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(54) **Title**: FORWARD SLIDING RECLINING CHAIR

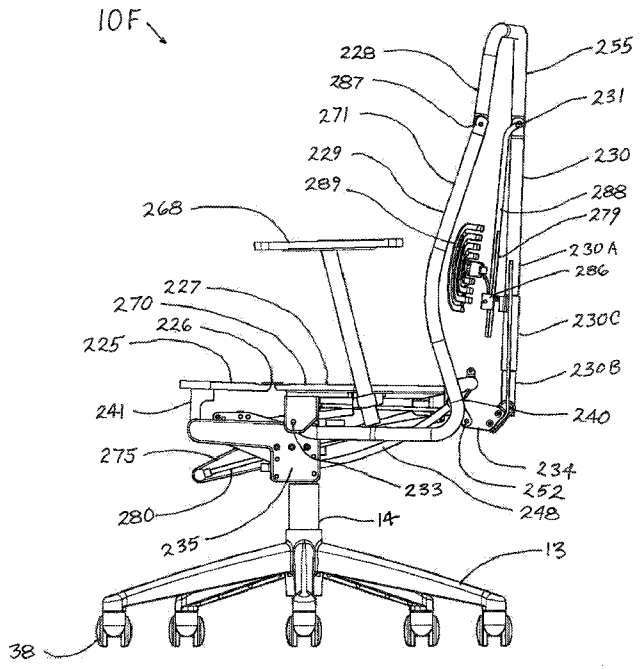


FIG. 34

(57) **Abstract**: An office chair includes a seat and a backrest that are pivotally connected together at a pivot axis such that the backrest can pivot with respect to the seat between an upright position and a reclining position. The seat is mounted on a base such that the seat can move with respect to a base, and the seat includes front and rear portions that can pivot with respect to one another. When the backrest is pivoted from the upright position to the reclining position, both of the seat and the pivot axis move forward with respect to said base, and the seat front portion flexes with respect to the seat rear portion such that the angle between said upward faces of said seat front portion and the seat rear portion increases. The backrest may also include an upper portion and a lower portion that can pivot with respect to one another. When the backrest is moved to the recline position, the angle between the forward faces of the upper and lower backrest portions decreases.

WO 2012/170863 A2

FORWARD SLIDING RECLINING CHAIR

FIELD OF THE INVENTION

[0001] This invention relates to an improved reclining swiveling task chair of the type used in offices.

BACKGROUND OF THE INVENTION

[0002] Modern reclining office chairs can be quite comfortable for many people, and, due to advances in recline technology, can be comfortable for users sitting in various positions from upright to reclined. However, common office chair recline mechanisms may not be fully accommodating for certain users that prefer to work in a reclined position with the body stretched into a straightened form. For example, it is common to see a designer or computer programmer in an extremely reclined position where they have slid forward into a position where their buttocks is supported only by the front edge of their chair seat and their back is only supported in the upper back area by the chair backrest support. With their feet on the floor, the seat front edge is serving as a ledge for the user's buttocks to stop them from sliding completely off the chair. The user's back is arched so that their upper back and head remains substantially vertical while their lower back and waist are relatively straightened and significantly reclined. In this type of reclined body position (which is referenced throughout the present application), the rearward portion of the chair seat and the lower portion of the chair back support are virtually unused in that the user's body is not being supported by them. In this position, the user's body can be in a nearly straight standing posture (except for their arched upper back) yet reclined nearly 45° with respect to the floor while the chair back support may be only partially reclined.

[0003] Typical reclining office chairs provide substantially planar seat support and back support surfaces that may adequately support the user when the user sits upright, but they do not provide adequate contours and/or bends that will support a user in the above described

reclined body position. In addition, these typical office chairs do not move between the upright and reclined positions in a manner that provides a proportional transition from the upright to the reclined position that will support a user as they move from upright to the above described reclined body form.

[0004] Typical reclining office chairs also carry the user's head and shoulders significantly rearward as the user reclines. The result is, before the user can resume working again after assuming the above noted reclined body form, they must walk their chair forward (rolling on the castered base) to maintain the distance between their eyes and the computer display screen.

[0005] Typical reclining office chairs often provide an adjustable lumbar support device mounted to the chair backrest support. However, as the user reclines, the typical lumbar support remains in the same relationship to the backrest support. As the user assumes the above reclined body form and the seat front portion becomes the buttocks support, the user's upper legs are supported in cantilevered fashion between the seat edge and the floor and the user's lower back is spaced away from the chair backrest and lumbar supports. This may limit or eliminate the effectiveness of the lumbar support while increasing the pressure of the buttocks on the seat ledge.

[0006] Typical reclining office chairs often provide an adjustable headrest support device mounted to the chair backrest support. However, in some chairs, as the user reclines, the headrest support remains in the same relationship to the backrest support. In a few other chairs the headrest is operated by a 4-bar linkage the keep the headrest substantially vertical as the back reclines. This type of headrest tends to bend the users neck so that the users head moves forward with respect to the user's shoulders, affectively pressing the user's chin closer to their chest. The user in the above noted reclined body form may try to overcome this affect by sitting excessively reclined in a reclining chair that is only partially reclined. This keeps

the user's upper back and head supported in a substantially vertical orientation with the head comfortably balanced. Unfortunately, the user sacrifices proper lower back and upper leg support to achieve this working position. The user's back lumbar area is thus supported only by the muscles in his back as it sags into the area above the seat rear portion and the slightly reclined backrest lower portion.

[0007] U.S. Patent No. 677234 (Kelly) discloses a lounge chair that moves the seat and lower back forward as the backrest reclines. However, neither the seat nor the backrest of this chair conform to the shaped of a user in the above noted reclined body position. Also, the upper back of a user in this chair tends to fall away from the user's computer monitor, moving the user's eyes significantly rearward.

[0008] U.S. Patent No. 5,979,984 discloses a chair that moves the seat forward slightly by pivotally attaching the back support to the stationary chair base. Once again, however, the shape of the seat surface does adequately conform to the shape of a user sitting in the above noted reclined body position. Similarly, the upper back of a user in this chair tends to fall away from the user's computer monitor and other objects sitting on the user's worksurface, moving the user's eyes significantly rearward.

[0009] U.S. Patents 6820936 and 7922248 each disclose a seat surface with front and rear portions connected by a bend area where the angle of bend increases proportional to the back recline angle. However, the seat and backrest do not move forward as backrest reclines, leaving the seat out of position, and the backrest (and any lumbar support) spaced away from the back of a person in the above noted recline position.

There is need for an office chair that provides sufficient back and leg support through the entire work posture range by conforming to user's body profile and carrying the user's body forward, thereby keeping user's eyes substantially the same distance from the screen regardless of the amount of recline.

SUMMARY OF THE INVENTION

[0010] The present invention provides a chair that includes a seat and a backrest that are pivotally connected togther at a pivot axis such that the backrest can pivot with respect to the seat between an upright position and a reclining position. The seat is mounted on a base such that the seat can move with respect to a base, and the seat includes front and rear portions that can pivot with respect to one another. When the backrest is pivoted from the upright position to the reclining position, both of the seat and the pivot axis move forward with respect to said base, and the seat front portion flexes with respect to the seat rear portion such that the angle between said upward faces of said seat front portion and the seat rear portion increases.

[0011] In one embodiment, the backrest includes an upper portion and a lower portion that can pivot with respect to one another. When the backrest is moved to the recline position, the angle between the forward faces of the upper and lower backrest portions decreases.

[0012] The above noted movement of the chair of the present invention provides good back and upper leg support for a user from full upright to an extreme reclined position. More particularly, the progressive bending of the back support in the area just below the user's shoulders maintains the user's head and shoulders substantially upright while the user moves from fully upright to a reclined posture, and the progressive bending of the back support in the area just below the user's shoulders maintains support to the user's lower back while the user moves from fully upright to a reclined posture. The bending of the seat portion of the chair relieves pressure from under the user's upper legs as the user moves from fully upright to a fully reclined position.

[0013] In one embodiment, the angular orientation of the upper portion of the backrest remains substantially the same as the backrest is moved to the reclined position. In another embodiment, upper portion of the backrest travels in a substantially vertical plane as the

backrest is moved to the reclined position, such that the distance between the upper portion of the backrest and a fixed object in front of the user's chair, such as a computer monitor, remains substantially the same.

[0014] In another embodiment, the chair includes a lumbar pressure arm and the backrest includes a lumbar support having a surface for supporting the seated user's lower back area. The lumbar support is mounted on a support arm, and the support arm is pivotally mounted to the backrest. The lumbar pressure arm is mounted to the chair and configured to engage the lumbar support arm as the backrest rotates from the upright position to the reclined position. The rotation of the backrest to the reclining position increases the engagement force of the lumbar support arm on the pressure arm, and consequently moves the lumbar support towards a seated user's lower back. The adjustable lumbar support device can thus move forwardly with respect to the chair backrest as the user moves from fully upright to a reclined posture to maintain engagement with the user's back.

[0015] In yet another embodiment, the movements of the chair can be controlled with electrically powered motion for moving the user from fully upright to intermediate positions or a fully reclined position and returning back to the fully upright position with reduced effort.

[0016] Before the embodiments of the invention are explained in detail, it is to be understood that the invention is not limited to the details of operation or to the details of construction and the arrangement of the components set forth in the following description or illustrated in the drawings. The invention may be implemented in various other embodiments and of being practiced or being carried out in alternative ways not expressly disclosed herein. Also, it is to be understood that the phraseology and terminology used herein are for the purpose of description and should not be regarded as limiting. The use of "including" and "comprising" and variations thereof is meant to encompass the items listed thereafter and equivalents thereof as well as additional items and equivalents thereof. Further, enumeration may be

used in the description of various embodiments. Unless otherwise expressly stated, the use of enumeration should not be construed as limiting the invention to any specific order or number of components. Nor should the use of enumeration be construed as excluding from the scope of the invention any additional steps or components that might be combined with or into the enumerated steps or components.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Fig. 1 is a perspective upper left view of a first embodiment of the forward sliding reclining swivel chair.

[0018] Fig. 2 is a perspective upper left rear view of a first embodiment of the forward sliding reclining swivel chair.

[0019] Fig. 3 is a perspective lower left rear view of a first embodiment of the forward sliding reclining swivel chair (having the left frame side removed).

[0020] Fig. 4 is a front fully reclined view of a first embodiment of the forward sliding reclining swivel chair.

[0021] Fig. 5 is a rear fully reclined view of a first embodiment of the forward sliding reclining swivel chair.

[0022] Fig. 6 is a side view of a fully reclined first embodiment of the forward sliding reclining swivel chair.

[0023] Fig. 7 is a perspective upper right view of a fully reclined first embodiment of the forward sliding reclining swivel chair.

[0024] Fig. 8 is a perspective lower right view of a fully reclined first embodiment of the forward sliding reclining swivel chair.

[0025] Fig. 9 is a left side view of a fully reclined first embodiment of the forward sliding reclining swivel chair (having the left frame side removed).

[0026] Fig. 10 is a left side view of a fully upright first embodiment of the forward sliding reclining swivel chair (having the left frame side removed).

[0027] Fig. 11 is a left side view of a fully reclined second embodiment of the forward sliding reclining swivel chair.

[0028] Fig. 12 is a left side view of a fully upright second embodiment of the forward sliding reclining swivel chair.

[0029] Fig. 13 is a left front upper perspective view of a fully reclined second embodiment of the forward sliding reclining swivel chair.

[0030] Fig. 14 is a left front lower perspective view of a fully reclined second embodiment of the forward sliding reclining swivel chair.

[0031] Fig. 15 is a fragmentary underside perspective view of a second embodiment of the forward sliding reclining swivel chair.

[0032] Fig. 16 is a fragmentary upper rear perspective view of a third embodiment of the forward sliding reclining swivel chair.

[0033] Fig. 17 is a fragmentary lower right front perspective view of a third embodiment of the forward sliding reclining swivel chair.

[0034] Fig. 18 is a perspective view of an adjustable roller guide of a third embodiment of the forward sliding reclining swivel chair.

[0035] Fig. 19 is a left side view of a fully upright fourth embodiment of the forward sliding reclining swivel chair.

[0036] Fig. 20 is a left side view of a fourth embodiment of the forward sliding reclining swivel chair (shown reclined about one-fourth of the recline stroke).

[0037] Fig. 21 is a left side view of a fourth embodiment of the forward sliding reclining swivel chair (shown reclined about one-half of the recline stroke).

[0038] Fig. 22 is a left side view of a fourth embodiment of the forward sliding reclining swivel chair (shown reclined about three-fourths of the recline stroke).

[0039] Fig. 23 is a left side view of a fully reclined fourth embodiment of the forward sliding reclining swivel chair.

[0040] Fig. 24 is a left lower perspective view of a fourth embodiment of the forward sliding reclining swivel without wheeled base.

[0041] Fig. 25 is a front lower perspective view of a fourth embodiment of the forward sliding reclining swivel without wheeled base.

[0042] Fig. 26 is an upper left perspective view of a fourth embodiment of the forward sliding reclining swivel without wheeled base.

[0043] Fig. 27 is an upper left front perspective view of a fifth embodiment of the forward sliding reclining swivel chair.

[0044] Fig. 28 is a left side view of a fully upright fifth embodiment of the forward sliding reclining swivel chair.

[0045] Fig. 29 is a left side view of a fully reclined fifth embodiment of the forward sliding reclining swivel chair.

[0046] Fig. 30 is a left side hidden-line view of a fifth embodiment of the forward sliding reclining swivel chair

[0047] Fig. 31 is a left side hidden-line view of a fully reclined fifth embodiment of the forward sliding reclining swivel chair.

[0048] Fig. 32 is a perspective upper left rear view of a fifth embodiment of the forward sliding reclining swivel chair.

[0049] Fig. 33 is a perspective lower left view of a fifth embodiment of the forward sliding reclining swivel chair (with wheeled base removed).

[0050] Fig. 34 is a left side view of a fully upright sixth embodiment of a forward sliding recline swivel chair.

[0051] Fig. 35 is a front view of a fully upright sixth embodiment of a forward sliding recline swivel chair.

[0052] Fig. 36 is a rear view of a fully upright sixth embodiment of a forward sliding recline swivel chair.

[0053] Fig. 37 is a left front lower perspective view of a fully upright sixth embodiment of a forward sliding recline swivel chair.

[0054] Fig. 38 is a left rear lower perspective view of a fully upright sixth embodiment of a forward sliding recline swivel chair.

[0055] Fig. 39 is a fragmentary right side partially hidden line view of a fully reclined sixth embodiment of a forward sliding recline swivel chair.

[0056] Fig. 40 is a fragmentary right rear lower perspective view of a fully reclined sixth embodiment of a forward sliding recline swivel chair.

[0057] Fig. 41 is a fragmentary left front lower perspective view of a fully reclined sixth embodiment of a forward sliding recline swivel chair.

[0058] Fig. 42 is a fragmentary right side view of the lumbar area of a fully upright sixth embodiment of a forward sliding recline swivel chair.

[0059] Fig. 43 is a fragmentary left front upper perspective view of a fully upright sixth embodiment of a forward sliding recline swivel chair (with seat top plates removed).

[0060] Fig. 44 is a right front lower perspective view of the seat assembly of the sixth embodiment of a forward sliding recline swivel chair.

[0061] Fig. 45 is a left front upper perspective view of the seat assembly of the sixth embodiment of a forward sliding recline swivel chair.

[0062] Fig. 46 is a left front upper perspective view of the roller guide frame assembly of the sixth embodiment of a forward sliding recline swivel chair.

[0063] Fig. 47 is a left front lower perspective view of the roller guide frame assembly of the sixth embodiment of a forward sliding recline swivel chair.

[0064] Fig. 48 is a right side partially hidden line view of the roller guide frame assembly of the sixth embodiment of a forward sliding recline swivel chair.

[0065] Fig. 49 is a fragmentary left rear lower perspective view of a fully upright seventh embodiment of a forward sliding recline swivel chair.

[0066] Fig. 50 is a fragmentary right front lower perspective view of a fully upright seventh embodiment of a forward sliding recline swivel chair.

[0067] Fig. 51 is a fragmentary right bottom perspective view of a fully upright seventh embodiment of a forward sliding recline swivel chair.

[0068] Fig. 52 is a fragmentary left front bottom perspective view of a fully reclined seventh embodiment of a forward sliding recline swivel chair.

[0069] Fig. 53 is a fragmentary right bottom perspective view of a fully reclined seventh embodiment of a forward sliding recline swivel chair.

[0070] Fig. 54 is a left side view of a fully upright eighth embodiment of a forward sliding recline swivel chair.

[0071] Fig. 55 is a fragmentary left rear lower perspective view of a fully upright eighth embodiment of a forward sliding recline swivel chair.

[0072] Fig. 56 is a left side view of a fully reclined eighth embodiment of a forward sliding recline swivel chair.

[0073] Fig. 57 is a left rear lower perspective view of a fully reclined eighth embodiment of a forward sliding recline swivel chair.

[0074] Fig. 58 is a left rear upper perspective view of the recline guide bar assembly of the eighth embodiment of a forward sliding recline swivel chair.

[0075] Fig. 59 is a left front upper perspective view of a fully upright ninth embodiment of a forward sliding recline swivel chair.

[0076] Fig. 60 is a left side view of a fully upright ninth embodiment of a forward sliding recline swivel chair.

[0077] Fig. 61 is a left side view of a fully reclined ninth embodiment of a forward sliding recline swivel chair.

[0078] Certain terminology will be used in the following description for the convenience in reference only, and will not be limited. For example, with respect to the chair, "Front" is the side of the chair shown in Fig. 4; the abbreviation "RH" which means "right hand" and "LH" which means "left hand" as related to the user's right hand or left hand as he or she is supported in the chair while seated and facing in the same direction as the chair's "front" faces. The word "slidingly" is used where "rollingly" could also be used when rollers are involved. The word "pin" is sometimes used where the word "axis" could also be used for pivoting connections. The words "inwardly" and "outwardly" will refer to directions toward and away from, respectively the geometric center of the forward sliding reclining swivel chair and designated parts thereof. Said terminology will include the words specifically mentioned, derivatives thereof, and words of similar import.

DETAILED DESCRIPTION

[0079] Referring to FIG. 1 - 10, there is illustrated a first embodiment of the forward sliding reclining swivel chair 10A (herein-after referred to as the "chair" for convenience) configured with a power driven recline mechanism.

[0080] The chair 10A includes a wheeled base assembly 13 having an upright support post 14 projecting therefrom. The upright support post 14 in turn mounts thereon a guide frame 15 which supports a slidable seat 16 which is pivoted to a reclinable back support 17, for supporting a seated user/occupant. The wheeled base assembly 13 includes a set of swiveling casters 38. Referring to Fig. 6, seat 16 has a front 18 and rear 19 portions that are pivotally connected by hinge 20. Back support 17 has upper 21 and lower 22 portions that are pivotally connected by hinge 23. The lower back support portion 22 is pivotally connected to seat rear portion 19 at pivot pins 24.

[0081] In one embodiment, the upper back portion 21 is pivotally connected near the top thereof to upper guide 25 by pin 26. Upper guide 25 is slidably supported by frame extension 27 of guide frame 15. Upper back portion 21 is pivotally connected near hinge 23 to middle guide 31 by guide roller 32. Upper guide 25 and middle guide roller 32 are slidably supported on frame extension 27 of guide frame 15.

[0082] Seat front portion 18 is pivotally supported by guides 28 which are slidingly supported and guided by guide supports 29. Seat rear portion 19 is pivotally and sliding supported near hinge 20 by guides 30 which are slidingly supported by guide supports 39 of guide frame 15. Seat rear portion 19 is also pivotally and slidingly supported on rollers 34 within guides 33.

[0083] In this powered embodiment, a linear actuator 35 includes motor 41 and screw 42. The front end of the linear actuator 35 is pivotally mounted to frame 15 at pins 36. The rear end of linear actuator 35 is pivotally mounted to nut 40, at the lower end of extension arm 37

of rear seat portion 19 near rollers 34. Motor 41 may be powered by battery 43, which may be wire connected through a conventional forward-off-reverse rocker switch (not shown) that is mounted on arm support 44 by a flexible cord (not shown).

[0084] The operation of the power driven recline and return first embodiment 10A of the forward sliding reclining swivel chair is accomplished by the user/occupant actuating a rocker switch, which may be mounted on armrest support 44 or another desired location. Switching "forward" (to recline) actuates the motor 35, which in turn rotates screw 42 so that nut 40 is threadingly pulled forward. The forward movement of nut 40 drives extension arm 37 of seat rear portion 19 along guide 33. In the illustrated embodiment, the trajectory of guides 28 and 30 is controlled by the positioning of the guide supports 29 and 39 respectively which guide the seat front portion 18 and rear portion 19 forward. Guide supports 29 and 39 are angled in a predetermined direction such that the front edge of seat front portion 18 progressively slopes downward as hinged junction 20 raises.

[0085] As the seat 16 moves forward, the lower portion of back support 17 is pulled forward via the pivoting connection between the lower back support portion 22 and the seat rear portion 19 at pivot pins 24. As the lower portion 22 of back support 17 moves forward, the back support 17 lower portion 22 bends with respect to the upper portion 21 by pivoting about hinge 23, and the upper edge 46 of upper portion 21 is consequently pulled downward with the roller 32 traveling downwardly within the roller guide track 31 and the guide 25 traveling downwardly within the guide support 47. The trajectory of guide 25 and roller 32 are controlled by the positioning of the guide support 47 and guide track 31 respectively. The chair is returned from a reclined position to an upright position by the user/occupant actuating "reverse" on the rocker switch on armrest support 44 which moves seat 16 and back support 17 back their respective upright positions.

[0086] Referring to FIG. 11 - 15, there is illustrated a second embodiment of the forward sliding reclining swivel chair 10B. This second embodiment 10B is also a power driven version that operates the same as version 10A except version 10B includes angularly adjustable guide support brackets 50 and 51 that control the trajectory of guides 28 and 30 respectively.

[0087] For example, guide support bracket 50 may be pivotally mounted on guide frame 15 at pivot pin 52 and may be slidably supported on guide frame 15 by shoulder screw 53. As illustrated, extension arm 54 of guide support bracket 50 is pivotally connected at the lower end 55 to cross connection bar 56. Cross connection bar 56 has an internally threaded T-portion 57 into which adjusting screw 58 can be turned. Adjusting screw 58 has knob 59 exposed at the forward end to allow easy adjustment.

[0088] Guide support bracket 51 is pivotally mounted on guide frame 15 at pivot pin 62 and is slidably supported on guide frame 15 by shoulder screw 63. Extension arm 64 of guide support bracket 51 is pivotally connected at the lower end 65 to cross connection bar 66. Cross connection bar 66 has an internally threaded T-portion 67 into which adjusting screw 68 can be turned. Adjusting screw 68 has knob 69 exposed at the forward end to allow easy adjustment. By adjusting/turning knobs 56, 69 cross connection bars 56, 66 move guide support brackets 50, 51 which changes the trajectory of guides 28, 30.

[0089] FIGS. 16 – 18 illustrate a third embodiment of the forward sliding reclining swivel chair 10C. This embodiment is generally the same as the second embodiment, and additionally includes rollers 72 in guide support brackets 70, 71 to reduce guiding friction when controlling guides 28, 30. Guide 77 includes rollers 78 to reduce guiding friction on guide 75.

[0090] FIGS. 19 – 26 illustrate a fourth embodiment of the forward sliding reclining swivel chair 10D. This embodiment is not motor driven. The recline motions are generally the same

as those described above in connection with embodiment 10A and thus will not be described again in detail, except that in this embodiment the movement is powered by gravity and the weight of the user/occupant while a compression spring 80 assists the user/occupant in the return stroke back to upright. Figs. 19 – 23 illustrate a 5-position sequence along the recline/return stroke.

[0091] As illustrated, the chair 10D includes a wheeled base assembly 13 having an upright support post 14 projecting therefrom. The upright support post 14 in turn mounts thereon a guide frame 100 which supports a slidable seat 116 which is pivoted to a reclinable back support 117, for supporting a seated user/occupant. The wheeled base assembly 13 includes a set of swiveling casters 38. Seat 116 has front 81 and rear 82 portions that are pivotally connected by hinge 85. Back support 117 has upper 84 and lower 83 portions that are pivotally connected by hinge 87. The lower back support portion 83 is pivotally connected to seat rear portion 82 at pivot pins 86.

[0092] The upper back portion 84 is pivotally connected near the top thereof to link 89 by pin 88. Link 89 is pivotally connected to seat rear portion bracket 104 at pin 90 at the lower end thereof. Lower back portion 83 is pivotally connected to guide extension 106 at the lower end thereof. Guide extension 106 has rollers 112 that are slidably connected to guide track 93. Seat front portion 81 is pivotally supported by guide extension 102 through support bracket 103. Guide extension 102 has rollers 113 that are slidingly engaged in guide track 101. Seat rear portion 82 has securely attached brackets 118 having rollers 105. Rollers 105 are slidingly engaged in guide track 94. Seat rear portion 82 has bracket 108 near hinge 85. Bracket 108 has roller 114 which rolls on guide track 111 of track bar 107.

[0093] Guide frame 100 has support posts 115 pivotally mounted thereto. Guide pins 110 securely attached to support posts 115 at attachment point 116 at the forward end thereof. Seat rear portion 82 has bracket extensions 117 securely attached thereto. Bracket extensions

117 has cross bar 109 pivotally attached thereto. Cross bar 109 has holes 120 through which pin 110 is slidingly engaged. Compression spring 80 is guided there through by pin 110 and contained between support posts 115 and cross bar 109.

[0094] Upper back portion 84 has armrest support 95 attached thereto. As illustrated, armrest 97 is height adjustably attached to armrest support 95 at slot 96.

[0095] Figs. 27 – 33 describe a fifth embodiment of the forward sliding reclining swivel chair 10E. Similar to the previous embodiment, this embodiment is not motor driven. Except as described below, the recline motions operate in generally the same manner as described in connection with embodiment 10A, but are powered by gravity and the user/occupant while a compression spring (not shown in these illustrations but is applied similar to compression spring 80 in the fourth embodiment) assists the user/occupant in the return stroke back from reclined to upright.

[0096] The chair 10E includes a wheeled base assembly 13 having an upright support post 14 projecting therefrom. The upright support post 14 in turn mounts thereon a guide frame 135 which supports a slidable seat 170 which is pivoted to a reclinable back support 171, for supporting a seated user/occupant. The wheeled base assembly 13 includes a set of swiveling casters 38. Seat 170 has a front 125 and rear 127 portions that are pivotally connected by hinge 126. Back support 171 has upper 128 and lower 129 portions that are pivotally connected by hinge 135. The lower back support portion 129 is pivotally connected to seat rear portion 127 at pivot pins 133.

[0097] The upper back portion 128 is pivotally connected near the bottom thereof to link 130 by pin 131 on upper back portion extension arm 155. Link 130 is pivotally connected to recline link 134 at pin 140 at the lower end thereof. Recline link 134 is pivotally connected at the upper end thereof to lower back bracket 137 at pin 152 and pivotally connected at the lower end thereof to guide frame 135 at pin 139.

[0098] Seat front portion 125 may have a securely attached support bracket 141 extending downwardly therefrom. As shown, support bracket 141 is pivotally connected to guide bar 143 at pin 144. The trajectory of guide bar 143 may be controlled by the positioning and angle of guide block 165 and guide rollers 166. Guide block 165 is mounted to guide frame 135 and may be angularly adjustable with respect to the guide frame to enable changes in trajectory of the guide bar 143. Seat rear portion 127 has securely attached brackets 162 having rollers 151. Rollers 151 are slidingly engaged in guide track 150. Seat rear portion 127 has bracket 142 mounted near hinge 126. Bracket 142 has roller 145 which rolls on guide track bar 146. Guide track bar 146 is pivotally mounted to cross frame 167 at pin 147 and is adjustably supported by knob-screw 148.

[0099] Back support 171 includes frame portions 128, 129 which are illustrated as open in area 132. In use, the back support 171 may be covered by a support fabric or membrane that is secured to frame portions 128, 129 and covering area 132.

[00100] Figs. 34 – 48 describe a sixth embodiment of the forward sliding reclining swivel chair 10F. This embodiment is not motor driven. Except as described below, the recline motions operate in generally the same manner as described in connection with embodiment 10A, but are powered by gravity and the user/occupant while a gas compression spring 280 assists the user/occupant in the return stroke from reclined back to upright.

[00101] As illustrated, chair 10F includes a wheeled base assembly 13 having an upright support post 14 projecting therefrom. Upright support post 14 in turn mounts thereon roller guide frame 235 which supports slidable seat assembly 270 which has pivotally connected thereto a reclinable back support 271, for supporting a seated user/occupant. Support post 14 may include a conventional height adjustable gas spring (not shown) which is height adjustable by actuation of upwardly protruding button 290 at the top end thereof. As shown, bracket 291 is pivotally mounted on roller guide frame 235 at pin 292. Bracket 291

has lever 293 securely attached at the lower end thereof. Bracket 291 has sideward extension 294 located above button 290. The momentary lifting of lever 293 forces button 290 downward which releases an internal valve of the conventional height adjustable gas spring in post 14, which allows post 14 to be changed to the user's desired seat height.

[00102] The upper face of seat assembly 270 may be covered by a layer of foam cushioning and fabric, which is not shown. As in the previously described embodiments, the wheeled base assembly 13 may include a set of swiveling casters 38. Seat 270 has front 225 and rear 227 portions that are pivotally connected by hinge 226. Back support 271 has upper 228 and lower 229 portions that are pivotally connected by hinge 287. The lower back support portion 229 is pivotally connected to seat rear portion 227 at pivot pin 233 on seat support bracket 262.

[00103] Upper back portion 228 is pivotally connected near the lower end thereof to the upper end of a link 230 by pivot pin 231 on extension arm 255 of upper back portion 228. The lower end of link 230 is pivotally connected to link 234 at pin 240. As shown in Fig. 40, link 234 is pivotally connected at the lower end thereof to a bracket 237 of lower back 229 at pin 252 and pivotally connected at the upper end thereof to the rearward end of link 299 at pivot 239. Link 299 is connected to seat support bracket 262 of seat rear portion 227 at pivot 190 at the forward end thereof. Bracket 237 is also pivotally connected to guide bar 248 at pin 218. Guide bar 248 is supported and guided by rollers 246 in roller guide frame 235. Link 230 can be length adjustable when optionally having three parts: upper link 230A, lower link 230B and sleeve link 230C. In the illustrated embodiment, upper link 230A has RH threaded lower end, lower link 230B has LH threaded upper end. Sleeve link 230C has mating RH threaded upper end and a mating LH threaded lower end.

[00104] Seat front portion 225 has securely attached support bracket 241 near the forward end thereof. Support bracket 241 is pivotally connected to guide bar 243 at pin 244.

The trajectory of guide bar 243 is controlled by guide block 265 and guide rollers 266. Seat rear portion 227 has securely attached bracket 262 having roller 251. Roller 251 is slidingly engaged in guide track 250. Guide track 250 may include recess 267 at the rearward end. Pressure from the user's weight pushes seat 271 downward causing roller 251 to engage recess 267 when 271 is in the most rearward location. Seat rear portion 227 has bracket 242 securely attached near the rear underside edge thereof. Guide bar 236 is pivotally mounted to bracket 242 at pin 247. The trajectory of guide bar 236 is controlled by rollers 245 mounted in guide block 265.

[00105] Seat rear portion 227 near the rear underside edge thereof has securely attached bracket 277 having ball pivot 276 at its rearward end. Roller guide frame 235 has securely attached bracket 275 projecting forwardly from the upper side thereof. Bracket 275 has ball pivot 274 attached at the forward end thereof. Gas compression spring 280 is pivotally attached to ball pivot 276 at the rearward end 273 and the forward end 272 is pivotally attached to ball pivot 274.

[00106] Seat rear portion 227 near the sideward edge has armrest mount bracket 269 securely attached and extending outward therefrom. An armrest assembly 268 may securely attach to the armrest bracket 269 and may extend upwardly therefrom. The seat rear portion 227 includes plate 253. Plate 253 includes opening 254 and ledge 256. Ledge 256 supports spring plate 257 for improved cushioning of the user's buttocks.

[00107] Back support 271 includes frame portions 228, 229 which define open area 232. In use, back support 271 may have a support fabric or membrane (not shown) secured to frame portions 228, 229 and covering area 232.

[00108] As shown in Figs. 40 and 42, the back support 271 includes arm 288 pivotally connected to extension 255 at pin 231 and is suspended downwardly therefrom. Arm 288 has bracket 286 slidably/lockably mounted near the lower end thereof. Bracket 286 supports

lumbar pressure pad 289. Bracket 286 has two halves 286A and 286B that clamp arm 288 therebetween by the adjustable clamping force of screw-knob 285 thereby making lumbar pressure pad 289 height adjustable on arm 288.

[00109] Link 234 has mounted thereon spring arm 284 at the lower end thereof. The upper end of spring arm 284 includes elongated slot 283. At the upper end portion of spring arm 284, roller bracket 282 is adjustably mounted thereto. Roller bracket 282 has a threaded hole into which screw-knob 281 is attached by passing through elongated slot 283, clamping spring arm 284 therebetween by the adjustable clamping force of screw-knob 283, thereby making roller bracket 282 height adjustable on spring arm 284. Roller bracket 282 includes roller 278. Roller 278 contacts the rearward face 279 of arm 288.

[00110] Pivots on link 234, lower back 229, link 299 and bracket 262 form a 4-bar linkage that controls the orientation of link 234, which keeps the orientation of link 234 substantially the same, regardless of the recline angle of lower back support 229. Therefore, as lower back 229 reclines, face 279 of arm 288 is forced against roller 278. This action causes spring arm 284 to resist rearward movement at the upper end thereof and forces arm 288 to pivot forward with respect to lower back 229, which carries lumbar pressure pad 289 forward to a greater extent than the forward travel of seat 270, thereby increasing the support pressure on the user's lumbar area. The extent of forward arcing travel of arm 288 is determined by the height that roller 278 contacts face 279.

[00111] During the recline and return-to-upright movements, seat 270 and back support 271 are driven forward and backward respectively by actions initiated by the user. As the back support 271 is reclined, the seat rear portion 227 is caused to move forwardly and also pivot downwardly about an axis defined by the roller 251, and the seat front portion 225 is caused to move forwardly, and also pivot downwardly about the axis of the hinge 226 to

increase the angle between the upper surfaces of the seat front portion 225 and seat rear portion 227.

