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Remarks:

Claims 16-20 are deemed to be abandoned due to non-payment of the claims fees (Rule 45(3) EPC).

(54) **ADJUSTABLE BENCH**

(57) An adjustable bench (100) includes a bench frame (102), a seat support (802) pivotally coupled to the bench frame (102) at a pivot (108), and an adjustment mechanism. The adjustment mechanism includes an adjustment frame (804) coupled to the seat support (802) and defining a plurality of openings (808). A seat plate

(818) of the mechanism is coupled to a seat cushion (120). An adjustment pin (814) is coupled to the seat plate (818) and selectively engageable with the plurality of openings (808). A bearing (822) is coupled to the seat plate (818) and is slidably engaged with a rail (824) coupled to the adjustment frame.

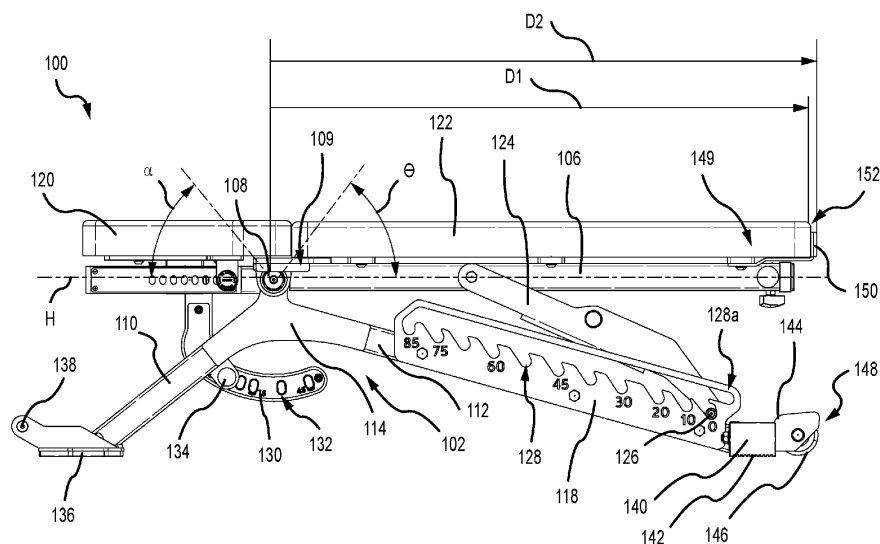


FIG.1C

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to and the benefit of U.S. Provisional Patent Application Serial No. 63/448,808, filed February 28, 2023, entitled "Adjustable Bench"; and U.S. Provisional Patent Application Serial No. 63/400,285, filed August 23, 2022, entitled "Adjustable Bench"; the disclosures of which are hereby incorporated by reference herein in their entireties.

INTRODUCTION

[0002] Some exercises are performed while lying down or seated on a bench. Such exercises can be performed while holding or using supplemental exercise equipment, such as weights, resistance bands, exercise balls, etc. Benches or seats used when performing these exercises may be in a public facility, such as a gym, or a private facility, such as in home.

SUMMARY

[0003] In one aspect, the technology relates to an adjustable bench including: a bench frame; a seat support pivotably coupled to the bench frame at a pivot; and an adjustment mechanism including: an adjustment frame coupled to the seat support, wherein the adjustment frame defines a plurality of openings; a seat plate coupled to a seat cushion; an adjustment pin coupled to the seat plate and selectively engageable with the plurality of openings; a bearing coupled to the seat plate; and a rail coupled to the adjustment frame, wherein the bearing is slidably engaged with the rail. In an example, the adjustable bench includes a pin flange coupled to the seat plate, wherein the adjustment pin is connected to the pin flange. In another example, the seat plate defines a first plane, and wherein the adjustment frame includes a side surface defining a second plane disposed substantially orthogonal to the first plane, and wherein the adjustment pin defines a pin axis disposed substantially orthogonal to the second plane. In yet another example the pin axis is disposed substantially parallel to the first plane. In still another example the rail includes a plurality of rails and wherein the bearing includes a plurality of bearings, wherein a first one of the plurality of bearings is slidably engaged with a first one of the plurality of rails, and wherein a second one of the plurality of bearings is slidably engaged with a second one of the plurality of rails.

[0004] In another example of the above aspect, the plurality of rails are disposed on opposite sides of the seat support. In another example, the adjustment pin is engageable in a first opening of the plurality of openings, whereby the seat cushion is disposed proximate the pivot, and wherein the adjustable pin is engageable in a second opening of the plurality of openings, whereby the seat cushion is disposed distal the pivot. In certain ex-

amples, the adjustable bench includes a rail flange, and wherein the rail includes a first end and a second end, wherein the first end is coupled to the adjustment frame, and wherein the second end is coupled to the rail flange.

5 In another example, the rail flange is disposed within the adjustment frame. In yet another example, the rail is disposed between the seat support and a portion of the adjustment frame that defines the plurality of openings. In still another example the adjustment pin is disposed on a side of the portion of the adjustment frame opposite the rail. In other examples, the rail defines a rail axis; the seat support defines a seat support axis; and the adjustment pin defines an adjustment pin axis disposed substantially orthogonal to each of the rail axis and the seat support axis.

15 **[0005]** In another aspect, the technology relates to an adjustable bench including: a frame; a hinge coupled to the frame; a back support pivotably coupled to the hinge at a first end of the back support; a stand coupled to a second end of the back support, wherein the stand includes a resting surface; and a back cushion coupled to the back support, wherein a terminal end of the back cushion extends a first distance from the hinge and wherein the resting surface extends a second distance from the hinge, wherein the second distance is greater than the first distance. In an example, the stand at least partially surrounds the terminal end of the back cushion. In another example, the adjustable bench includes a plurality of standing surfaces secured to the frame, wherein the plurality of standing surfaces are positioned at an end of the frame adjacent the terminal end of the back cushion and the stand. In yet another example, the bench is disposed substantially vertically, the bench rests on the stand and the plurality of standing surfaces. In still another example, the stand is removably coupled to the second end of the back support. In another example, the stand includes: a base having the resting surface; and a pair of tines, wherein each of the pair of tines includes an opening for receiving a removable securing element for removably coupling the stand to the second end of the back support, and wherein each of the pair of tines are disposed substantially orthogonally to the base.

30 **[0006]** In another aspect, the technology relates to an adjustable bench including: a frame; a front foot secured to the frame; a rear foot secured to the frame at an end of the frame opposite the front foot; a pair of housings secured to the rear foot; a back support pivotably coupled to the frame at a first end of the back support; a stand coupled to a second end of the back support; and a back cushion coupled to the back support, and wherein the adjustable bench is positionable in a use position, wherein when in the use position, the adjustable bench rests on a surface on the front foot and the rear foot, and wherein the adjustable bench is positionable in the stored position, wherein when in the stored position, the adjustable bench rests on the surface on the pair of housings and the stand.

45 **[0007]** In another aspect, the technology relates to an

adjustable bench having: a frame; a hinge coupled to the frame; a back support pivotably coupled to the hinge at a first end of the back support, wherein the back support is positionable in a decline use position, a level use position, and an incline use position; a back cushion coupled to the back support; and a telescoping support including a proximal end and a distal end, wherein the telescoping support is secured to the frame at the proximal end, and wherein the telescoping support is positionable at a first height and a second height greater than the first height, and wherein when the back support is positioned in the decline use position, the telescoping support is positioned at the first height and the distal end of the telescoping support is in contact with the back support, and wherein when the back support is positioned in the level use position, the telescoping support is positioned at the second height and the distal end of the telescoping support is in contact with the back support, and wherein when the back support is positioned in the incline use position, the telescoping support is positioned at at least one of the first height and the second height and the distal end of the telescoping support is separated from the back support.

[0008] The details of one or more examples are set forth in the accompanying drawings and the description below. Other features, objects, and advantages of these examples will be apparent from the description, drawings, and claims. Moreover, it is to be understood that both the foregoing summary of the disclosure and the following detailed description are exemplary and intended to provide further explanation without limiting the scope of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The following drawing figures, which form a part of this application, are illustrative of described technology and are not meant to limit the scope of the disclosure as claimed in any manner, which scope shall be based on the claims appended hereto.

FIG. 1A depicts a top rear perspective view of an adjustable bench.

FIG. 1B depicts a bottom rear perspective view of the adjustable bench of FIG. 1A.

FIG. 1C depicts a side view of the adjustable bench of FIG. 1A.

FIG. 2 depicts a partial exploded perspective view of an end of an adjustable bench.

FIGS. 3A, 3B, and 3C depict an adjustable bench in a use position, a moving position, and a stored position, respectively.

FIG. 4 depicts an adjustable bench in a declined use

position.

FIGS. 5 and 6 depict other examples of adjustable benches.

FIGS. 7A-7C depict enlarged partial views of an adjustable bench having an adjustable support post.

FIGS. 8A-8B depict perspective and exploded perspective views, respectively, of a sliding seat adjustment mechanism for an adjustable bench.

FIGS. 9A-9C depict partial side views of a sliding seat adjustment mechanism for an adjustable bench.

DETAILED DESCRIPTION

[0010] Examples of the present technology are directed to an adjustable bench that includes an integral stand. The stand allows the bench to be positioned substantially vertically in a stored or standing position. This allows the bench to take up less floor space in a gym or other room. The stand is removably or permanently secured or fixed to a back support of the bench, which allows the adjustable bench to be placed in a large range of use positions, including a decline use position, without interference from the stand.

[0011] FIGS. 1A-1C depict various views of an adjustable bench 100. The figures are described concurrently and not all components are depicted or labeled in every figure. The adjustable bench 100 includes frame 102, seat support 104, and back support 106. Seat support 104 is connected to frame 102 via a pivotable element 108 coupled to the frame 102. The pivotable element 108 may be in the form of a roller or ball bearing, hinge, or other structure. Similarly, back support 106 is coupled at a first end 109 to the pivotable element 108, or to a different pivotable element discrete from pivotable element 108. Typically, adjustable bench 100 is used during exercise or to facilitate an exercise. Other benches can include more or fewer components (e.g., a frame formed from a greater or fewer number of discrete components joined together). Frame 102 provides stability to adjustable bench 100. Frame 102 also provides structure to which seat support 104 and back support 106 are connected.

[0012] Generally, frame 102 includes a middle portion 114 connected to two leg portions 110 and 112. For example, leg portions 110 and 112 can be connected to middle portion 114 via welding, bolt members, robust chemical adhesive, or the like. In this configuration, the pivotable element 108 is secured to the middle portion 114 of the frame 102. Frame 102 also defines seat aperture 116. Further, an adjustment ladder 118 is secured to the frame 102. Preferably, seat aperture 116 is defined by a front end of frame 102, e.g., leg portion 110. Adjustment ladder 118 is secured to the second leg portion 112.

Seat support 104 allows for independent pivotal adjustability of seat cushion 120 relative to frame 102. Back support 106 allows for independent pivotal adjustability of back cushion 122 relative to frame 102.

[0013] Broadly, back cushion 122 provides a surface to support a user's torso in a sitting or lying down position. Back cushion 122 is a relatively larger component of adjustable bench 100 than seat cushion 120. Adjustability of the positions of both cushions 120, 122 may be as described below. Back support 106 pivots relative to frame 102 about pivot axis PA of the pivotable element 108. Positioning of back support 106 is provided by a brace 124 that is pivotably coupled thereto. The brace 124 terminates at a pin 126 that may be selectively engaged with gaps 128 between teeth of the adjustment ladder 118. Positioning of the brace 124 along the adjustment ladder 118 adjusts a position of the back support 106 relative to the frame 102. The adjustment ladder 118 may also include indicia that may help a user position the pin 126 in a preferred gap 128 for a desired exercise. Back cushion 122 provides a cushioned surface for a user and may be connected to back support 106 at one or more brackets 129, with fasteners or other elements.

[0014] Broadly, seat cushion 120 provides a surface to support a user in a sitting position and/or in a lying down position. Seat support 104 pivots relative to frame 102 about pivot axis PA, described above. Seat support 104 is connected to seat arcuate member 130 and passes through seat aperture 116. Seat arcuate member 130 defines a plurality of seat arcuate member apertures 132. As shown, apertures 132 are not equally-spaced from each other. However, in some instances, apertures 132 are equally spaced along seat arcuate member 130, or the arcuate member may have a different curvature than depicted. Seat cushion 120 provides a cushioned surface for a user and may be connected to seat support 104 at one or more brackets, with fasteners or other elements. Seat adjustment pin 134 may be positioned on frame 102 such that seat adjustment pin 134 may selectively connect to seat arcuate member 130, which passes through seat aperture 116. Seat adjustment pin 134, in combination with the plurality of seat arcuate member apertures 132 defined by seat arcuate member 130, enables selectable pivoting and positioning of seat support 104. In examples, the seat support 104 may include structures that allow for sliding movement of the seat cushion 120 relative to the hinge 108, e.g., as described in numerous examples in U.S. Patent No. 10,589,144, the disclosure of which is hereby incorporated by reference herein in its entirety.

[0015] Back support 106 is pivotably adjustable in a range of motion relative to frame 102. Pivotal motion of back support 106 is independent of pivotal motion of seat support 104. A degree of pivoting of back support 106 is shown as angle θ relative to horizontal H. Pivoting above H is a positive value of θ and pivoting below H is a negative value of θ . In examples, the pivotal range of back support is at least 0° (that is, horizontal) and not greater

than about 90° (vertical). In some examples, the pivotal range of motion of back support 106 is not greater than about 80° . Relative to the horizontal, back support 106 is capable of being positioned from about 0° to 90° . In another example, the back support 106 is capable of being positioned from about 0° to 85° . In another example, the pin 124 may be positioned in gap 128a, which positions the back support 104 in a so-called decline use position, desirable for certain exercises. This may be a declined angle of up to about 5° , up to about 8° , or up to about 10° .

[0016] A degree of pivoting of seat support 104 is shown as angle α relative to horizontal H. Pivoting above H is a positive value of α and pivoting below H is a negative value of α . In examples, the pivotal range of motion of seat support 104 is at least 0° (that is, horizontal) and not greater than about 90° (vertical). In some examples, the pivotal range of motion of seat support 104 is not greater than about 75° . Relative to the horizontal H, seat support 104 may be capable of pivoting from 0° to about -25° or greater.

