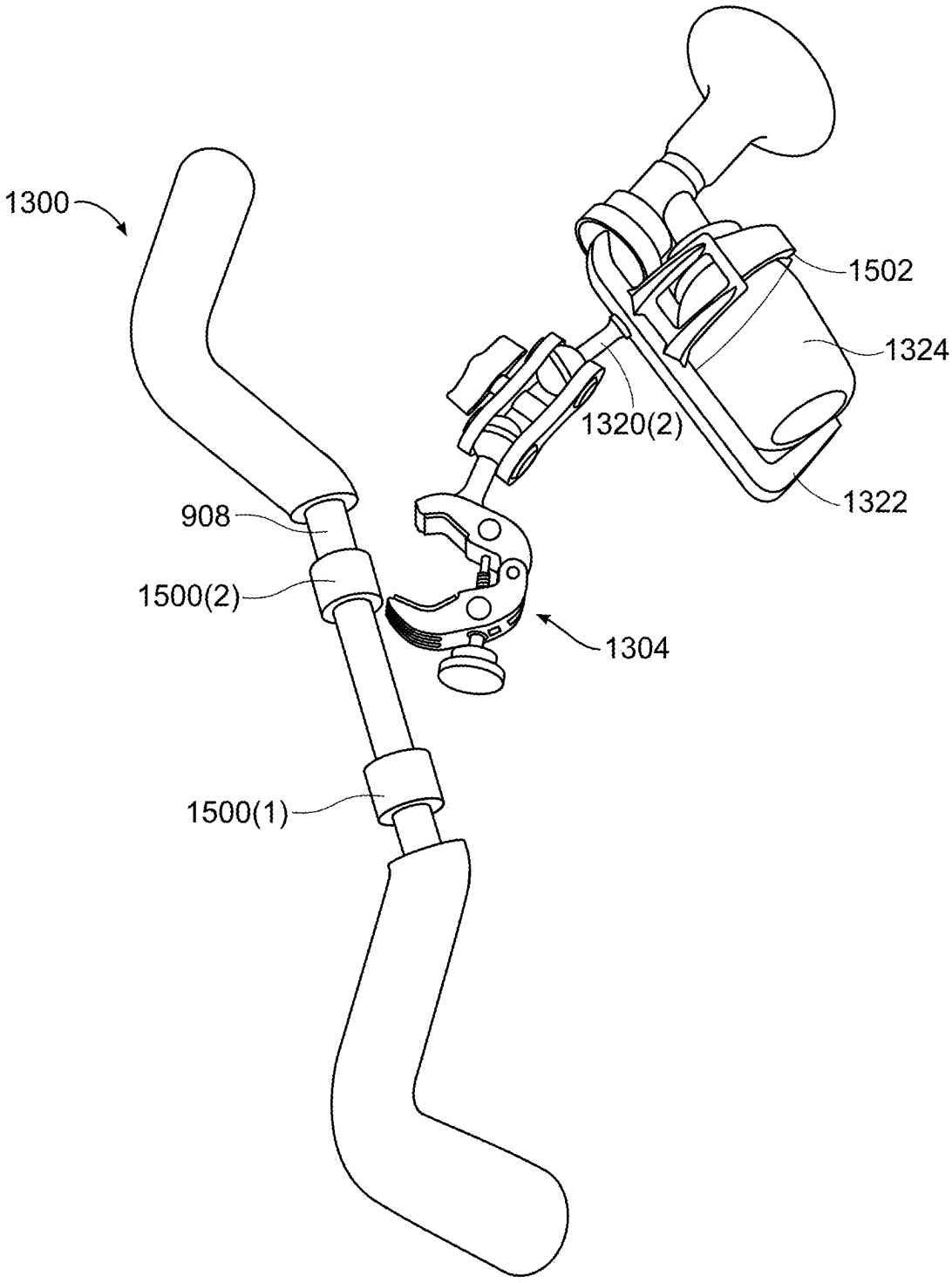


FIG. 15

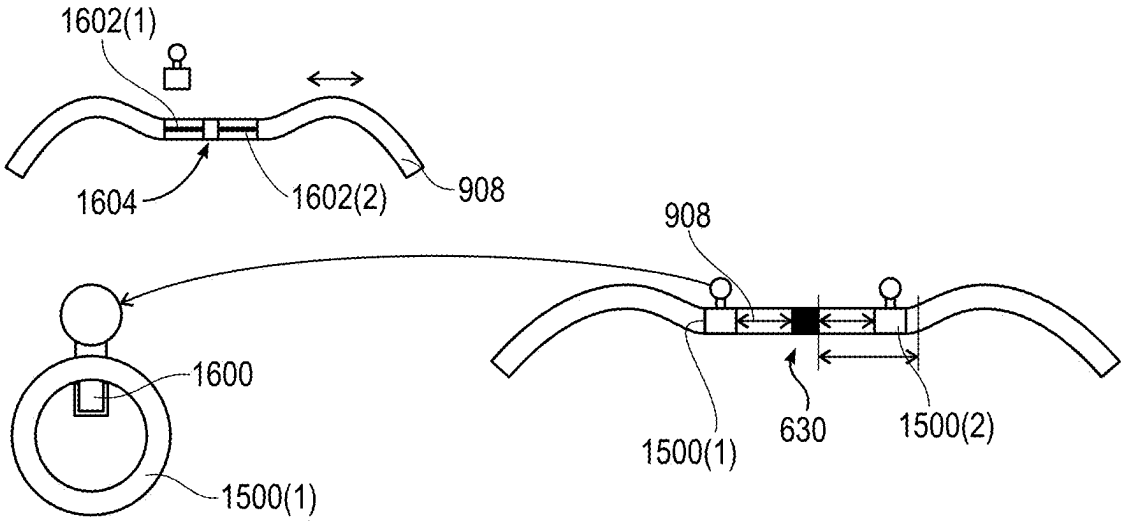
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FIG. 16