[00112] More particularly, as the user urges back support 271 to recline, lower back 229 pivots downwardly about axis 233, causing pin 218 and the rearward end of guide bar 248 to pivot downwardly about axis 233, such that the lower back 229 pivots with respect to the seat 270. In an alternative embodiment, the pivoting may occur by structure other than a pivot pin, including a flexible material, a flexible portion of material such as a living hinge, or another type of hinge mechanism. In the illustrated embodiment, the guide bar 248 applies pressure to rollers 246 which steer guide bar 248 in a forward and downward trajectory which causes seat 270 and axis 233 to move forwardly. Forward motion of Seat 270 and axis 233 results from the cam action pressure of guide bar 248 against rollers 246 as lower back 229 arcs downward. As seat 270 moves forwardly it is generally guided by roller 251 (shown in Fig. 44) along track 250 on roller guide frame 235. As seat 270 moves forwardly, the guide bar 236, which is pivotally attached to seat rear portion 227, is carried along and follows a trajectory controlled by rollers 245 in roller guide frame 235. The trajectory of guide bar 236 as it moves through the rollers 245 causes seat rear portion 227 to pivot downwardly about axis 233 as seat 270 moves forwardly. In addition, as seat 270 moves forwardly, guide bar 243, which is pivotally attached to seat front portion 225, is carried along and follows a trajectory controlled by rollers 265 in roller guide frame 235. The trajectory of guide bar 243 as it moves through the rollers 265 causes the seat front portion 225 to pivot downwardly about hinge 226 as seat 270 moves forwardly.

[00113] As lower back 229 reclines, pivoting downwardly about axis 233, upper back 228 pivots about axis 287 to decrease the angle between the forward surfaces of the upper back 228 and lower back 229 respectively. More particularly, since link 234 remains in substantially the same orientation, link 230, which is connected between link 234 and upper

back 228 extension 255, holds upper back 228 in substantially the same orientation throughout its path of travel as it pivots about axis 287 with respect to the reclining lower back 229. Figures 60, 61 illustrate that in similarly functioning embodiments 10F, 10G, 10H and 10J, the axis 287 (or 487) remains substantially horizontally stationary over base 13 as seat 270 and axis 233 move forward. In one embodiment, the initial force required to recline lower back 229 is increased when seat 271 is located fully rearward due to the additional force required to drive roller 251 out of the recess 267 in guide track 250. The extent of recline angle of lower back 229 can be controlled by the distance that the guide bar 248 is allowed to travel. The arcing travel of seat rear portion 227 is controlled by the trajectory of guide bar 236. The arcing travel of seat front portion 225 is controlled by the trajectory of guide bar 243.

[00114] Figs. 49 – 53 describe a seventh embodiment of the forward sliding reclining swivel chair 10G. The basic structure and motions of chair 10G are nearly identical to chair 10F except that the motions are powered by an electric linear actuator 380 that replaces gas spring 280. Roller guide frame 335 includes all the components of roller guide frame 235 except bracket 275 and ball pivot 274 are replaced by bracket 375 and pivot pin 374. Seat rear portion 327 includes all the components of seat rear portion 227 except bracket 277 and ball pivot 276 are replaced by bracket 377 and pivot pin 376. Linear actuator 380 includes body portion 310 and drive rod 396. Body portion 310 includes motor 394 and screw housing 395. Linear actuator 380 is pivotally attached to bracket 377 at pivot pin 376 near the rearward end 397 of screw housing 395 thereof. Drive rod 396 is pivotally attached to bracket 375 at pivot pin 374 at the forward end thereof. The operation of linear actuator 380 is conventional in that, the shaft (not shown) of motor 394 rotates a jackscrew (not shown) within screw housing 395. The rearward end (not shown) of drive rod 396 includes a threaded nut that is engaged with the jackscrew. Jackscrew rotation in one direction extends drive rod

396 outward from body portion 310. Jackscrew rotation in the opposite direction retracts drive rod 396 inwardly into body portion 310.

[00115] Motor 394 is powered by battery 343 which is wire connected through a conventional Forward-off-reverse rocker switch (not shown) that is mounted on armrest support 268 by a flexible cord (not shown). The operation of the power driven recline and return motions of the seventh embodiment 10G are accomplished by the user/occupant actuating the rocker switch on armrest support 268. Switching the rocker switch to "forward" (to recline) rotates motor and jackscrew so that the nut on drive rod 396 is threadingly pulled rearward, retracting drive rod 396. Retracting drive rod 396 pulls body portion 310 forward, seat 270 forward and lower backrest 229 forward and downward, while simultaneously proportionally bending the upward surface of seat 270 and the forward surface of backrest 271. Switching the rocker switch to "reverse" (to return upright) rotates motor and jackscrew so that the nut on drive rod 396 is threadingly pushed forward, extending drive rod 396. Extending drive rod 396 pushes body portion 310 rearward, seat 270 rearward and lower backrest 229 rearward and upward, while simultaneously proportionally straightening the bend in the upper surface of seat 270 and the bend in the forward surface of backrest 271.

[00116] Figs. 54 – 58 describe an eighth embodiment of the forward sliding reclining swivel chair 10H. This embodiment is not motor driven. The recline motions are powered by gravity and the user/occupant while a gas compression spring 480 assists the user/occupant in the return stroke from reclined back to upright.

[00117] Chair 10H includes a wheeled base assembly 13 having an upright support post 14 projecting therefrom which includes a conventional height adjustable gas spring (not shown). Upright support post 14 in turn mounts thereon roller guide frame 435 which supports slidable seat assembly 470 which has pivotally connected thereto reclinable back support 471, for supporting a seated user/occupant.

[00118] The upper face of seat assembly 470 will normally be covered by a layer of foam cushioning and fabric, which is not shown. The wheeled base assembly 13 includes a set of swiveling casters 38. Seat 470 has front 425 and rear 427 portions that are pivotally connected by hinge 426.

[00119] Back support 471 has upper 428 and lower 429 portions that are pivotally connected by hinge pivot 487. Lower back support portion 429 is pivotally connected to seat rear portion 427 at pivot pin 433 on seat support bracket 462 for angular travel between upright and reclined positions. Upper back portion 428 is pivotally connected near the lower end thereof to the upper end of link 430 by pivot pin 431 on extension arm 455 of upper back portion 428. Guide bar 448 includes securely attached bracket 434 at the rearward end thereof. Bracket 434 includes pivot 440 near the upper end thereof. Link 430 is pivotally connected to guide bar 448 at pivot 440 at the lower end thereof. Lower back portion 429 is also pivotally connected to guide bar 448 at pivot 418 for controlling the extent of upright to recline angular travel. Guide bar 448 is supported and guided by rollers 446 in roller guide frame 435.

[00120] Guide bar 448 between pivots 440 and 418, lower back portion 429 between pivots 487 and 418, link 430 between pivots 431 and 440 and upper back 428 between pivots 487 and 431, form a 4-bar linkage that controls the orientation of upper back 428. Due to the straight trajectory of guide bar 448, guided by rollers 446, as disclosed in chair 10H, the orientation of upper back 428 remains substantially the same regardless of the recline angle of lower back support 429.

[00121] Seat front portion 425 has securely attached support bracket 441 near the forward end thereof. Support bracket 441 is pivotally connected to guide bar 443 at pivot 444. The trajectory of guide bar 443 is controlled by guide block 465 and guide rollers 466. Seat rear portion 427 has securely attached bracket 462 and includes securely attached guide roller 451. Guide roller 451 is slidingly engaged in guide track 450. Seat rear portion 427 includes

bracket 442 near the rear underside edge thereof. Guide bar 436 is pivotally attached to bracket 442 at pivot 447. The trajectory of guide bar 436 is supported and controlled by rollers 445 mounted in guide block 465.

[00122] Seat rear portion 427 near the rear underside edge thereof includes bracket 477 having ball pivot 476 at its rearward end. Roller guide frame 435 includes bracket 475 projecting forwardly from the upper side thereof. Bracket 475 has ball pivot 474 attached at the forward end thereof. Gas compression spring 480 is pivotally attached to ball pivot 476 at the rearward end 473 and the forward end 472 is pivotally attached to ball pivot 474.

[00123] Seat rear portion 427 near the sideward edge includes armrest mount bracket 469 extending outward therefrom. Armrest bracket 469 has securely and height-adjustably attached armrest assembly 468 extending upwardly therefrom.

[00124] Back support 471 includes frame portions 428 and 429 which defines area 432 therebetween. In use, back support 471 will have a support fabric or membrane (not shown) secured to frame portions 428, 429 and covering area 432.

[00125] Lower back portion 429 has arm 488 pivotally attached at pivot 453 and projecting upwardly therefrom. Arm 488 has bracket 486 mounted near the upper end thereof. Bracket 486 supports lumbar pressure pad 489.

[00126] Spring arm 484 is securely mounted on bracket 434 of guide bar 448 at the lower end thereof. Roller mount bracket 482 is mounted near the upper end of spring arm 484. Roller 478 is pivotally attached to roller mount bracket 482. Roller 478 contacts the rearward face 479 of arm 488.

[00127] As lower back 429 reclines, face 479 of arm 488 is forced against roller 478. This action causes spring arm 484 to resist reward movement at the upper end thereof and forces arm 488 to pivot forward with respect to seat 470, which carries lumbar pressure pad 489 forward to a greater extent than the forward travel of seat 470, thereby increasing the

support pressure on the user's lumbar area. The extent of forward arcing travel of arm 488 is determined by the initial location (height) that roller 478 contacts face 479.

[00128] During the recline and return-to-upright strokes, seat 470 and back support 471 are driven forward and backward respectively. The forward travel results from the cam action pressure of guide bar 448 against rollers 446 as lower back 429 arcs downward. The extent of recline angle of lower back 429 is controlled by the distance guide bar 448 is allowed to travel. The arcing travel of seat rear portion 427 is controlled by the trajectory of guide bar 436. The arcing travel of seat front portion 425 is controlled by the trajectory of guide bar 443.

[00129] Figs. 59 – 61 describe a ninth embodiment of the forward sliding reclining swivel chair 10J. This embodiment is identical to embodiment 10F (Figs. 34-48) with the addition of a headrest support 215 extending upwardly from upper portion 228 of back support 271. In both Figs. 60 and 61, vertical phantom line 217 aligns with pivot 233 and vertical phantom line 216 aligns with pivot 287 indicating the horizontal locations of pivots 233 and 287 with respect to base 13 in full upright (fig. 60) and fully reclined (fig. 61).

[00130] The seat forward movement distance for the above embodiments ranges from 10-inches for chair 10A to 6-inches for chair 10F. The best forward movement range is five to seven inches. To maintain user viewing distance, the best performance for any of the above embodiments is achieved when the seat back upper portion does not move significantly rearward as the seat moves forward.

[00131] The above description is that of current embodiments of the invention. Various alterations and changes can be made without departing from the spirit and broader aspects of the invention as defined in the appended claims, which are to be interpreted in accordance with the principles of patent law including the doctrine of equivalents. This

disclosure is presented for illustrative purposes and should not be interpreted as an exhaustive description of all embodiments of the invention or to limit the scope of the claims to the specific elements illustrated or described in connection with these embodiments. For example, and without limitation, any individual element(s) of the described invention may be replaced by alternative elements that provide substantially similar functionality or otherwise provide adequate operation. This includes, for example, presently known alternative elements, such as those that might be currently known to one skilled in the art, and alternative elements that may be developed in the future, such as those that one skilled in the art might, upon development, recognize as an alternative. Further, the disclosed embodiments include a plurality of features that are described in concert and that might cooperatively provide a collection of benefits. The present invention is not limited to only those embodiments that include all of these features or that provide all of the stated benefits, except to the extent otherwise expressly set forth in the issued claims. Any reference to claim elements in the singular, for example, using the articles “a,” “an,” “the” or “said,” is not to be construed as limiting the element to the singular.

What is claimed is:

1. A chair for supporting a seated user on a floor surface while the seated user is performing tasks, comprising:

a base;

a seat configured for forwardly guided movement with respect to said base, said seat including front and rear portions connected by a central flexible region enabling said seat front portion to flex with respect to said seat rear portion, each of said seat front portion and said seat rear portion including an upward face; and

a backrest pivotally connected to said seat at a first pivot axis such that said backrest can pivot with respect to said seat between upright and reclining positions, wherein movement of said backrest from said upright position to said reclining position causes both of said seat and said first pivot axis to move forward with respect to said base, and causes said seat front portion to flex with respect to said seat rear portion at said central flexible region, wherein the angle between said upward faces of said seat front portion and said seat rear portion increases.

2. A chair according to claim 1 wherein said forwardly guided movement of said seat and said angular increase between said upward faces of said seat front portion and said seat rear portion are proportional to said backrest rotation.

3. A chair according to claim 2 wherein said backrest includes a lumbar support pad mounted thereon and wherein said lumbar support pad is caused to move relative to said backrest in a direction toward the seated occupant's lower back as said backrest rotates from said upright position to said reclining position.

4. A chair according to claim 2 wherein said backrest has upper and lower portions connected by a flexible region therebetween, such that said upper portion can flex with respect to said lower portion at said flexible region, each of said upper and lower portions including a

forwardly facing surface; wherein the angle between said forwardly facing surfaces of said upper and lower portions decreases as said backrest rotates from upright to reclining positions.

5. A chair according to claim 3 wherein said backrest has upper and lower portions connected by a flexible region therebetween, such that said upper portion can flex with respect to said lower portion at said flexible region, each of said upper and lower portions including a forwardly facing surface, wherein the angle between said forwardly facing support surfaces of said upper and lower portions decreases as said backrest lower portion rotates from upright to reclining positions.

6. A chair according to claim 5 wherein said backrest upper portion includes a generally upwardly extending headrest support structure and wherein said headrest support structure maintains its orientation relative to said base as said backrest lower portion rotates from upright to reclining positions.

7. A chair according to claim 1 wherein said seat rear portion includes at least one upwardly extending armrest structure extending therefrom.

8. A chair according to claim 5 wherein said backrest upper portion includes at least one forwardly extending armrest structure extending therefrom.

9. A chair according to claim 2 wherein the movement of said backrest with respect to said seat from said reclining position to said upright position, movement of the pivot axis rearwardly, and decrease in the angle between said upward faces of said seat portion are spring assisted.

10. A chair according to claim 2 wherein the movement of said backrest with respect to said seat from said reclining position to said upright position, movement of the pivot axis rearwardly, and decrease in the angle between said upward faces of said seat portion are driven by an electric motor.

11. A chair comprising:

a base;

a seat mounted on said base for movement with respect to said base, said seat having front and rear portions including substantially planar upwardly facing surfaces, said front and rear portions connected by a first flexible region enabling said seat front portion to flex with respect to said seat rear portion at said first flexible region; and

a backrest, said back rest having upper and lower portions including substantially planar forwardly facing surfaces, said upper and lower portions connected by a second flexible region enabling said upper portion to flex with respect to said lower portion at said second flexible region, wherein said backrest is pivotally mounted to said chair at a first horizontal pivot axis for movement between upright and reclining positions, wherein the angle between said upwardly facing surfaces of said seat front portion and said seat rear portion increases as said backrest is pivoted to said reclining position about said first pivot axis, and wherein said seat moves forward with respect to said base as said backrest is pivoted to said reclining position.

12. A chair according to claim 11 wherein the angle between said forwardly facing surfaces of the upper and lower portions of said backrest decreases as said backrest is moved to said reclining position.

13. A chair according to either of claims 11 or 12 wherein said chair includes a lumbar pressure arm and said backrest includes a lumbar support having a surface for supporting said seated user's lower back area, said lumbar support being mounted on a support arm, said support arm pivotally mounted to said backrest at a second pivot axis; said lumbar pressure arm mounted to said chair and configured to engage said lumbar support arm as said backrest rotates from said upright position to said reclining position, wherein the rotation of said backrest to said reclining position moves said pressure arm into engagement with said support arm, which moves said support arm and said lumbar support towards a seated user's

lower back and consequently increases the engagement force of said lumbar support against said user's back.

14. A chair according to claim 13 wherein said movement between upright and reclining positions is powered by an electric motor.

15. A chair including a base assembly for supporting the chair on a floor surface while a seated user is performing tasks comprising:

a seat; and

a backrest, said backrest pivotally connected to said seat at a first horizontal pivot axis for movement of said backrest with respect to said seat between upright and reclining positions, wherein said seat is configured for progressive forwardly guided movement with respect to said base as said backrest reclines, said backrest including upper and lower portions connected by a flexible region therebetween, each of said upper and lower portions including a forwardly facing user support surface; wherein the angle between said forwardly facing user support surfaces of said upper and lower portions progressively decreases as said backrest rotates from said upright position to said reclining position.

16. A chair according to claim 15 wherein said flexible region does not move significantly rearward as said backrest is moved from said upright to said reclining position, and as said seat moves forward with respect to said base.

17. A chair according to claim 15 wherein said upper portion includes a generally upwardly extending headrest support structure and wherein said headrest support structure maintains its orientation relative to said upper portion as said backrest lower portion rotates from upright to reclining positions.

18. A chair comprising:

a base assembly for supporting the chair on a floor surface while a seated user is performing tasks;

a seat comprising a front portion and a rear portion that are pivotally connected therebetween at a first transverse horizontal pivot axis, wherein said seat rear portion is pivotally connected to said base at a second horizontal transverse pivot axis, said second pivot axis being located near a rear edge of said seat rear portion, wherein said second pivot axis is slidably guidingly supported on said base for generally horizontal movement along a first guide track, wherein a front portion of said seat front portion is pivotally connected to said base at a third transverse horizontal pivot axis wherein said third axis is guided on said base for generally forward and downward movement along a second guide track, said first transverse horizontal pivot axis being guided for generally forward movement by a third guide track;

a back support having a lumbar support area, said back support pivotally mounted to said seat rear portion at a forth transverse horizontal pivot axis located near a lower end thereof for pivotal movement with respect to said seat about said forth axis between upright and reclined positions;

a first linkage arm having one end pivotally mounted to said back support at a fifth transverse horizontal pivot axis, said fifth axis being located proximate said lumbar support area of said back support and wherein the other end of said first linkage arm is pivotally mounted to said base about a sixth transverse horizontal pivot axis, wherein said seat front and rear portions each include an upper surface, wherein said upper surfaces of said seat front and rear portions are substantially planar when said back support is in said upright position and wherein the angle between said upper surface of said seat front portion and said upper surface of said seat rear portion increases proportionally with respect to an increase of a recline angle of said back support, and wherein said fourth pivot axis moves forward with respect to said base assembly as said back portion recline angle increases.

19. A chair according to claim 18 wherein said base assembly is mounted on a floor supported base, said base assembly capable of swiveling about a first vertical axis with respect to said floor supported base.

20. A chair according to claim 18 wherein said back support includes an upper portion and a lower portion that are pivotally connected therebetween by a seventh transverse horizontal pivot axis, said seventh axis being located between said fifth axis and the upper end of said back support.

21. A chair according to claim 20 wherein an upper portion recline angle, defined between said upper portion of said back support and said lower portion of said back support, is controlled by a 4-bar linkage arrangement interconnected by 4-pivot axis so that said upper portion recline angle is different from a back support lower portion recline angle, defined between said seat and said back support lower portion, when said back support is reclined.

22. A chair according to claim 21 wherein said upper portion recline angle is less than said back support lower portion recline angle (with respect to vertical) when said back support is reclined.

23. A chair according to claim 22 wherein one bar of said 4-bar linkage arrangement is formed from a portion of said first linkage arm and one pivot axis of said 4-bar linkage is formed from said fifth axis.

24. A chair comprising:

a base assembly for supporting the chair on a floor surface while a seated user is performing tasks;

a seat supported on said base assembly;

a back support pivotally mounted to the chair at a first transverse horizontal pivot axis located near a lower end thereof for pivotal movement about said first axis between upright

and reclined positions, wherein said first pivot axis moves forward with respect to said base assembly as said back support reclines;

a lumbar support having a surface for supporting said seated user's lower back area, said lumbar support being mounted on a support arm, said support arm being pivotally mounted to said chair at a second pivot axis; and

a pressure arm mounted to said chair, wherein said pressure arm is configured to move to apply proportionally increasing force against said support arm as said chair back support pivots from said upright position towards said reclined position when the lumbar support is engaged with the user's back.

25. A chair comprising:

a base assembly for supporting the chair on a floor surface while a seated user is performing tasks;

a seat having a front portion and a rear portion, wherein said seat is slidably guidingly supported on said base for generally horizontal forward and rearward movement with respect to said base along a first guide track;

a back support pivotally mounted to said seat at a first transverse horizontal pivot axis for pivotal movement between upright and reclined positions;

a lumbar support having a surface for supporting said seated user's lower back area, said lumbar support being mounted on a support arm, said support arm pivotally mounted to said back support at a second transverse horizontal pivot axis; and

a pressure arm mounted to said chair wherein said pressure arm is configured to move to apply proportionally increasing force against said lumbar support arm as said back support rotates from said upright position towards said reclined position.

26. A chair comprising:

a base assembly for supporting the chair on a floor surface while a seated user is performing tasks;

a seat having a front portion and a rear portion, wherein said seat is mounted to said base;

a back support having an upper portion and a lower portion that are pivotally connected therebetween at a first transverse horizontal pivot axis, said lower portion including a lumbar support area and said upper portion including an upper back support area defining a region generally aligned with and supporting the seated users' shoulder blades and the area therebetween, said first pivot axis located between said lumbar support area of the lower portion and said upper back support area of said upper portion, wherein said lower portion is pivotally mounted to said chair about a second transverse horizontal pivot axis for pivotal movement between upright and reclined positions, wherein said upper portion includes a third horizontal transverse axis horizontally spaced from said first pivot axis and pivotally connected to a first link arm near the upper end thereof, wherein said lower back support structure, said upper portion and said first link arm are 3-links of a 4-bar linkage and wherein said 4-bar linkage controls the angle of recline of said upper portion as said lower portion reclines.

27. A chair comprising:

a base assembly for supporting the chair on a floor surface while a seated user is performing tasks;

a seat including a front portion and a rear portion, wherein said seat is guidingly supported on said base for generally horizontal forward and rearward movement along a first guide track;

a back support pivotally mounted to said seat at a first transverse horizontal pivot axis for pivotal movement between upright and reclined positions, wherein said back support includes an upper portion and a lower portion that are pivotally connected therebetween at a second transverse horizontal pivot axis, said lower portion including a lumbar support area and said upper portion including an upper back support area defining a region generally aligned with and supporting said seated users' shoulder blades and the area therebetween, said first pivot axis located between said lumbar support area of the lower portion and said upper back support area of said upper portion and wherein said lower portion is pivotally mounted to said chair at a second transverse horizontal pivot axis near the lower end thereof for pivotal movement between upright and reclined positions, wherein said upper portion includes a third horizontal transverse axis located horizontally distant from said first pivot axis and pivotally connected to a first link arm near the upper end thereof, wherein said lower back support structure, said upper portion and said first link arm are 3-links of a 4-bar linkage and wherein said 4-bar linkage controls the angle of recline of the upper portion as said lower portion reclines.

28. A chair according to claim 27 or 28 wherein the recline angle of said upper portion, defined between said upper portion of said back support and said lower portion of said back support, is different from the recline angle of said lower portion, defined between said seat and said back support lower portion, when said back support is reclined.

29. A chair according to claim 28 whereby the length of said first link arm is adjustable

30. A chair according to claim 29 wherein said upper portion includes a generally upwardly extending headrest support structure that is substantially rigidly mounted to said upper portion so that said headrest support structure maintains its orientation relative to said upper portion as said lower portion is reclined.

31. A chair including a base assembly for supporting the chair on a floor surface while a seated user is performing tasks comprising:

a seat; and

a backrest pivotally connected to said seat at a first horizontal pivot axis for movement between upright and reclining positions, said seat configured for progressive forwardly guided movement with respect to said base as said backrest reclines, wherein the trajectory of movement of said seat with respect to said base is controlled by track followers on guide tracks, wherein said seat includes at least one track follower guided by a guide track included on said base and at least one guide track guided by a track follower included on said base.

32. A chair comprising:

a base assembly for supporting the chair on a floor surface while a seated user is performing tasks;

a seat comprising a front portion and a rear portion that are pivotally connected therebetween at a first transverse horizontal pivot axis, said seat front portion pivoted to said base at a second transverse horizontal pivot axis, wherein said second axis is guided on said base for generally forward and rearward movement along a first guide track; said rear portion of said seat pivoted to said base by a third transverse horizontal pivot axis, wherein said third axis is guided on said base for generally forward movement along a second guide track; said seat is pivoted to said base by a fourth horizontal transverse pivot axis, said fourth pivot axis being located generally between said second and third pivot axis, wherein said fourth pivot axis is guidingly supported on said base for generally horizontal movement along a third guide track;

a back support pivotally mounted to said seat about a fifth transverse horizontal pivot axis for pivotal movement about said fifth axis between upright and reclined positions, said

back support including a sixth transverse horizontal pivot axis, said sixth axis spaced from said fifth axis and wherein said sixth axis is slidably guided on said base on a fourth guide track so that the trajectory of said sixth axis controls the extent of the pivotal recline motion of said back support about said fifth axis.

33. A chair according to claim 32 wherein said base assembly is mounted on a floor supported base, said base assembly capable of swiveling about a first vertical axis with respect to said floor supported base.

34. A chair according to claim 32 wherein said back support includes an upper portion and a lower portion that are pivotally connected therebetween by a seventh transverse horizontal pivot axis, said seventh axis being located between said fifth axis and the upper end of said back support.

35. A chair according to claim 34 wherein the recline angle of said upper portion of said back support with respect to said lower portion of said back support is controlled by a 4-bar linkage arrangement so that said back support upper portion recline angle is different from the recline angle of said back support lower portion with respect to said seat when said back support is reclined.

36. A chair according to claim 35 wherein the recline angle of said back support upper portion is less than the recline-angle of said back support lower portion (with respect to vertical) when said back support is reclined.

37. A chair comprising:

a base;

a seat mounted on said base, said seat having front and rear portions including substantially planar upwardly facing surfaces, said front and rear portions connected by a first flexible region enabling said seat front portion to flex with respect to said seat rear portion at said first flexible region; and

a backrest, said backrest having upper and lower portions including substantially planar forwardly facing surfaces, said upper and lower portions connected by a second flexible region enabling said upper portion to flex with respect to said lower portion at said second flexible region, wherein said backrest is pivotally mounted to said chair at a first horizontal pivot axis for movement between upright and reclining positions, wherein the angle between said upwardly facing surfaces of said seat front portion and said seat rear portion increases as said backrest is pivoted to said reclining position about said first pivot axis, and wherein the angle between said forwardly facing surfaces of the upper and lower portions of said backrest decreases as said backrest is moved to said reclining position.

38. A chair according to claim 37 wherein said chair includes a lumbar pressure arm and said backrest includes a lumbar support having a surface for supporting said seated user's lower back area, said lumbar support being mounted on a support arm, said support arm pivotally mounted to said backrest at a second pivot axis; said lumbar pressure arm mounted to said chair and configured to engage said lumbar support arm as said backrest rotates from said upright position to said reclining position, wherein the rotation of said backrest to said reclining position moves said pressure arm into engagement with said support arm, which moves said support arm and said lumbar support towards a seated user's lower back and consequently increases the engagement force of said lumbar support against said user's back.