[0017] A front foot 136 is disposed at the end of leg portion 110, proximate the seat cushion 120. In the depicted example, foot 136 has a width sufficient to resist wobbling as the bench 100 is used for exercises. The foot 136 may also include an integral handle 138 that may be used to lift the end of the bench 100 proximate the seat cushion 120. The frame 102 also includes a lateral support 140 distal the foot 136, at an end of the frame 102 proximate the back cushion 122. The lateral support 140 provides stability to the bench 100 when in use. Rear feet 142 are disposed at each end of the lateral structure 140. Two housings 144 also extend from lateral support 140. Each housing 144 houses one or more rollers 146 to enable easy rolling movement of the bench 100, as described in more detail below. Each housing 144 also includes a standing surface 148, described in more detail below. Last, the bench 100 includes a stand 150 that is coupled to a second end 149 the back support 106, and is described in more detail below. A surface of the stand 150 is disposed a distance D2 from the hinge 108, which is greater than a distance D1 of a terminal end 152 of the back cushion 122 from the hinge 108. This enables the stand 150 to protect the back cushion 122 when in a standing or stored position, as described below.

[0018] FIG. 2 depicts a partial exploded perspective view of an end of an adjustable bench 200. In relevant part, FIG. 2 displays a stand 202 removably coupled or mounted to the adjustable bench 200. The stand 202 may be secured to a back support 204 of the bench 200, either directly or via brackets 206 secured thereto, wherein the brackets 206 provide further support to a back cushion 208. In the depicted configuration, the stand 202 is removably coupled or mounted to the bracket 206 via a pair of screws 210 that in examples may be rotatable via a tool such as a hex wrench, screw driver, or ratchet; or in other examples may be manually rotatable, as a thumb screw or a knobbed screw. The stand 202 includes

a base 212 that includes a resting surface 214 on a side thereof. The base 212 is disposed substantially orthogonal to a pair of tines 216, each of which define an opening for receiving one of the screws 210. Each tine 216 includes an offset 218 that accommodates a thickness of the bracket 206, so that the parts of the stand 202 remain closely disposed to the back cushion 208. This helps minimize interference between a user and the stand 202 when the bench 200 is being used for certain exercises. Similarly, the base 212 is disposed closely adjacent to a terminal end 220 of the back cushion 208, so as to at least partially surround the terminal end 220. A width W of the stand base 212 may be such as to completely or nearly completely cover the terminal end 220 of the back cushion 208, so as to protect the back cushion 208 from abrasion when the bench is placed in certain positions, as described herein. The stand 202 is manufactured of robust material such as steel, which is significantly more rigid than the material that forms the back cushion 208, thus forming a component on which the weight of the bench 200 may be supported in certain positions.

[0019] Different configurations of the stand 202 are contemplated. In the depicted configuration, the tines 216 are disposed on either side of the back support 204. In other examples, the tines may be disposed at an angle of substantially 90° to that depicted, and may be secured to either side of the back support 204 itself, as opposed to the brackets 206, as depicted. In other examples, the stand 202 may be configured with an end that may be inserted into and secured to an end 222 of the back support 204. This may be particularly advantageous, since the back support 204 may be formed of hollow tube steel having a square profile; a mating configuration of a similar shape extending from the base 212 may be readily contemplated by a person of skill in the art.

[0020] FIGS. 3A, 3B and 3C depict an adjustable bench 300 in a use position, a moving position, and a stored position, respectively. These positions are described relative to a surface S, such as a floor of a gym. In the use position depicted in FIG. 3A, the bench 300 may be positioned such as depicted, where the bench 300 is supported in a substantially horizontal position (e.g., as defined by an upper surface of a seat cushion 302 or the back cushion 304 being substantially parallel to the surface S). In the use position, the bench 300 is supported on the front foot 306 and the rear feet 308. These feet 306, 308, in one example, may correspond to feet 136, 142, such as depicted in FIGS. 1A-1C. In the context of adjustable benches, such as the types depicted and described herein, multiple use positions are contemplated. For example, any position where the adjustable bench 300 may be used for exercising may be considered a use position. In use positions, the seat cushion 302 and/or back cushion 304 may be raised, lowered, or kept substantially horizontal. In each use position, a stand 316 remains coupled to a back support that supports the back cushion 304, unless the stand 316 is re-

moved by a user. As such, the user may place the adjustable bench 300 in a decline use position, such as depicted and described in more detail in FIG. 4, without interference from the stand 316.

[0021] In the moving position depicted in FIG. 3B, the bench 300 may be positioned such as depicted, where a seat end of the bench 300 has been lifted from the surface S, e.g., by a user grabbing and lifting the handle 310. With the end lifted, the front foot 306 is elevated relative to the surface S such that the bench 300 is supported on the rollers 312 and may be easily moved around a space. These rollers 312, in one example, may correspond to rollers 146, such as depicted in FIGS. 1A-1C.

[0022] In the stored or standing position depicted in FIG. 3C, the bench 300 may be positioned such as depicted, where the bench 300 is supported in a substantially vertical position (e.g., as defined by an upper surface of a seat cushion 302 or the back cushion 304 being substantially orthogonal to the surface S). In the stored position, the bench 300 is supported on the standing surfaces 314 and a surface of the stand 316. The standing surfaces 314 and the stand 316, in one example, may correspond to the standing surfaces 148 and the stand 150 (more specifically, a resting surface thereof), such as depicted in FIGS. 1A-1C. In the stored position, the adjustable bench 300 stands vertically, which reduces the footprint of the adjustable bench 300 during periods of non-use.

[0023] FIG. 4 depicts an adjustable bench 400 in a declined use position. Certain components in FIG. 4 are described elsewhere herein but are not necessarily described or labeled further. Components of the bench 400 not described in detail would be apparent to a person of skill in the art upon reading the present disclosure. In this position, a pin 402 is disposed in a decline gap 404 of an adjustment ladder 406. The pin 402 is connected to a terminal end of a brace 408 pivotably coupled to a back support 410. In this position, the back cushion 412 is in a declined use position. Relevant to the present technology, a stand 414 remains in a fixed position relative to the back cushion 412. As such, by securing the stand 414 relative to the back support 410 and the back cushion 412, greater versatility of the bench 400 (and other similar benches described herein) is increased. Known adjustable benches that may be positioned in a standing position (such as depicted in FIG. 3C) utilize a stand secured to a post or other projection that extends upward from a portion of the bench (e.g., from a frame or lateral support, depicted in FIGS. 1A-1C). This post or support prevents known benches from being placed into a decline use position, as the post is often used to further support the terminal end of the back support disposed distal from the hinge. As such, the technologies described herein display marked improvements over existing solutions.

[0024] While the stands described herein as secured to the back support improve versatility of benches that may be placed in a decline use position, stands secured

to the back support may nevertheless improve adjustable benches that do not include such decline functionality. FIGS. 5 and 6 depict other examples of non-decline adjustable benches 500, 600 with integral stands 514, 614. FIG. 5 depicts an adjustable bench 500 that is adjusted by selectively engaging a pin 502 with one or more openings 504 on an arcuate member 506. A similar pin-and-arcuate member adjustment system 522 is utilized to move the seat 524. Even with this adjustability, however, the adjustable bench 500 includes a frame or base 520 that prevents the back support 510 from being lowered to a position below the horizontal. The base 520 provides support to a distal end of the back cushion 512 during use. The adjustable bench 500 also includes multiple handles and wheels, to increase maneuverability of the bench 500 in potentially confined quarters of an exercise room or gym. For example, a forward handle 526 may be gripped by a user such that a forward end of the bench 500 may be lifted, thus engaging one or more rear wheels 528 with a floor, allowing a user to roll the bench 500 about a room. Alternatively or additionally, the bench 500 may include a rearward handle 530 may be gripped by a user such that a rear end of the bench 500 may be lifted, thus engaging one or more forward wheels 532 with a floor, allowing a user to roll the bench 500 about a room. Additional accessories are also depicted on the bench of FIG. 5. For instance, a rear corner portion of the frame or base 520 is reinforced by a brace 534. One or more band pegs 536 may extend from either or both sides of the brace 534 so as to enable engagement of elastic bands with the bench 500, thereby offering another means of resistance training available to a user of the bench 500.

[0025] FIG. 6 depicts an adjustable bench 600 that is adjusted by selectively engaging a pin 602 with one or more gaps 604 on an adjustment ladder 506. A similar ladder adjustment system 622 is utilized to move the seat 624. Even with this adjustability, however, the adjustable bench 600 includes a post 620 that prevents the back support 610 from being lowered to a position below the horizontal. The post 620 provides support to a distal end of the back cushion 612 during use. In both configurations of the adjustable bench 500, 600, securing the stand 514, 614 to the back support 510, 610 helps protect the terminal end of the back cushion 512, 612 from abrasion or puncture due to inadvertent contact with walls or equipment within the tight confines of a gym or other room. The post 620 depicted in FIG. 6 may be of a fixed or adjustable height. A bench having an adjustable height post is depicted in FIGS. 7A-7C.

[0026] FIGS. 7A-7C depict enlarged partial views of an adjustable bench 700 having an adjustable support post 702. FIGS. 7A-7C are described concurrently. As with other adjustable benches depicted herein, the adjustable bench 700 includes a back support 704 pivotably coupled to a frame 706. The back support 704 has secured thereto a back cushion 708, as well as a stand 710, such as depicted elsewhere herein. A position of the back cushion

708 may be adjusted by adjusting a position of a brace 712 relative to an adjustment ladder 714. As described elsewhere herein, the brace 712 is pivotably coupled to the back support 704. While an adjustment mechanism including a brace 712 and adjustment ladder 714 is depicted, other adjustment mechanisms that utilize a pin selectively positionable in openings of an arcuate member (such as depicted in FIGS. 4 and 5), are also contemplated for use in the depicted adjustable bench 700. The adjustable bench 700 also includes a foot 716. Secured to either or both of the foot 716 and the frame 706 is a proximal end 718 of the adjustable support post 702. A distal end 720 slides telescopically into and out of the proximal end 718, and a position thereof may be adjusted by selectively engaging a pin 722 therewith (e.g., with openings 724 in the distal end 720). In the depicted configuration, the proximal end 718 is an outer housing in which the distal end 720, in the form of a post, is slidably disposed.

[0027] In FIG. 7A, the adjustable bench 700 is depicted in a level use position, where the back cushion 708 is disposed substantially level to a floor on which the adjustable bench 700 rests. In this level use position, the adjustable support 702 is in contact with the back support 704 so as to provide support thereto. In this position, the adjustable support 702 may be at its maximum height, greater than the height depicted in FIG. 7B. Once the distal end 720 of the adjustable support 702 is lowered, the brace 712 may be adjusted relative to the adjustment ladder 714 and the adjustable bench 700 positioned in the decline use position, where the distal end 720 contacts the back support 704 to provide support thereto. Multiple decline use positions are contemplated, depending on the number of openings 724 in the distal end 720. In FIG. 7C, the adjustable bench 700 is depicted in an incline use position, where the brace 712 is positioned on the adjustment ladder 714 do as to include the back support 704 and back cushion 708. In the incline use position, the distal end 720 is at its maximum height, but separated from the back support. In all three positions depicted in FIGS. 7A-7C, the stand 710 remains adjacent the back cushion 708, thereby minimizing damage thereto due to impact with walls or other surfaces and equipment.

[0028] FIGS. 8A-8B depict perspective and exploded perspective views, respectively, of a sliding seat adjustment mechanism 800 for an adjustable bench. Benches such as depicted in FIGS. 1A-1C, 3A-3C, and 5, may utilize such a sliding seat adjustment mechanism 800. The sliding seat adjustment mechanism 800 enables changing (e.g., increasing or decreasing or eliminating) of the size of a gap that may be present between a seat cushion and a back cushion of an adjustable bench depending on the various relative positions of the seat and back cushions to each other. Such a gap, as well as adjustment thereof, is depicted in FIGS. 9A-9C. FIGS. 8A and 8B are described concurrently and not all components described are visible in both figures. The sliding

seat adjustment mechanism 800 is supported by a seat support 802 of an adjustable bench that may be pivotably connected to a frame (such as frame 102 in FIGS. 1A and 1B) of an adjustable bench at a pivotable element (such as pivotable element 108 in FIGS. 1A and 1B). A seat support is also depicted in FIG. 1B as seat support 104. In general, a seat support provides underlying structural support to a seat cushion, such as seat cushion 830 in FIGS. 8A and 8B. In the case of the sliding seat adjustment mechanism 800 of FIGS. 8A and 8B, the seat support 802 provides underlying structural support for the various components described herein that both support the seat cushion 820, as well as enable the adjustability function described herein. The mechanism 800 includes an adjustment frame 804 coupled to the seat support 802. In the depicted embodiment, the adjustment frame 804 includes a side surface or central portion 806 defining a plurality of openings 808, a forward portion 810 facing a forward portion of the bench, and a rearward portion 812 facing a rearward portion of the bench. The adjustment frame 804 provides a robust connection to the seat support for the rails 824, upon which the seat cushion 820 may be slid.

[0029] The central portion 806 of the adjustment frame 804 defines a substantially vertical element that defines the openings 808 that are configured to selectively receive an adjustment pin 814. The adjustment pin 814 is coupled via a pin flange 816 to a planar seat plate 818. The seat plate 818 supports the seat cushion 820, upon which a user may be completely or partially supported during use of the bench. The seat plate 818 is coupled to a pair of bearings 822, though in certain examples, a single bearing may be utilized. Each of the bearings 822 are slidably engaged with one of the two rails 824 that is connected at a first end to the forward portion 810 of the adjustment frame 804 and at a second end to a rail flange 826 that is, in turn, connected to the seat support 802. At least one of the rail flanges 826 is disposed within a volume defined by the adjustment frame 804.

[0030] The depicted configuration supports the weight of the user, and any weights they may be holding, from the seat cushion 820, to the planar support plate 818, to the pair of bearings 822, to the pair of rails 824, which are ultimately supported at either ends by the rail flanges 826 and forward portion 810 of the adjustment frame 804. This distributes the weight to several points of contact with the seat support 802. Further, no weight of the user or weights being held thereby is transferred via the adjustment pin 814 to the central portion 806 of the adjustment frame 804. This prevents potential twisting of the adjustment frame 804 under load (if any load was transferred by the adjustment pin 814) and, more importantly, enables the user to adjust the position of the seat cushion 820 while being fully supported thereby. Since the adjustment pin 814 is also disposed at a side of the seat adjustment mechanism 800 (as opposed to below), a user may easily grasp the adjustment pin 814 while seated, enabling quick changes of seat cushion 820 position. In

another example, the second end of the rail 824 may be connected to the rearward portion 812 of the adjustment frame 804, instead of the rail flanges 826, which may enable a longer range of motion of the sliding seat adjustment mechanism 800. A greater number of openings 808, and/or a wider distribution thereof, may also increase the range of motion. Some known adjustable benches include an adjustment pin that engages with the pivoting component that supports the seat cushion (e.g., such as the seat support 802). By utilizing the sliding seat adjustment mechanism 800 depicted herein (having an adjustment pin 814 that engages with the adjustment frame 804), a user need not reach below and around the rails 824, thus reducing or eliminating the potential for pinching of the fingers during adjustment. Further, by utilizing a separate adjustment frame 804, no openings need be formed in the seat support 802 to engage the adjustment pin, thereby limiting the potential for deformation of the seat support 802. Other advantages of the present configuration over the prior art would be apparent to a person of skill in the art.