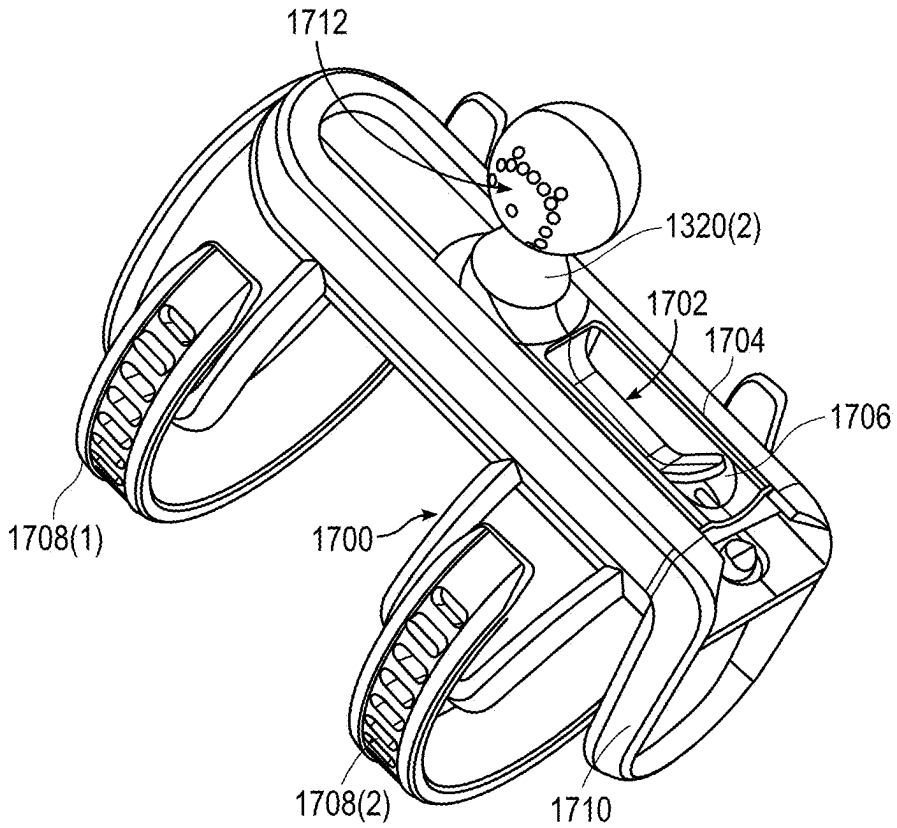
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FIG. 17