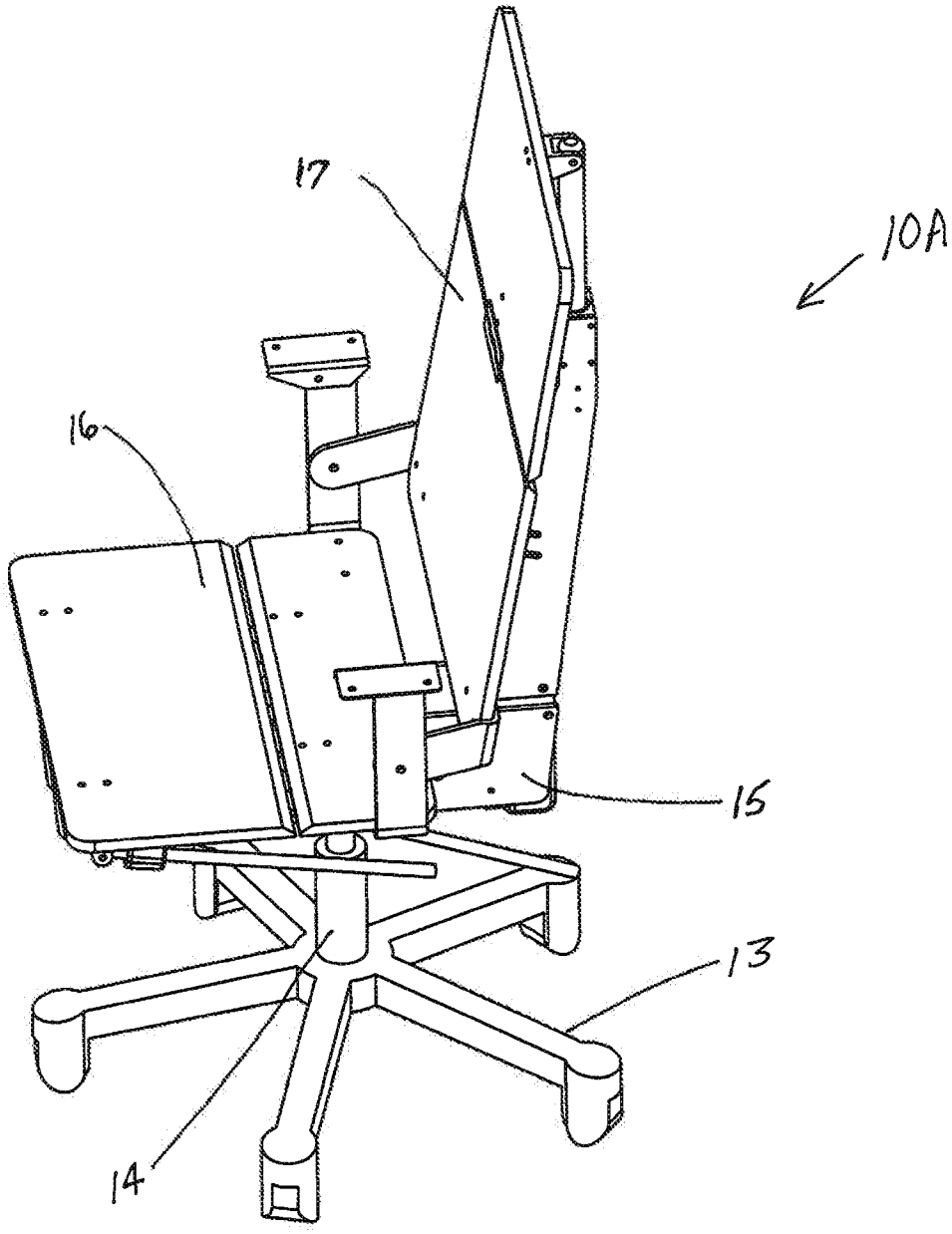


FIG. 1

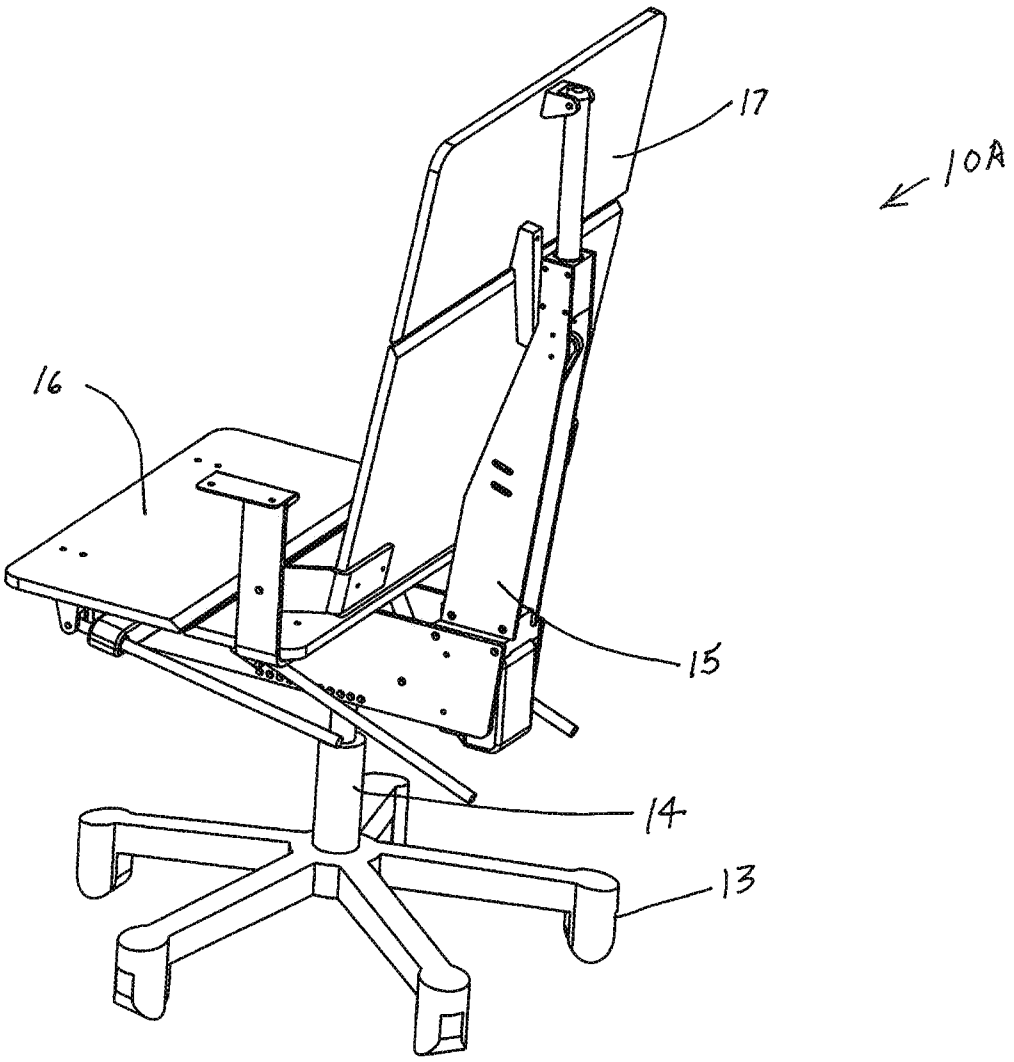


FIG. 2

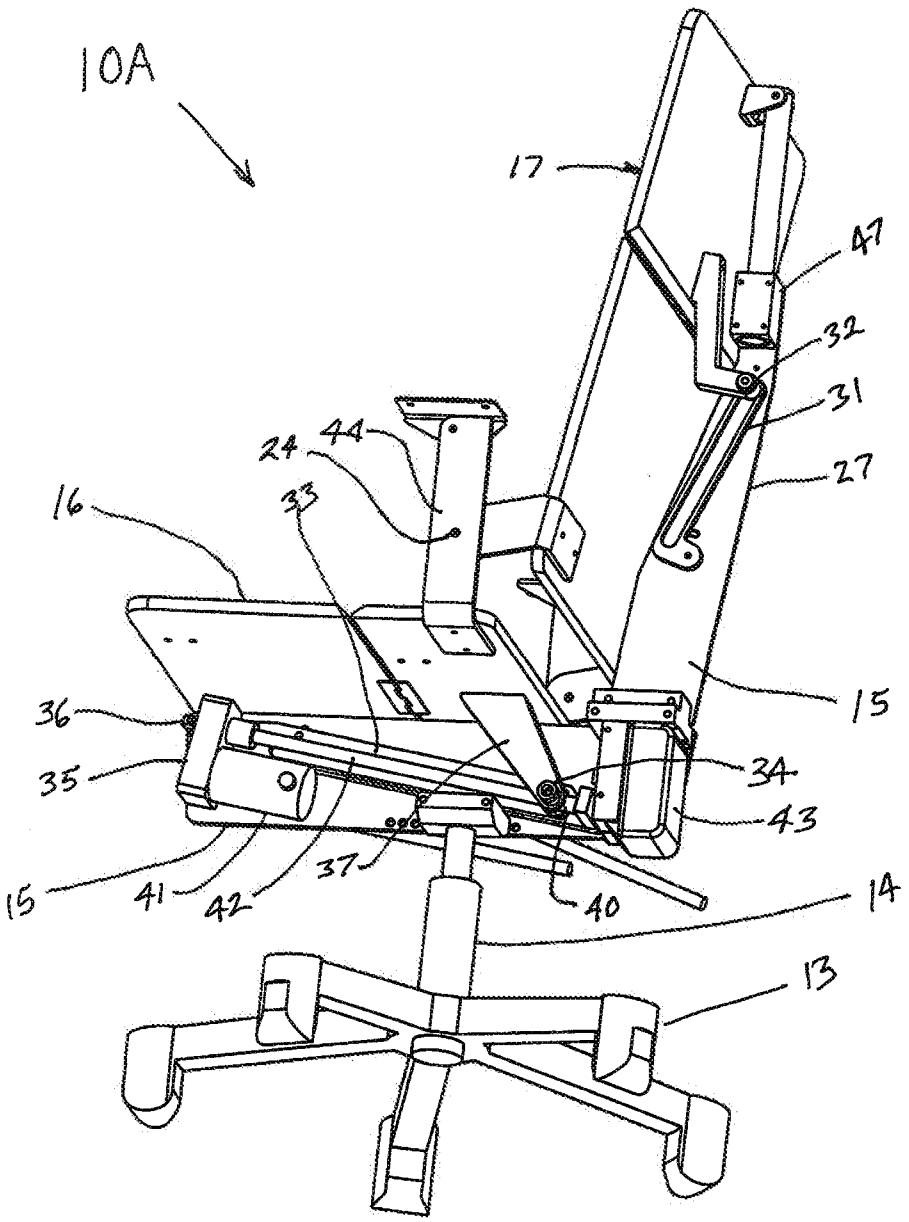


FIG. 3

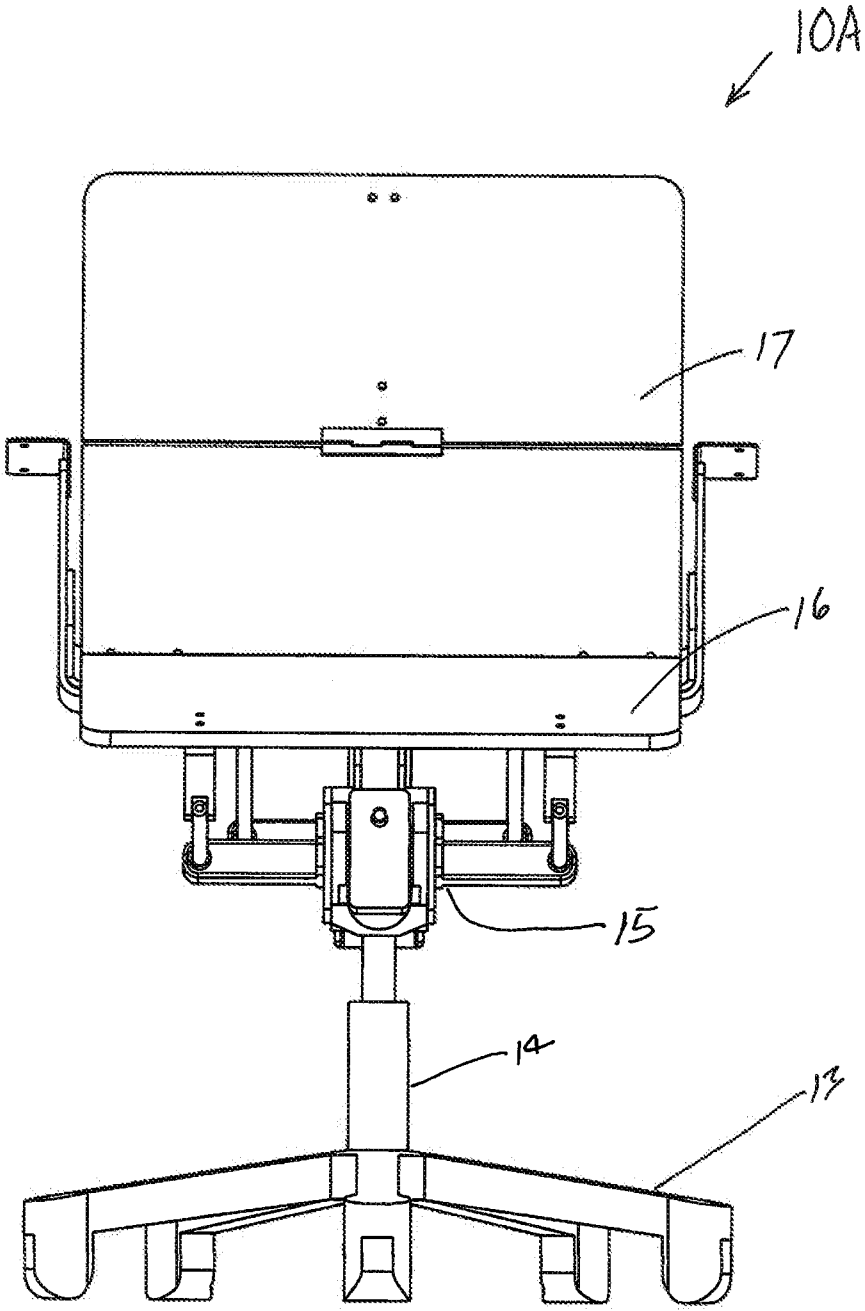


FIG. 4

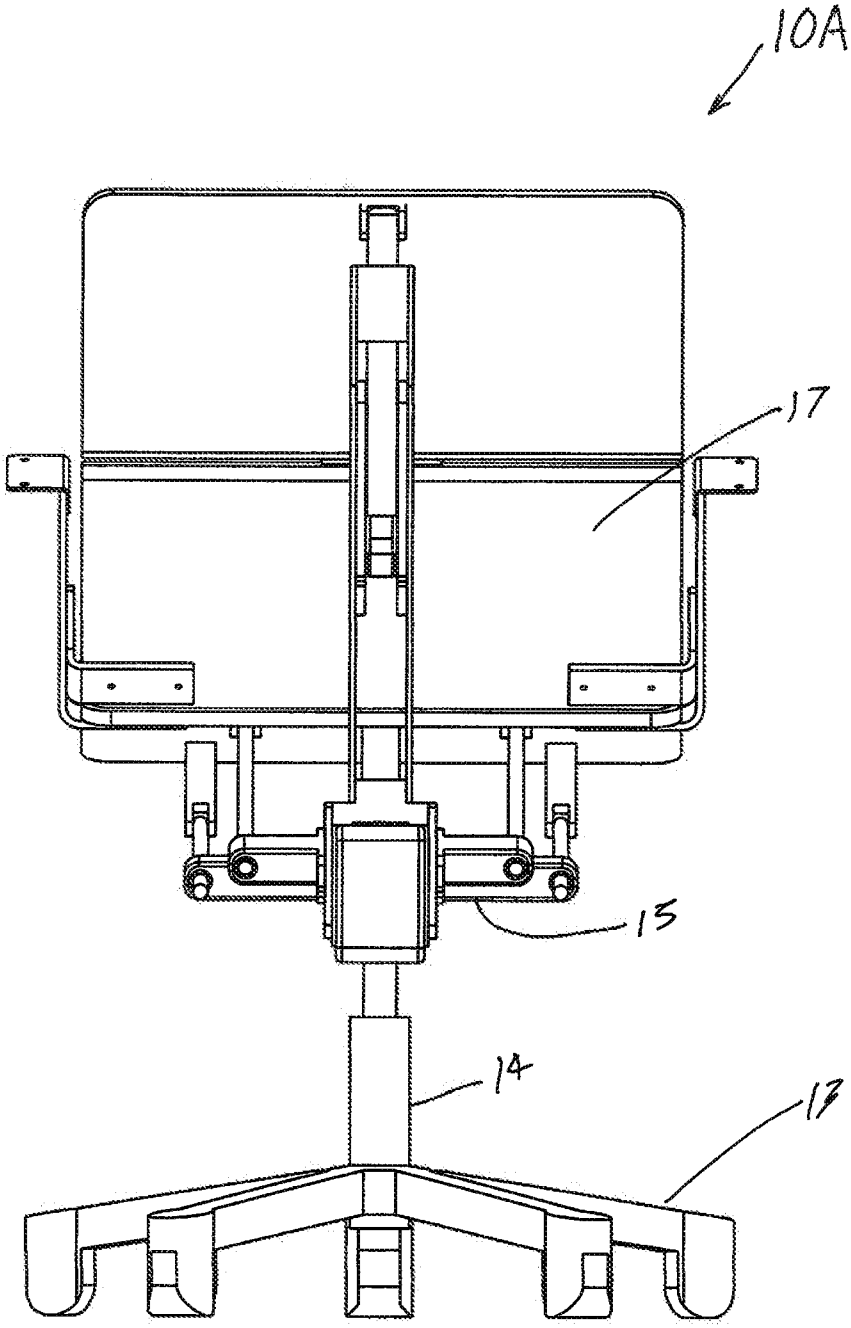


FIG. 5

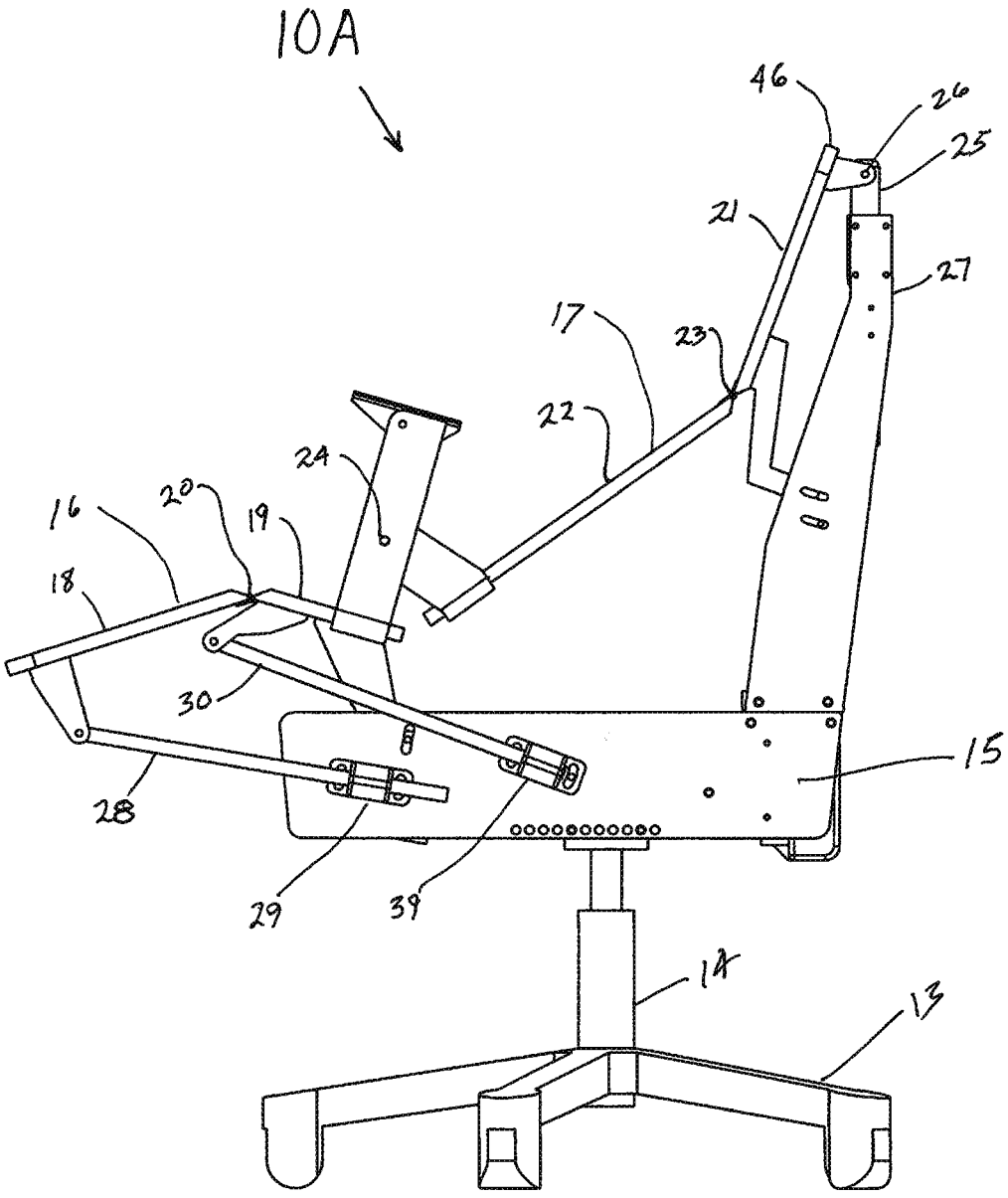


FIG. 6

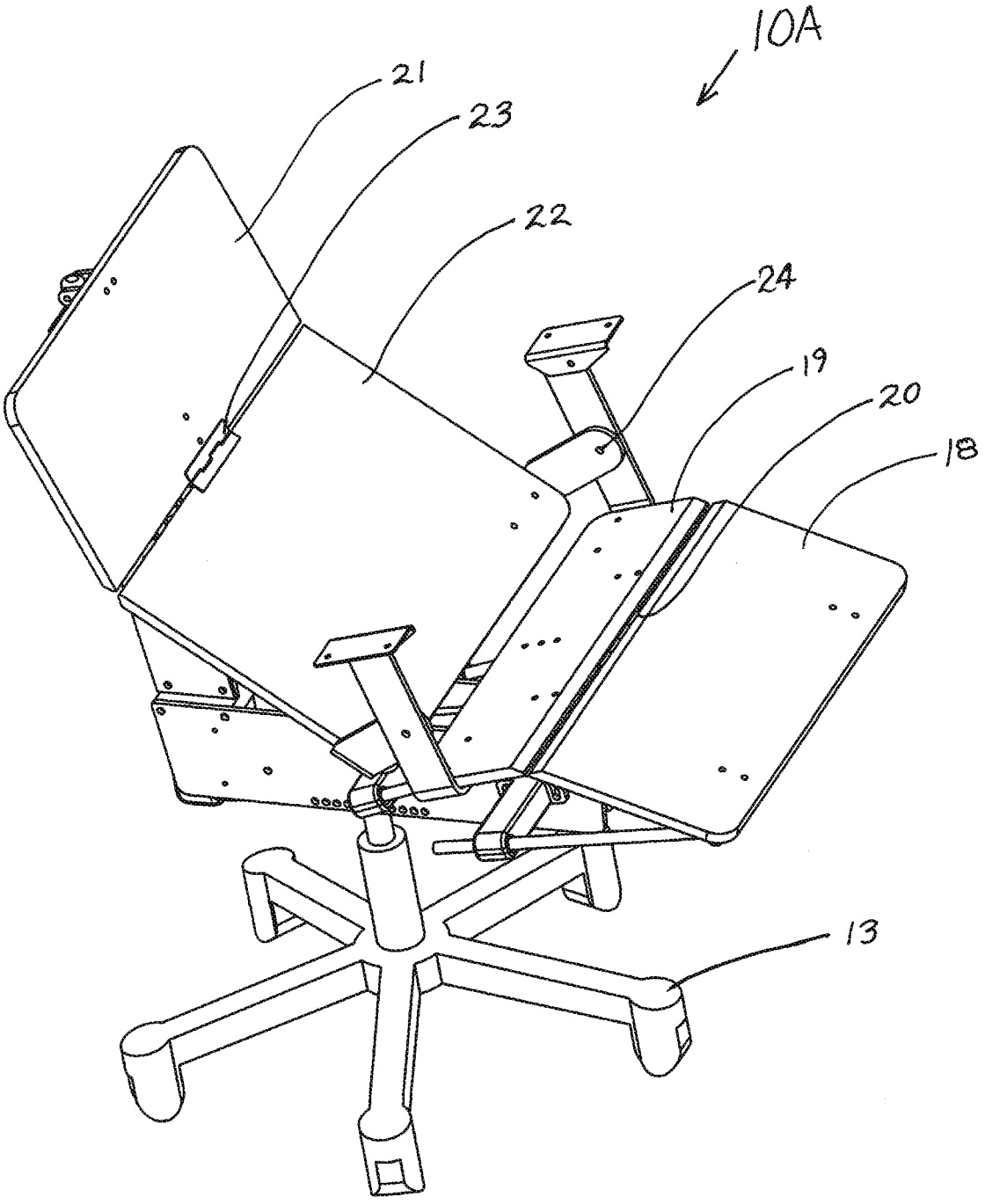


FIG. 7

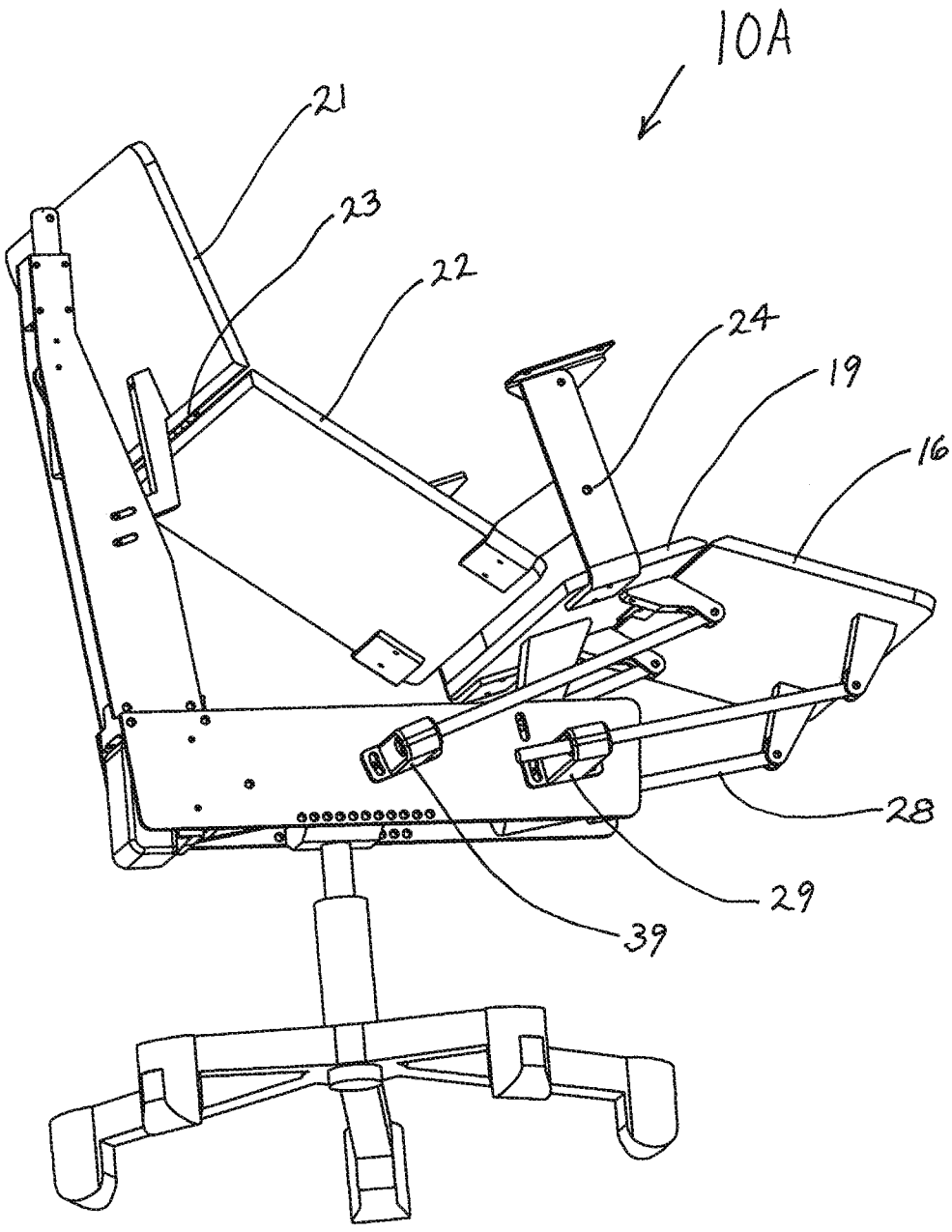


FIG. 8

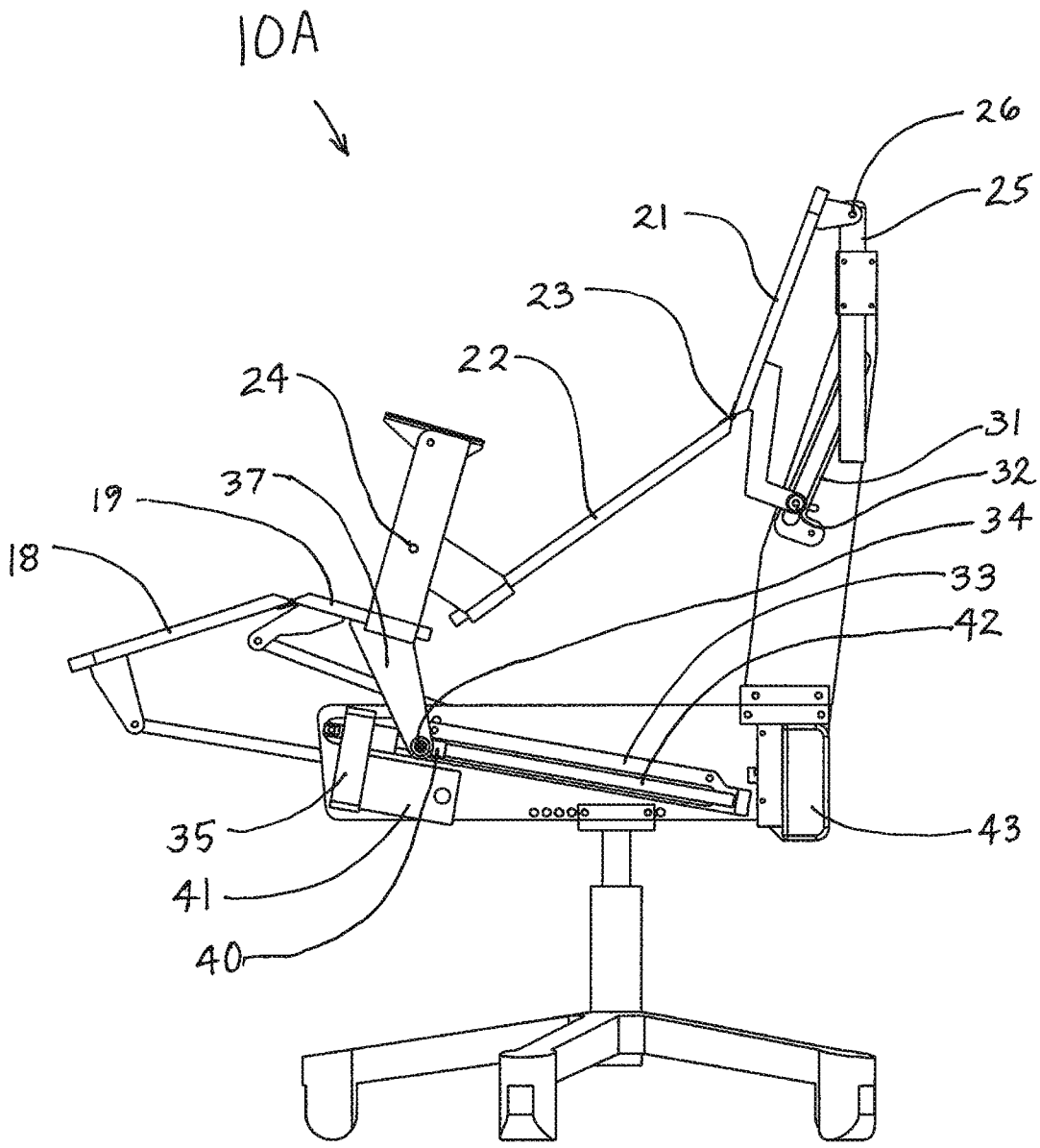


FIG. 9

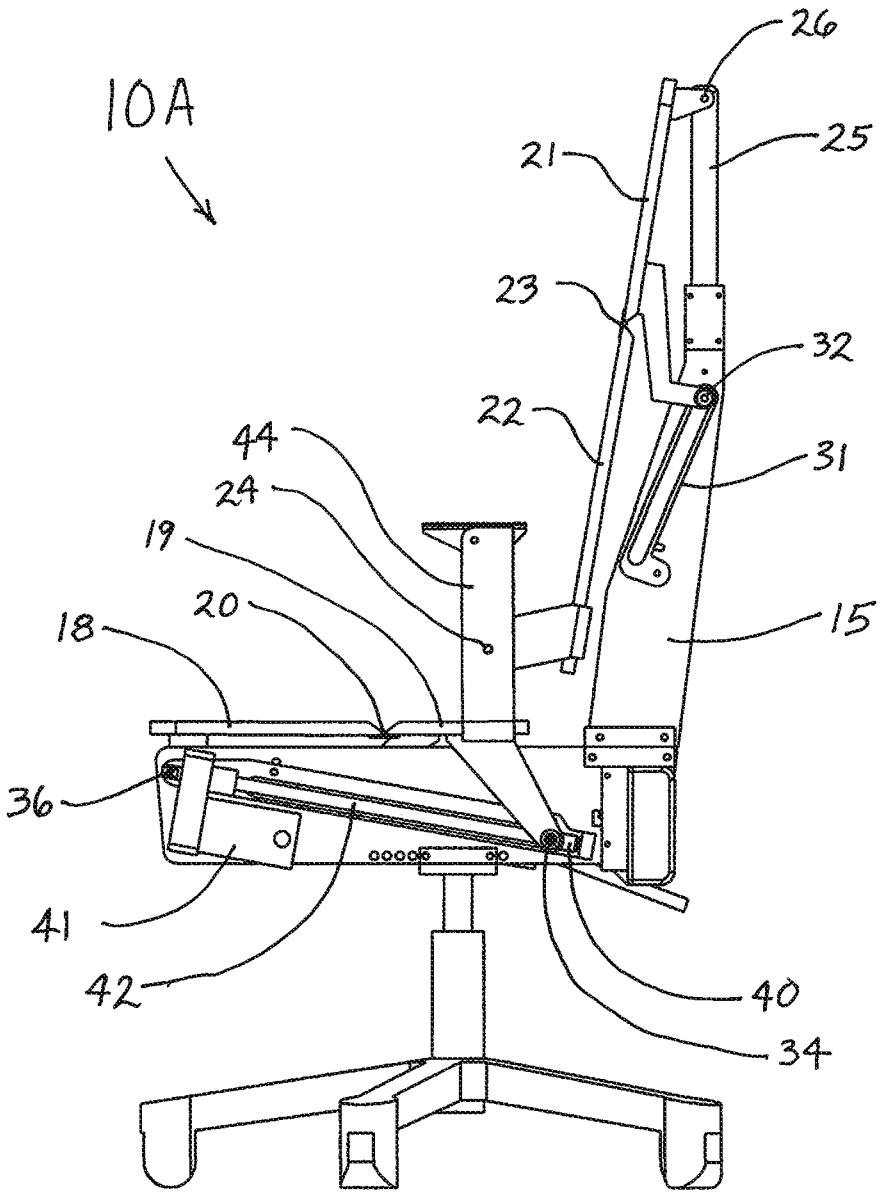


FIG. 10

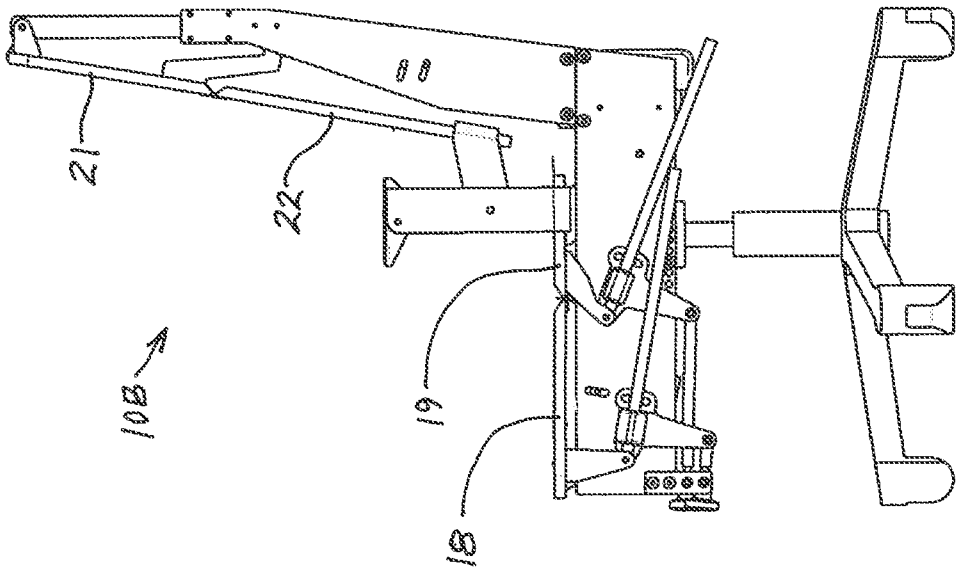
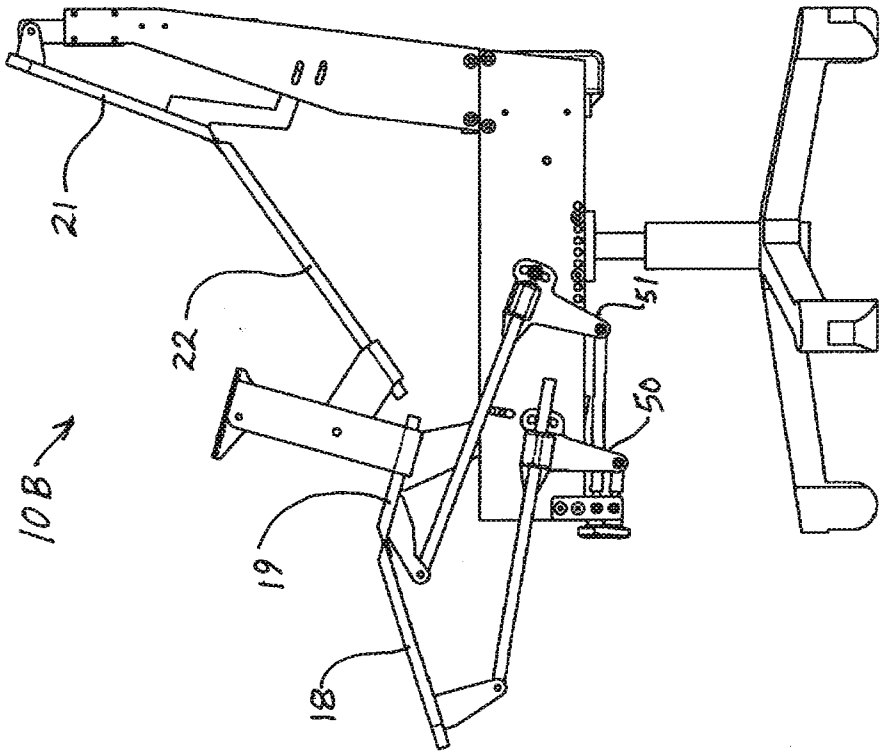


FIG. 12



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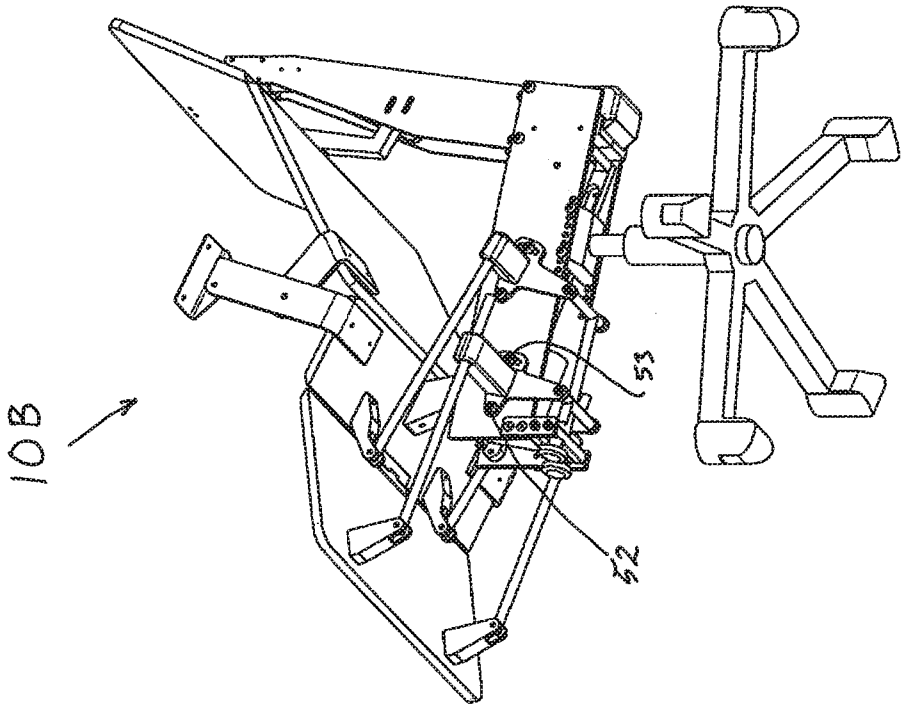