[0031] As described above, the relative positions of the various components of the sliding seat adjustment mechanism 800 enable convenient use of same by a user. The mechanism 800 may be adjusted while a user sits on the seat cushion 820 or otherwise. The seat cushion 820 is supported on a first or upper plane 828 surface of the seat plate 818. The side surface or central portion 806 also defines a second or side plane 829 surface that, in the depicted example, is substantially orthogonal to the upper plane 828. The orthogonal orientations of these two components enable the adjustment pin 814 to be disposed on a side of the adjustment frame 804, such that it may be easily gripped and manipulated (e.g., pulled) by a user whether seated or otherwise. Further, the adjustment pin 814 is more easily visible to a user (whether seated or not) than an adjustment pin disposed below the seat that requires a downward pull to adjust the seat position. By placing the adjustment pin 814 at the side of the mechanism 800, the adjustment pin 814 is also easier to grip, especially for users having shorter arms or arms those with a limited range of motion. In the position depicted in FIGS. 8A and 8B, where a horizontal pull to the side is required, an axis A_p of the adjustment pin 814 is disposed substantially orthogonal to the second plane 829 of the adjustment frame 804 and substantially parallel to (and below) the first plane 828 of the planar seat plate 818.

[0032] In addition to enabling ready access to the adjustment pin 814, positioning the sliding seat adjustment mechanism 800 as depicted in FIGS. 8A and 8B aids in balancing loads on either side of the seat support 802, by using a pair of rail/bearing systems, each rail/bearing system being disposed on either side of the seat support 802. Each of the rails 824, seat support 802, and central portion 806 of the adjustment frame 804 are defined by respective axes that are substantially parallel to each other, as well as parallel to an axis defined by a length of

the associated bench. Such an axis would be parallel to the horizontal H line depicted and described in FIG. 1C. The adjustment pin 814 is defined by an adjustment pin axis substantially orthogonal to all of these axes, and may be skew to some, depending on the position of the adjustment pin 814 relative to, e.g., the axes of each rail 824. Further, by positioning the adjustment pin 814 on an outside position of the adjustment frame 804, relative to at least one rail 824, inadvertent access to that rail 824 and associated bearing 822 is limited since those components are disposed within the adjustment frame 804. If required or desired, an additional plate positioned opposite the support structure 802 from the central portion 806 may be secured to the adjustment frame 804 so as to prevent access to that nearby rail 824 and bearing 822. Further plating or robust metal or plastic mesh may be installed on an underside of the mechanism 800, for example, below the seat support 802, to prevent inadvertent contact or tampering with the components of the mechanism 800.

[0033] The sliding seat adjustment mechanism 800 may include the seat support 802 or may be secured to the seat support 802, for example, if the sliding seat adjustment mechanism 800 is sold as a kit, including all components depicted in FIGS. 8A and 8B (other than, e.g., the seat support 802). Such a sliding seat adjustment mechanism may be secured to an existing seat support of a pivoting bench (once the existing seat cushion is removed) with appropriate bolts, screws, or other fasteners provided with the kit. Thus, an existing adjustable bench without sliding seat functionality may be retrofitted, for example, by an end user to increase versatility thereof. Since the sliding seat adjustment mechanism described herein does not engage with the seat support of an adjustable bench other than for support, the structure described herein may be utilized in many different types of adjustable benches.

[0034] FIGS. 9A-9C depict partial side views of the sliding seat adjustment mechanism 800 of FIGS. 8A-8B, utilized with an adjustable bench 900. Examples of such adjustable benches are depicted for example in FIGS. 1A-1C, 3A-3C, and 5. The depicted configuration includes, for illustrative purposes, a frame 902, a pivot 904, and a pivoting mechanism including a seat arcuate member 906. Adjustable benches that utilize other pivoting mechanisms may similarly incorporate the sliding seat adjustment mechanism 800 such as described herein, or as modified as would be apparent to a person of skill in the art, to accommodate different structures of pivoting mechanisms. Certain components described above in the context of FIGS. 8A and 8B are depicted but are not necessarily described further in the following figures.

[0035] As described in the context of FIGS. 8A and 8B, the sliding seat adjustment mechanism 800 is supported by the seat support 802 and includes the adjustment frame 804 defining the plurality of openings 808 in a central portion 806 thereof. The adjustment pin 814 may be selectively engaged with the plurality of openings 808 as

needed to adjust a position of the seat cushion 820 relative to a back cushion 908. One of the rails 824 is depicted in dashed lines, as is the bearing 822 slidable along that rail 824. The bearing 822 is coupled to the planar seat plate 818, as is the pin flange 816. The seat cushion 820 is secured to the planar seat plate 818 on a side opposite the rails 824. The axis A of the rails is depicted as axis A and, in an example, is considered parallel to an axis of the adjustable bench 900 as defined by the seat support 802. In FIG. 9A, the seat cushion 820 is depicted in a position nearest to the back cushion 908, where a gap (depicted in FIGS. 9B and 9C as 910) therebetween has been reduced or eliminated. In this position, the adjustment pin 814 is engaged with the opening 818 nearest to the pivot 904, bringing the seat cushion 820 to its closest position with the back cushion 908. Sliding adjustment of the sliding seat adjustment mechanism is depicted in FIGS. 9B and 9C. In those figures, as the pin 814 is engaged with openings 818 further along the adjustment frame 804 (and further from a pivot 904 to which the seat support 802 is connected to the frame 902, the size of a gap 910 between the seat cushion 820 and the back cushion 908 increases.

EXAMPLES

[0036] Illustrative examples of the systems and methods described herein are provided below. An embodiment of the system or method described herein may include any one or more, and any combination of, the clauses described below:

Clause 1. An adjustable bench comprising: a frame; a hinge coupled to the frame; a back support pivotably coupled to the hinge at a first end of the back support; a stand coupled to a second end of the back support, wherein the stand comprises a resting surface; and a back cushion coupled to the back support, wherein a terminal end of the back cushion extends a first distance from the hinge and wherein the resting surface extends a second distance from the hinge, wherein the second distance is greater than the first distance.

Clause 2. The adjustable bench of claim 1, wherein the stand at least partially surrounds the terminal end of the back cushion.

Clause 3. The adjustable bench of claim 1, wherein the stand at least partially covers the terminal end of the back cushion.

Clause 4. The adjustable bench of claim 1, further comprising a plurality of standing surfaces secured to the frame, wherein the plurality of standing surfaces are positioned at an end of the frame adjacent the terminal end of the back cushion and the stand.

Clause 5. The adjustable bench of claim 4, wherein when the bench is disposed substantially vertically, the bench rests on the stand and the plurality of standing surfaces.

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Clause 6. The adjustable bench of claim 1, wherein the stand is removably coupled to the second end of the back support.

Clause 7. The adjustable bench of claim 6, wherein the stand further comprises: a base comprising the resting surface; and a pair of tines, wherein each of the pair of tines comprises an opening for receiving a removable securing element for removably coupling the stand to the second end of the back support, and wherein each of the pair of tines are disposed substantially orthogonally to the base.

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Clause 8. The adjustable bench of claim 7, wherein when the stand is secured to the back support, the pair of tines are disposed on either side of the back support.

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Clause 9. The adjustable bench of claim 7, further comprising a plurality of the removable securing elements for removably coupling the stand to the second end of the back support.

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Clause 10. The adjustable bench of claim 9, wherein the plurality of removable securing elements comprise screws.

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Clause 11. The adjustable bench of claim 1, further comprising: an adjustment ladder secured to the frame; and a brace extending from and pivotably connected to the back support, wherein a terminal end of the brace is selectively engageable with the adjustment ladder, and wherein positioning of the brace along the adjustment ladder adjusts a position of the back support relative to the frame.

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Clause 12. An adjustable bench comprising: a frame; a front foot secured to the frame; a rear foot secured to the frame at an end of the frame opposite the front foot; a pair of housings secured to the rear foot; a back support pivotably coupled to the frame at a first end of the back support; a stand coupled to a second end of the back support; and a back cushion coupled to the back support, and wherein the adjustable bench is positionable in a use position, wherein when in the use position, the adjustable bench rests on a surface on the front foot and the rear foot, and wherein the adjustable bench is positionable in the stored position, wherein when in the stored position, the adjustable bench rests on the surface on the pair of housings and the stand.

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Clause 13. The adjustable bench of claim 12, where-

in the use position comprises a plurality of use positions, wherein each use position of the plurality of use positions comprises a different pivoted position of the back support, and wherein the stand is coupled to the second end of the back support in each use position of the plurality of use positions.

Clause 14. The adjustable bench of claim 12, further comprising a seat support pivotably coupled to the frame.

Clause 15. The adjustable bench of claim 12, further comprising: an adjustment ladder secured to the frame; and a brace extending from and pivotably connected to the back support, wherein a terminal end of the brace is selectively engageable with the adjustment ladder, and wherein positioning of the brace along the adjustment ladder adjusts a position of the back support relative to the frame.

Clause 16. The adjustable bench of claim 12, further comprising a roller disposed in each of the pair of housings.

Clause 17. The adjustable bench of claim 16, wherein the adjustable bench is positionable in a moving position, wherein when in the moving position, the front foot is elevated relative to the surface and the adjustable bench contacts the surface at the pair of rollers.

Clause 18. The adjustable bench of claim 12, further comprising a back cushion secured to the back support and wherein the stand at least partially covers a terminal end of the back cushion.

Clause 19. The adjustable bench of claim 12, further comprising a pair of removable securing elements for removably coupling the stand to the back support.

Clause 20. The adjustable bench of claim 19, wherein the pair of removable securing elements comprise screws.

Clause 21. An adjustable bench comprising: a frame; a hinge coupled to the frame; a back support pivotably coupled to the hinge at a first end of the back support, wherein the back support is positionable in a decline use position, a level use position, and an incline use position; a back cushion coupled to the back support; and a telescoping support comprising a proximal end and a distal end, wherein the telescoping support is secured to the frame at the proximal end, and wherein the telescoping support is positionable at a first height and a second height greater than the first height, and wherein when the back support is positioned in the decline use position, the telescoping support is positioned at the first height and

the distal end of the telescoping support is in contact with the back support, and wherein when the back support is positioned in the level use position, the telescoping support is positioned at the second height and the distal end of the telescoping support is in contact with the back support, and wherein when the back support is positioned in the incline use position, the telescoping support is positioned at at least one of the first height and the second height and the distal end of the telescoping support is separated from the back support.

Clause 22. The adjustable bench of claim 21, further comprising a stand coupled to a second end of the back support, wherein the stand comprises a resting surface.

Clause 23. The adjustable bench of claim 21, wherein the distal end of the telescoping support contacts a second end of the back support when the back support is positioned in the decline use position and the level use position.

Clause 24. The adjustable bench of claim 21, further comprising a seat support pivotably coupled to the frame.

Clause 25. The adjustable bench of claim 21, further comprising: an adjustment ladder secured to the frame; and a brace extending from and pivotably connected to the back support, wherein a terminal end of the brace is selectively engageable with the adjustment ladder, and wherein positioning of the brace along the adjustment ladder adjusts a position of the back support relative to the frame in the decline use position, the level use position, and the incline use position.

Clause 26. The adjustable bench of claim 21, wherein the telescoping support comprises: an outer housing comprising the proximal end; an inner post slidably disposed within the outer housing, wherein the inner post comprises the distal end and defines a plurality of openings; and an adjustment pin secured to the outer housing, wherein the adjustment pin is selectively engageable with the plurality of openings.

Clause 27. An adjustable bench comprising: a bench frame; a seat support pivotably coupled to the bench frame at a pivot; and an adjustment mechanism comprising: an adjustment frame coupled to the seat support, wherein the adjustment frame defines a plurality of openings; a seat plate coupled to a seat cushion; an adjustment pin coupled to the plate and selectively engageable with the plurality of openings; a bearing coupled to the seat plate; and a rail coupled to the adjustment frame, wherein the bearing is slidably engaged with the rail.

Clause 28. The adjustable bench of claim 27, further comprising a pin flange coupled to the seat plate, wherein the adjustment pin is connected to the pin flange.

Clause 29. The adjustable bench of claim 27, wherein the seat plate defines a first plane, and wherein the adjustment frame comprises a side surface defining a second plane disposed substantially orthogonal to the first plane, and wherein the adjustment pin defines a pin axis disposed substantially orthogonal to the second plane.

Clause 30. The adjustable bench of claim 29, wherein the pin axis is disposed substantially parallel to the first plane.

Clause 31. The adjustable bench of claim 27, wherein the rail comprises a plurality of rails and wherein the bearing comprises a plurality of bearings, wherein a first one of the plurality of bearings is slidably engaged with a first one of the plurality of rails, and wherein a second one of the plurality of bearings is slidably engaged with a second one of the plurality of rails.

Clause 32. The adjustable bench of claim 31, wherein the plurality of rails are disposed on opposite sides of the seat support.

Clause 33. The adjustable bench of claim 27, wherein the adjustment pin is engageable in a first opening of the plurality of openings, whereby the seat cushion is disposed proximate the pivot, and wherein the adjustable pin is engageable in a second opening of the plurality of openings, whereby the seat cushion is disposed distal the pivot.

Clause 34. The adjustable bench of claim 27, further comprising a rail flange, and wherein the rail comprises a first end and a second end, wherein the first end is coupled to the adjustment frame, and wherein the second end is coupled to the rail flange.

Clause 35. The adjustable bench of claim 34, wherein the rail flange is disposed within the adjustment frame.

Clause 36. The adjustable bench of claim 27, wherein the rail is disposed between the seat support and a portion of the adjustment frame that defines the plurality of openings.

Clause 37. The adjustable bench of claim 36, wherein adjustment pin is disposed on a side of the portion of the adjustment frame opposite the rail.

Clause 38. The adjustable bench of claim 36, where-

in: the rail defines a rail axis; the seat support defines a seat support axis; and the adjustment pin defines an adjustment pin axis disposed substantially orthogonal to each of the rail axis and the seat support axis.