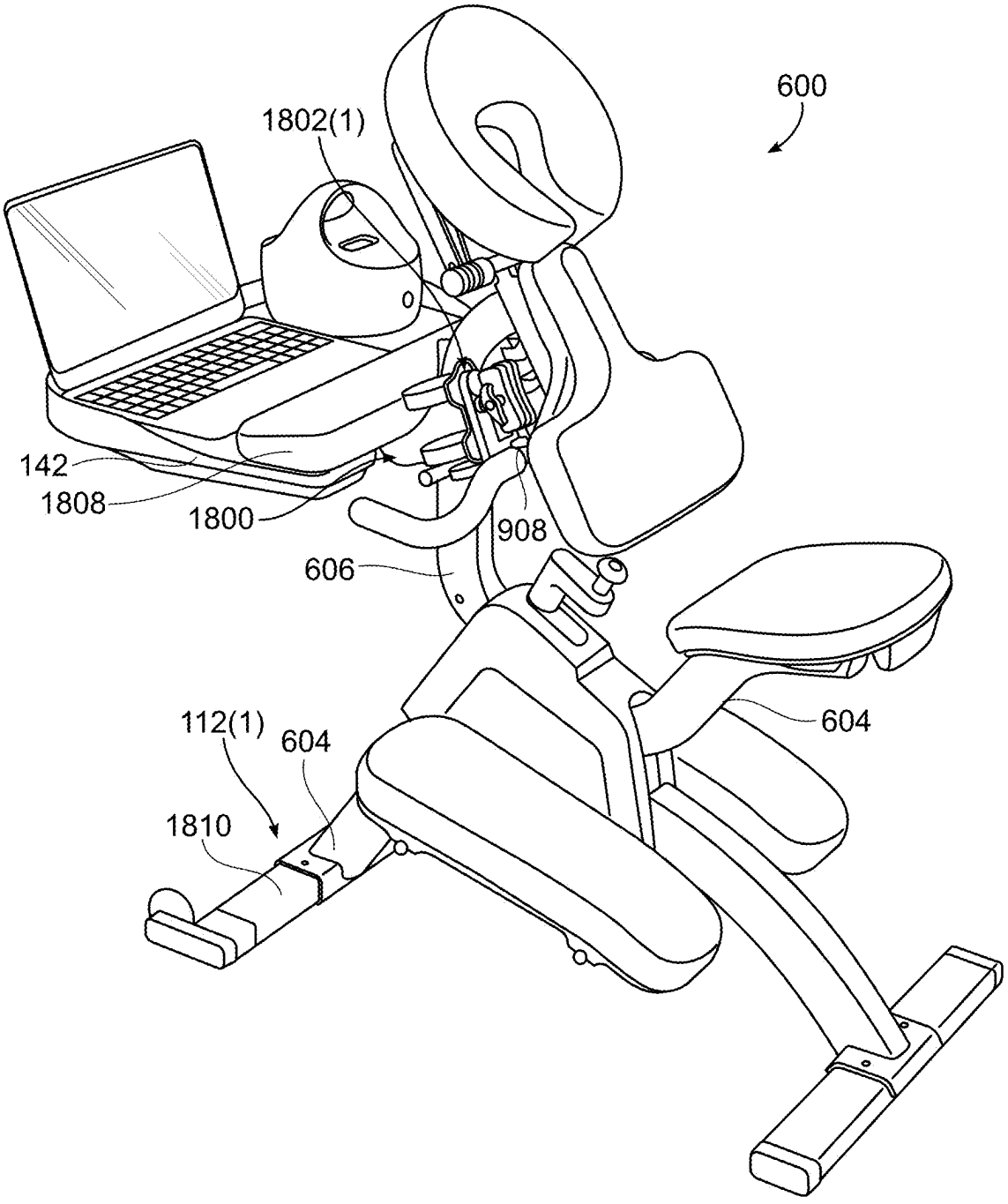


FIG. 18

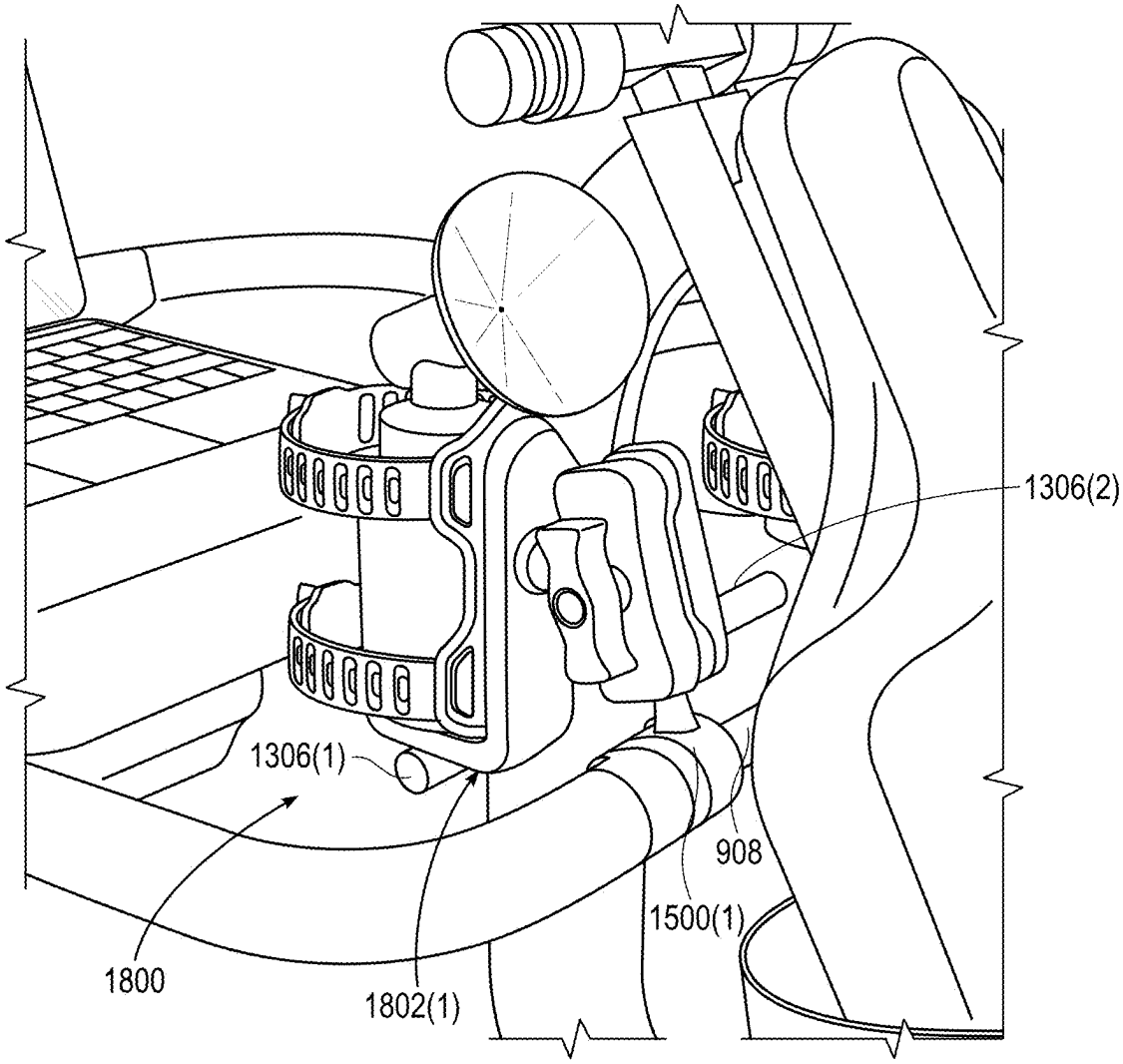


FIG. 19

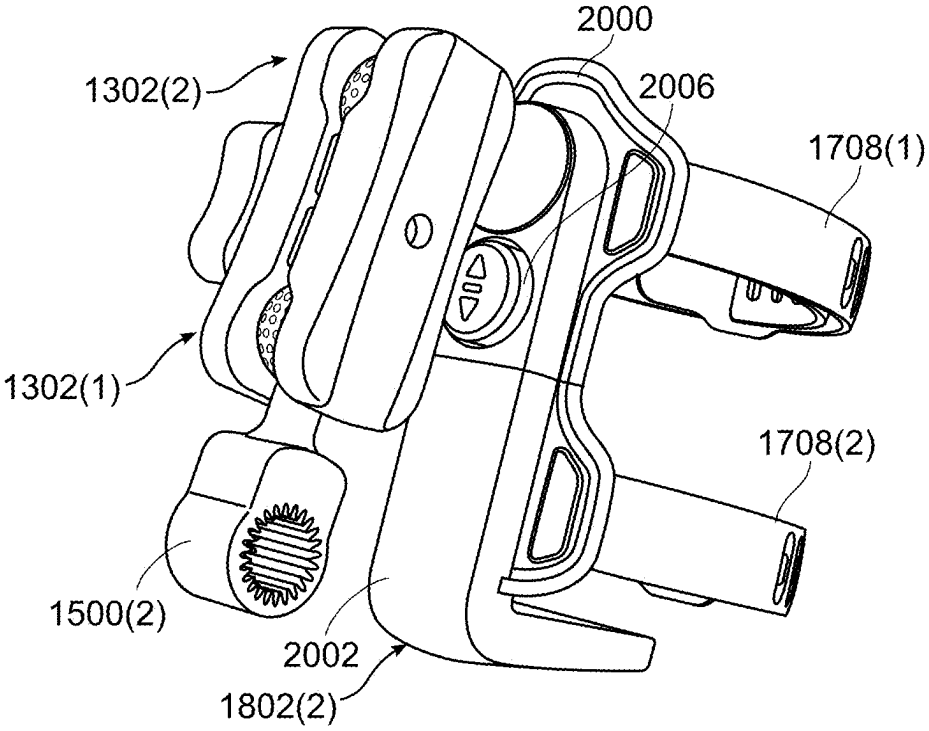


FIG. 20A

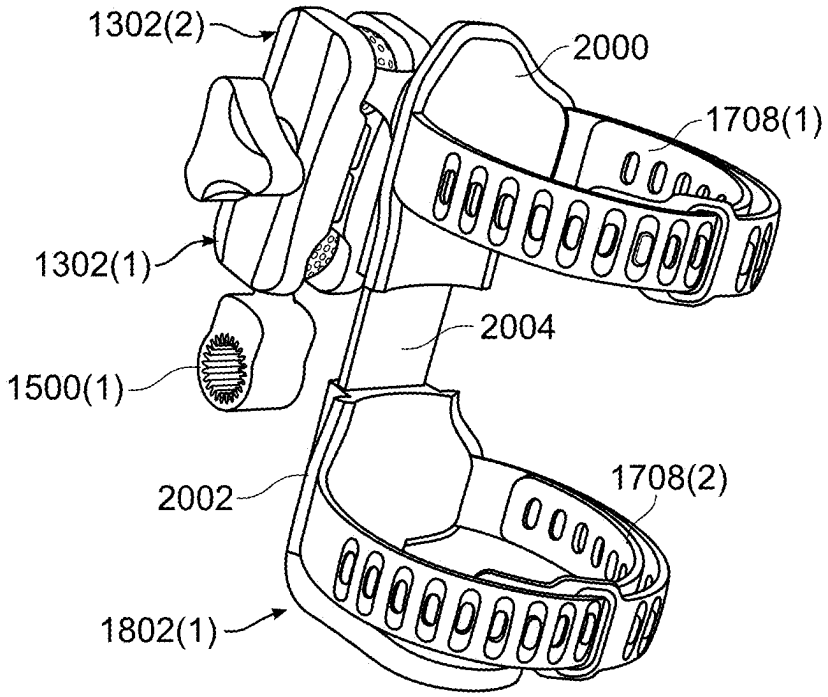


FIG. 20B

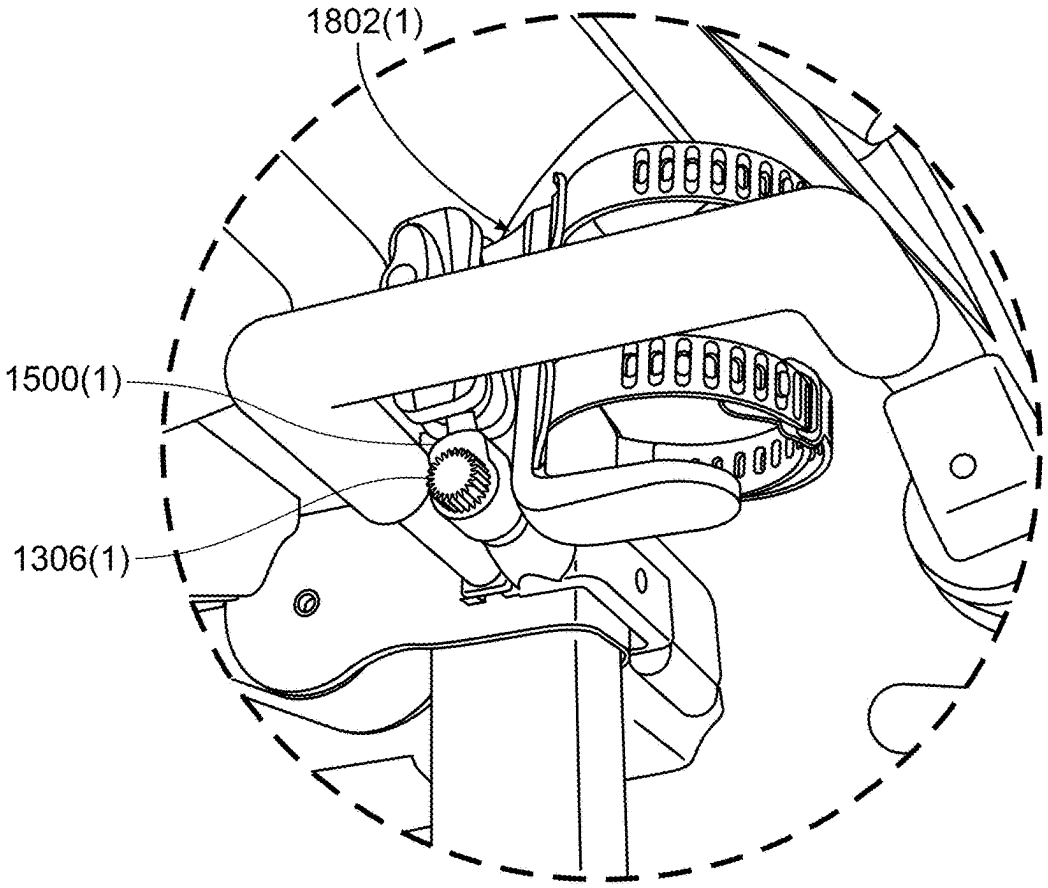


FIG. 21

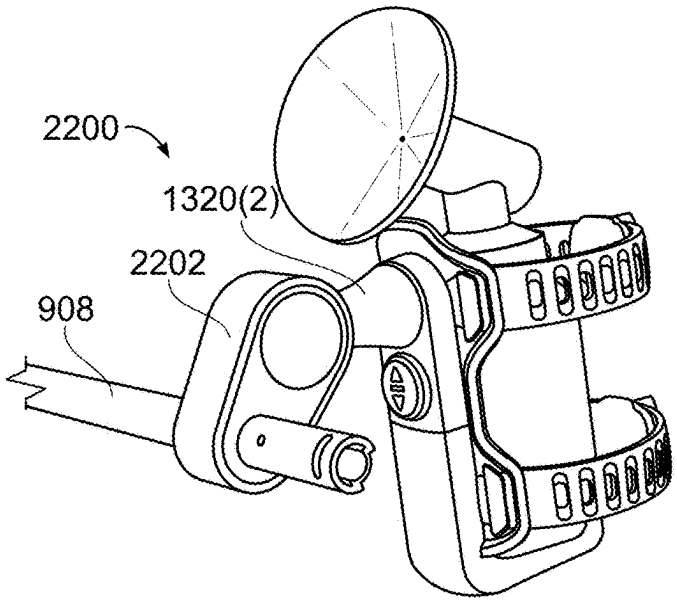


FIG. 22

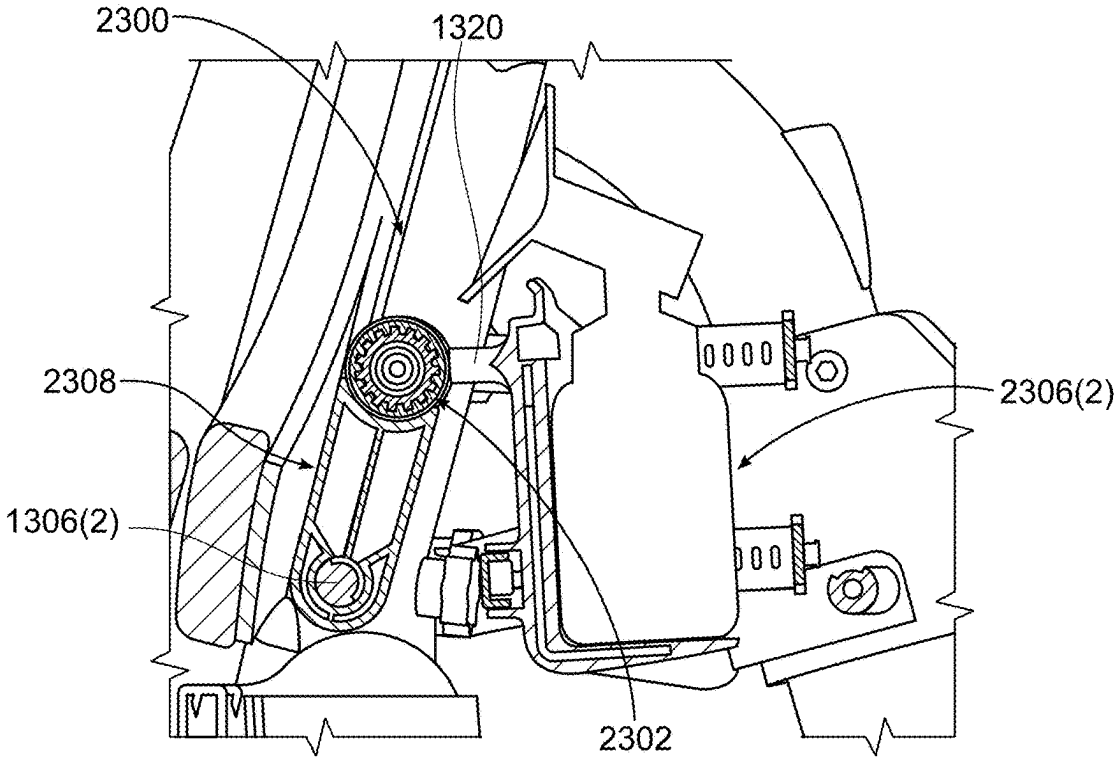


FIG. 23A

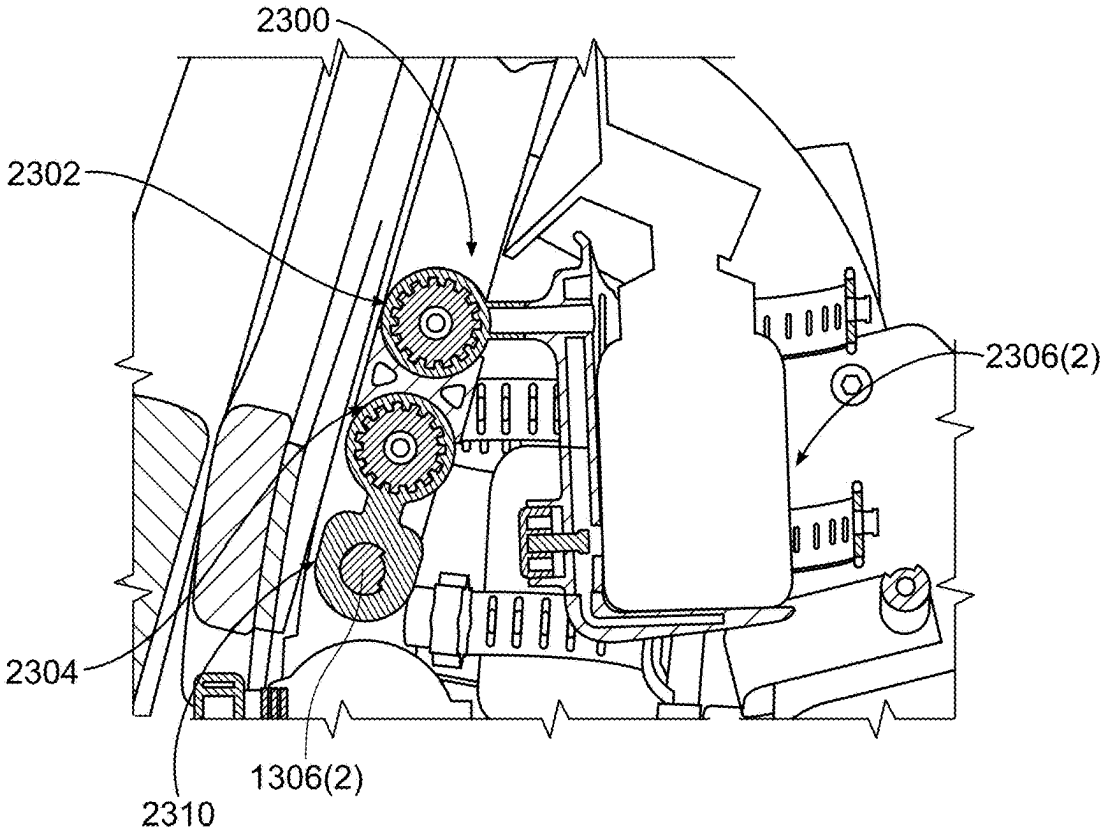


FIG. 23B

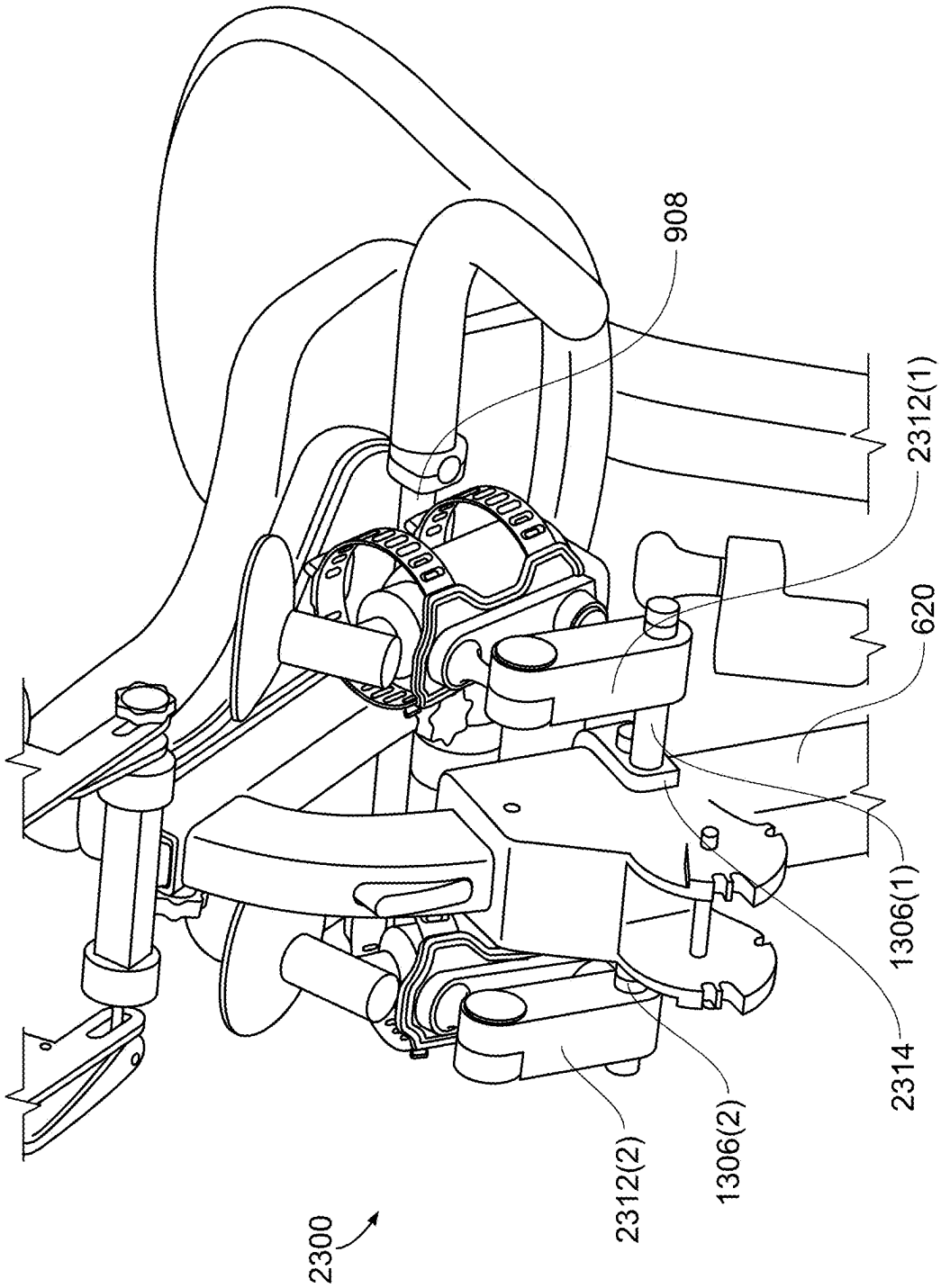