FIG. 14

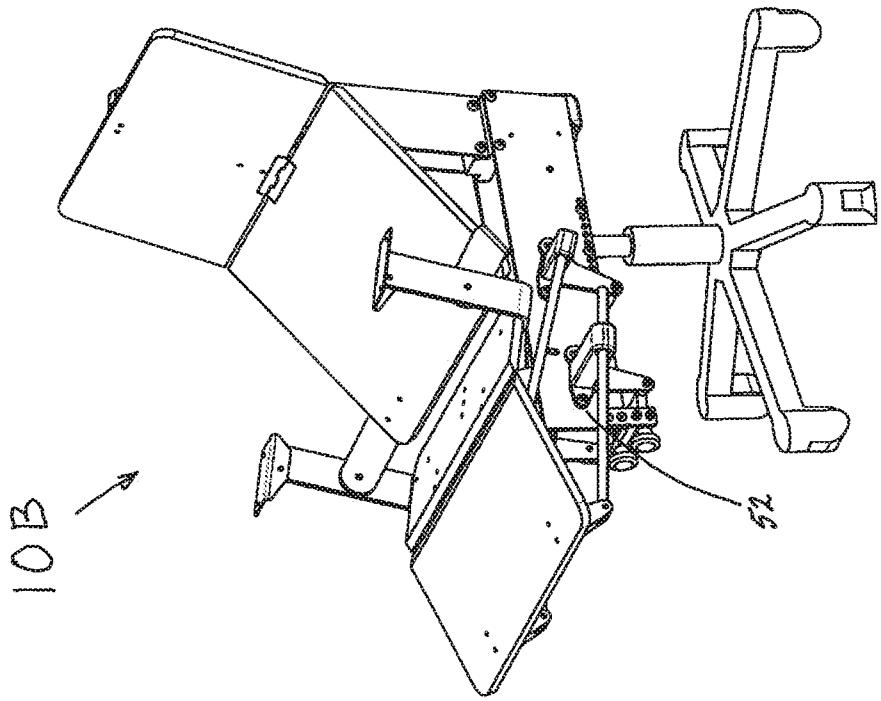


FIG. 13

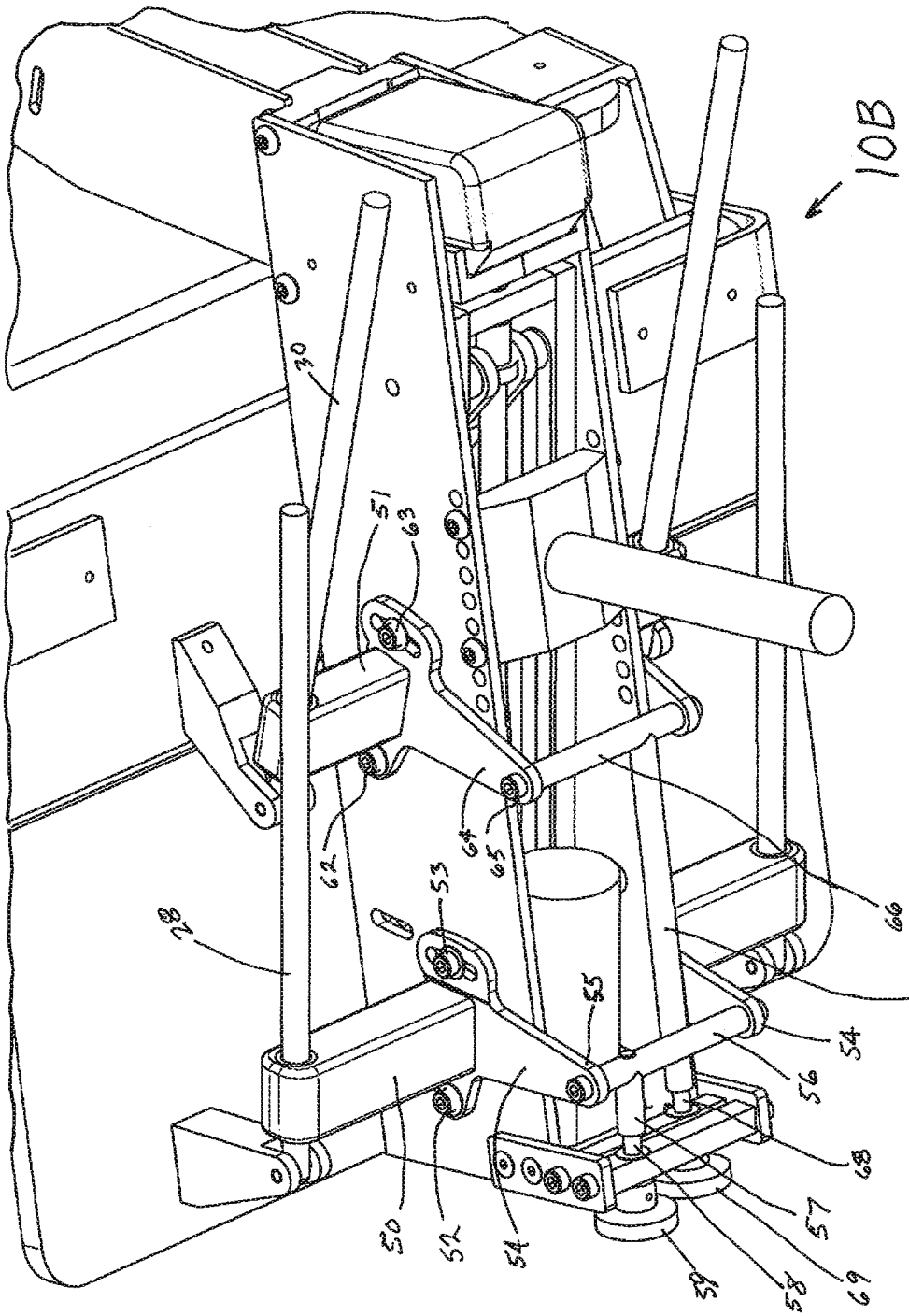


FIG. 15

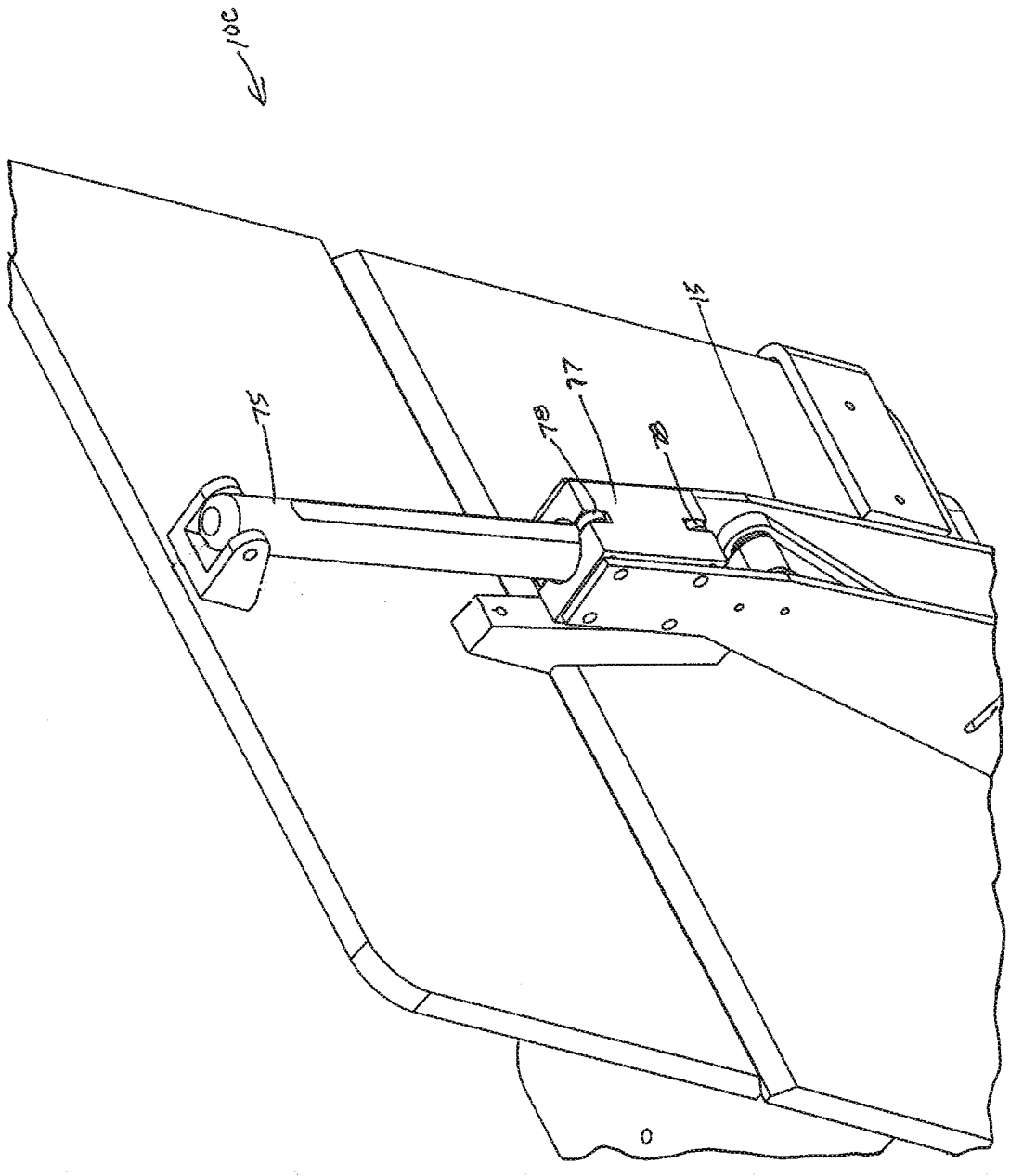


FIG. 16

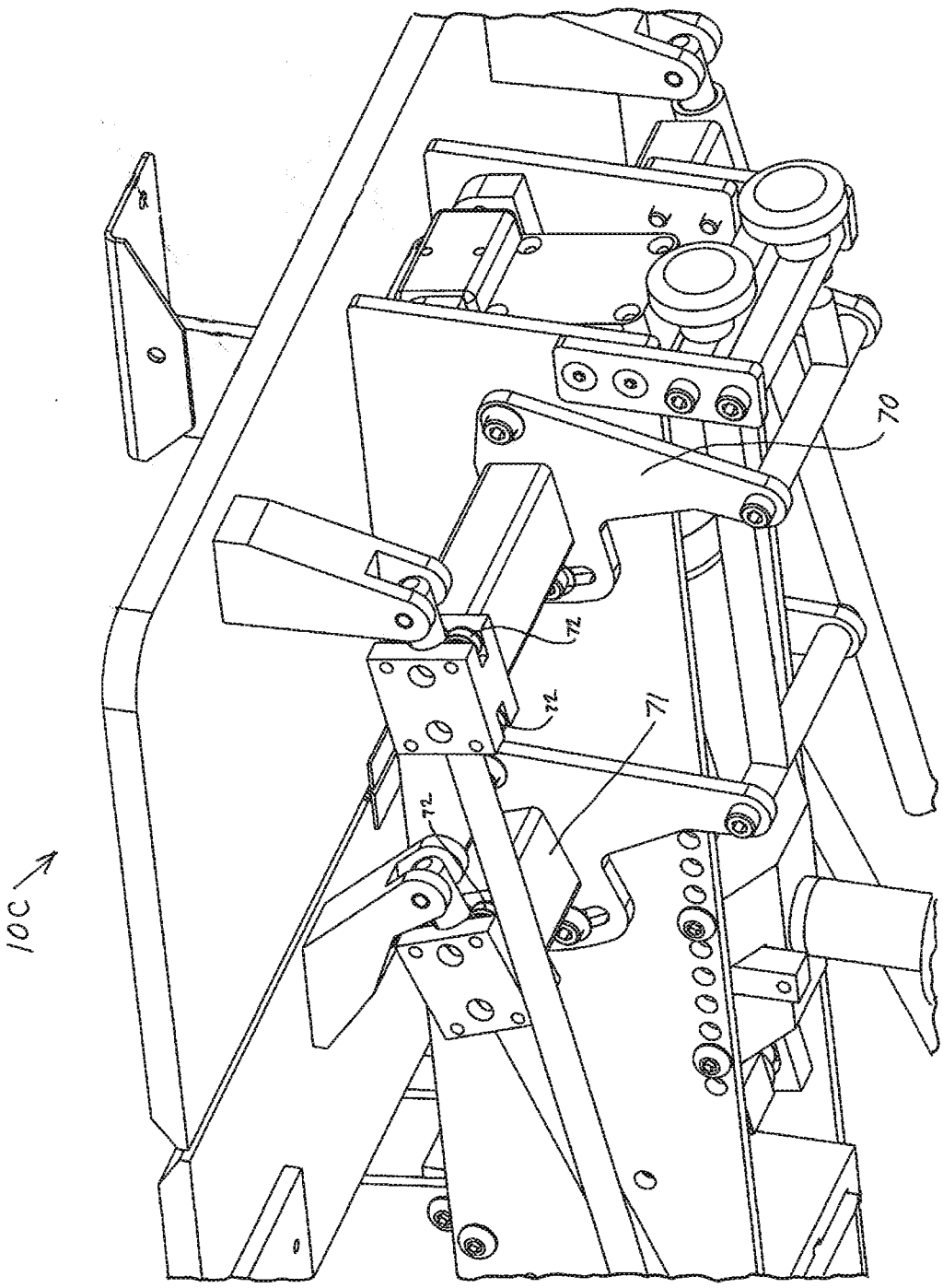
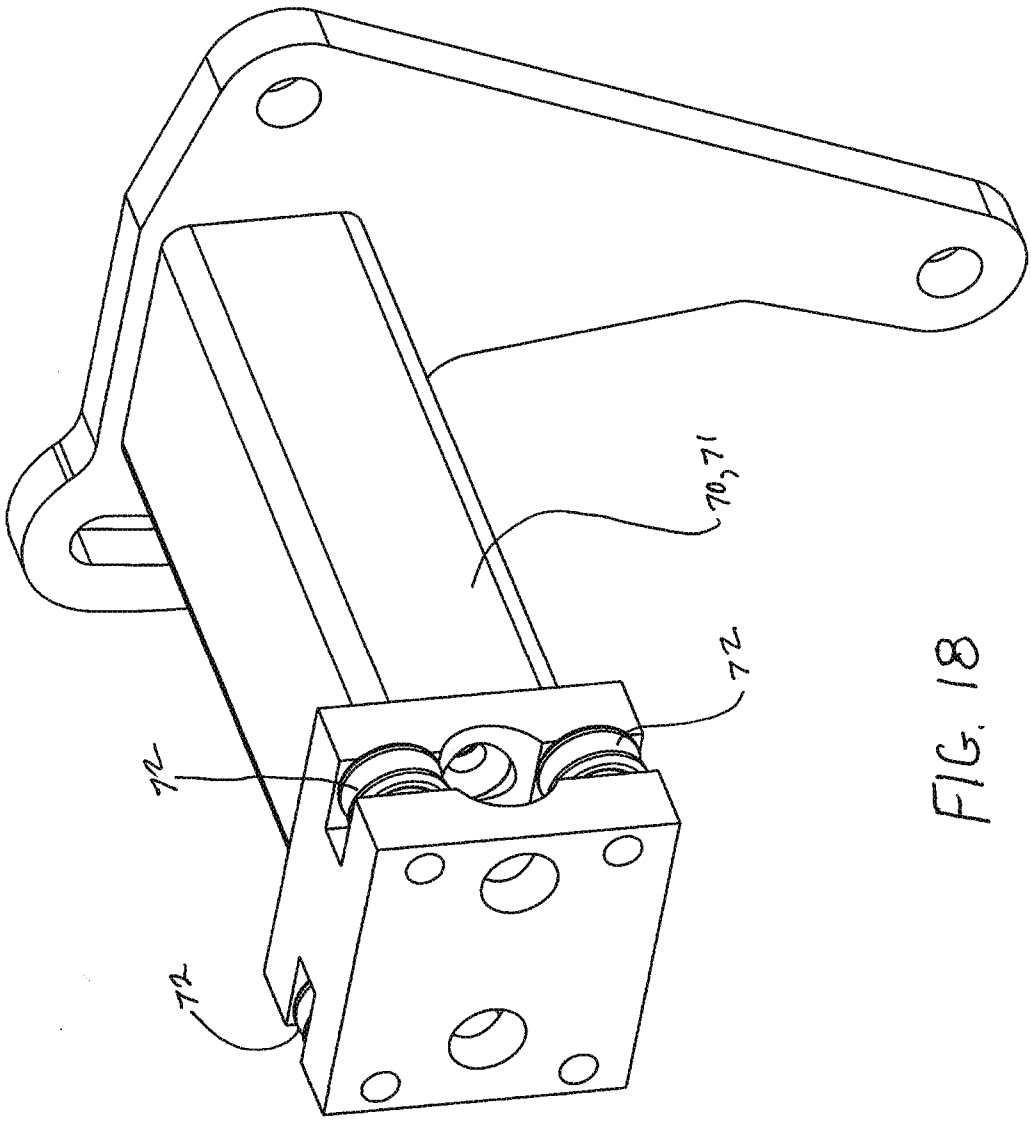


FIG. 17



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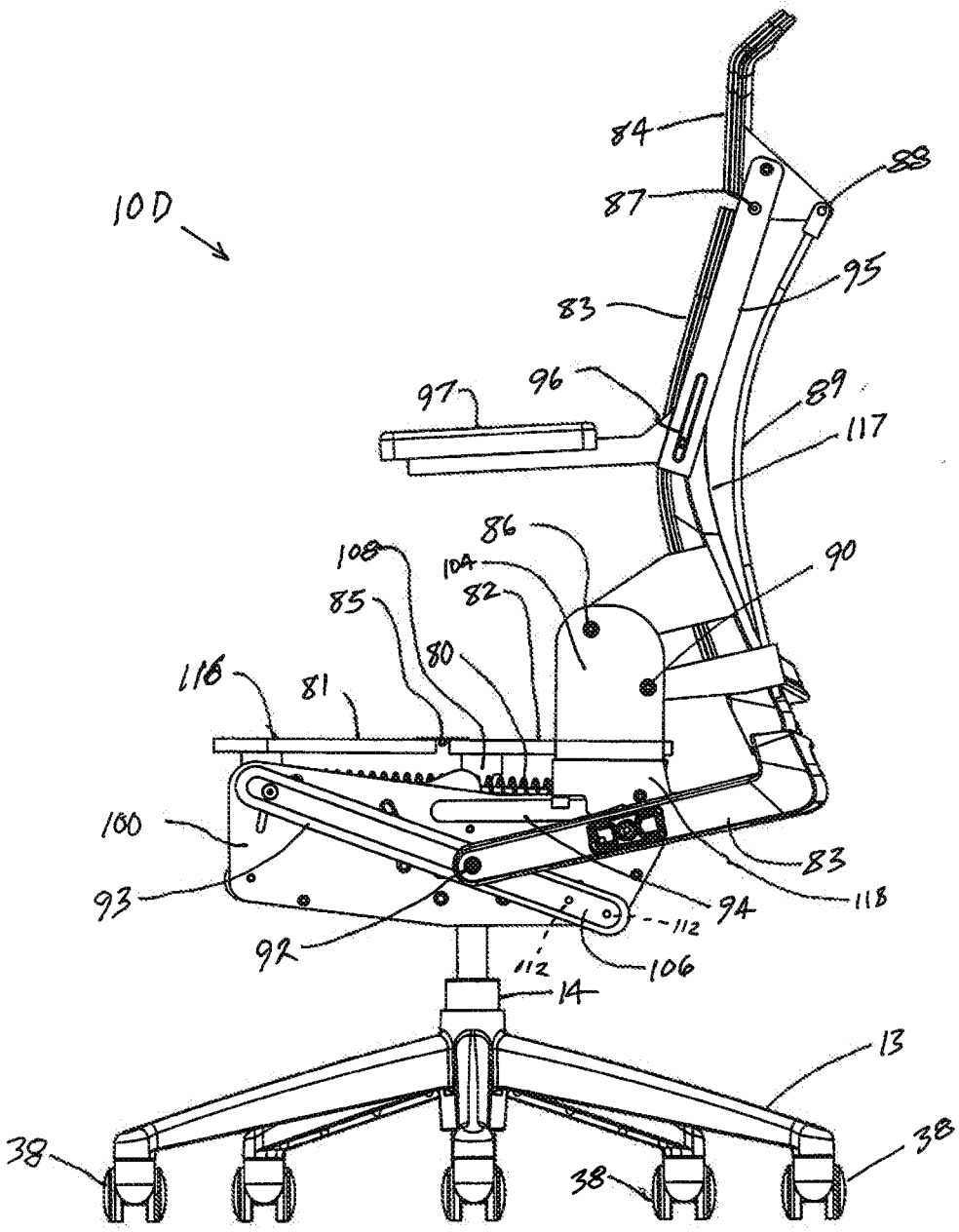
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FIG. 19

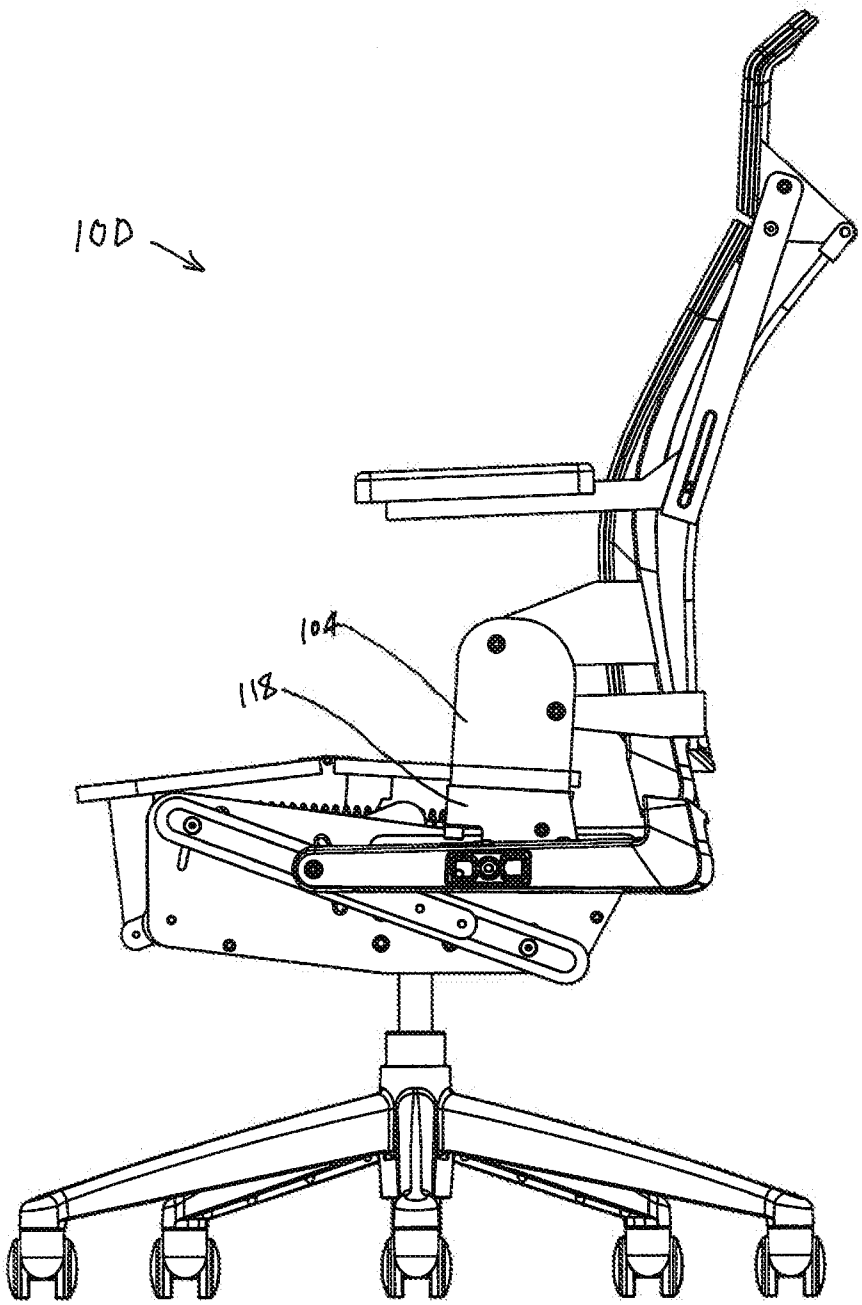

FIG. 20

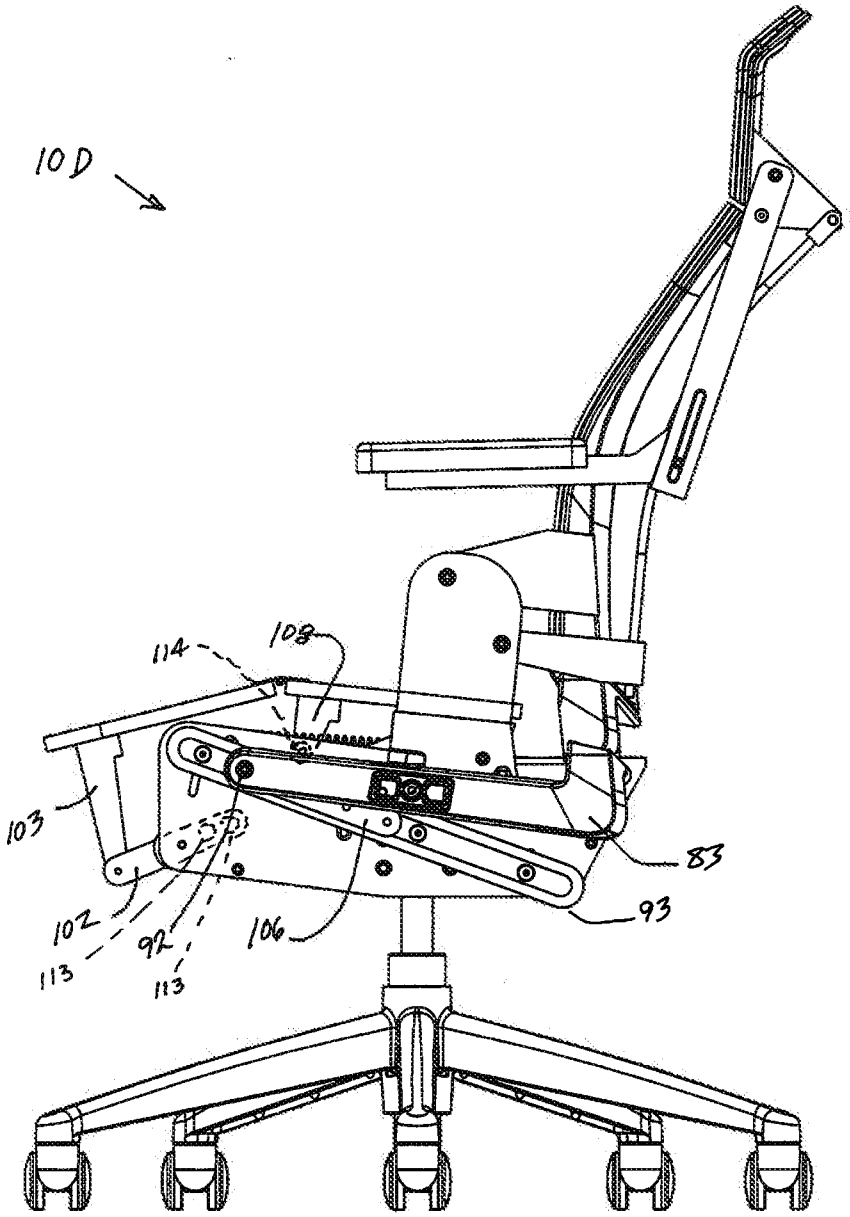

FIG. 21

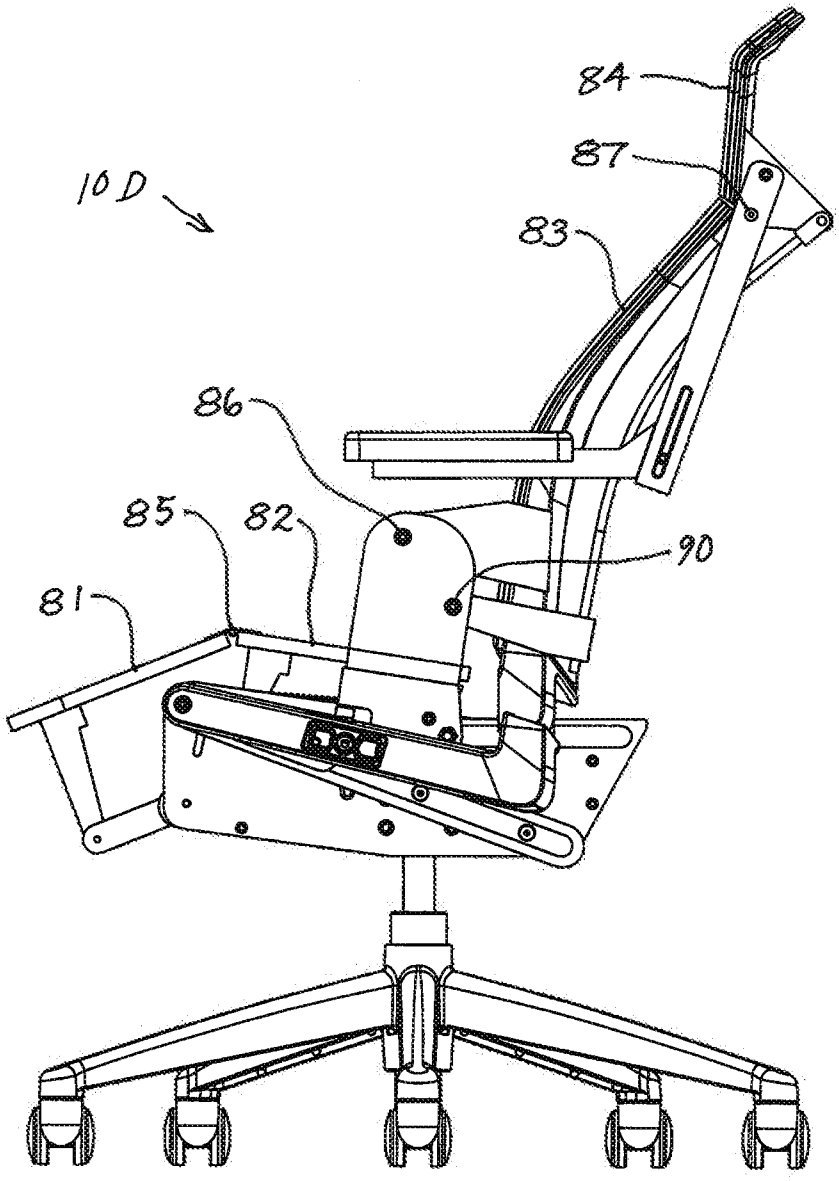

FIG. 22

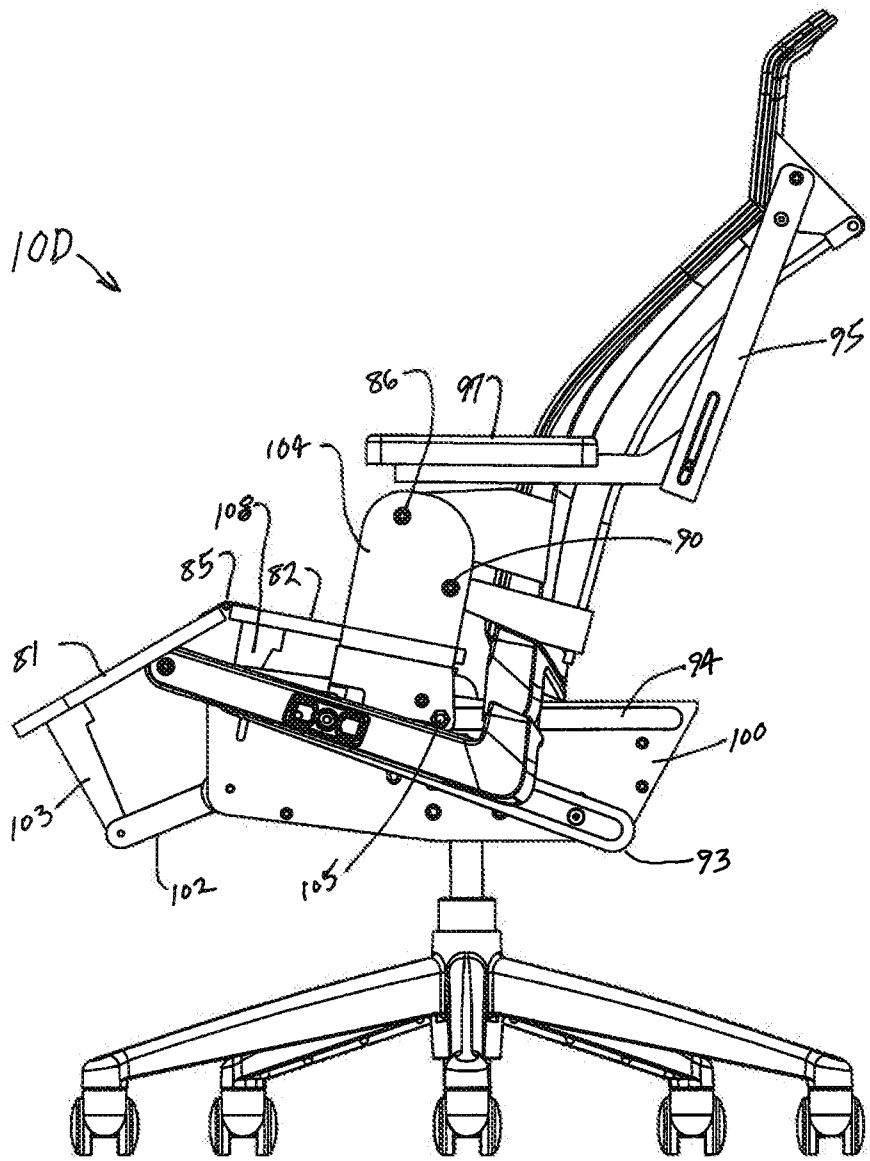

FIG. 23

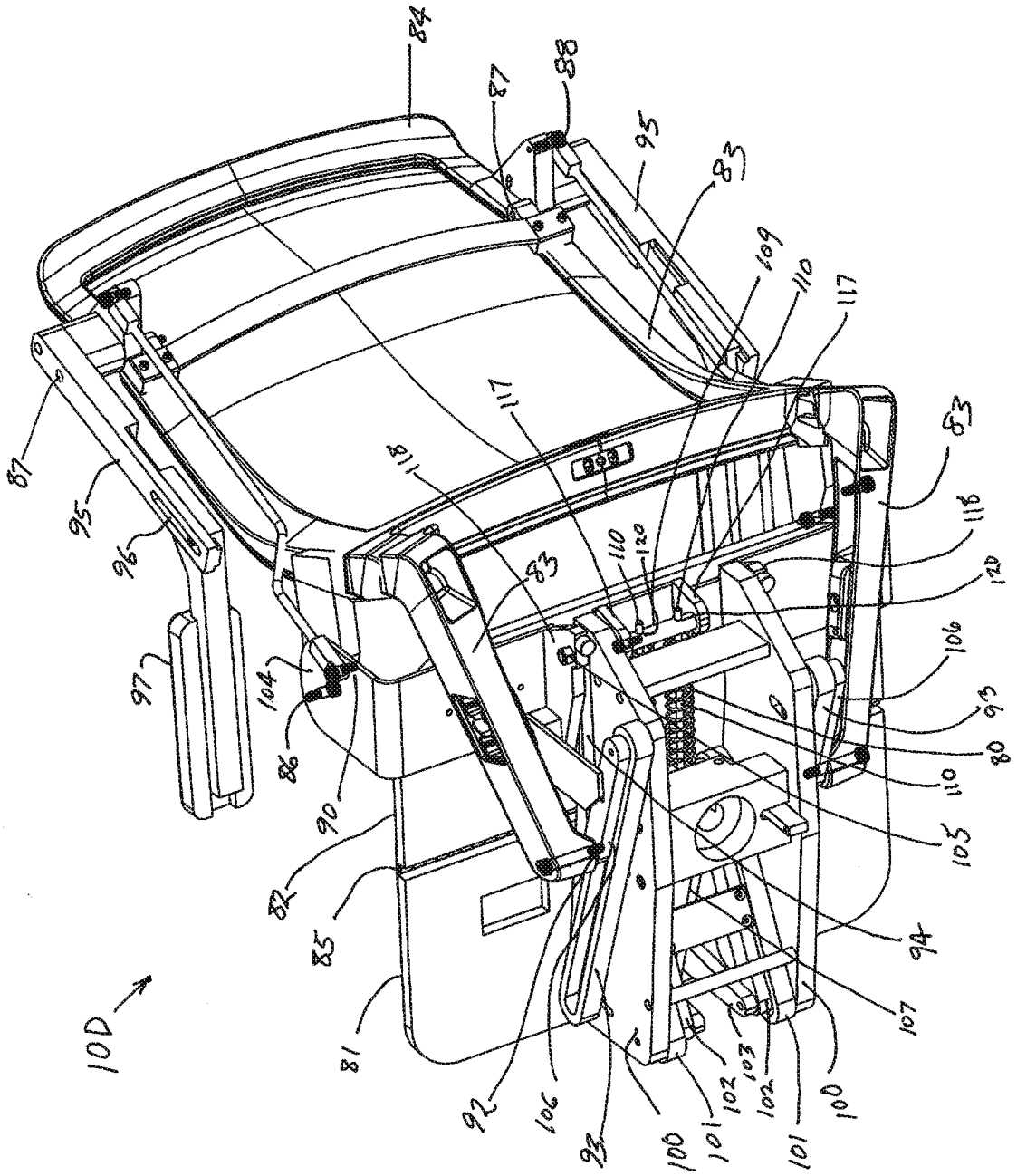
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FIG. 24