[0037] It is to be understood that this disclosure is not limited to the particular structures, process steps, or materials disclosed herein, but is extended to equivalents thereof as would be recognized by those ordinarily skilled in the relevant arts. It should also be understood that terminology employed herein is used for the purpose of describing particular examples only and is not intended to be limiting. It must be noted that, as used in this specification, the singular forms "a," "an," and "the" include plural referents unless the context clearly dictates otherwise.

[0038] It will be clear that the systems and methods described herein are well adapted to attain the ends and advantages mentioned as well as those inherent therein. Those skilled in the art will recognize that the methods and systems within this specification may be implemented in many manners and as such is not to be limited by the foregoing exemplified examples and examples. In this regard, any number of the features of the different examples described herein may be combined into one single example and alternate examples having fewer than or more than all of the features herein described are possible.

[0039] While various examples have been described for purposes of this disclosure, various changes and modifications may be made which are well within the scope contemplated by the present disclosure. Numerous other changes may be made which will readily suggest themselves to those skilled in the art and which are encompassed in the spirit of the disclosure.

Claims

1. An adjustable bench comprising:

a bench frame;
a seat support pivotably coupled to the bench frame at a pivot; and
an adjustment mechanism comprising:

an adjustment frame coupled to the seat support, wherein the adjustment frame defines a plurality of openings;
a seat plate coupled to a seat cushion;
an adjustment pin coupled to the seat plate and selectively engageable with the plurality of openings;
a bearing coupled to the seat plate; and
a rail coupled to the adjustment frame, wherein the bearing is slidably engaged with the rail.

2. The adjustable bench of claim 1, further comprising a pin flange coupled to the seat plate, wherein the adjustment pin is connected to the pin flange.

3. The adjustable bench of claim 1, wherein the seat plate defines a first plane, and wherein the adjustment frame comprises a side surface defining a second plane disposed substantially orthogonal to the first plane, and wherein the adjustment pin defines a pin axis disposed substantially orthogonal to the second plane.

4. The adjustable bench of claim 3, wherein the pin axis is disposed substantially parallel to the first plane.

5. The adjustable bench of claim 1, wherein the rail comprises a plurality of rails and wherein the bearing comprises a plurality of bearings, wherein a first one of the plurality of bearings is slidably engaged with a first one of the plurality of rails, and wherein a second one of the plurality of bearings is slidably engaged with a second one of the plurality of rails.

6. The adjustable bench of claim 5, wherein the plurality of rails are disposed on opposite sides of the seat support.

7. The adjustable bench of claim 1, wherein the adjustment pin is engageable in a first opening of the plurality of openings, whereby the seat cushion is disposed proximate the pivot, and wherein the adjustable pin is engageable in a second opening of the plurality of openings, whereby the seat cushion is disposed distal the pivot.

8. The adjustable bench of claim 1, further comprising a rail flange, and wherein the rail comprises a first end and a second end, wherein the first end is coupled to the adjustment frame, and wherein the second end is coupled to the rail flange.

9. The adjustable bench of claim 8, wherein the rail flange is disposed within the adjustment frame.

10. The adjustable bench of claim 1, wherein the rail is disposed between the seat support and a portion of the adjustment frame that defines the plurality of openings.

11. The adjustable bench of claim 10, wherein adjustment pin is disposed on a side of the portion of the adjustment frame opposite the rail.

12. The adjustable bench of claim 10, wherein:

the rail defines a rail axis;
the seat support defines a seat support axis; and
the adjustment pin defines an adjustment pin

axis disposed substantially orthogonal to each of the rail axis and the seat support axis.

13. An adjustable bench comprising:

a frame;
a hinge coupled to the frame;
a back support pivotably coupled to the hinge at a first end of the back support;
a stand coupled to a second end of the back support, wherein the stand comprises a resting surface; and
a back cushion coupled to the back support, wherein a terminal end of the back cushion extends a first distance from the hinge and wherein the resting surface extends a second distance from the hinge, wherein the second distance is greater than the first distance.

14. The adjustable bench of claim 13, wherein the stand at least partially surrounds the terminal end of the back cushion.

15. The adjustable bench of claim 13, further comprising a plurality of standing surfaces secured to the frame, wherein the plurality of standing surfaces are positioned at an end of the frame adjacent the terminal end of the back cushion and the stand.

16. The adjustable bench of claim 4, wherein when the bench is disposed substantially vertically, the bench rests on the stand and the plurality of standing surfaces.

17. The adjustable bench of claim 1, wherein the stand is removably coupled to the second end of the back support.

18. The adjustable bench of claim 6, wherein the stand further comprises:

a base comprising the resting surface; and
a pair of tines, wherein each of the pair of tines comprises an opening for receiving a removable securing element for removably coupling the stand to the second end of the back support, and wherein each of the pair of tines are disposed substantially orthogonally to the base.

19. An adjustable bench comprising:

a frame;
a front foot secured to the frame;
a rear foot secured to the frame at an end of the frame opposite the front foot;
a pair of housings secured to the rear foot;
a back support pivotably coupled to the frame at a first end of the back support;

a stand coupled to a second end of the back support; and
a back cushion coupled to the back support, and

wherein the adjustable bench is positionable in a use position, wherein when in the use position, the adjustable bench rests on a surface on the front foot and the rear foot, and
wherein the adjustable bench is positionable in the stored position, wherein when in the stored position, the adjustable bench rests on the surface on the pair of housings and the stand.

20. An adjustable bench comprising:

a frame;
a hinge coupled to the frame;
a back support pivotably coupled to the hinge at a first end of the back support, wherein the back support is positionable in a decline use position, a level use position, and an incline use position;
a back cushion coupled to the back support; and
a telescoping support comprising a proximal end and a distal end, wherein the telescoping support is secured to the frame at the proximal end, and wherein the telescoping support is positionable at a first height and a second height greater than the first height, and

wherein when the back support is positioned in the decline use position, the telescoping support is positioned at the first height and the distal end of the telescoping support is in contact with the back support, and

wherein when the back support is positioned in the level use position, the telescoping support is positioned at the second height and the distal end of the telescoping support is in contact with the back support, and

wherein when the back support is positioned in the incline use position, the telescoping support is positioned at at least one of the first height and the second height and the distal end of the telescoping support is separated from the back support.