FIG. 23C

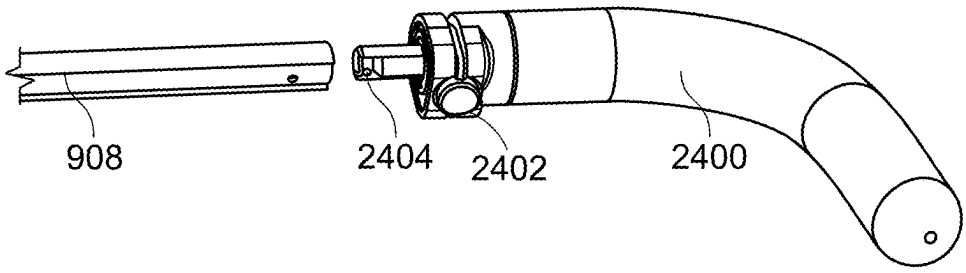


FIG. 24A

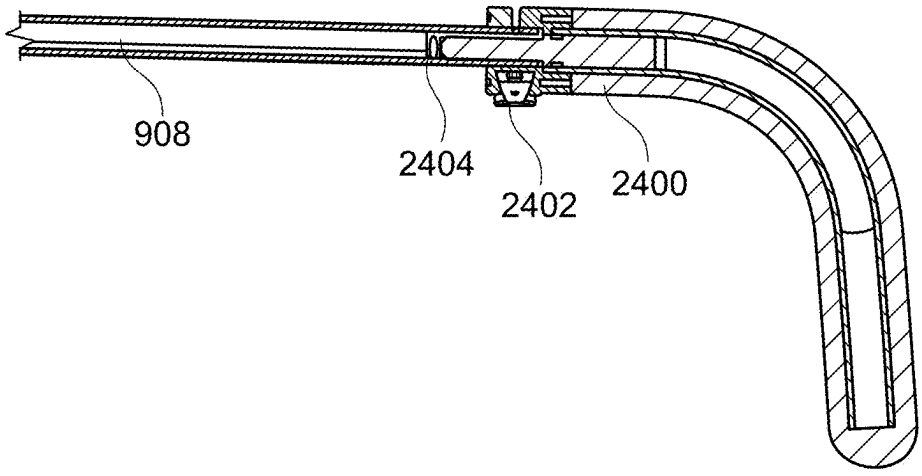


FIG. 24B

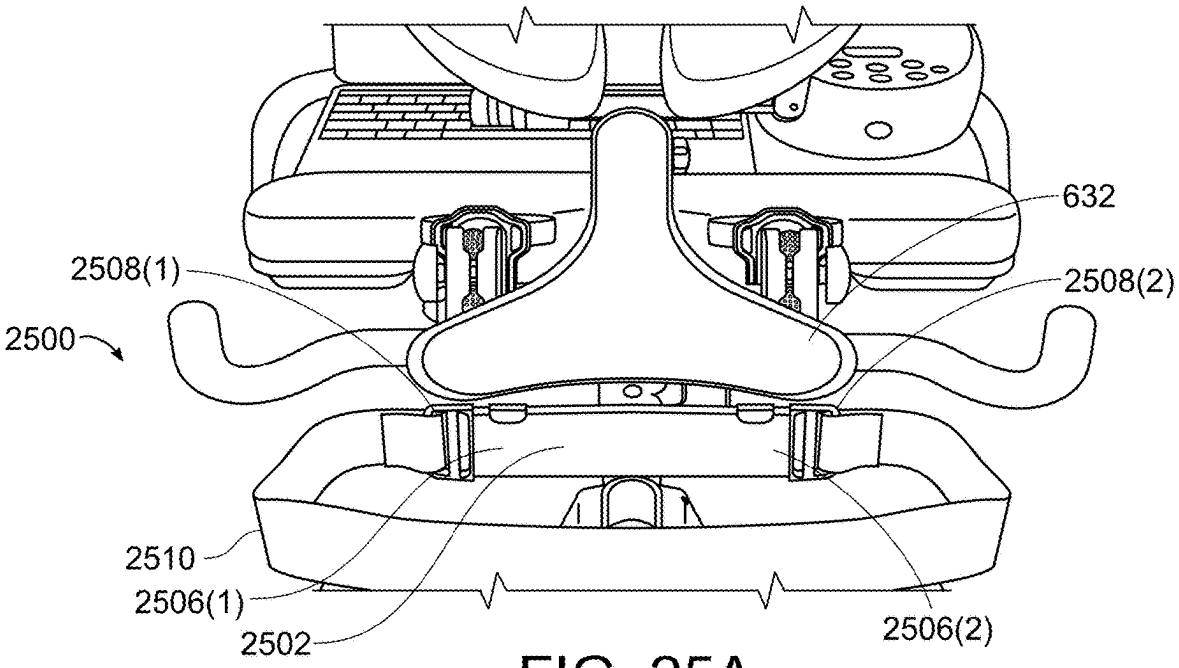


FIG. 25A

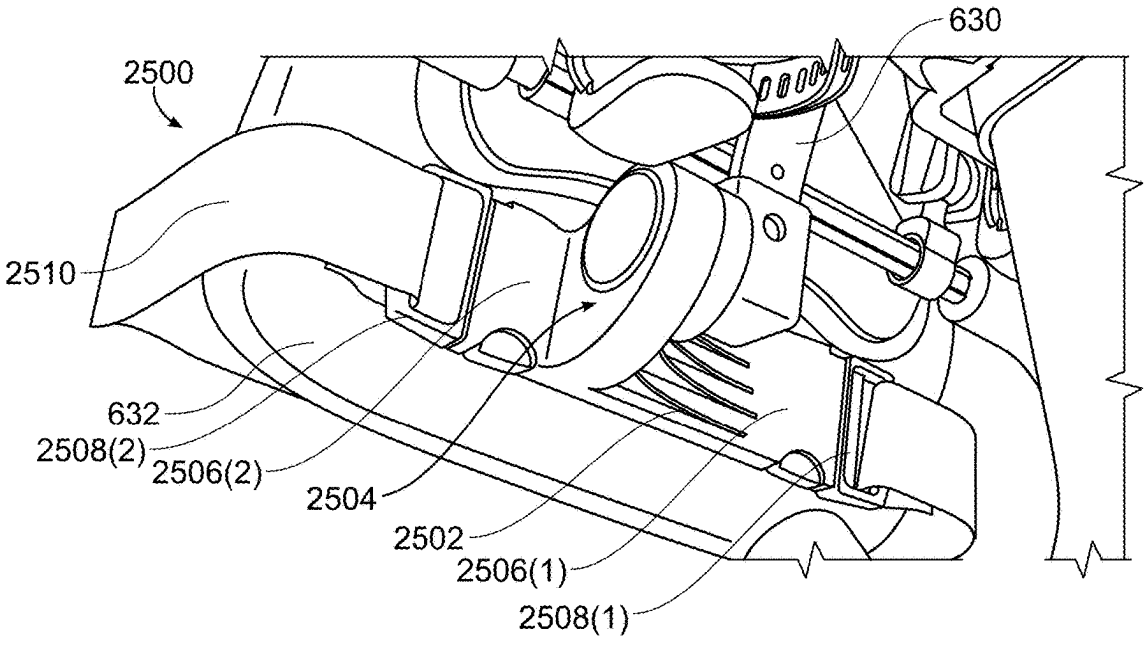


FIG. 25B

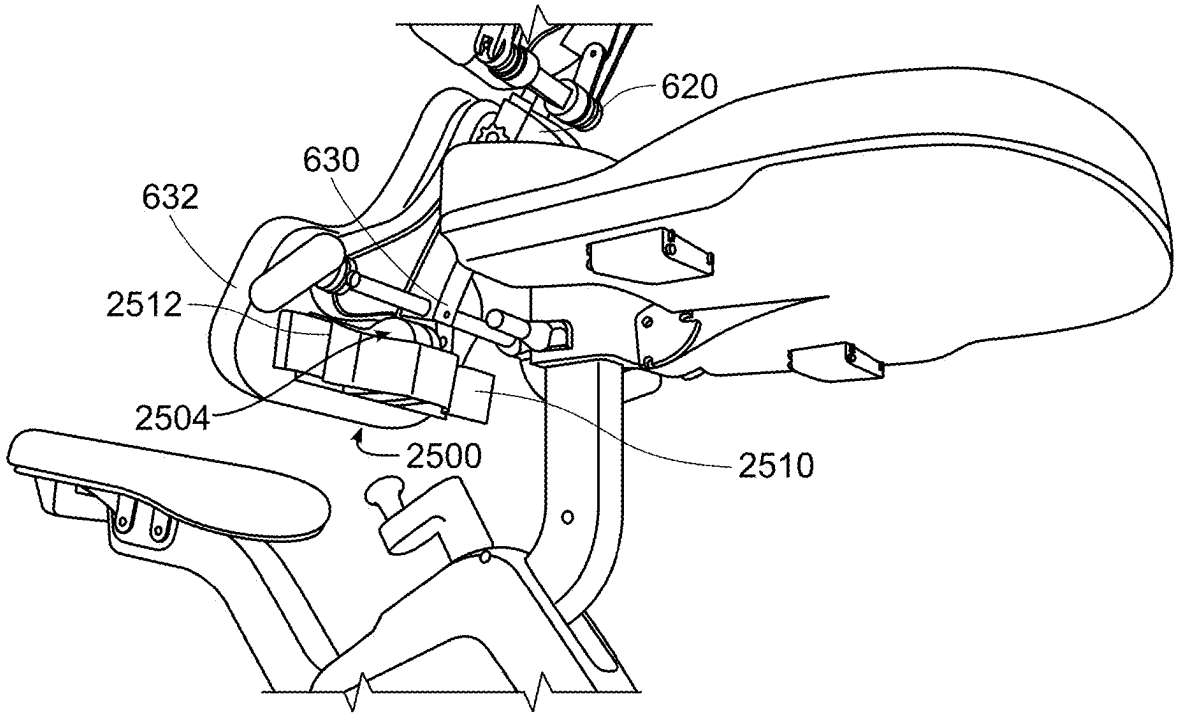


FIG. 25C

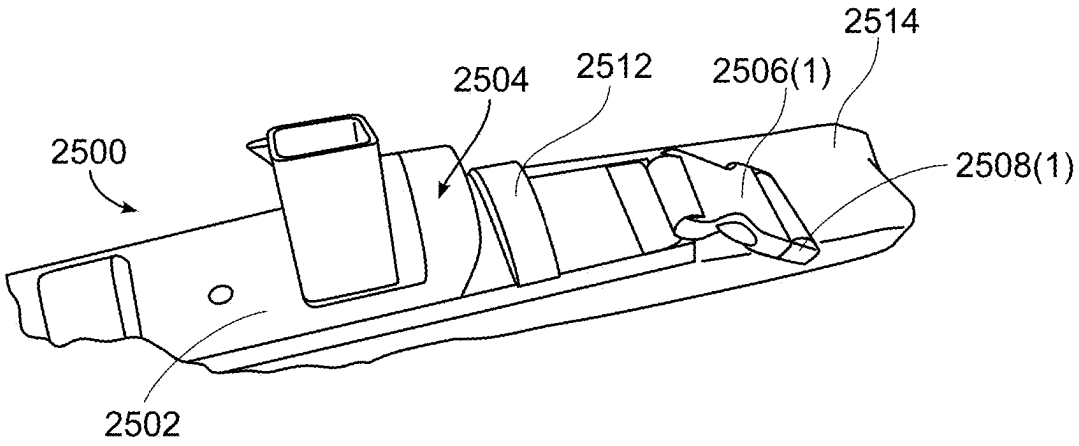


FIG. 25D

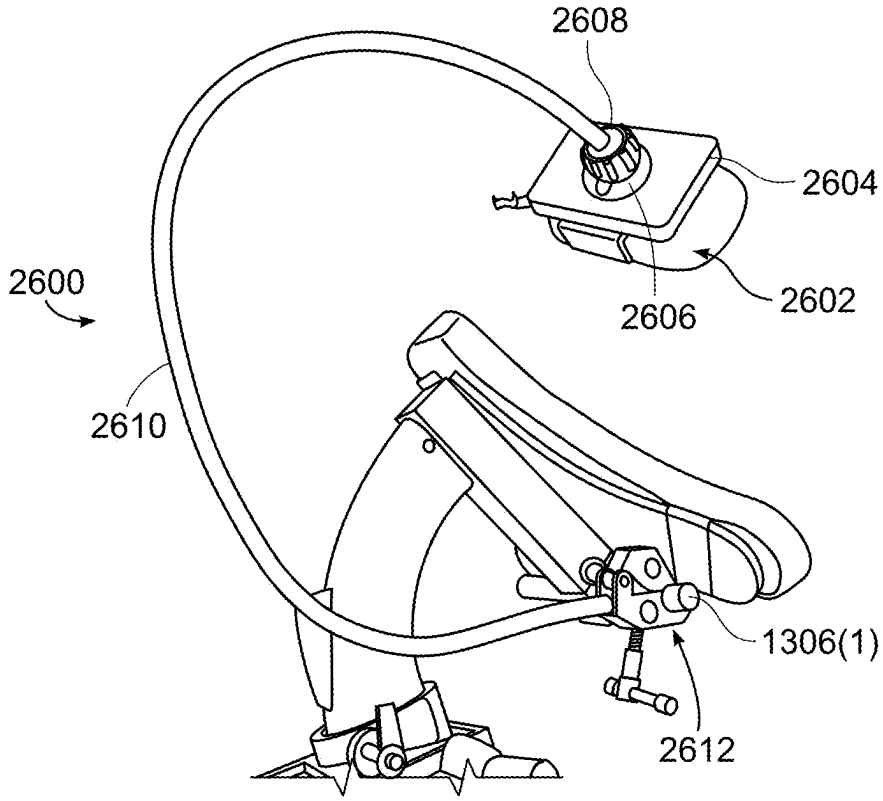


FIG. 26A

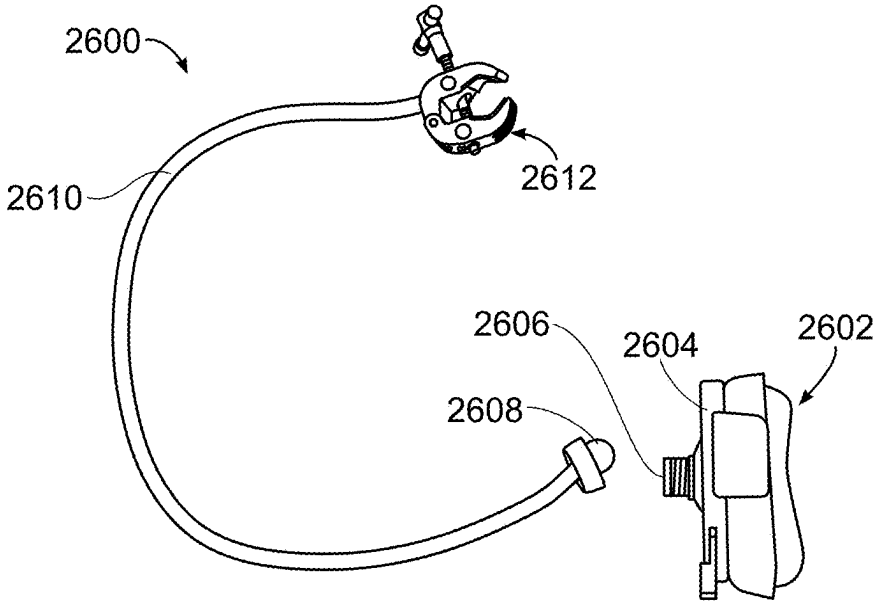


FIG. 26B