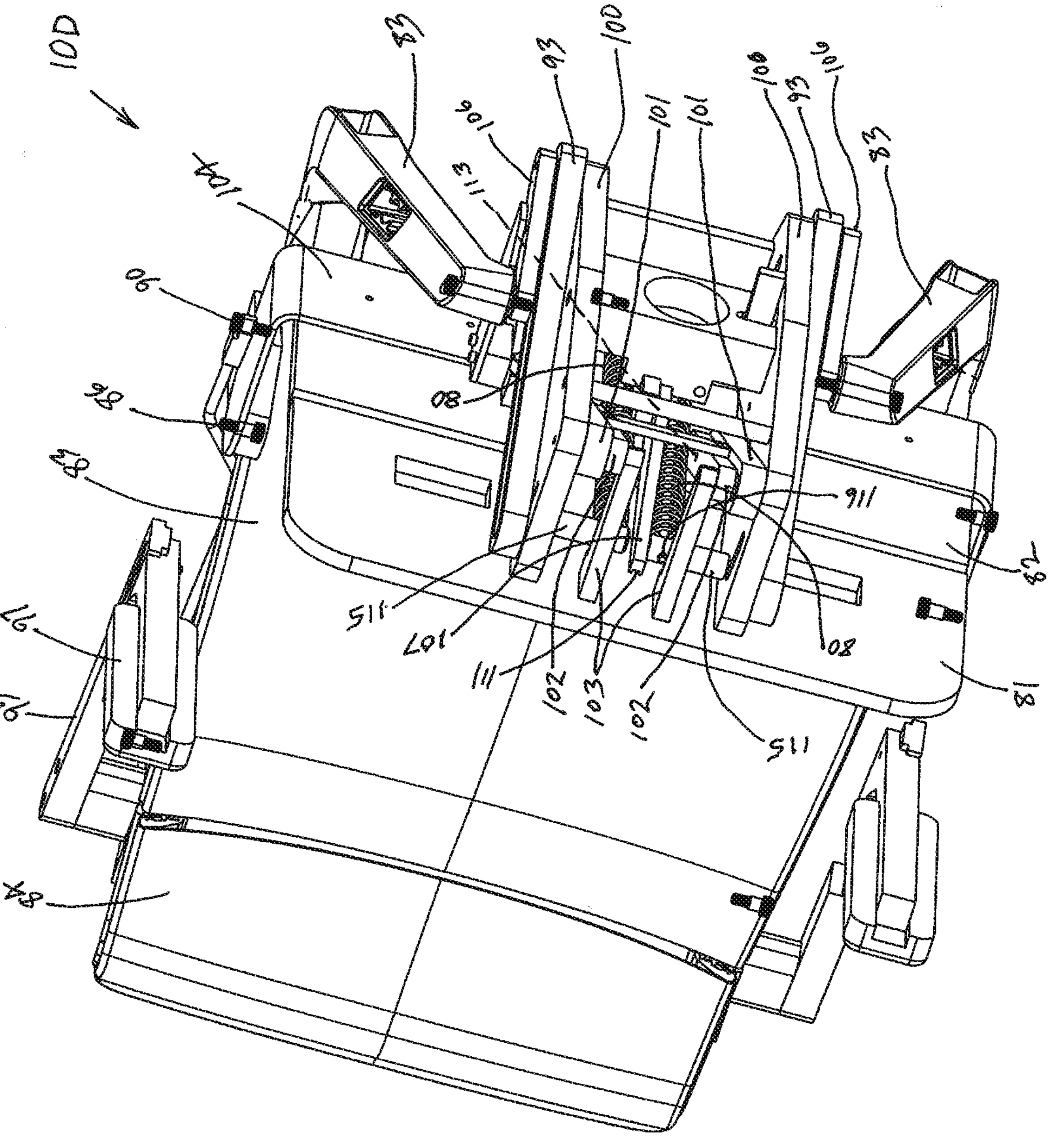
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FIG. 25

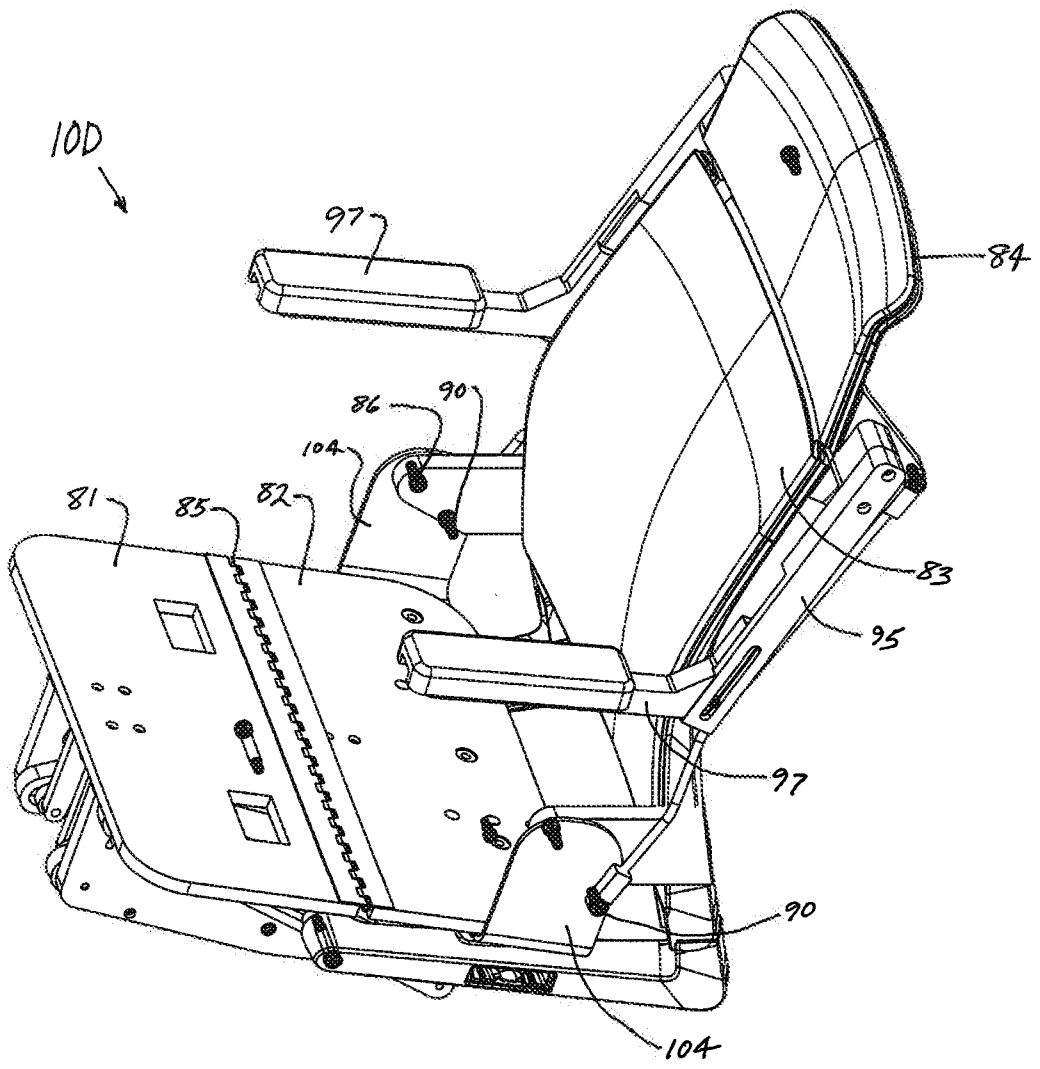

FIG. 26

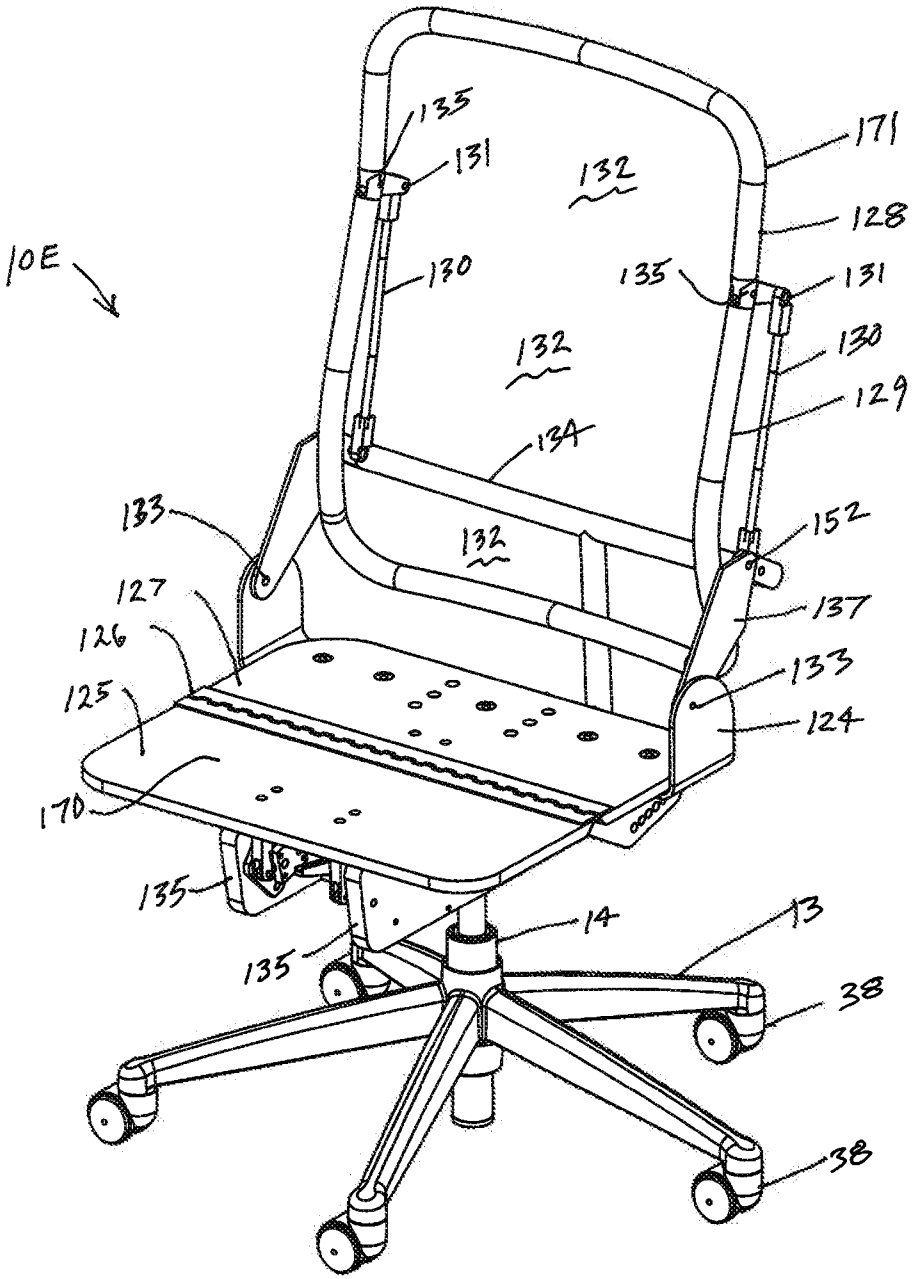
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FIG. 27

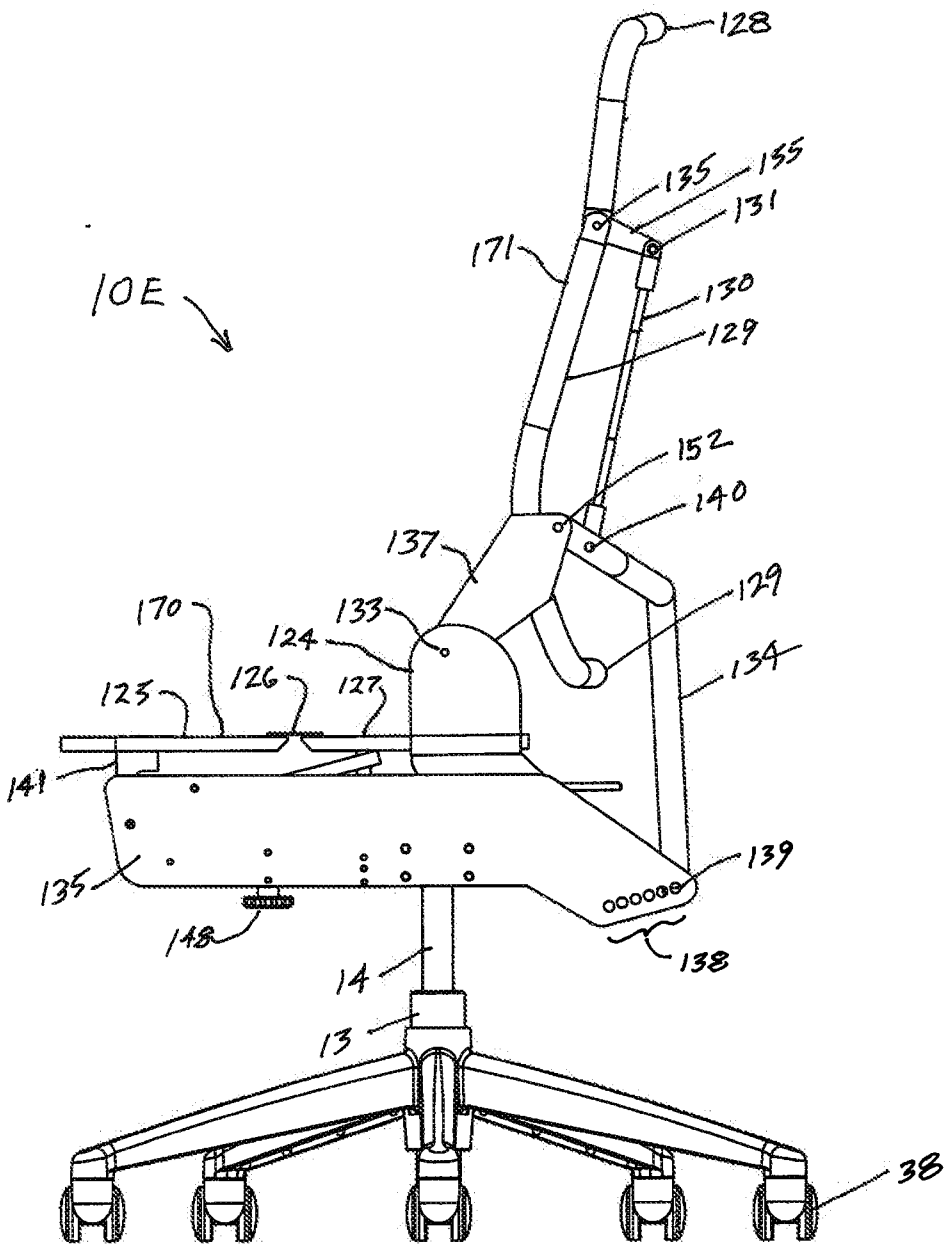
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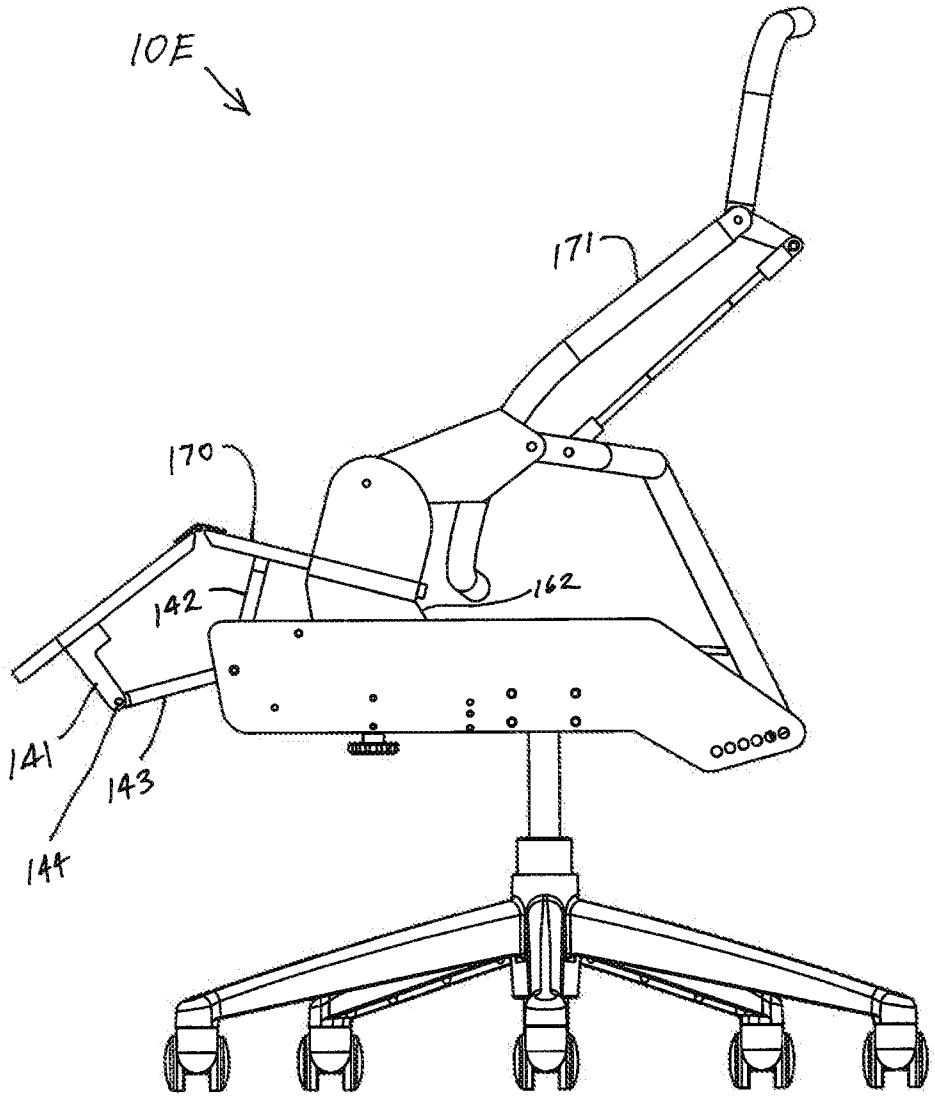
FIG. 28



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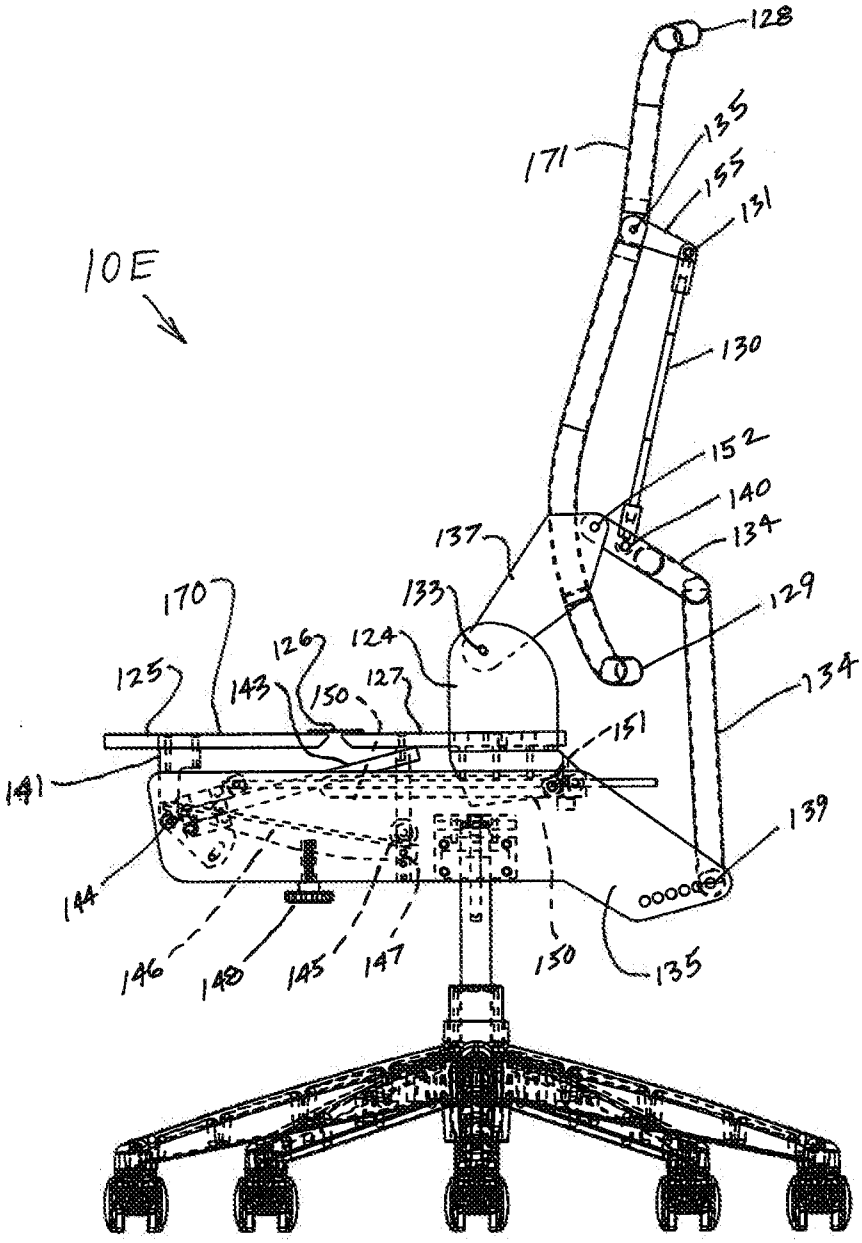
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FIG. 30

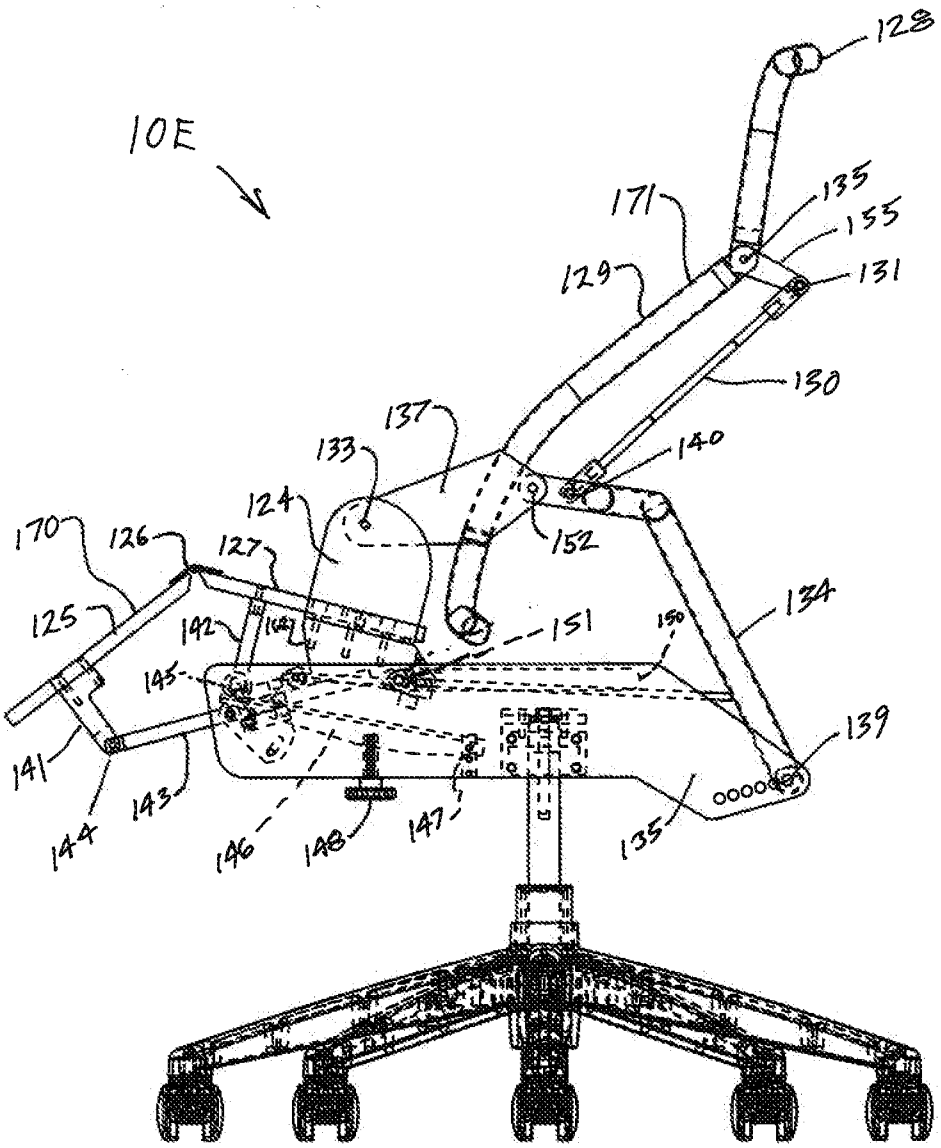
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FIG. 31

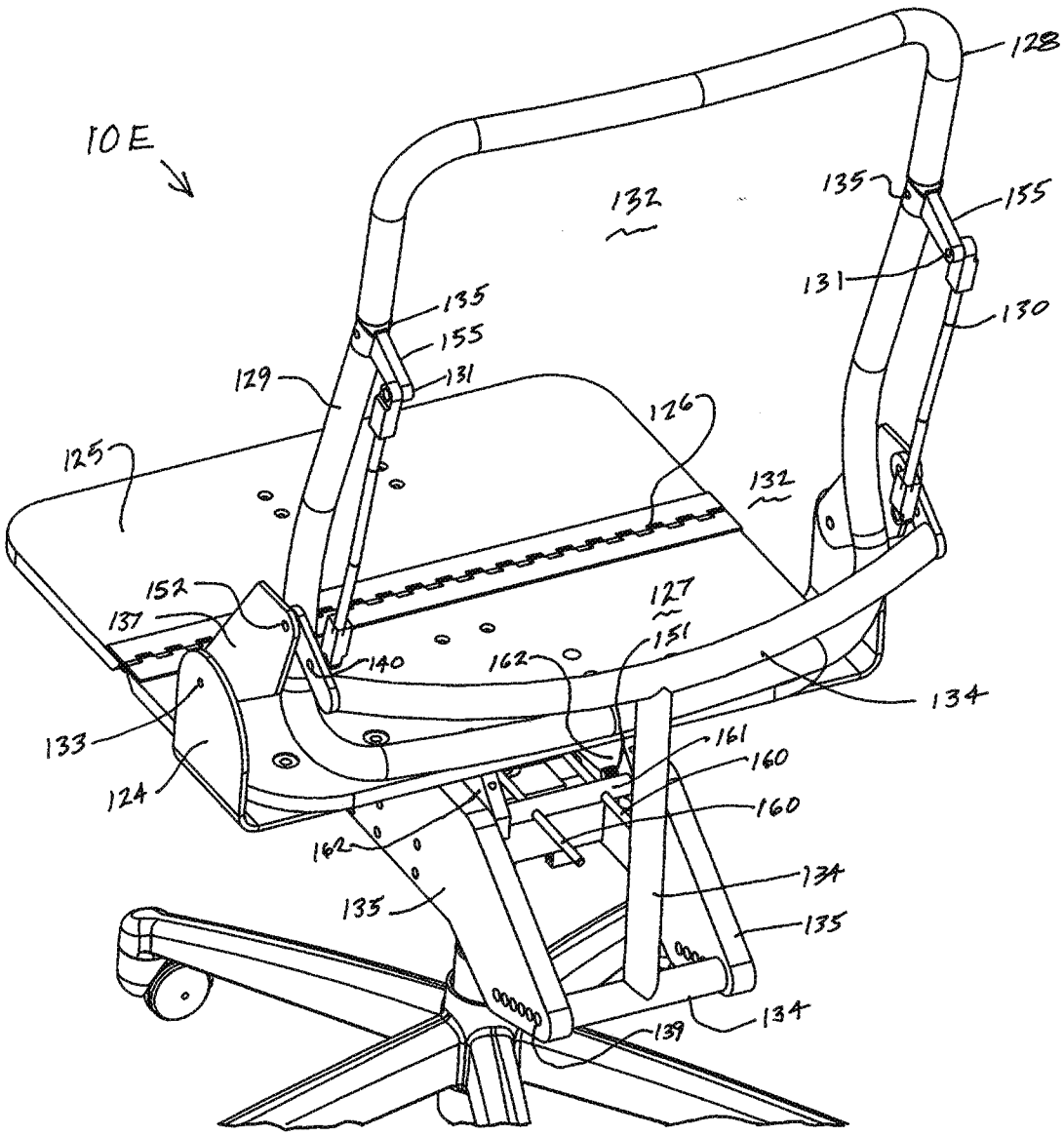
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FIG. 32

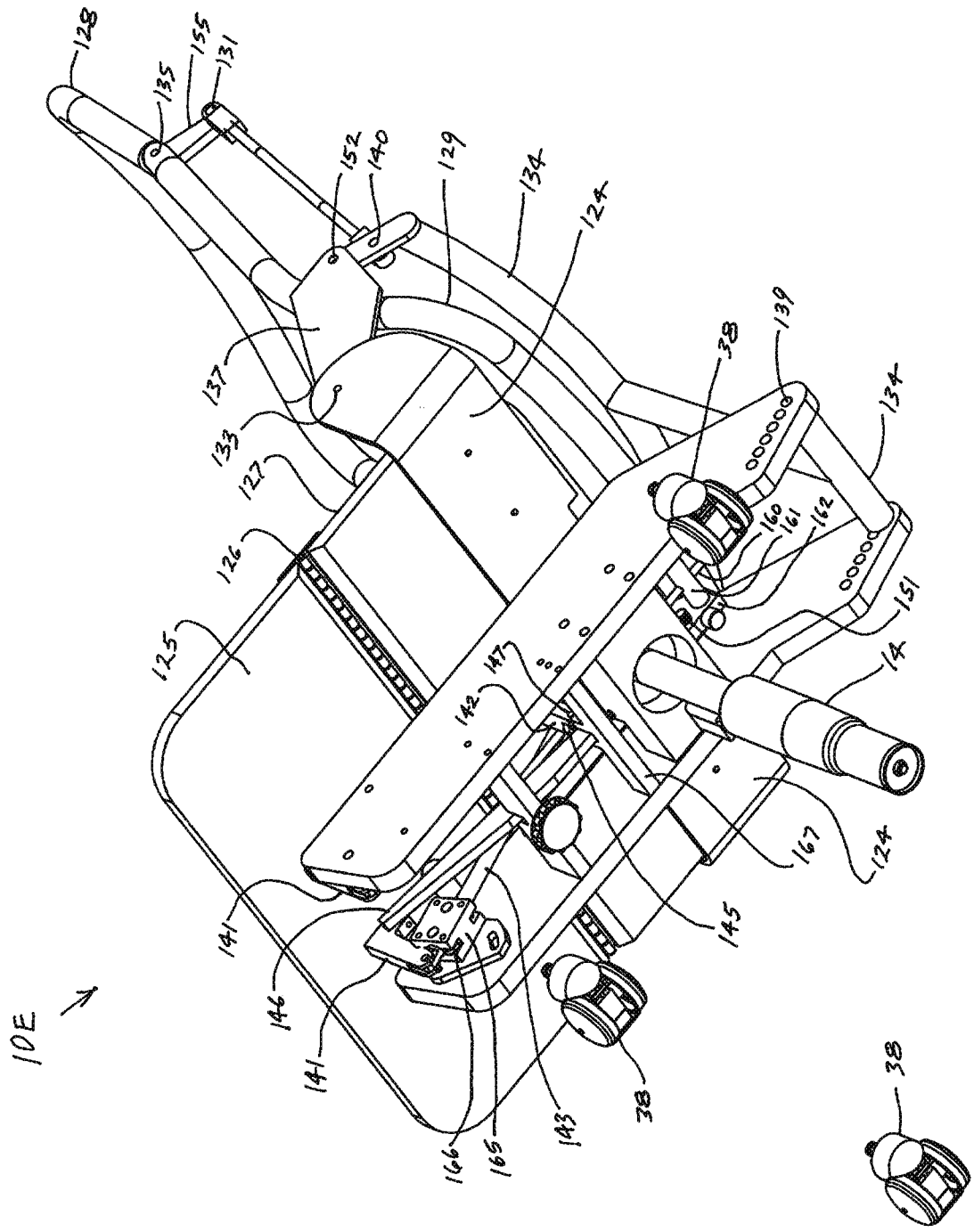
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FIG. 33