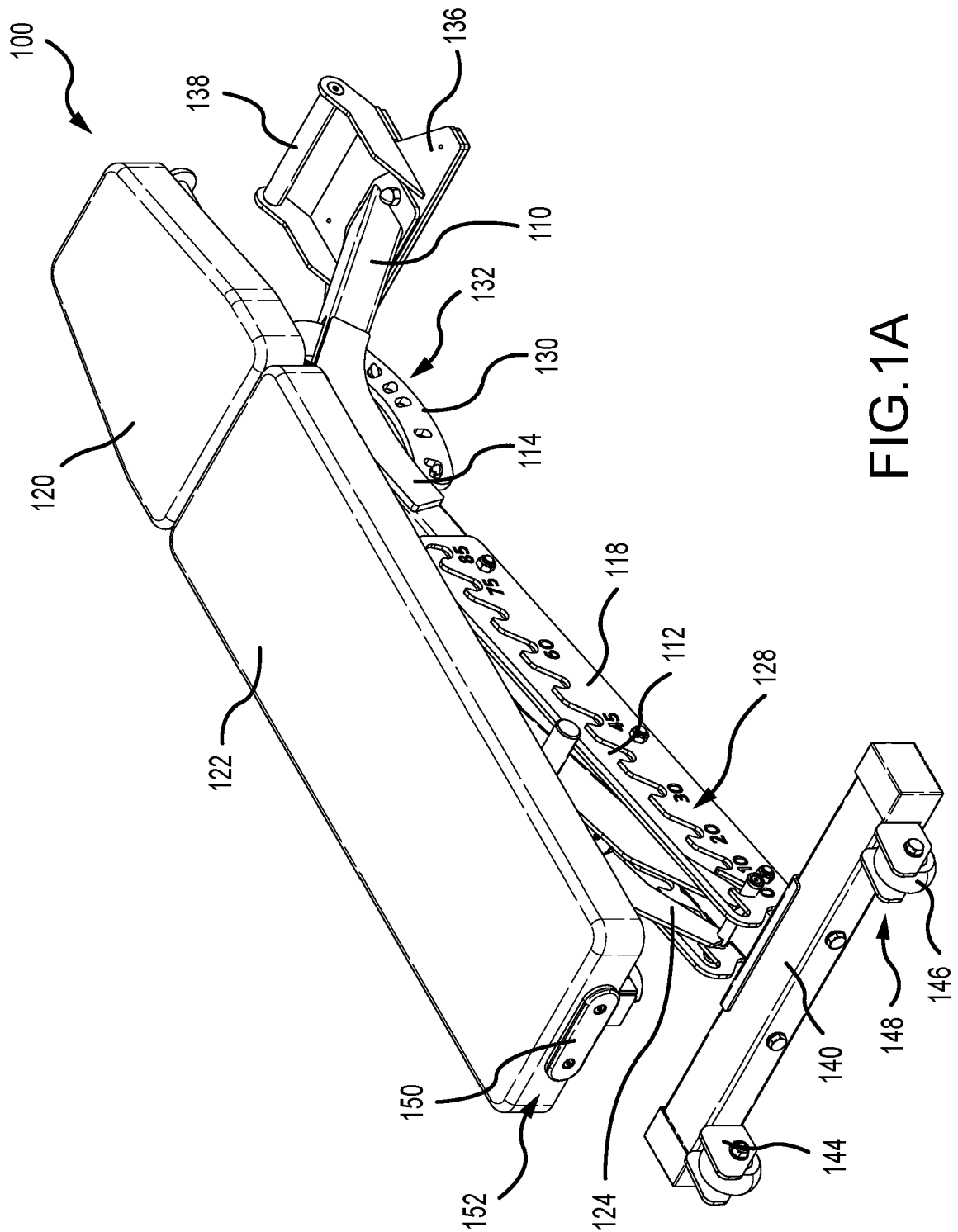


FIG. 1A

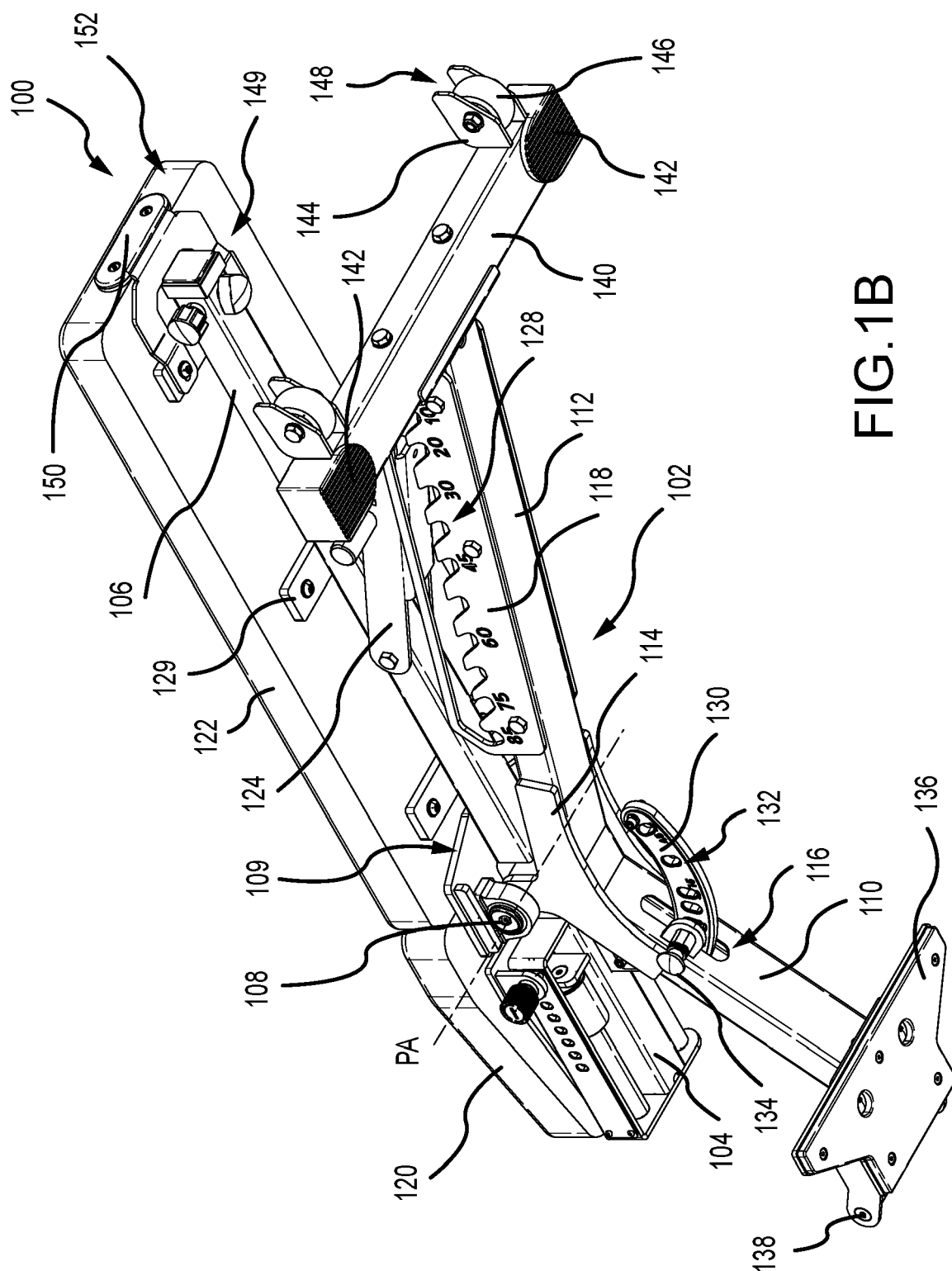


FIG. 1B

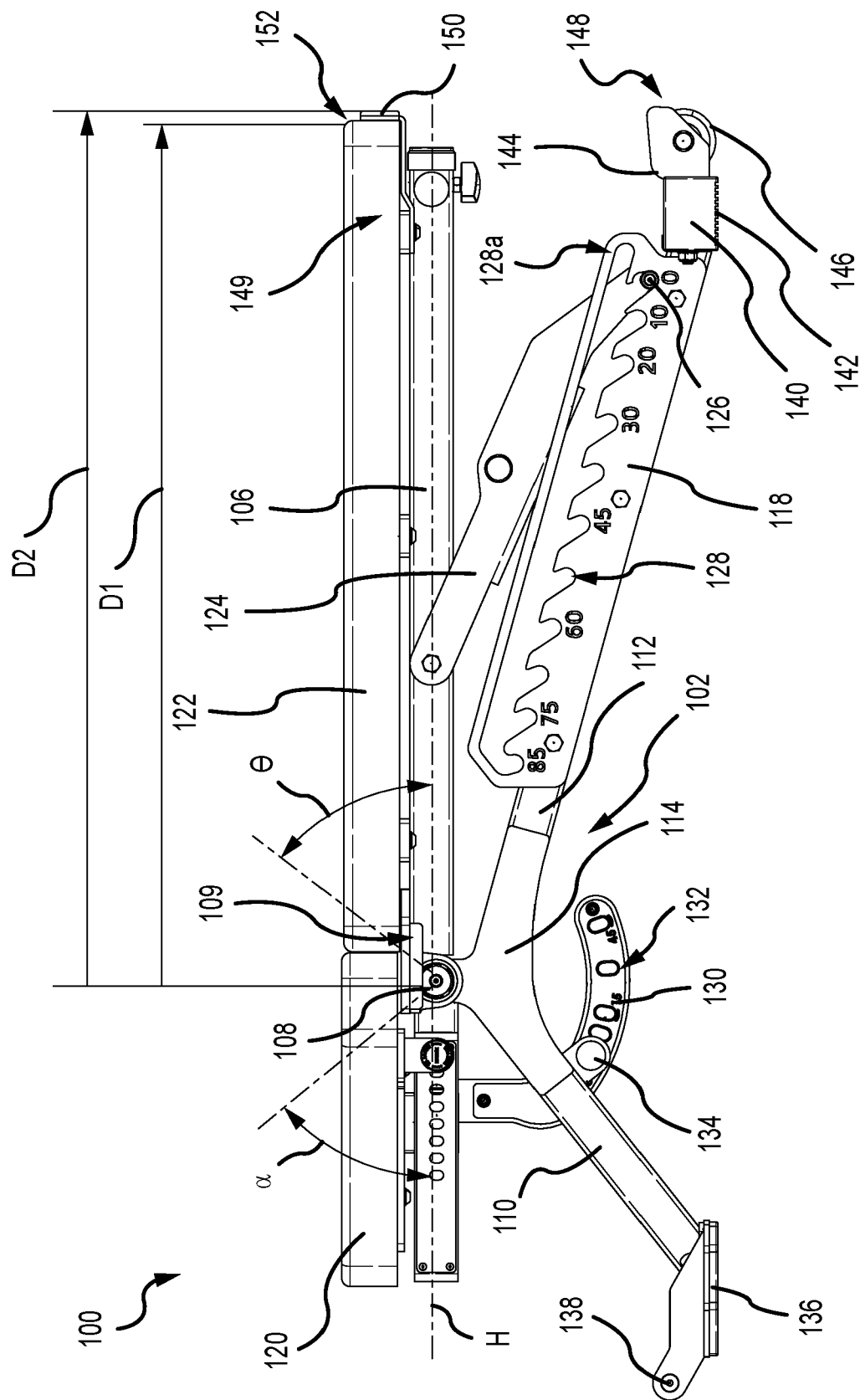


FIG.1C