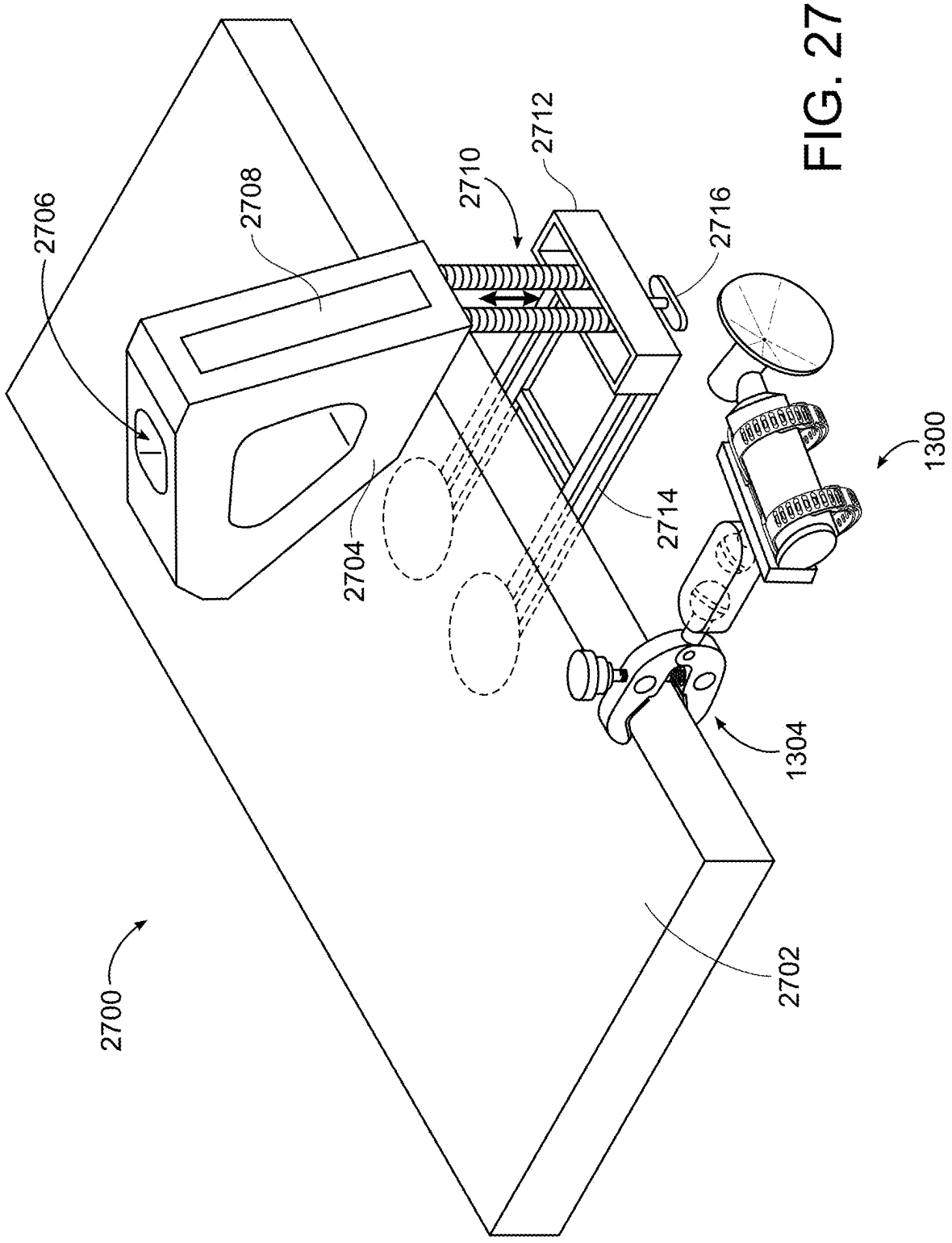


FIG. 27

# 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. **10**A-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. **20**A-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. **23**A-C are perspective views of another exemplary milk collection system with gears;

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

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

**[0034]** FIGS. **26**A-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 learning 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 learning 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 **14**(**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 learning 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. **10**A-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. **10**B, 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 typers 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. **20**A-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. **20**B illustrates an extended position of the first bottle holder **1802**(**1**) as compared to that of FIG. **20**A, 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. **23**A-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. **23**A-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. **23**A, 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. **23**B, 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**(**1**) 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. **23**C, 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. **24**A-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. **25**A-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. **26**A-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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