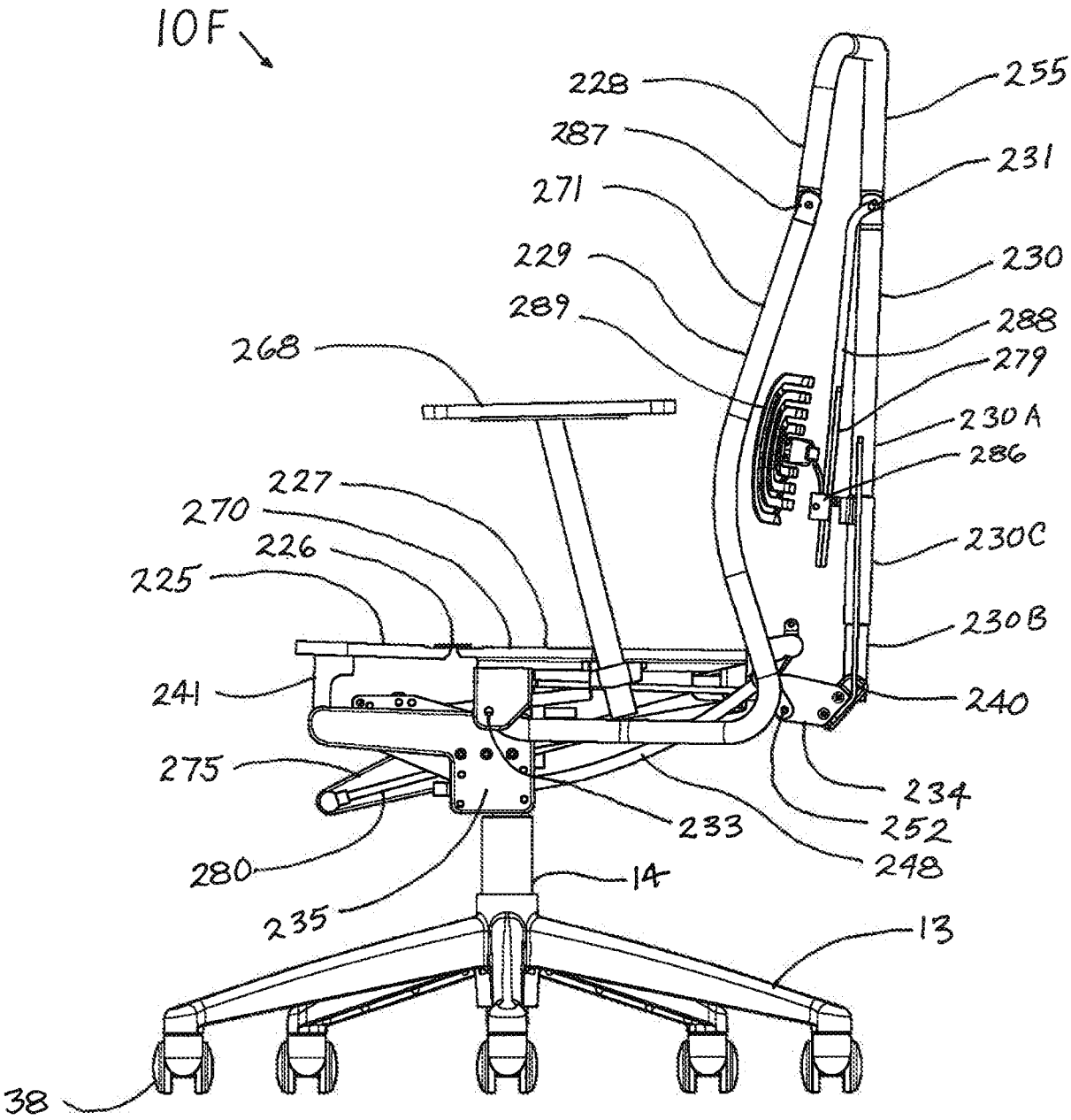
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FIG. 34

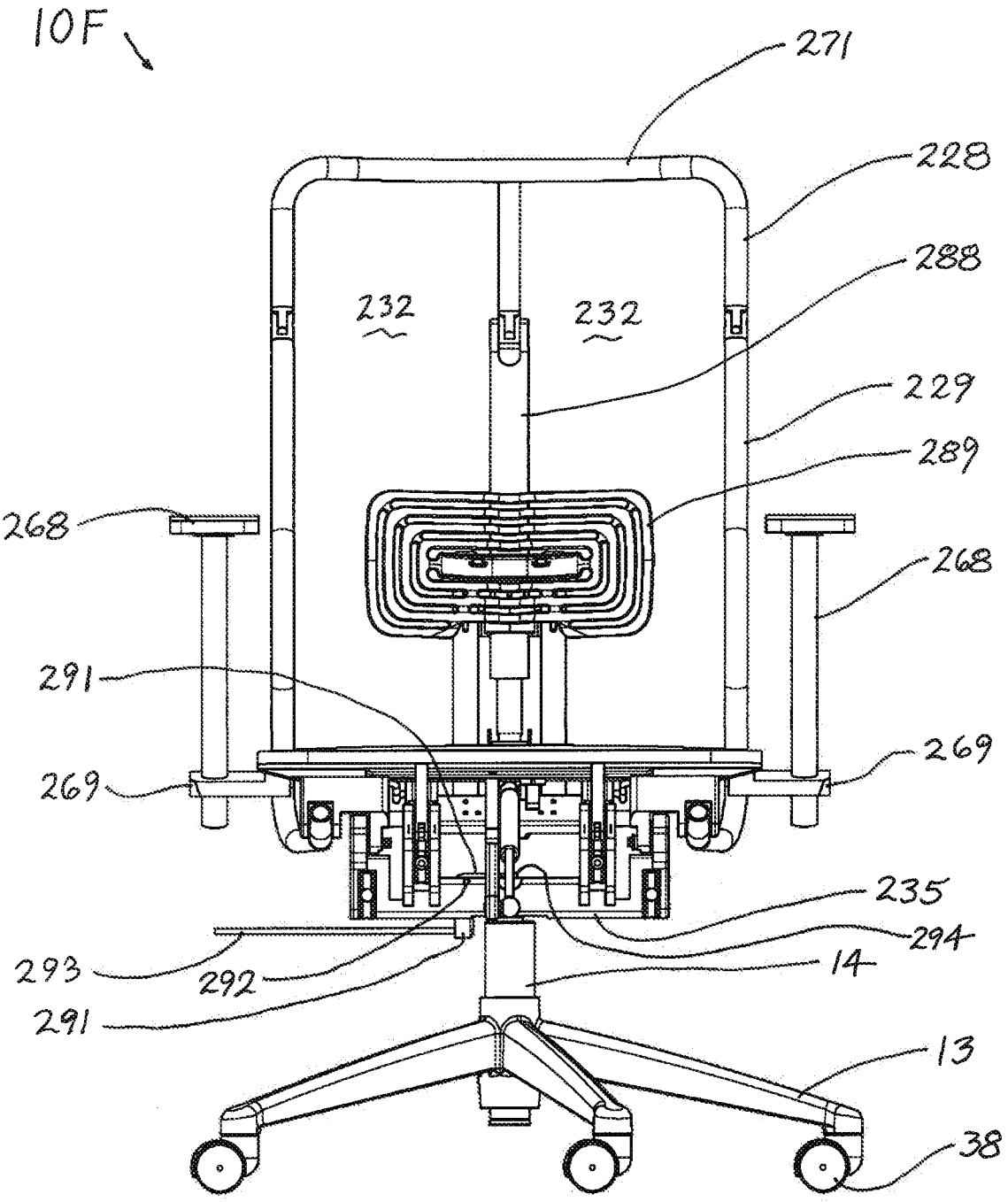
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FIG. 35

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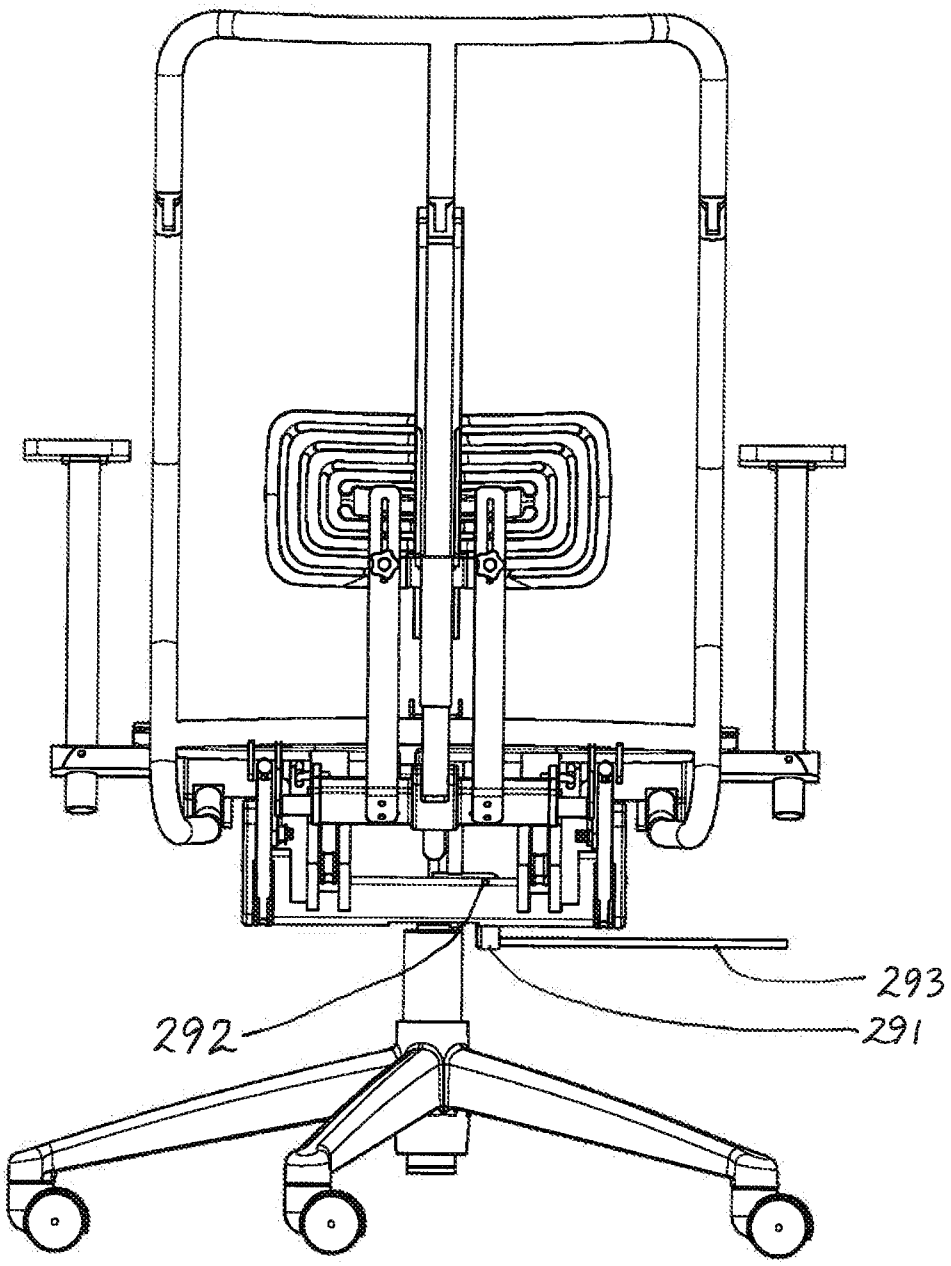

FIG. 36

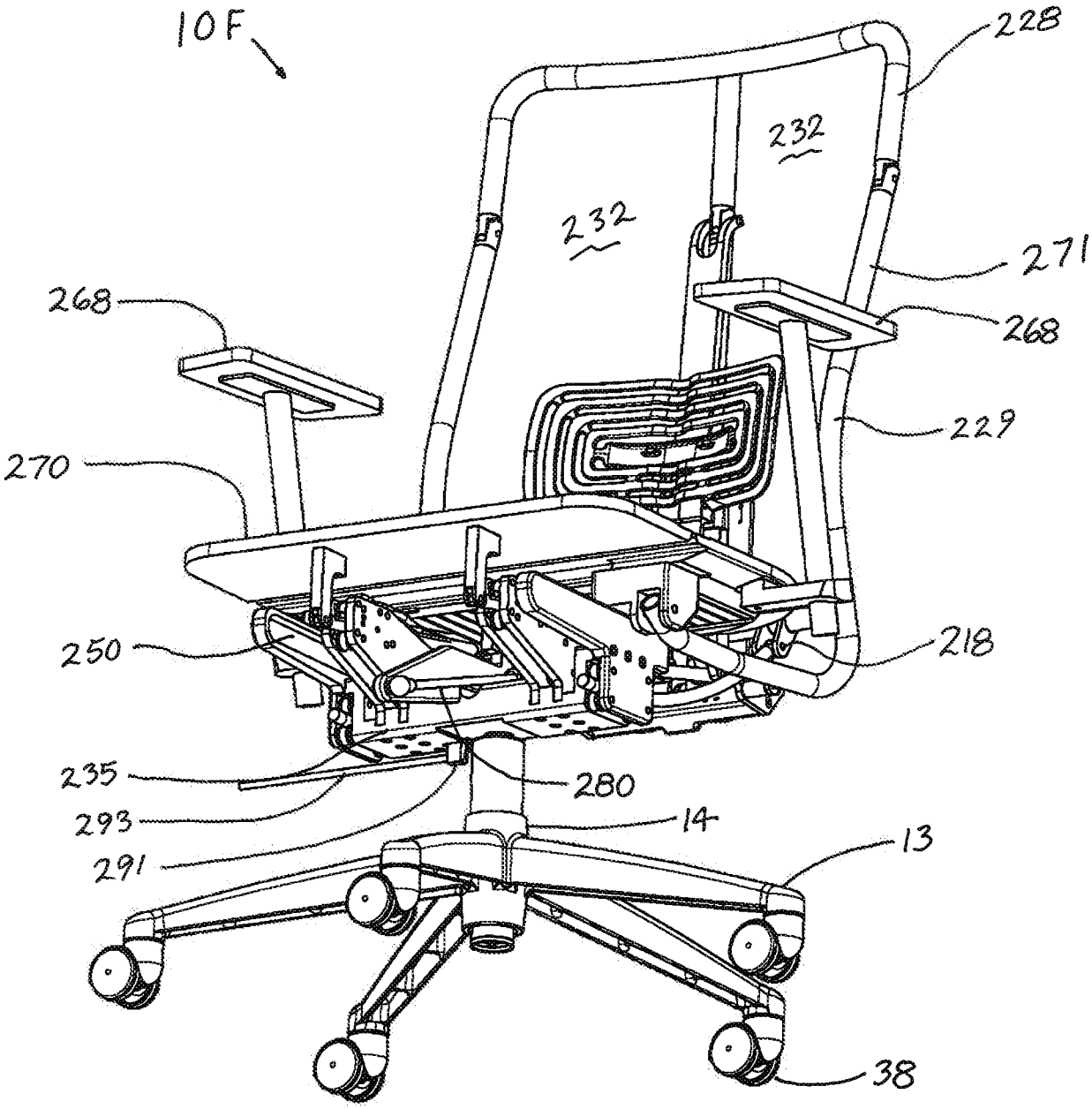
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FIG. 37

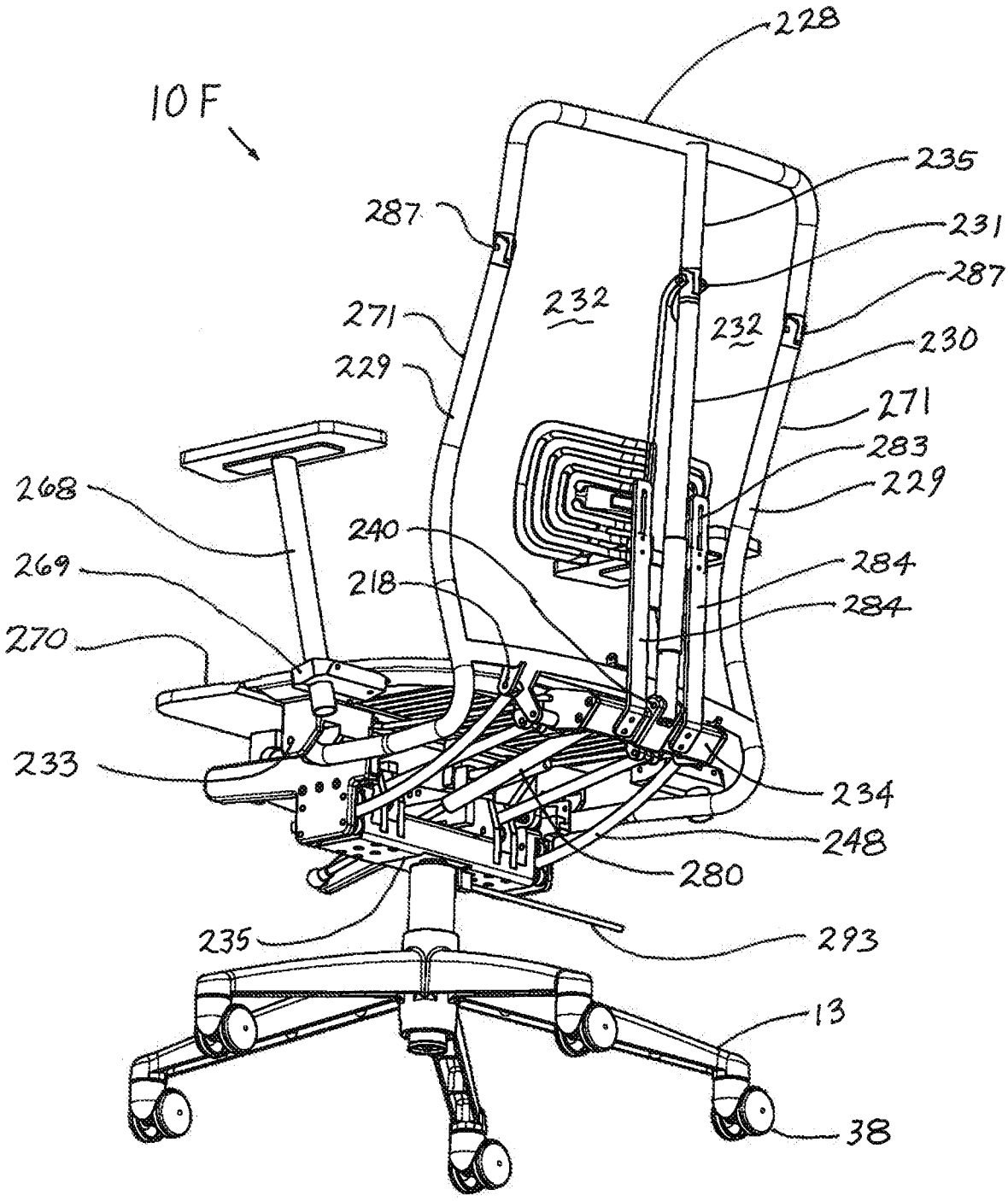
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FIG. 38

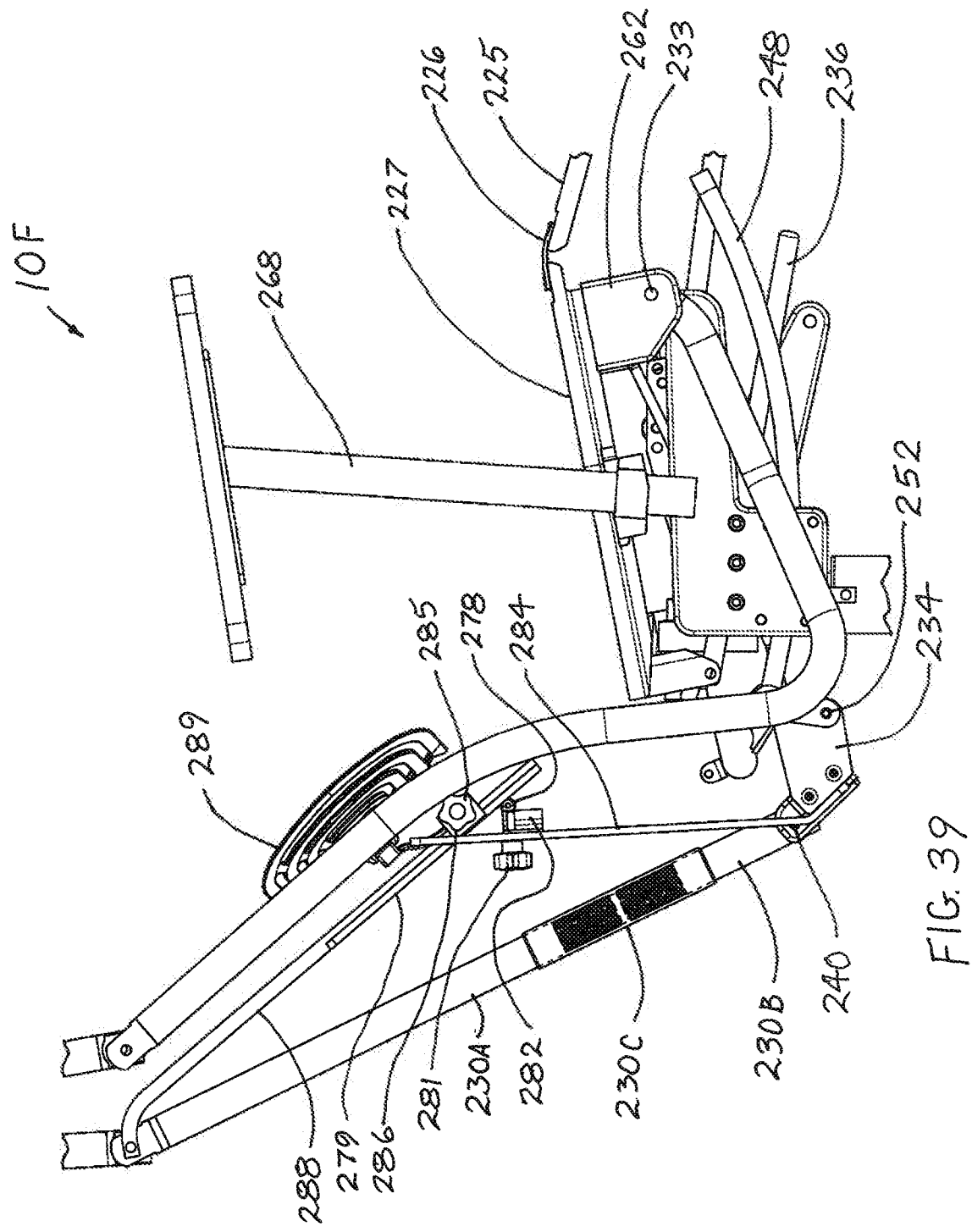
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FIG. 39

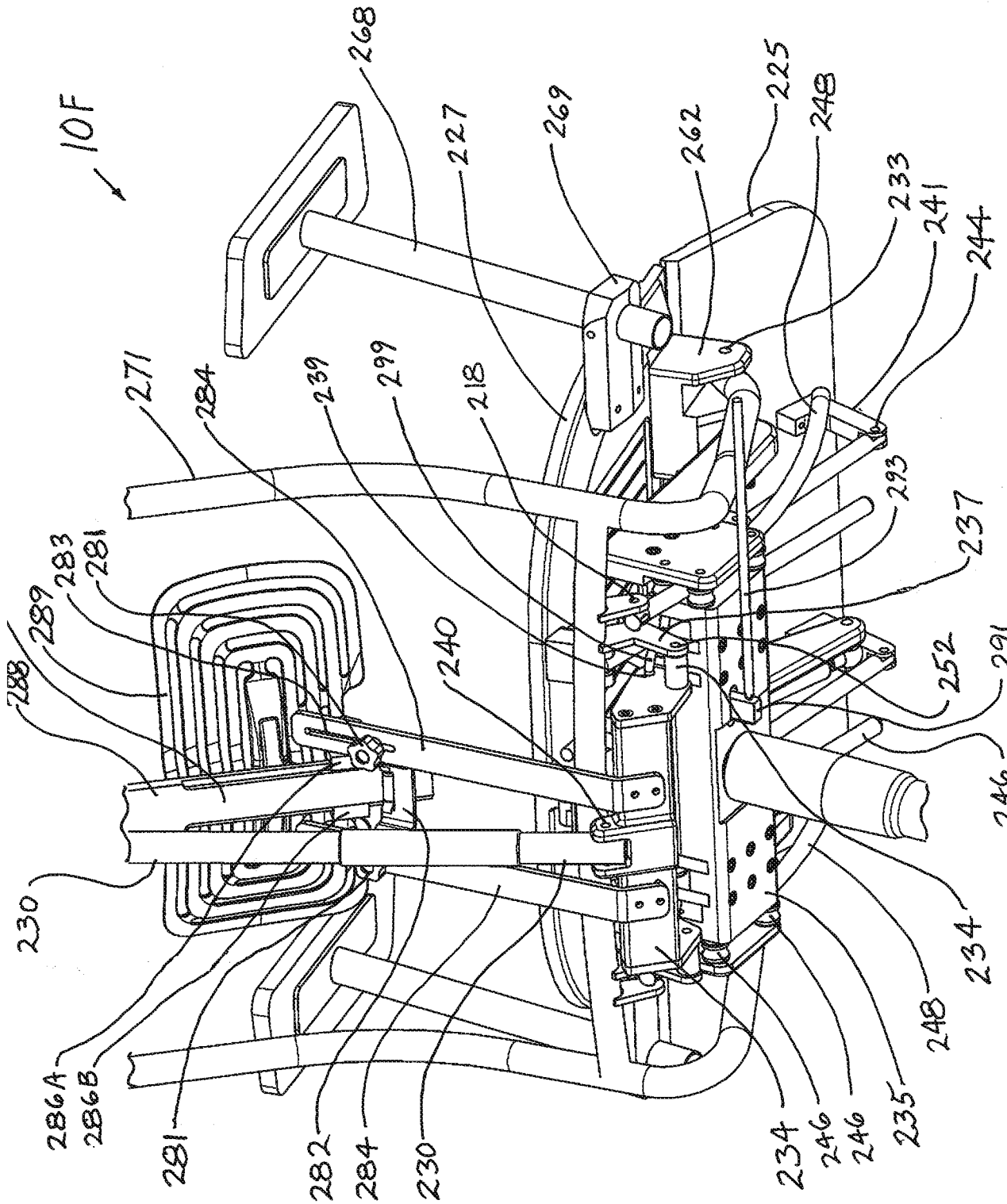
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FIG. 40

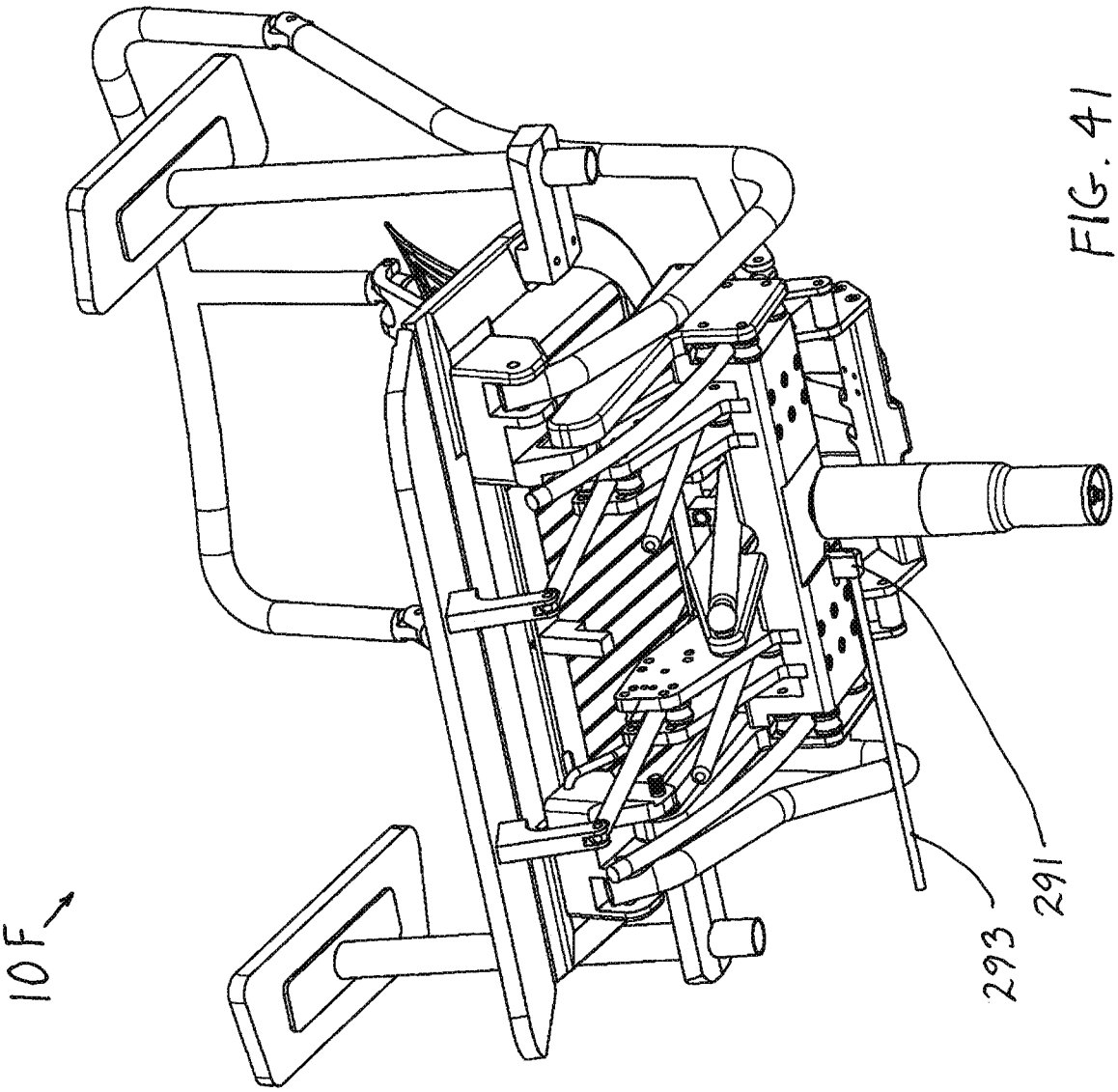

FIG. 41

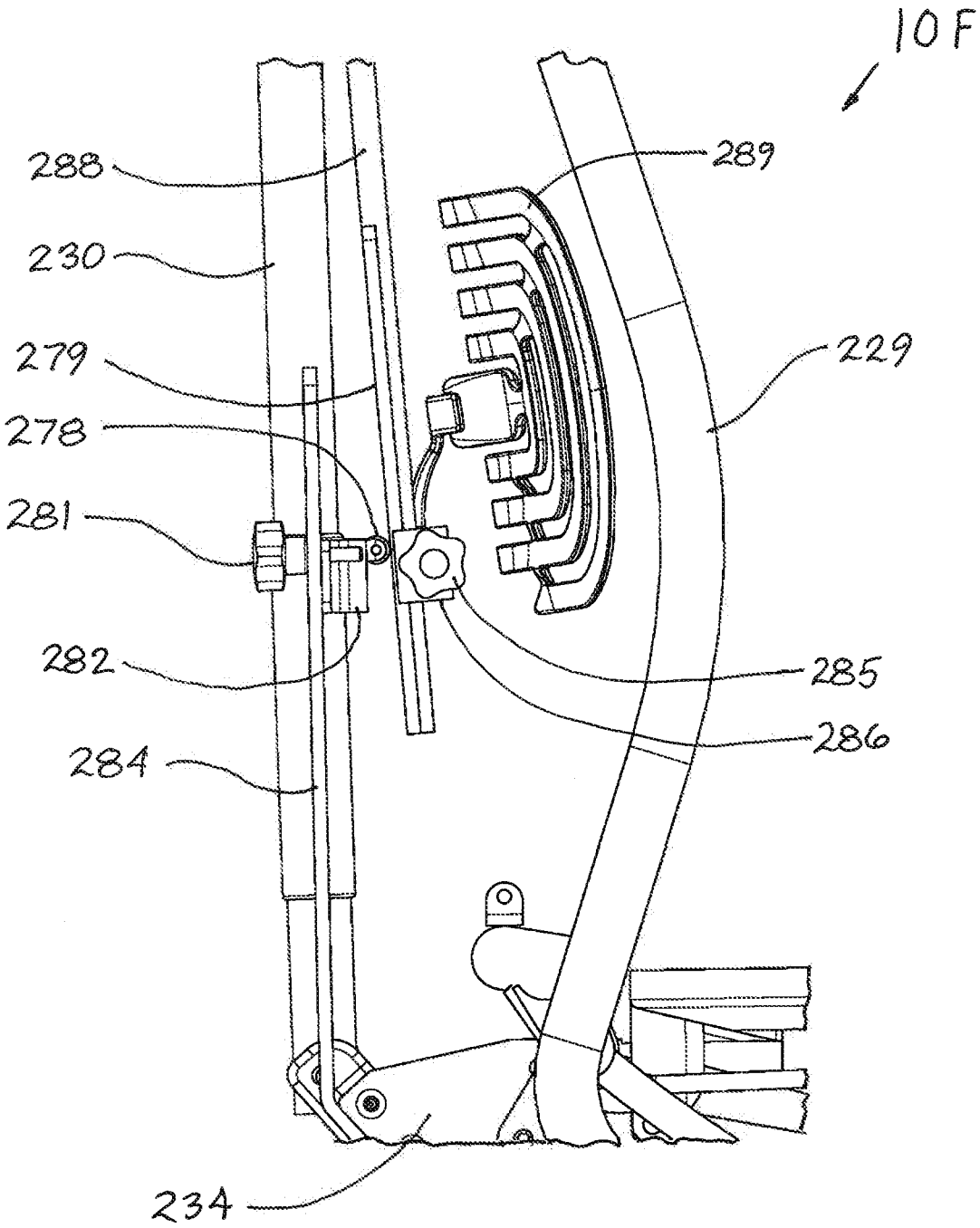

FIG. 42

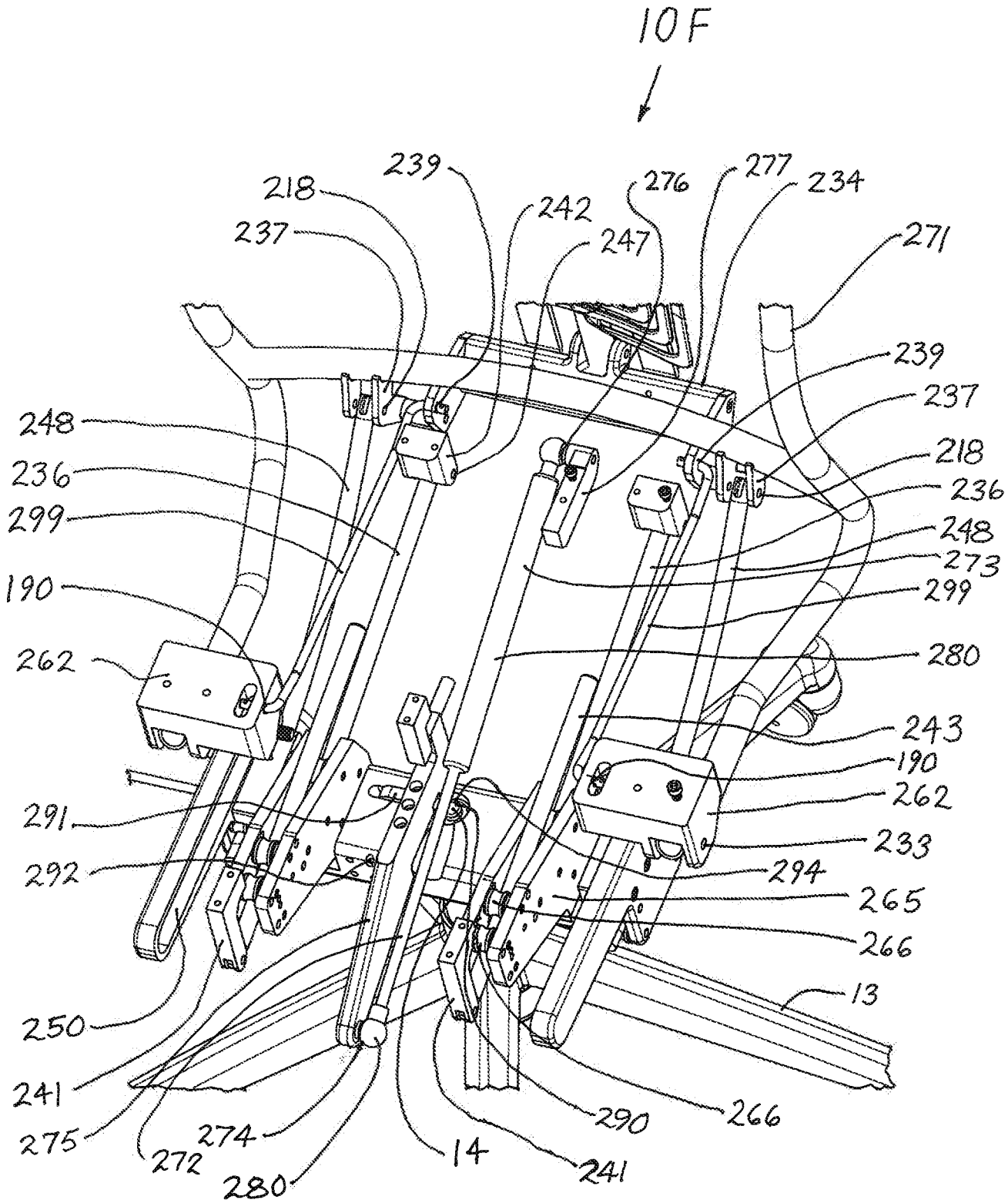
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FIG. 43