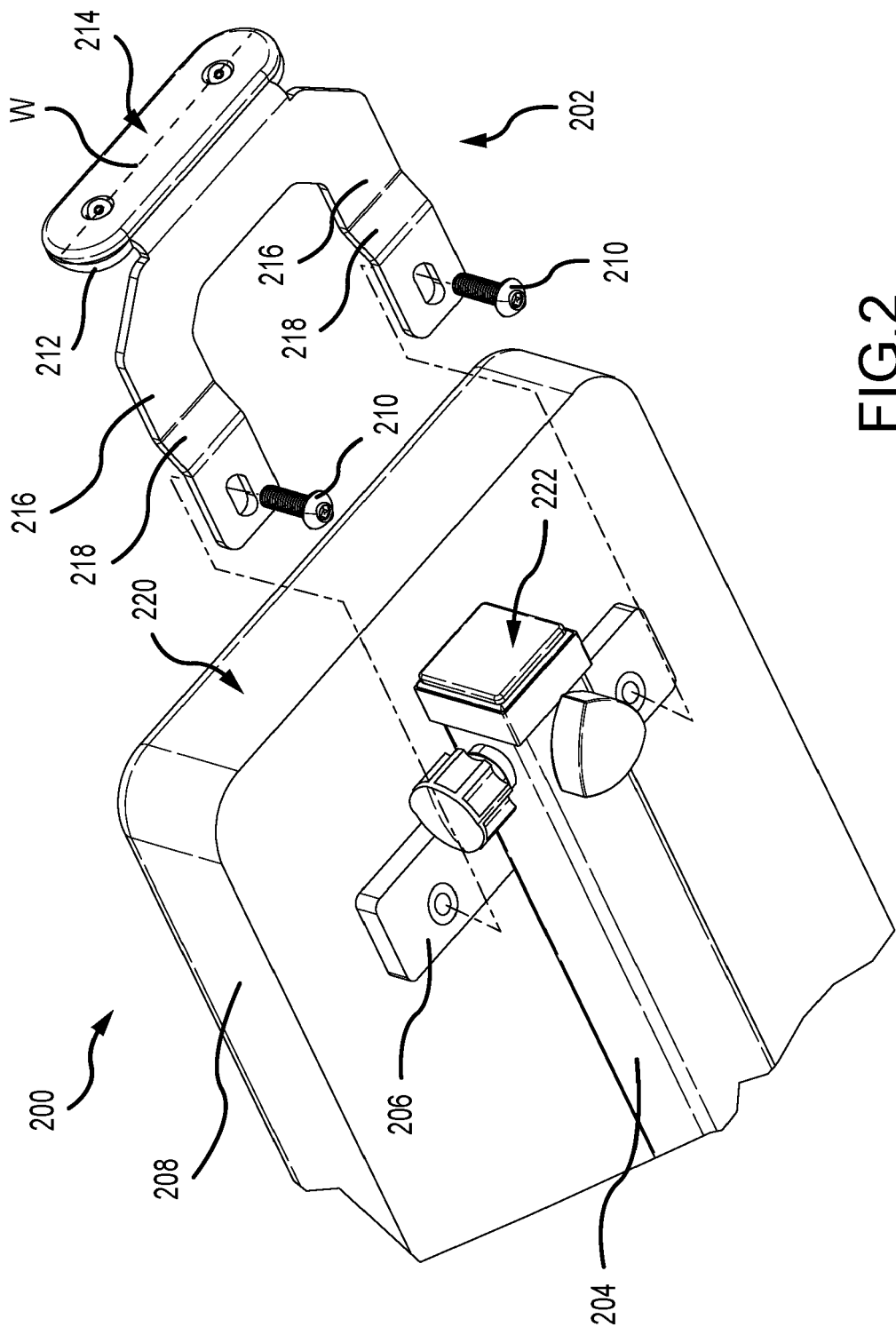
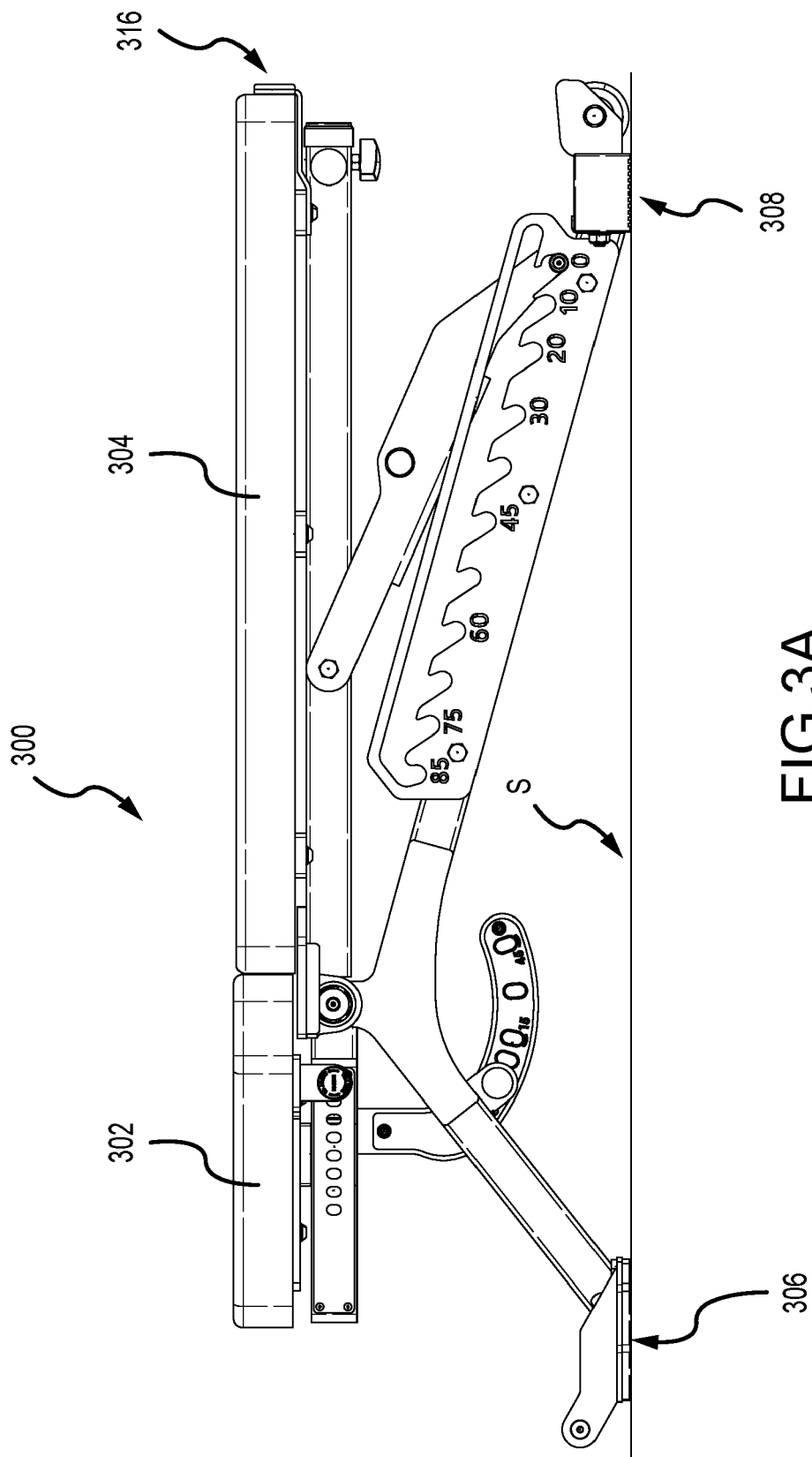


FIG.2



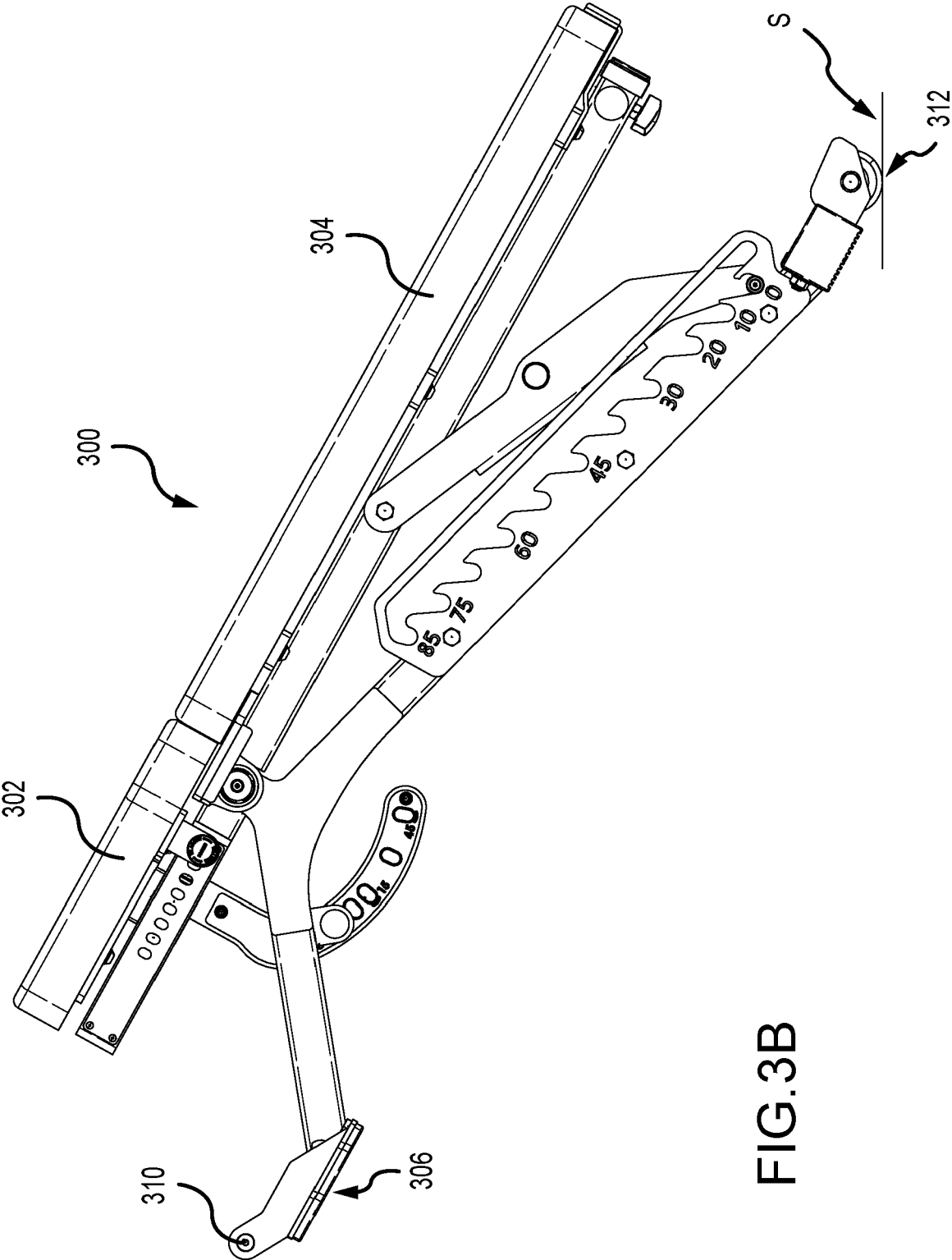
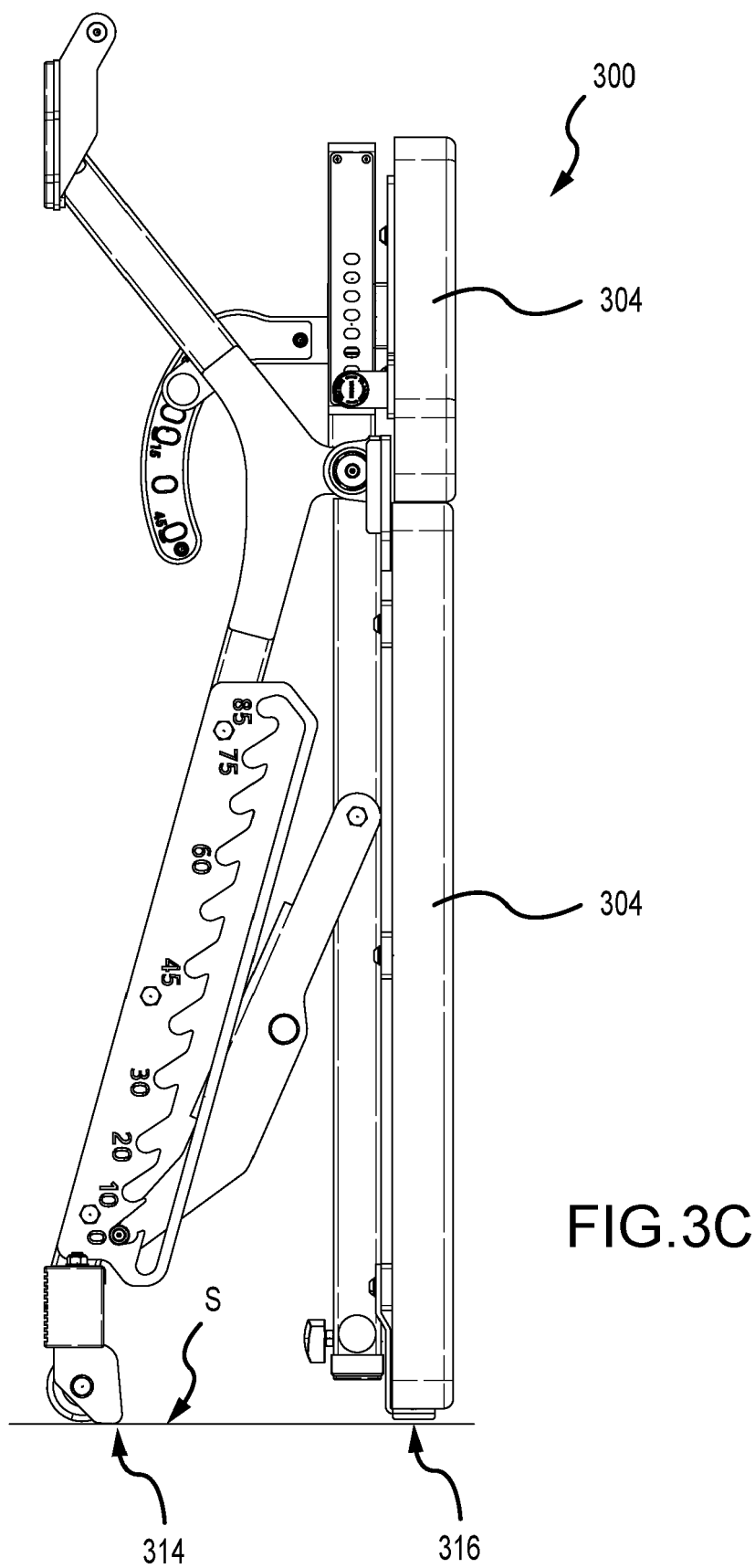