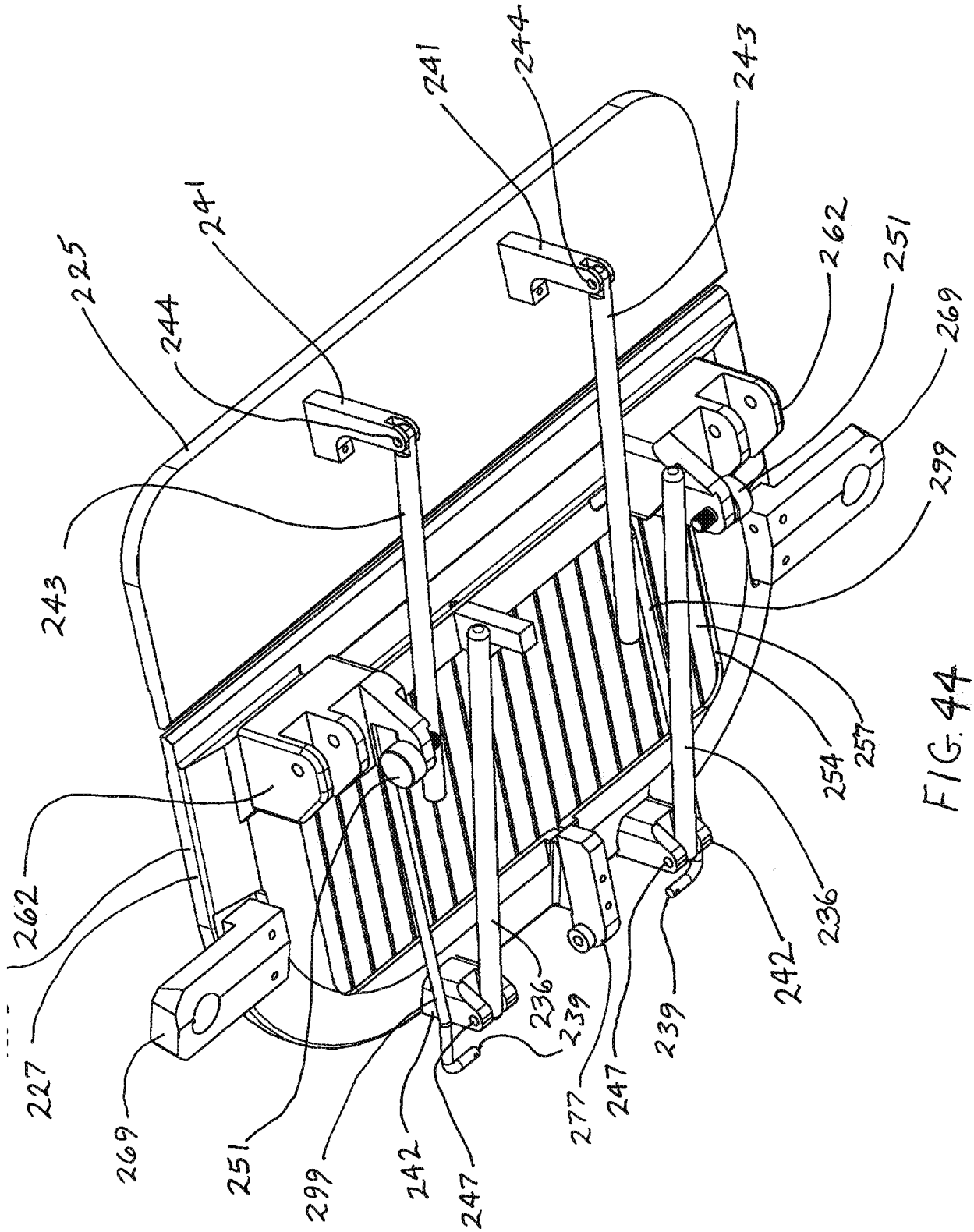
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FIG. 44

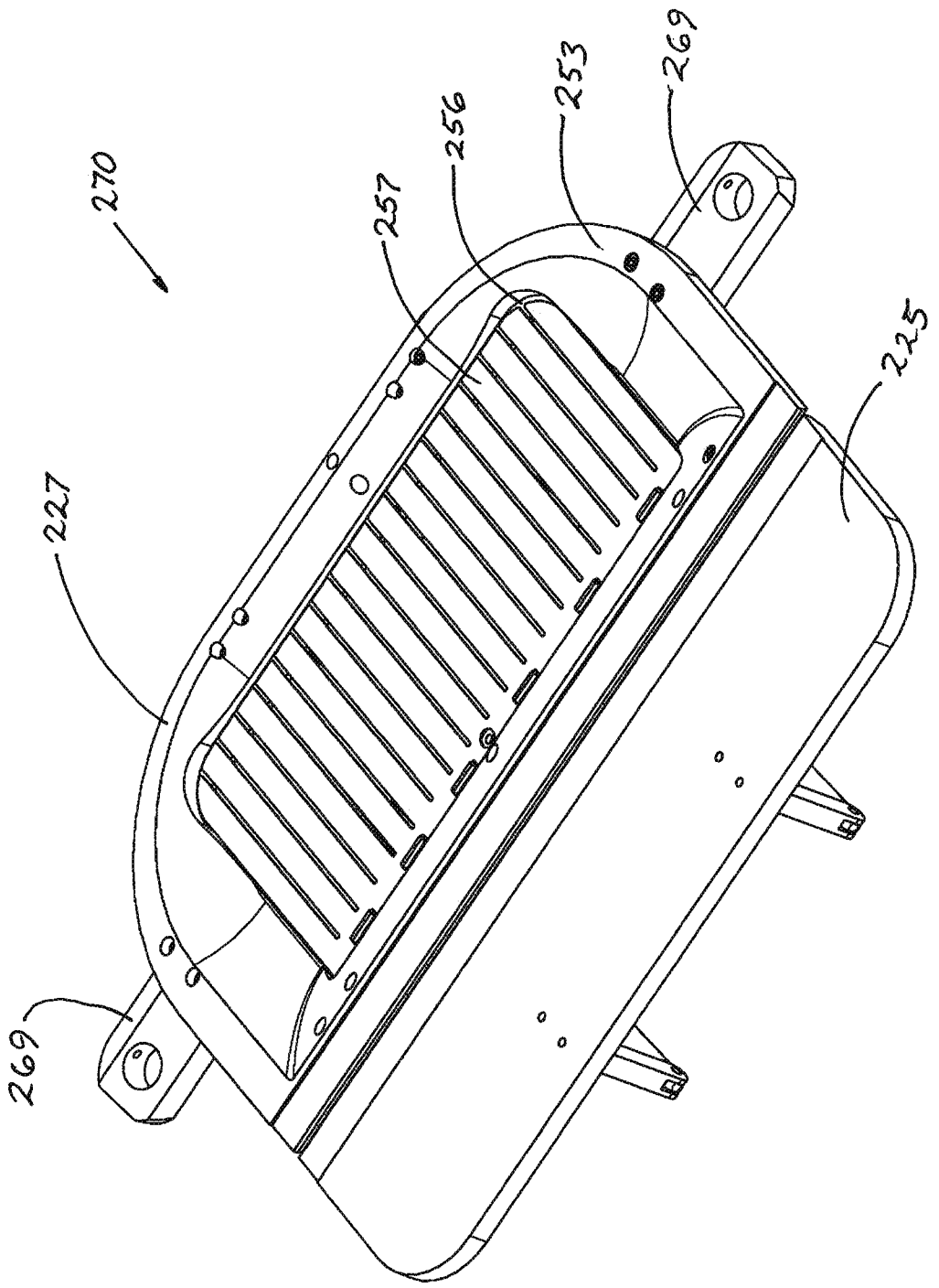

FIG. 45

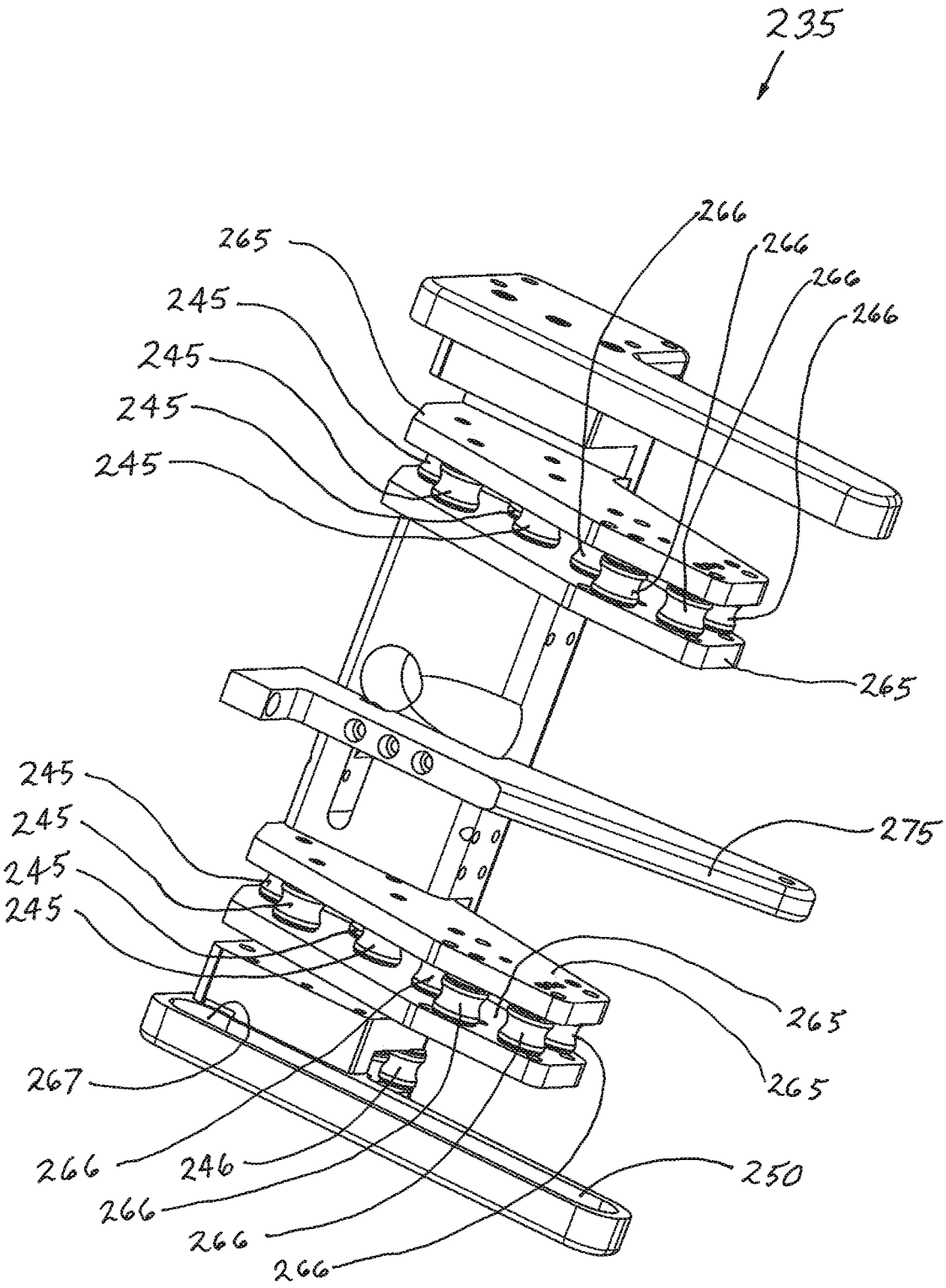
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FIG. 46

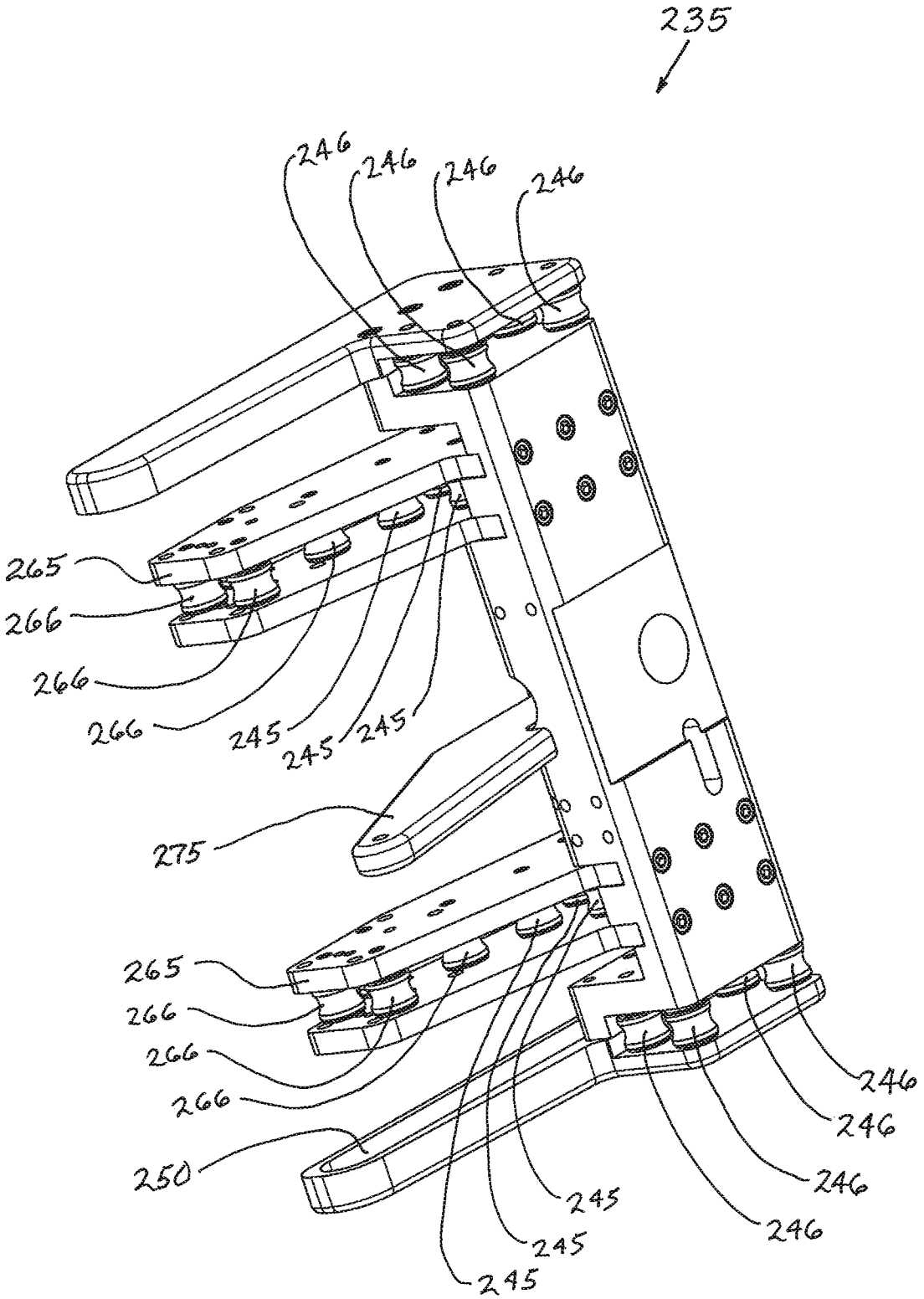
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FIG. 47