FIG. 3B



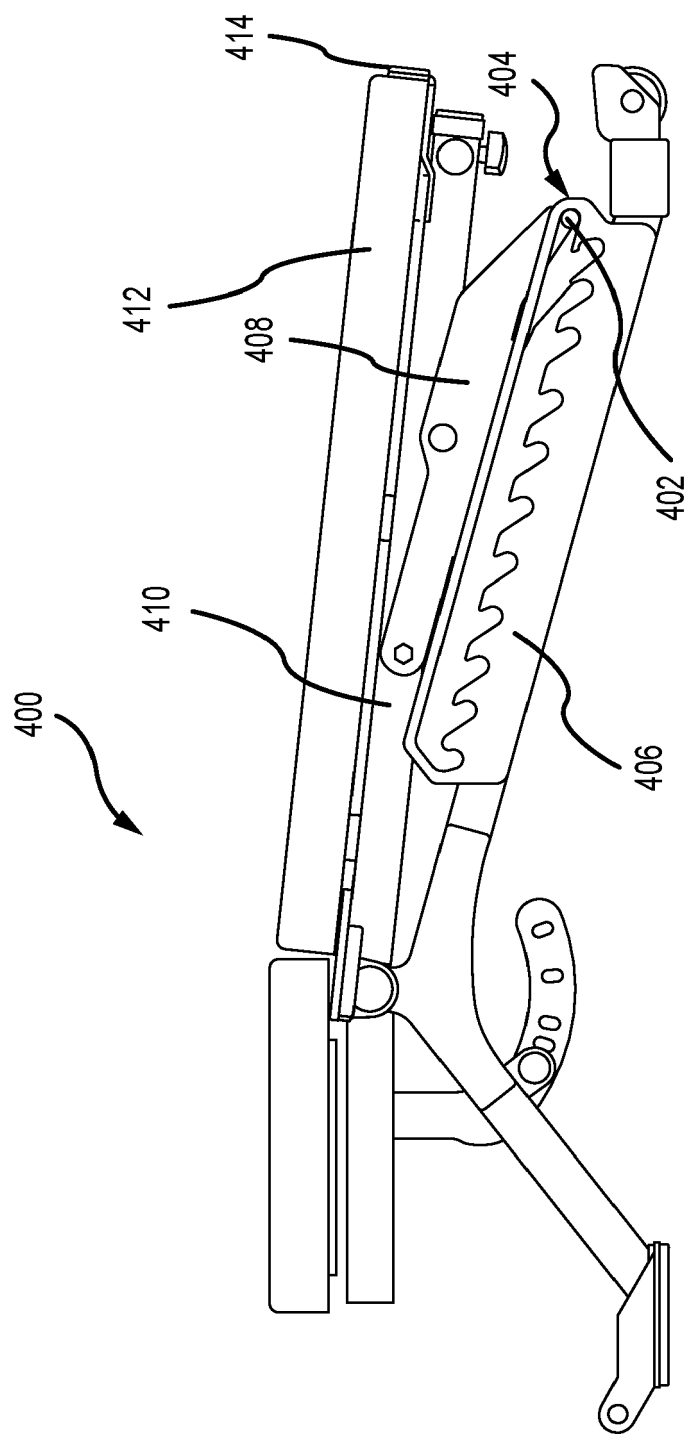


FIG.4

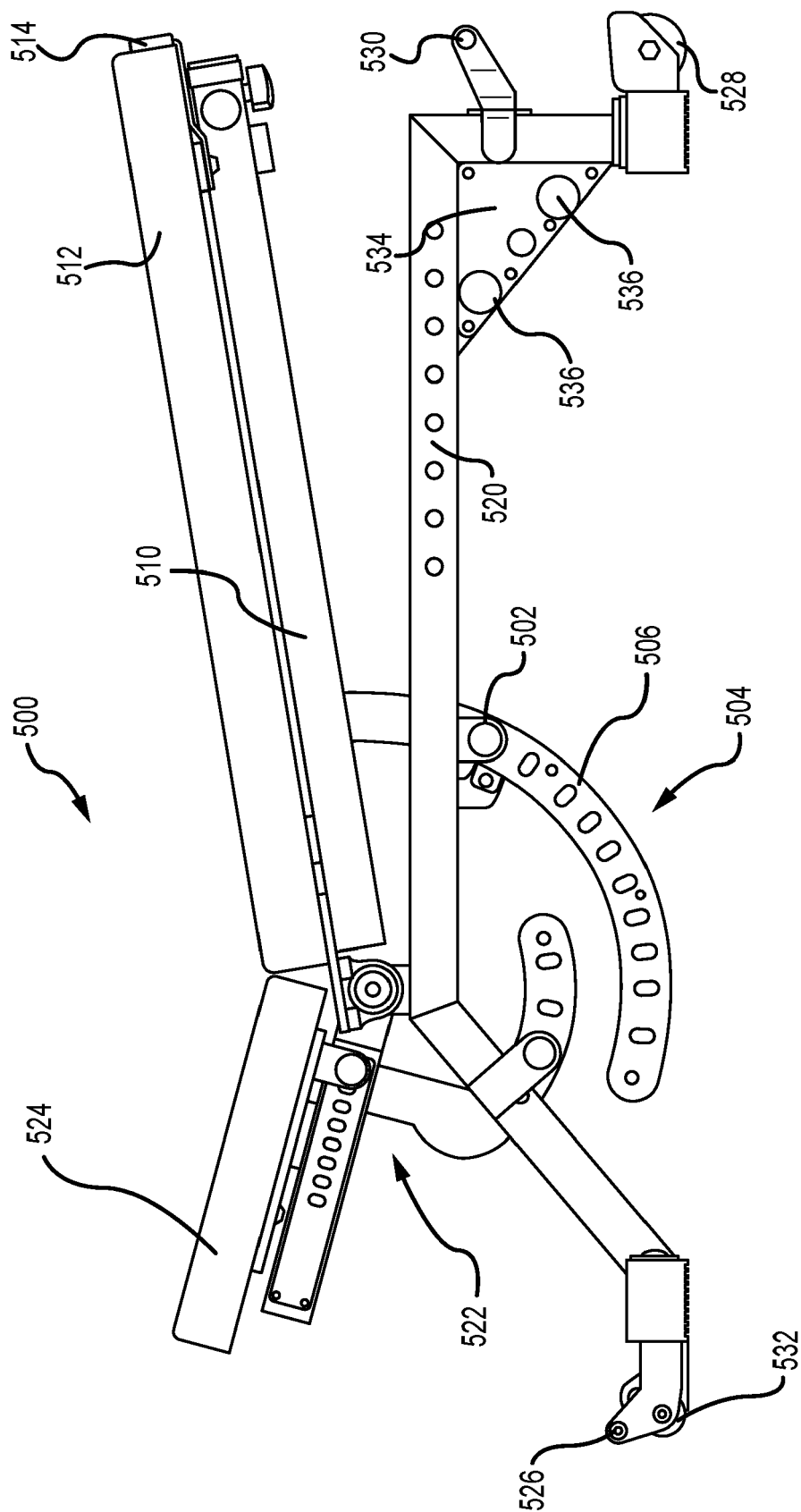


FIG.5

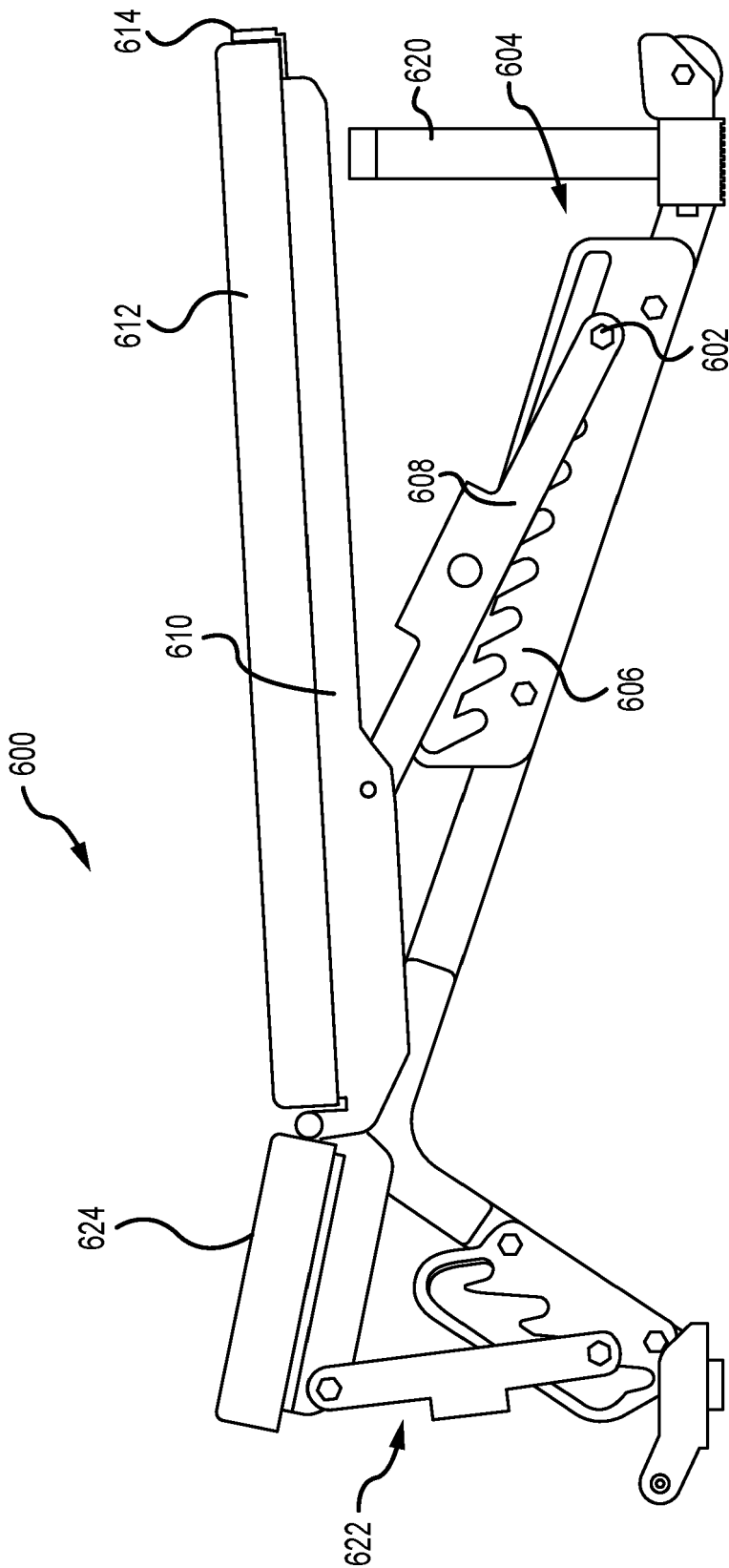


FIG.6

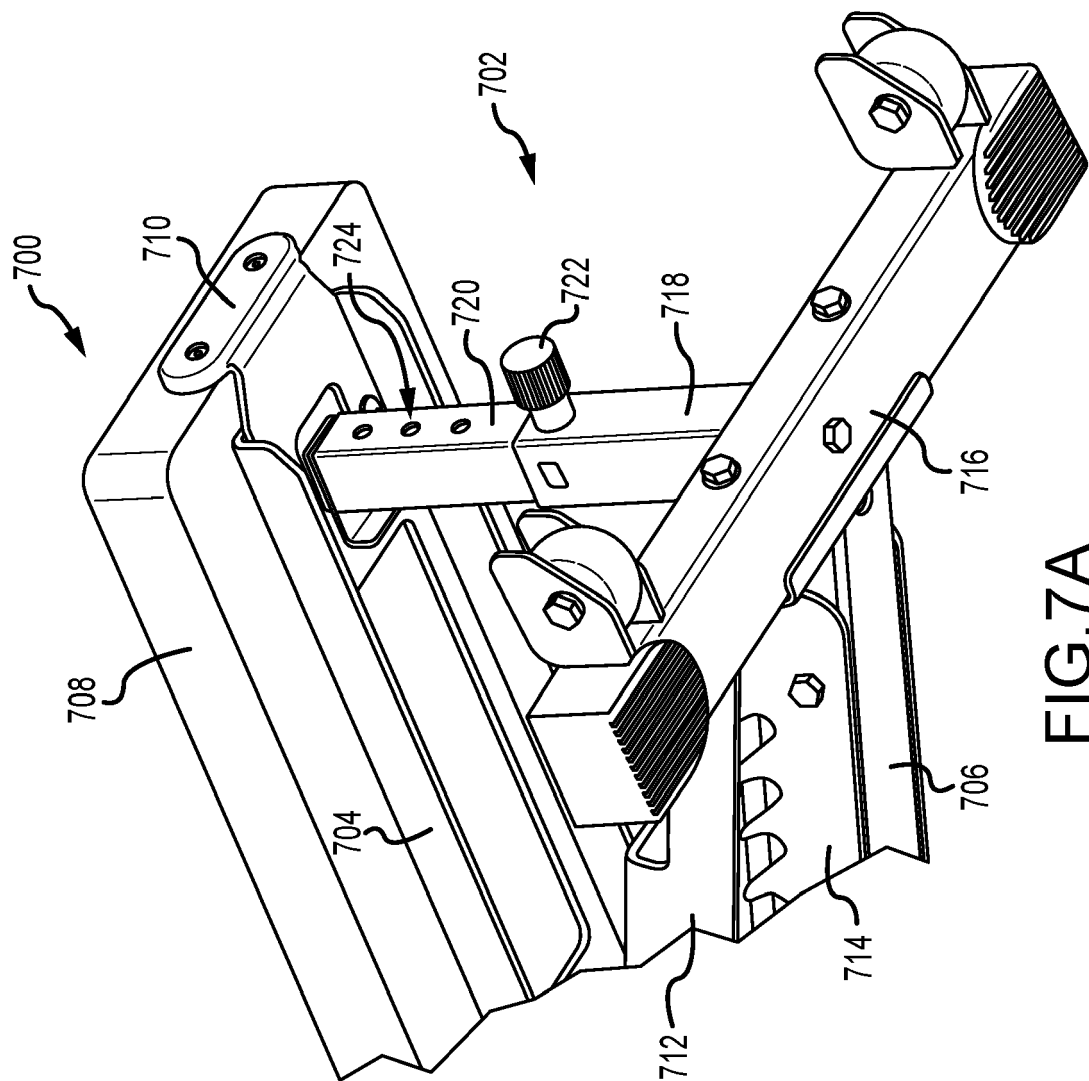
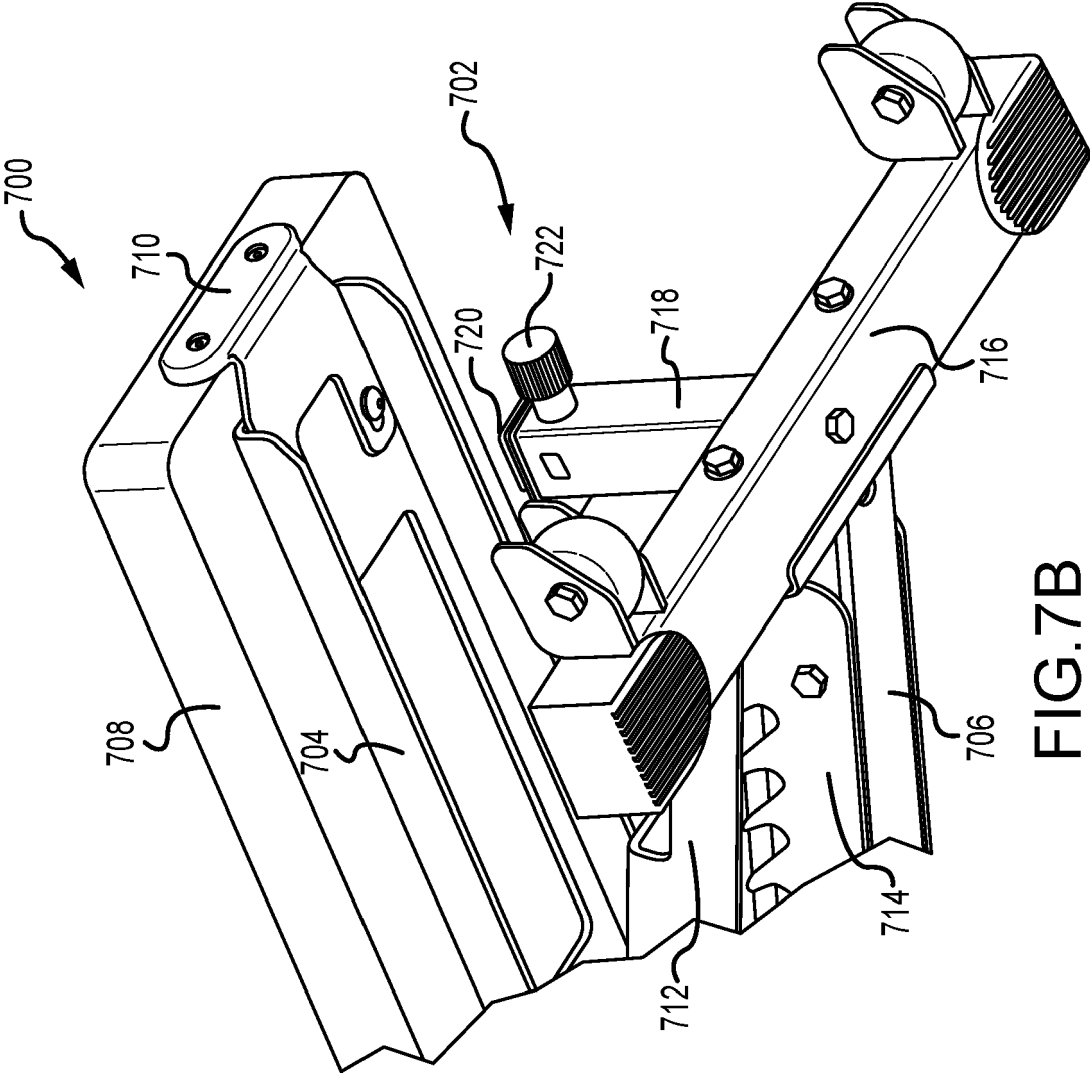