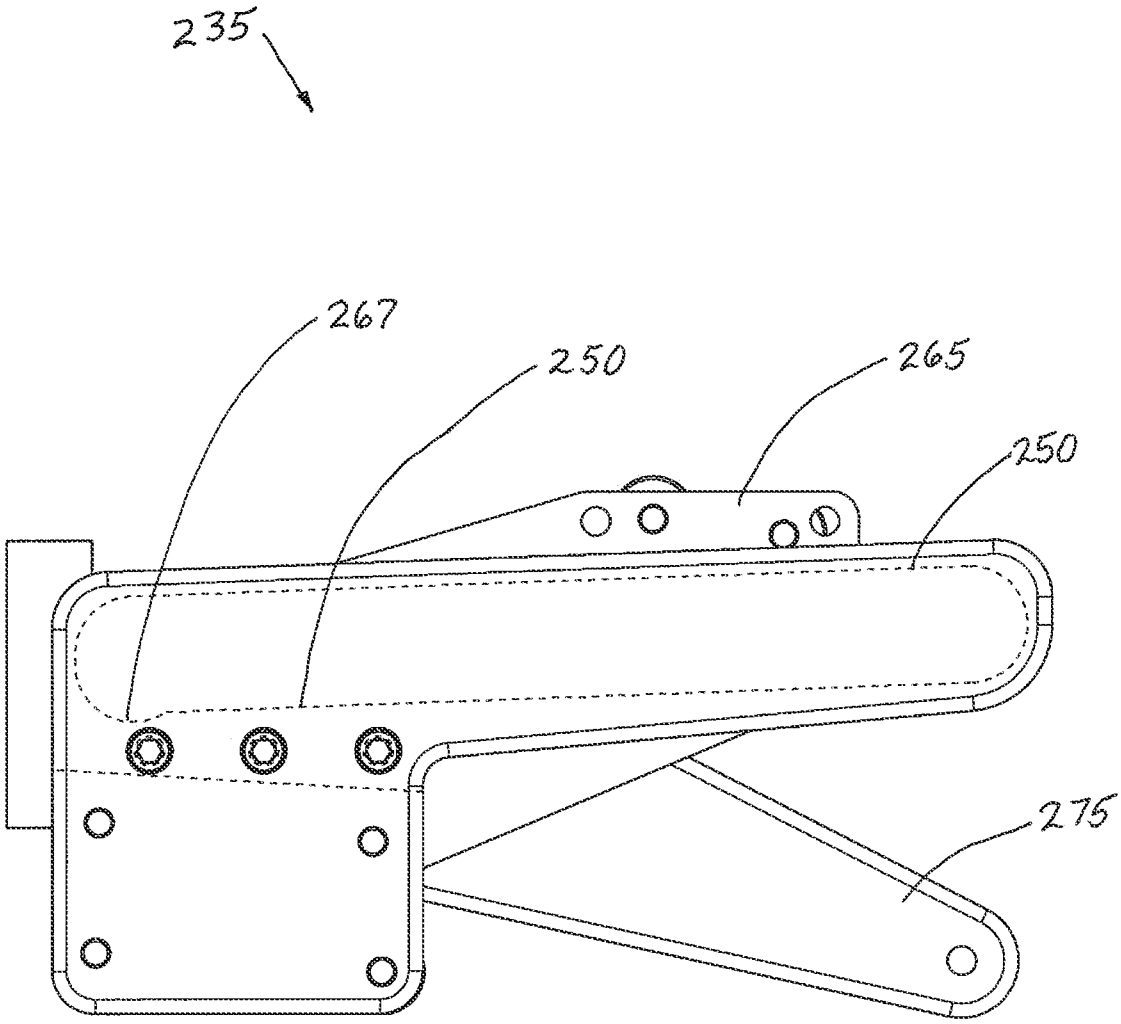

FIG. 48

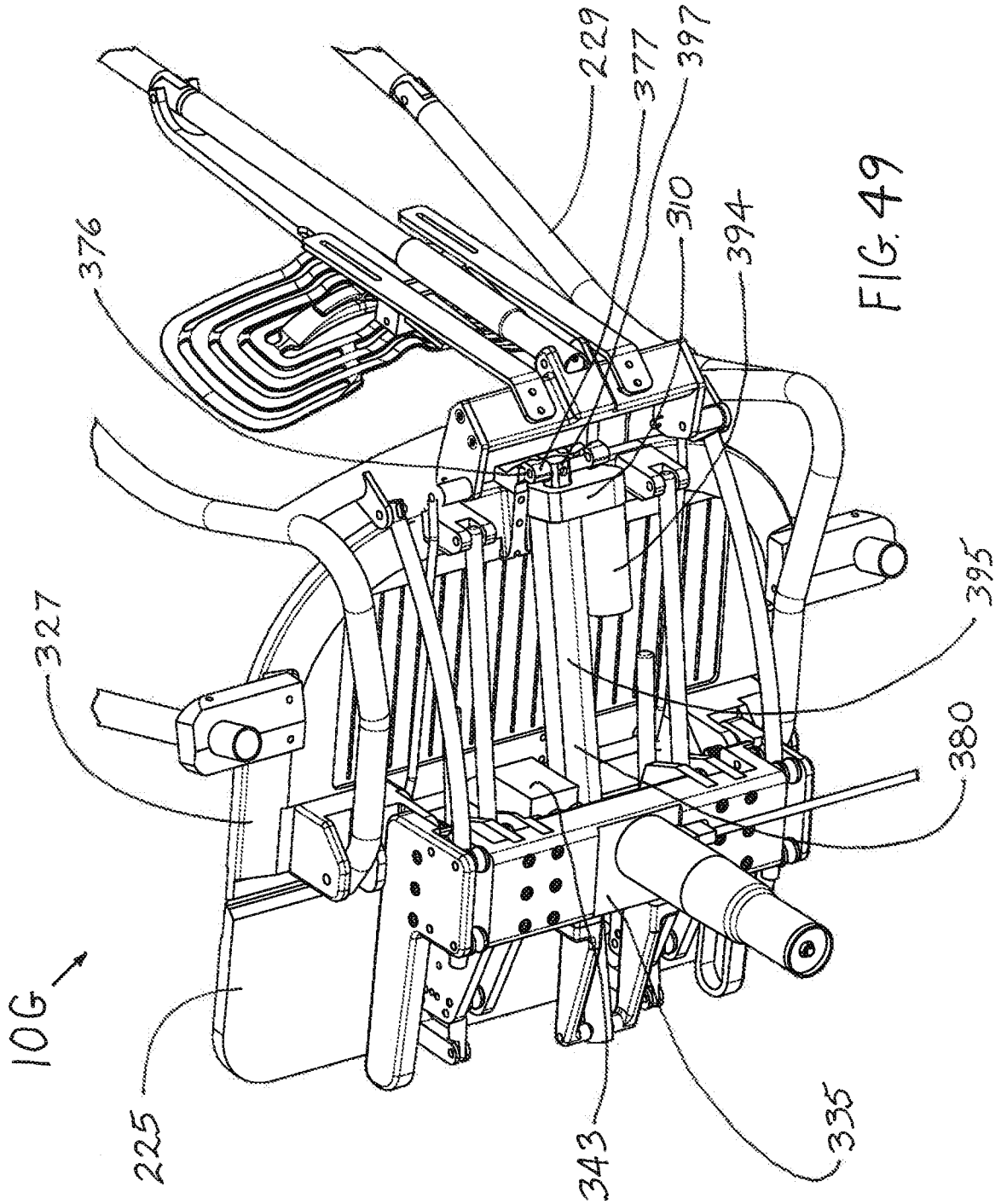

FIG. 49

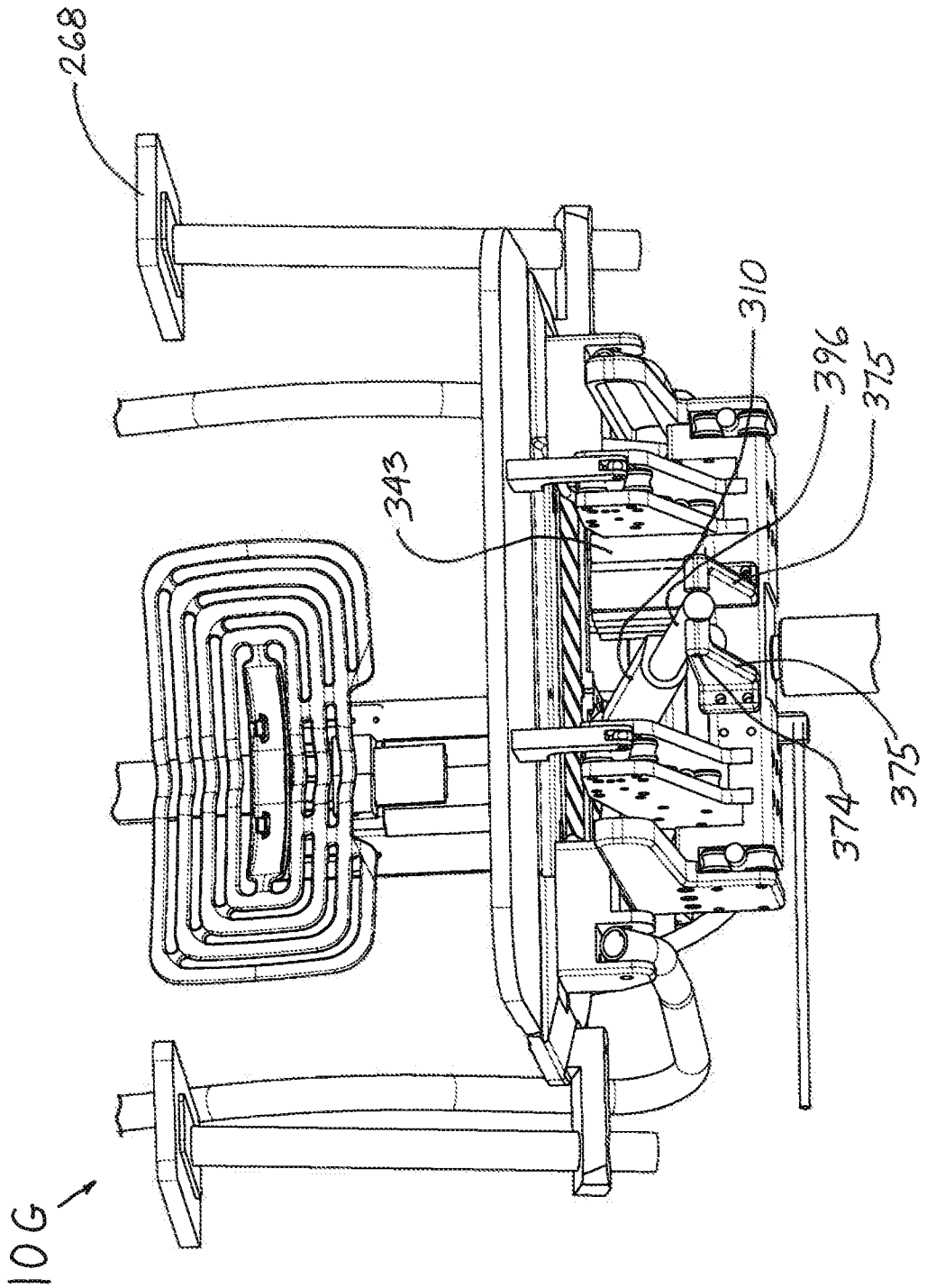

FIG. 50

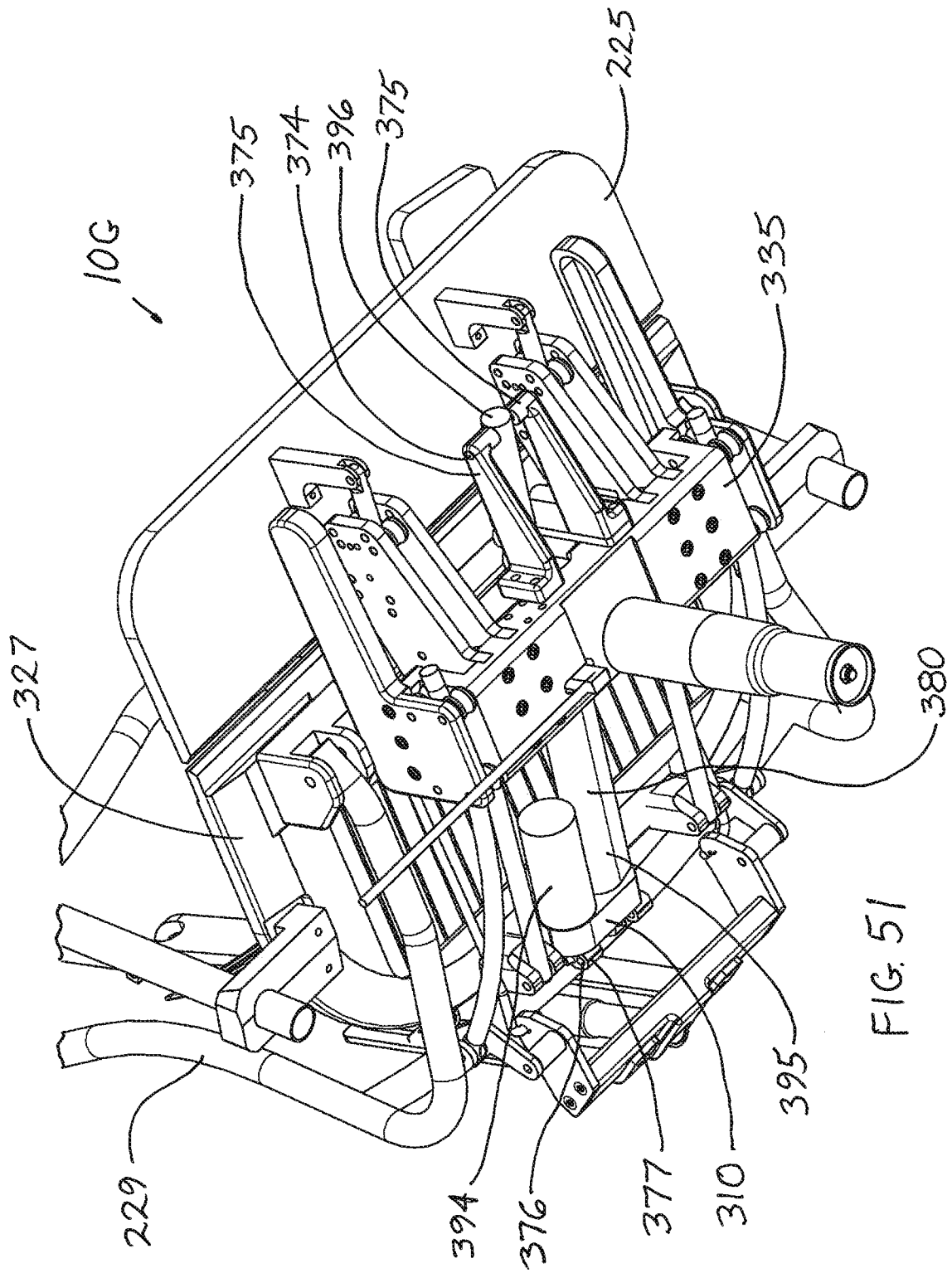

FIG. 51

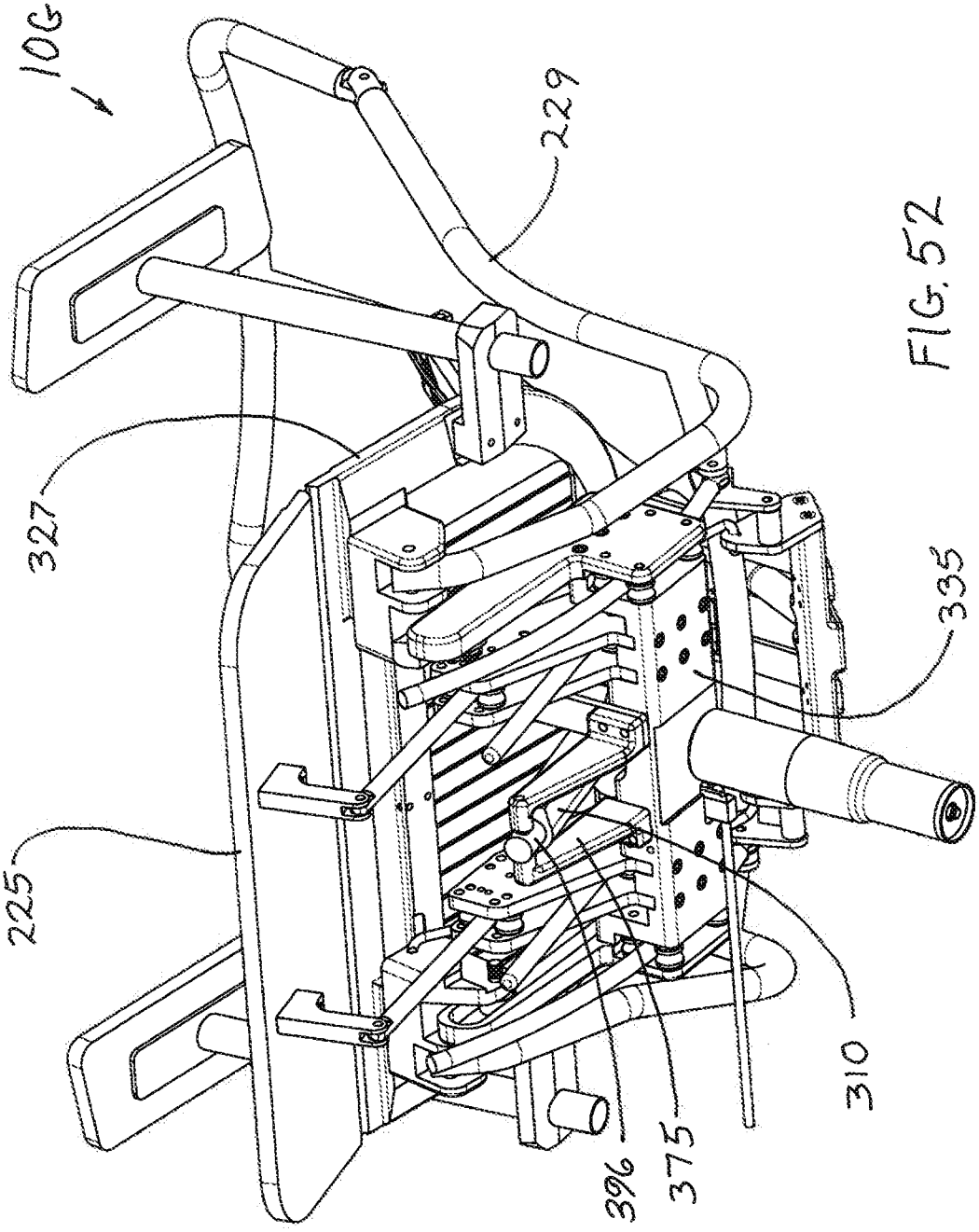

FIG. 52

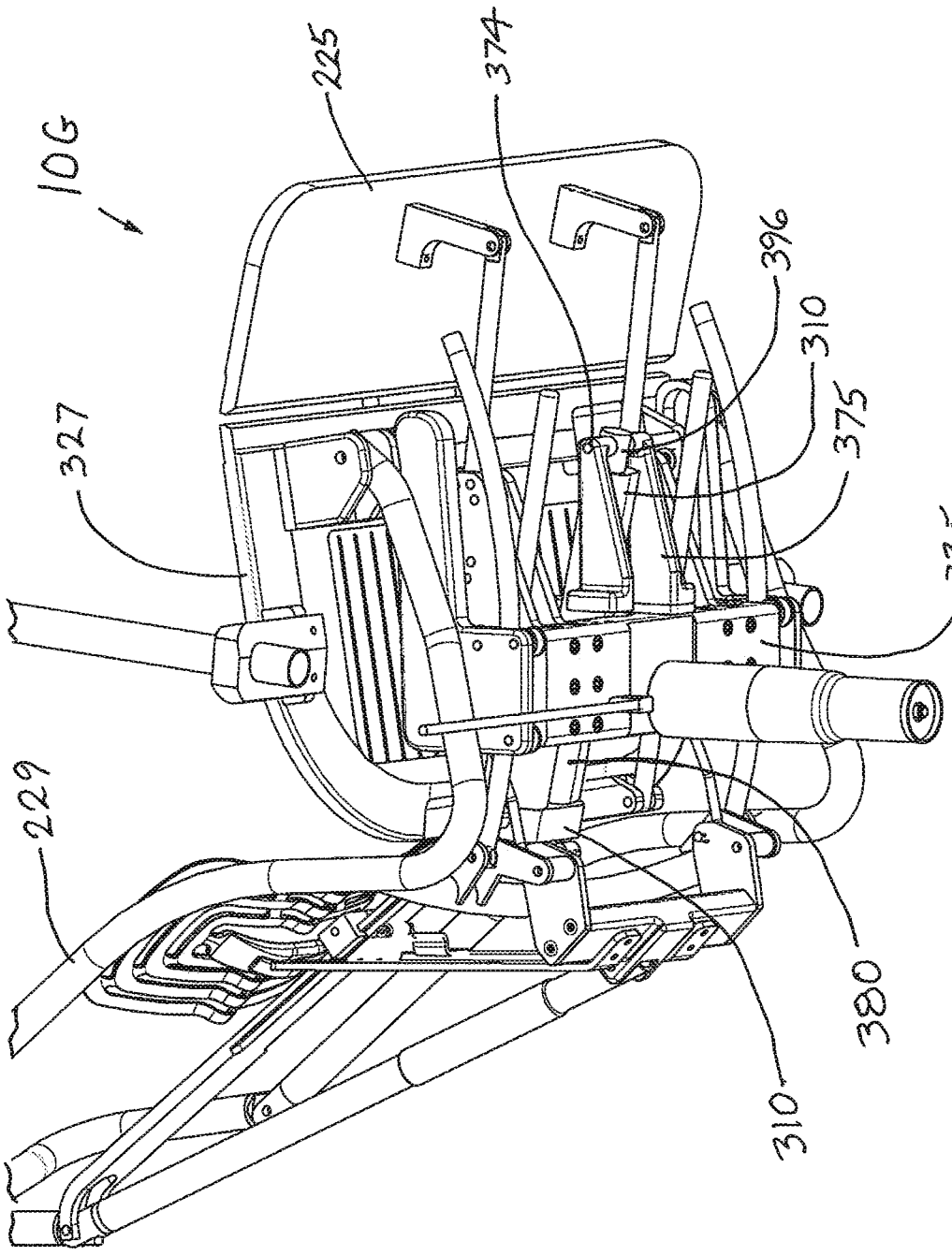

FIG. 53

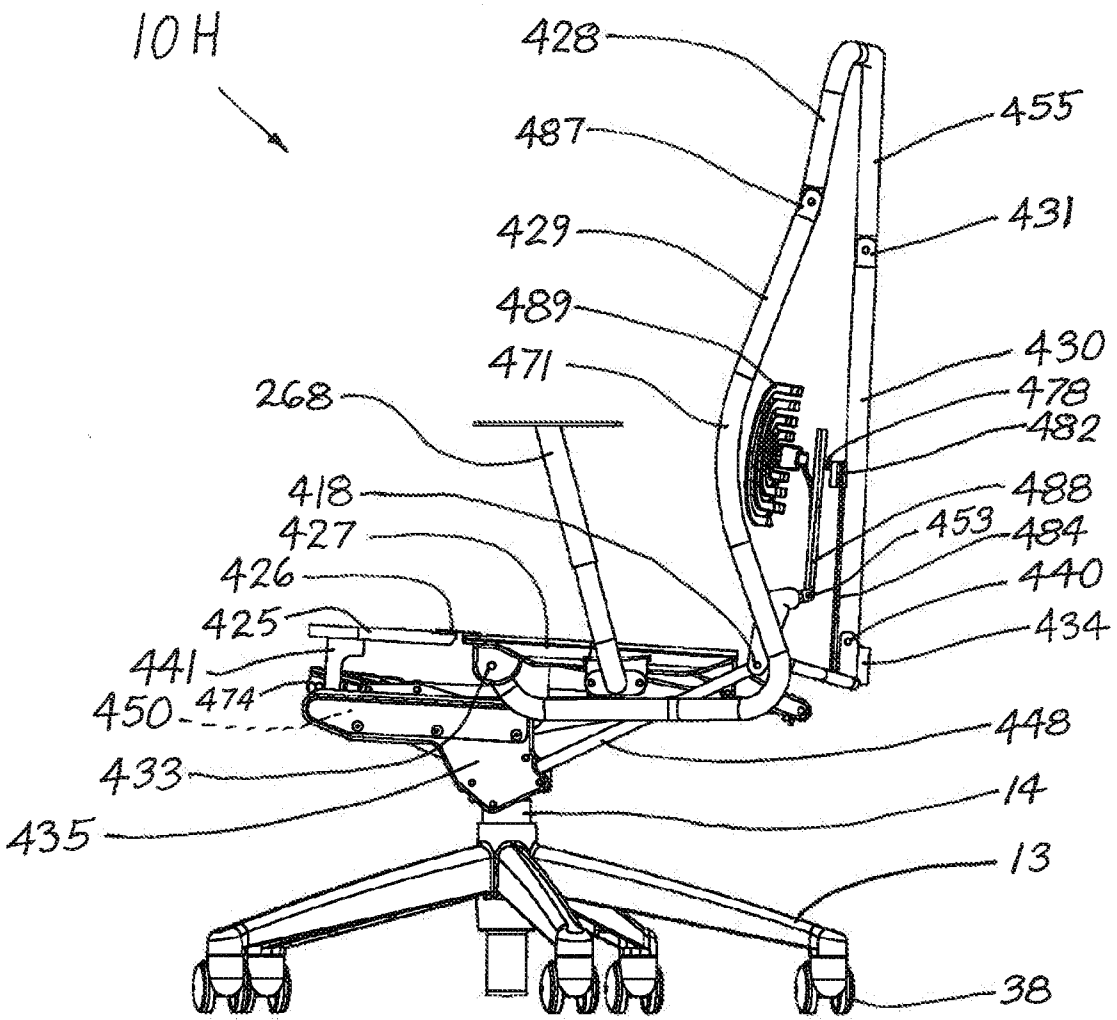
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FIG. 54

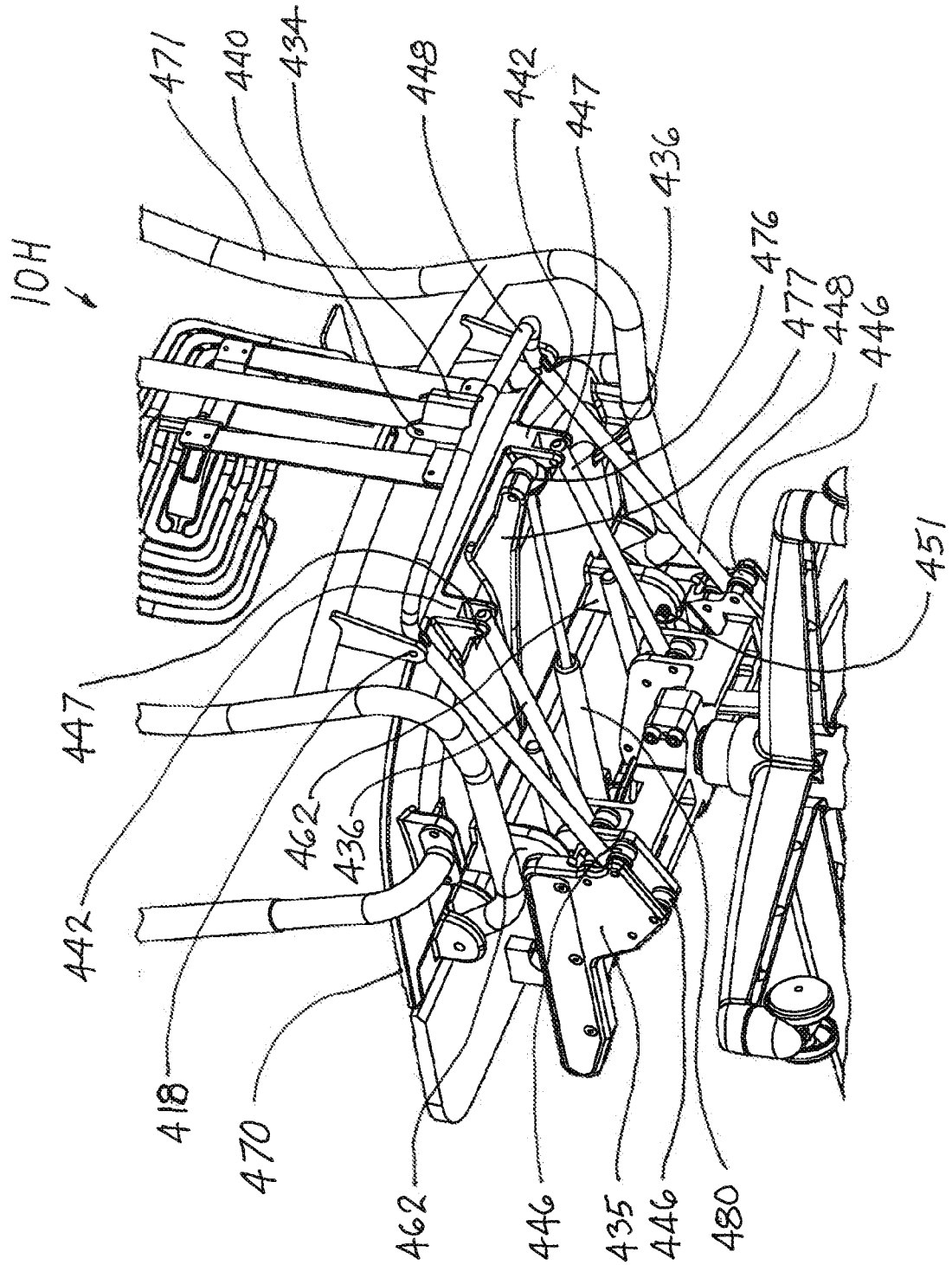
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FIG. 55

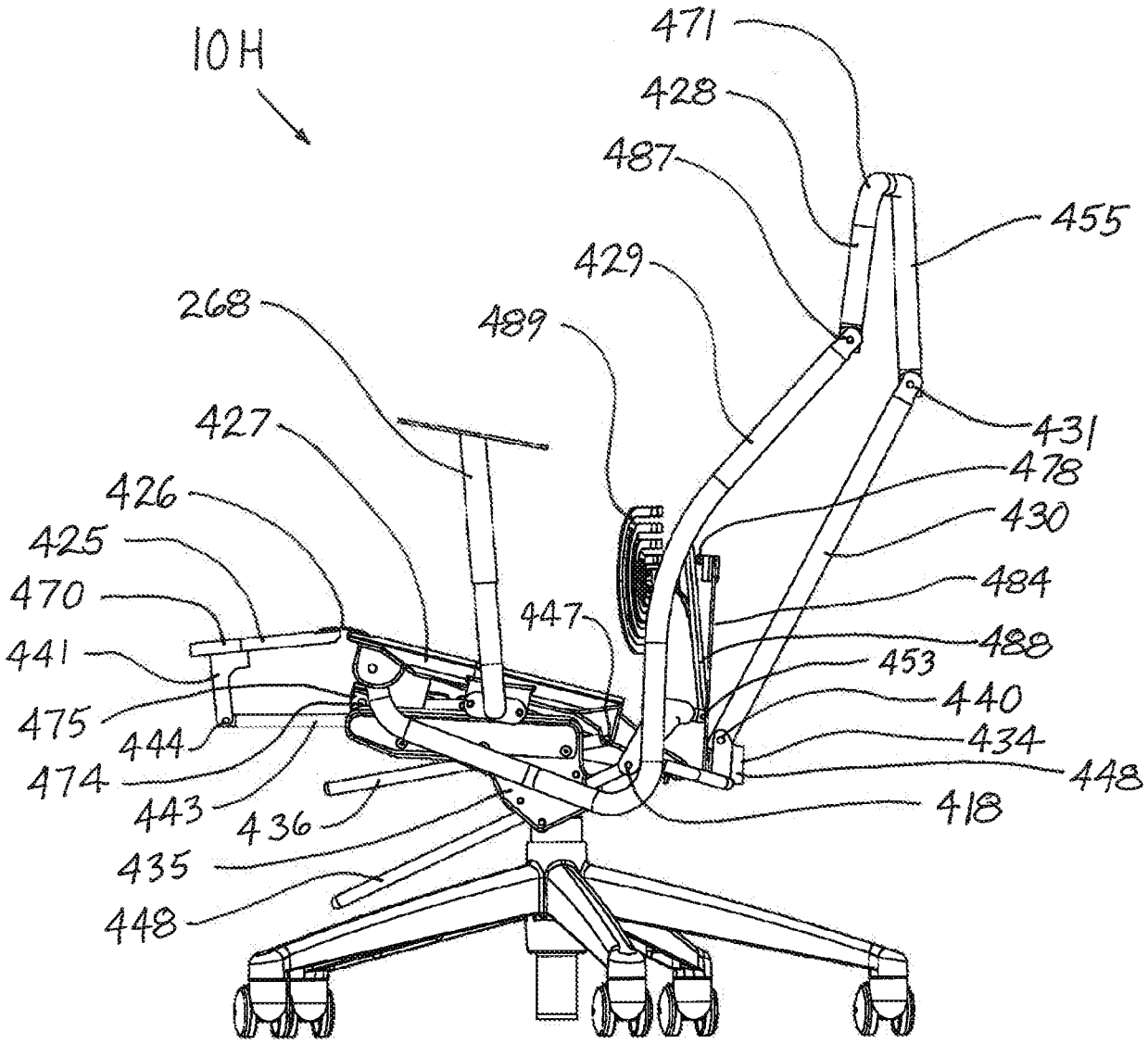
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FIG. 56

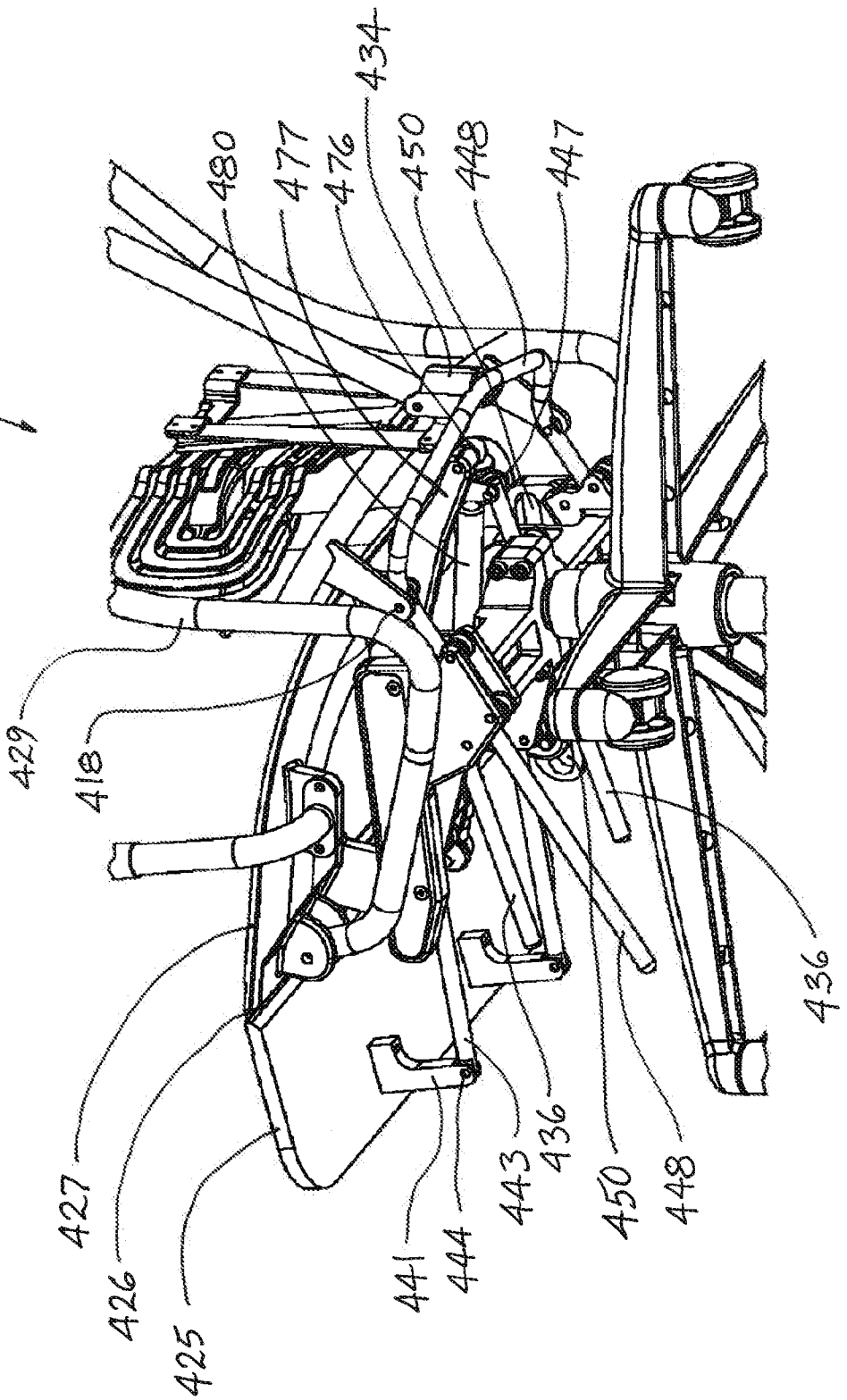
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FIG. 57

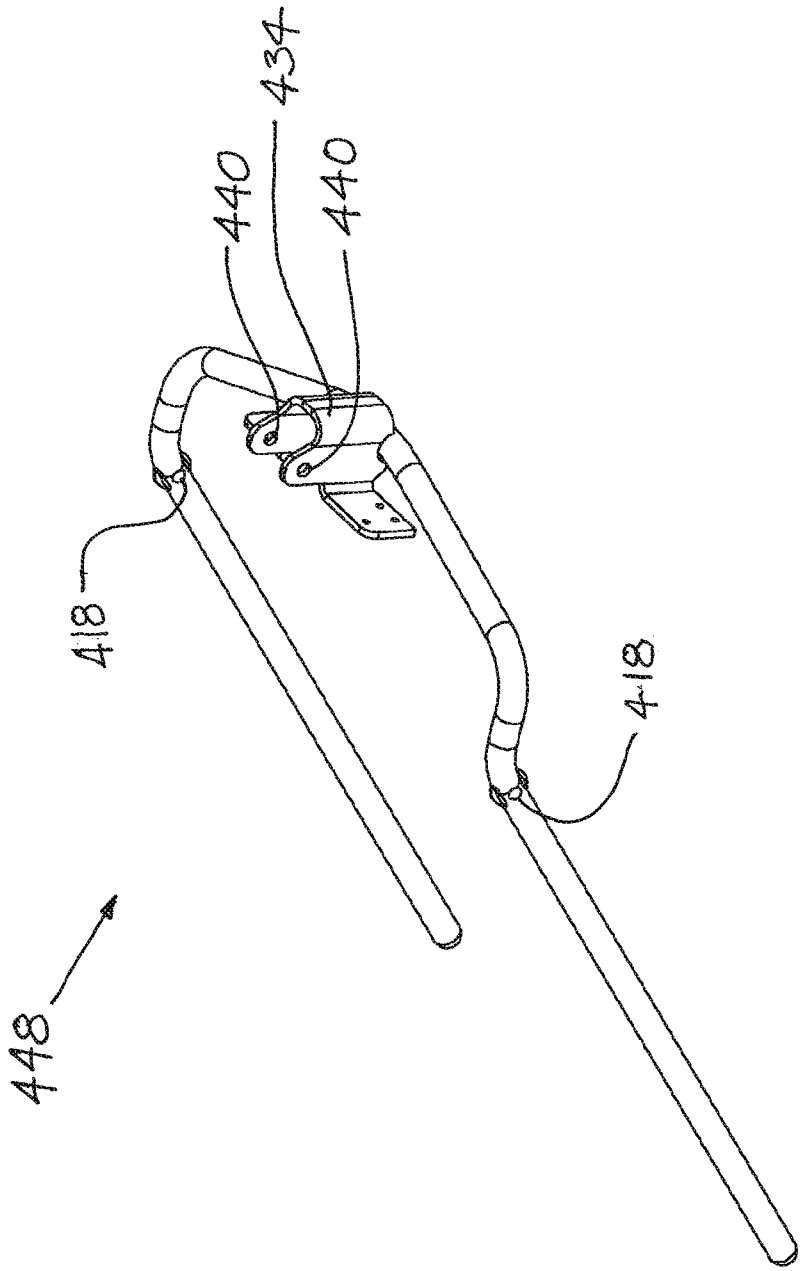

FIG. 58

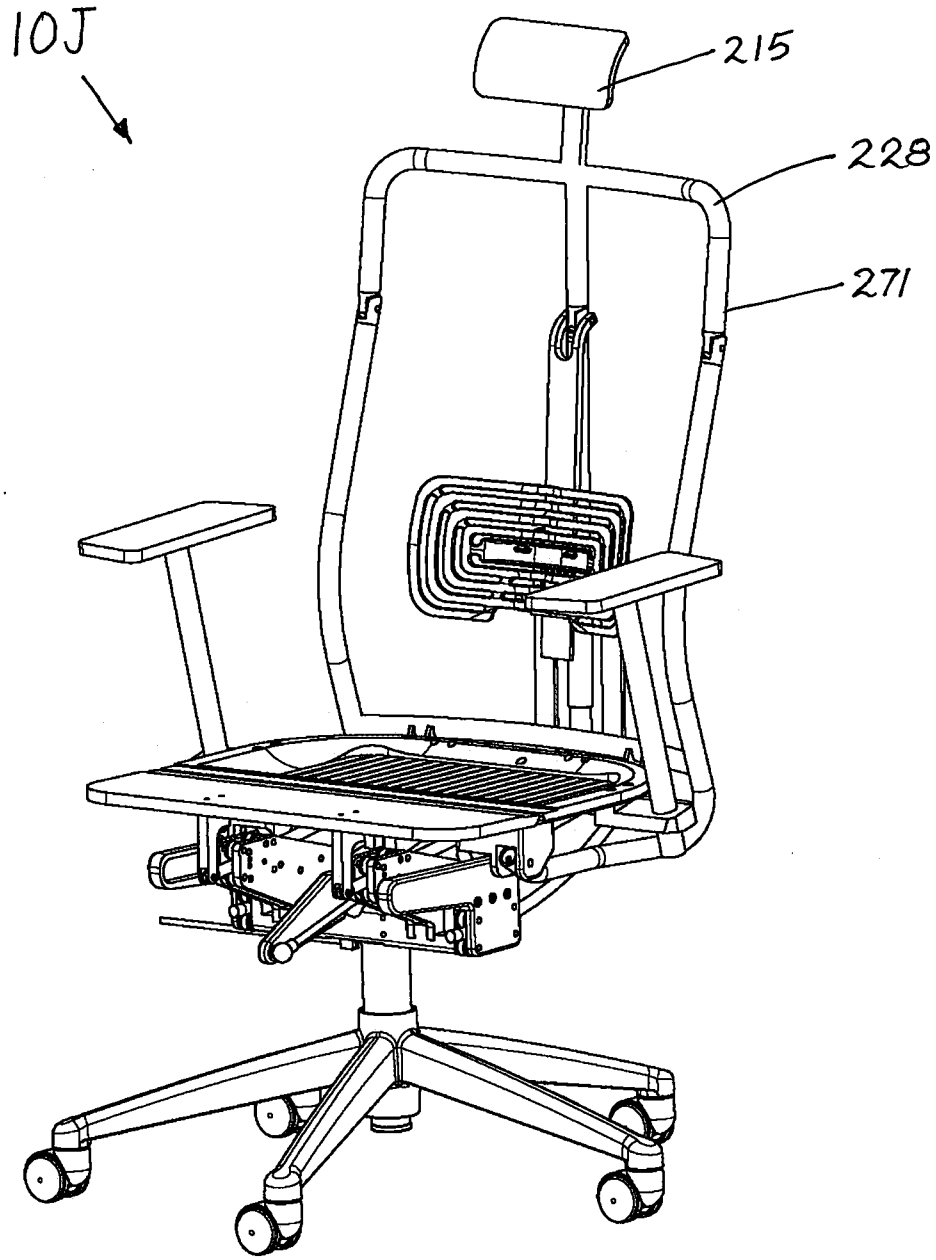

FIG. 59

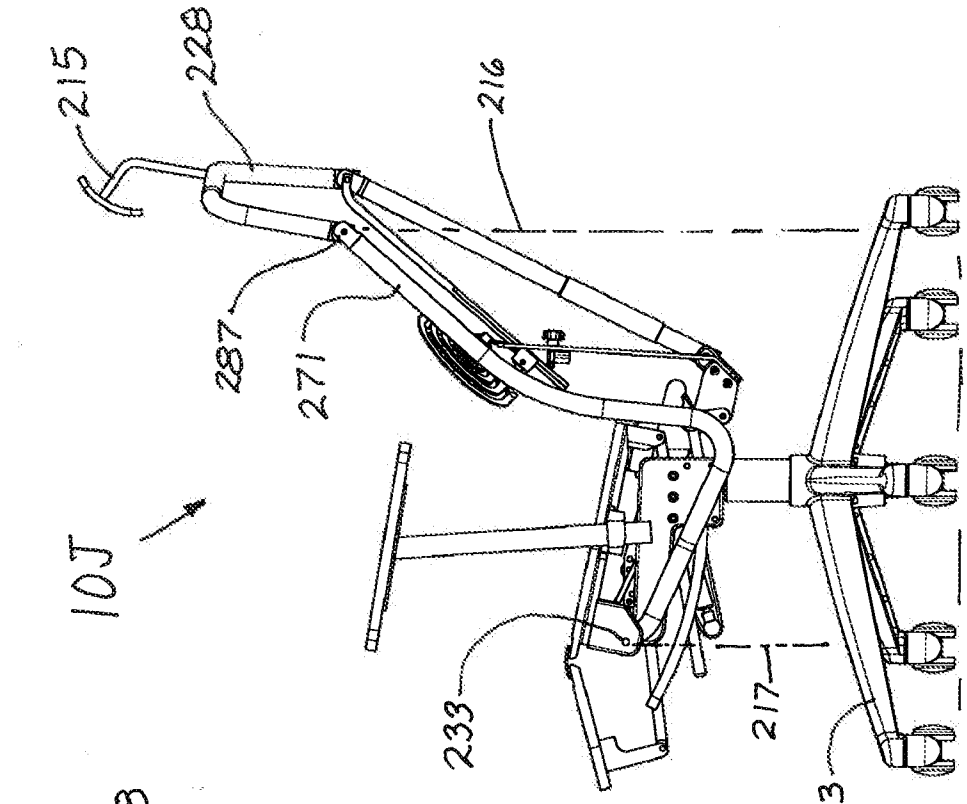
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FIG. 61

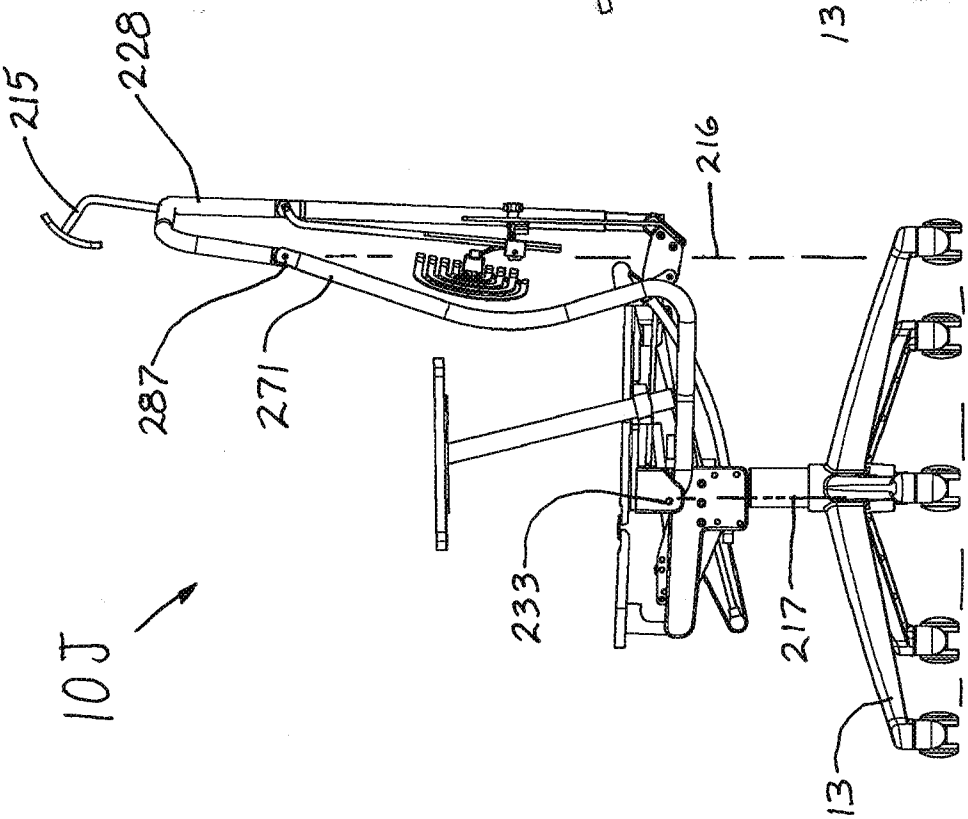
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FIG. 60