FIG. 7A



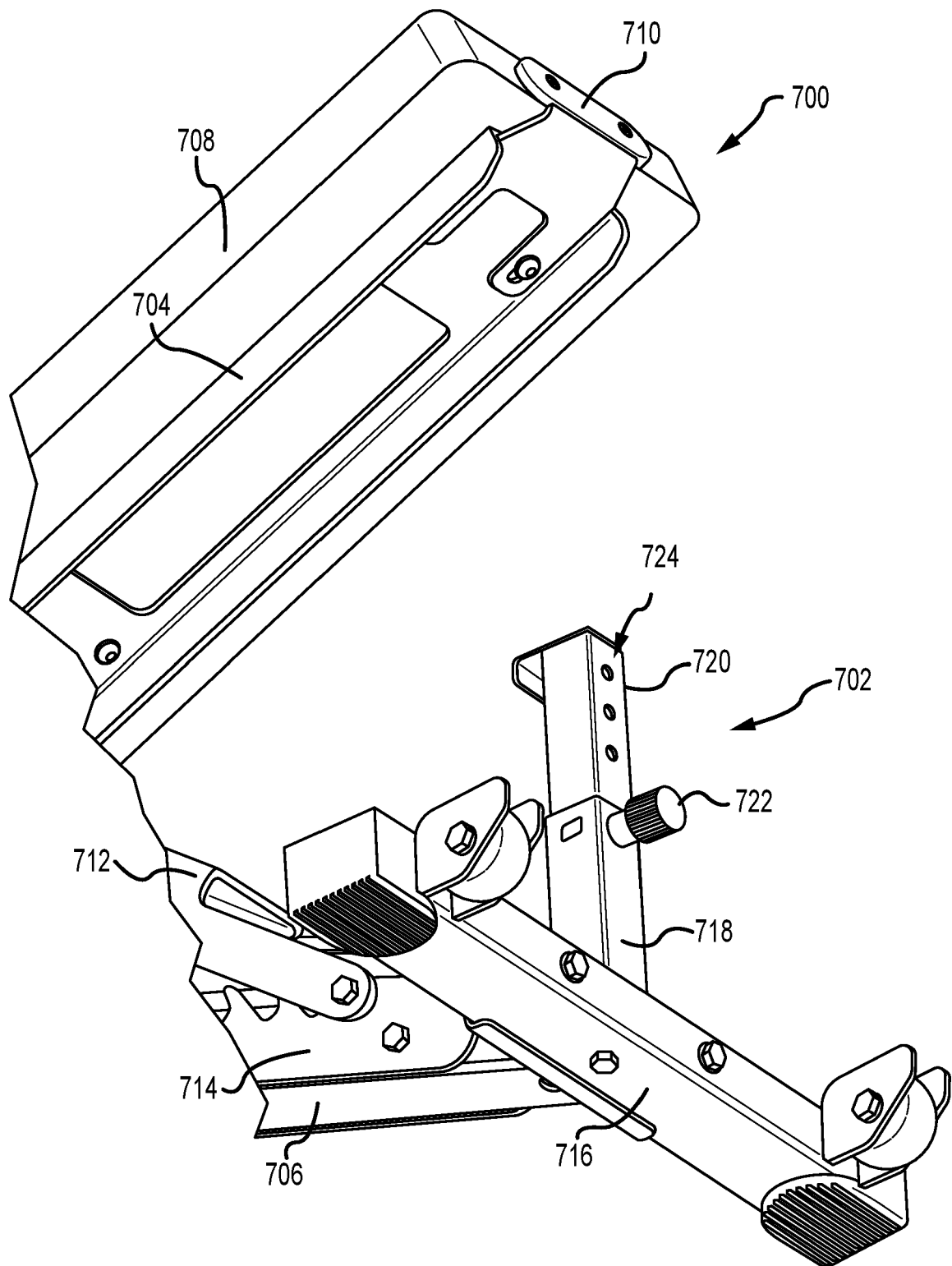


FIG.7C

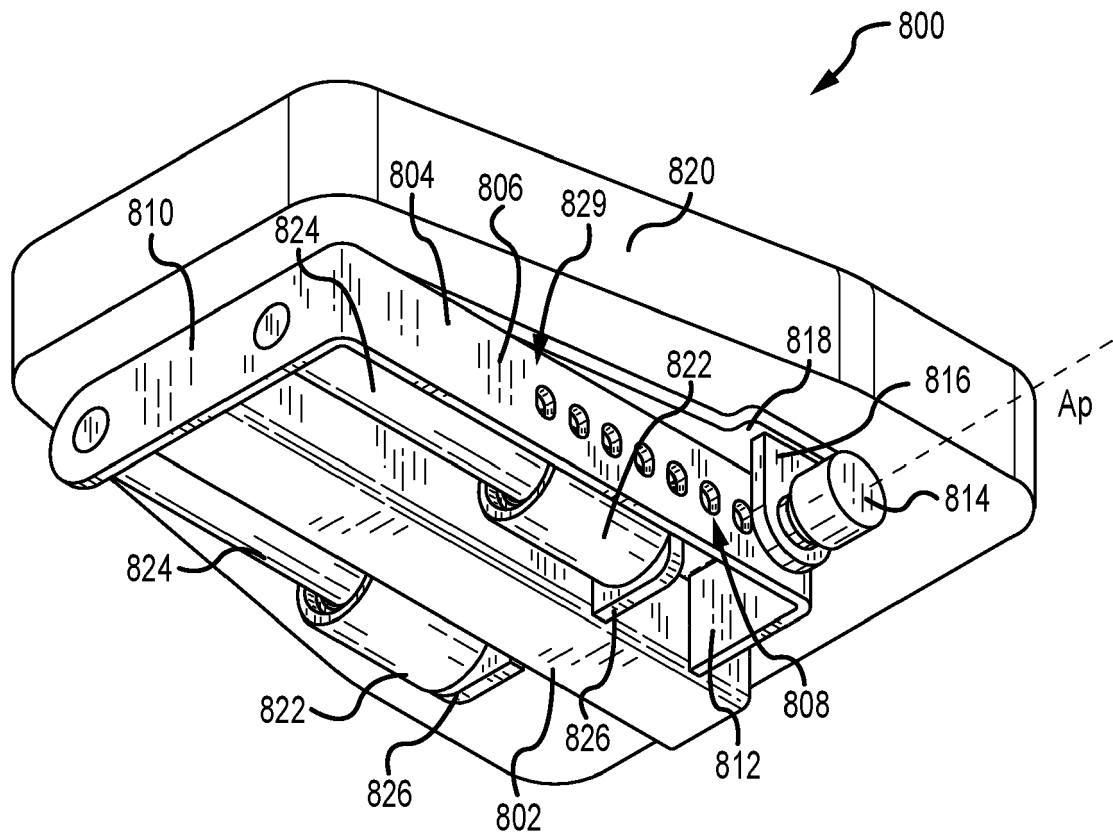


FIG.8A

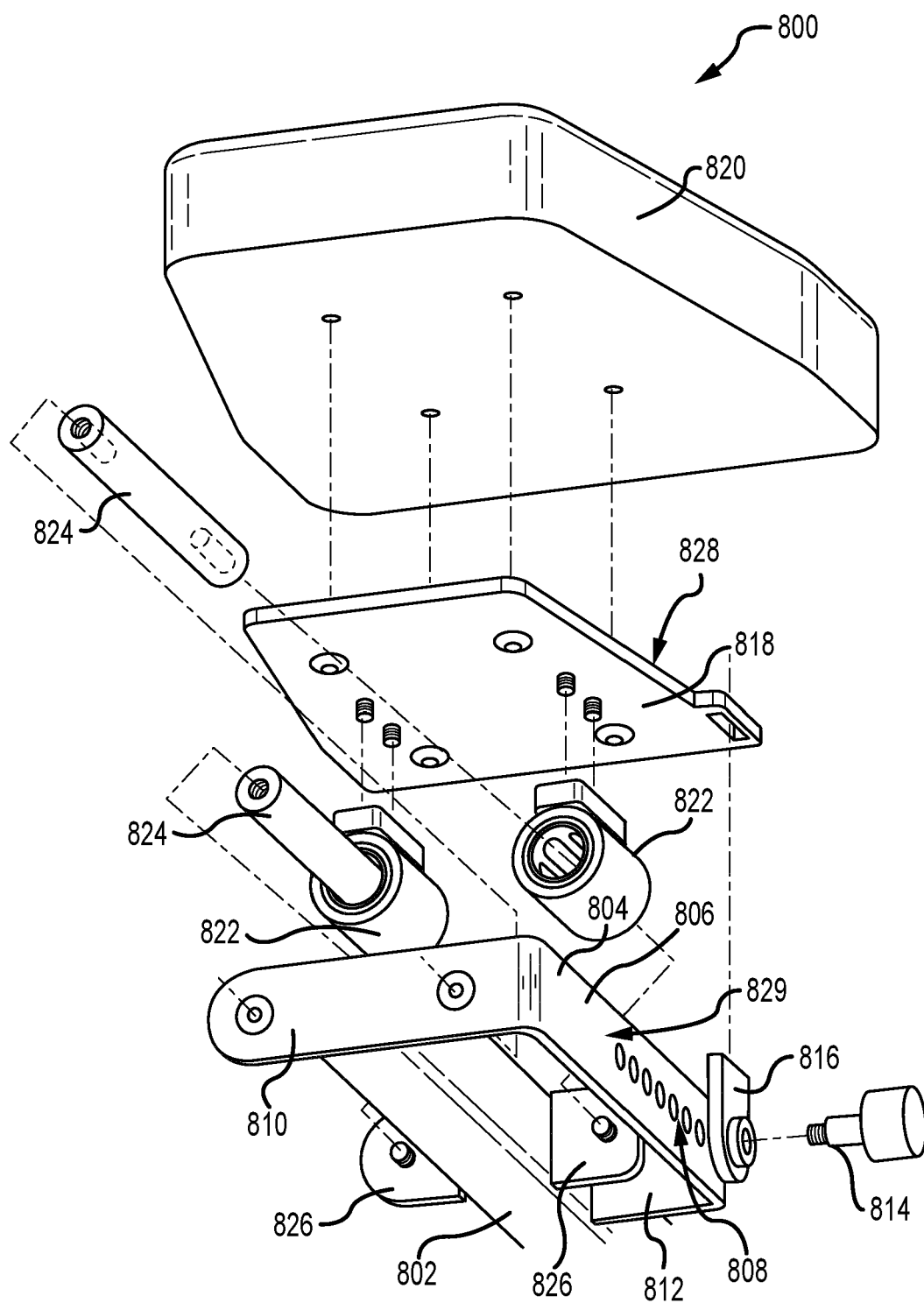
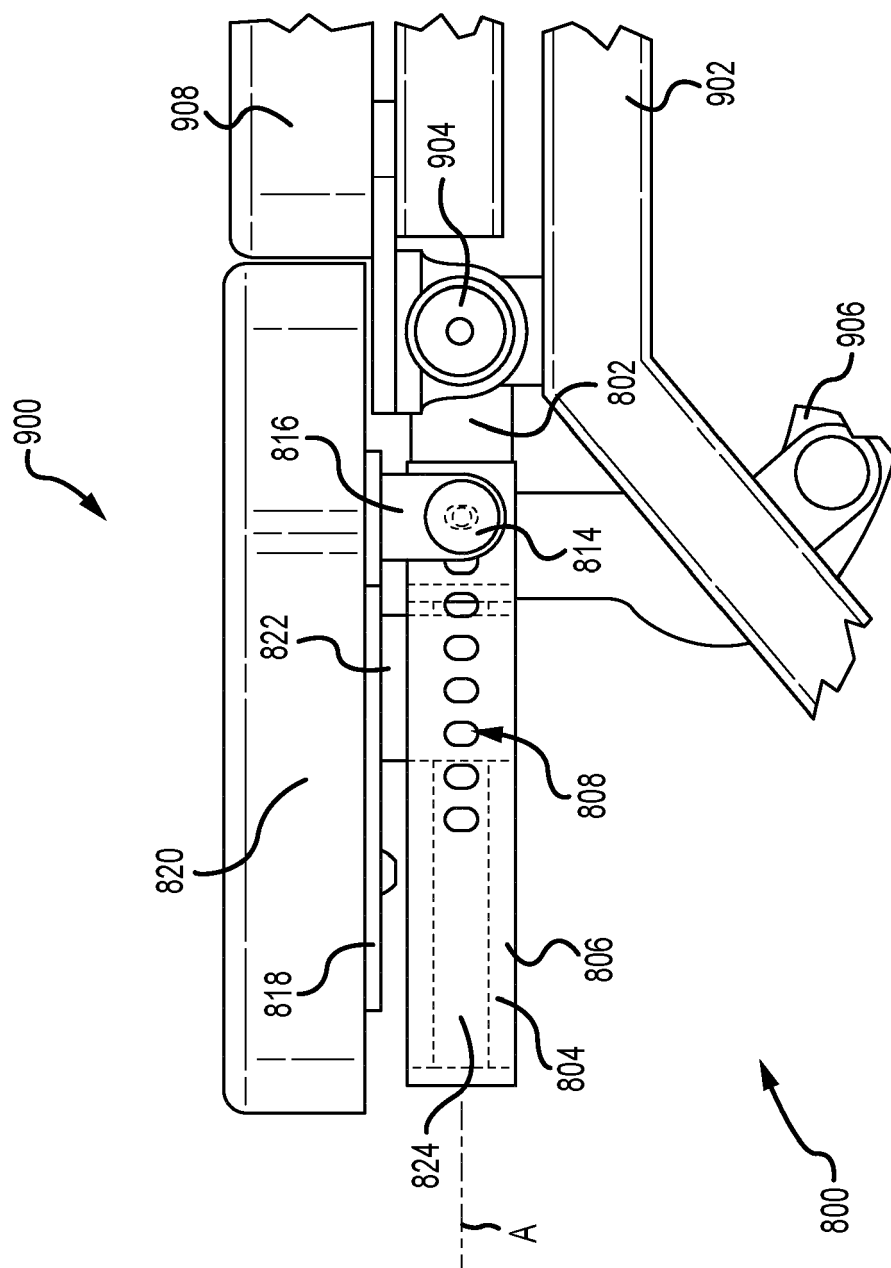


FIG. 8B



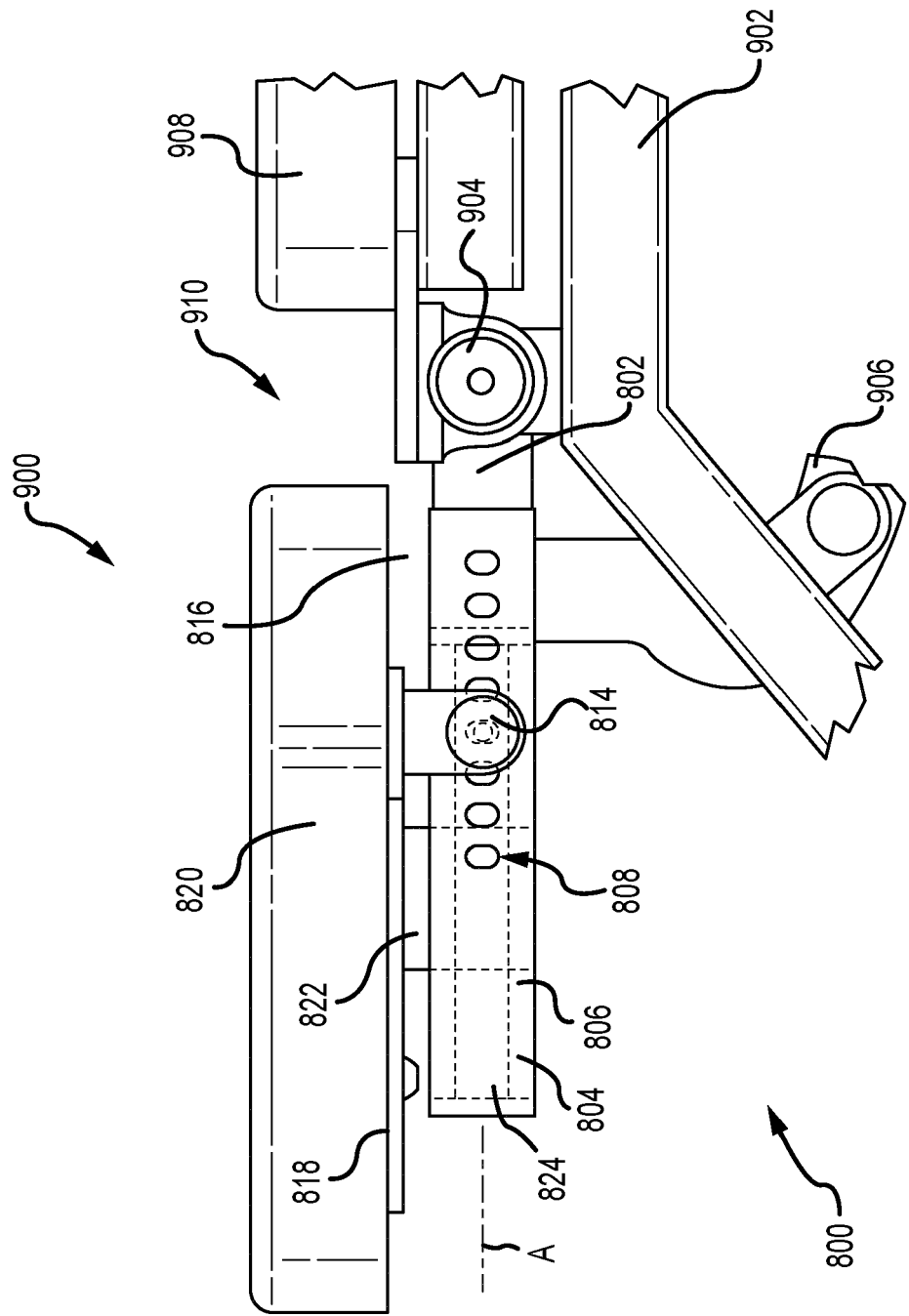


FIG. 9B

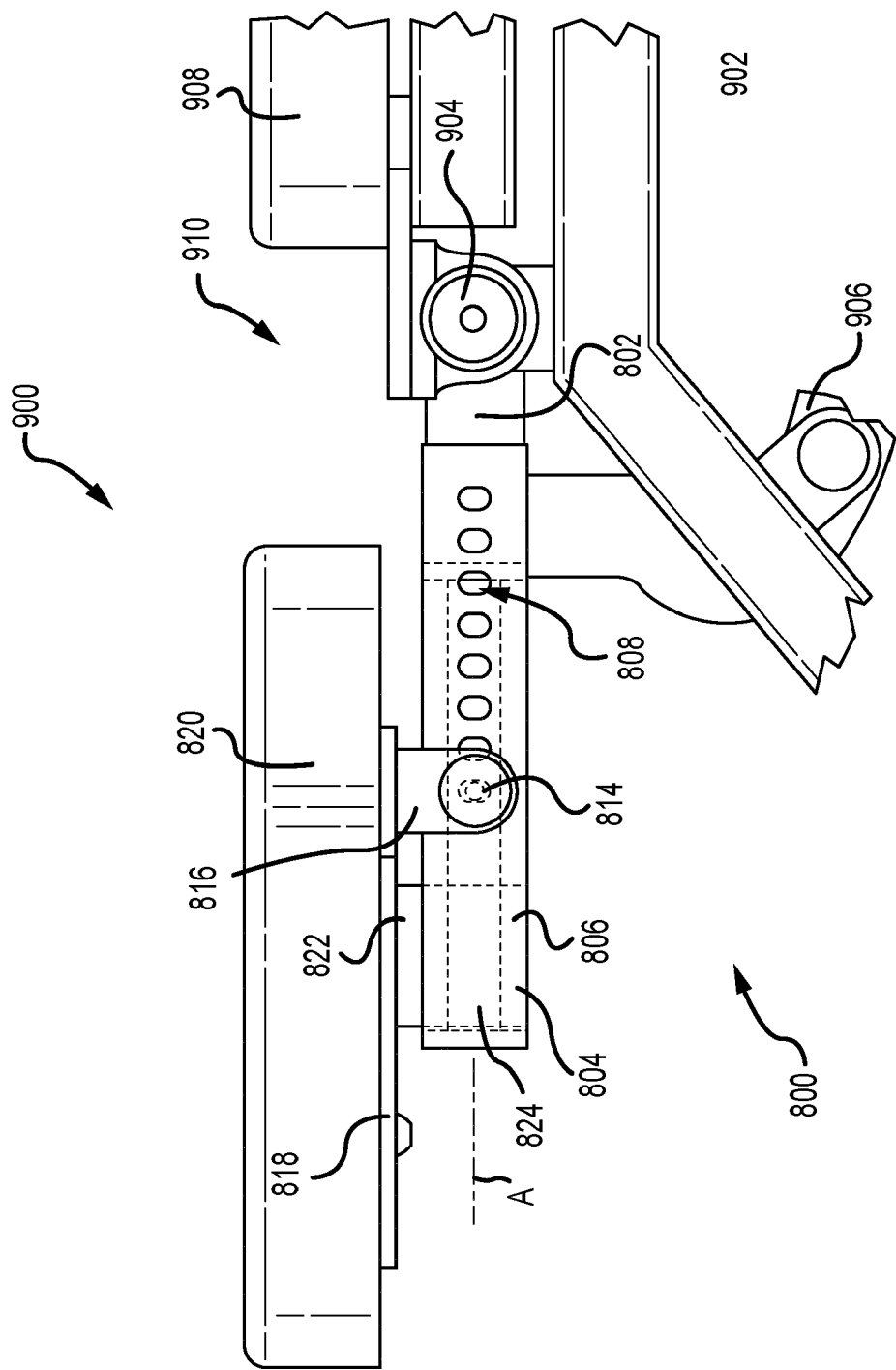


FIG. 9C

REFERENCES CITED IN THE DESCRIPTION

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