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(54) Title: A CHAIR AND SUPPORTS

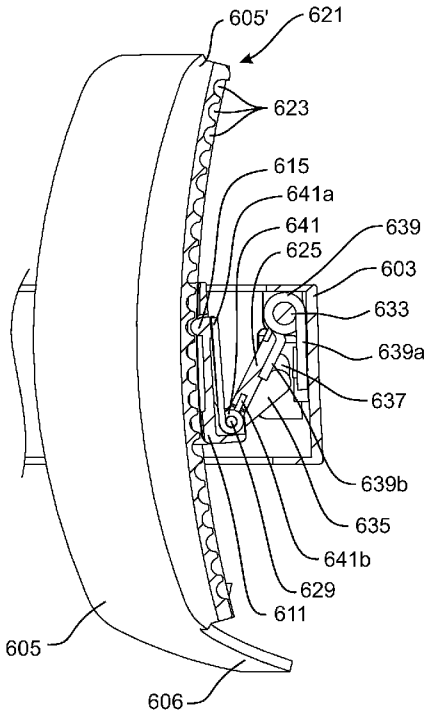

FIGURE 77(a)

(57) Abstract: An adjustable support assembly for use in a chair has a mounting member 603, a support 605 for supporting part of the body of a chair occupant, and a carrier 611 slidably carrying the support 605. The support has a plurality of engagement features 621 and the carrier has an engagement member 615 that is selectively engageable with the engagement features to enable the support to be selectively positioned relative to the carrier at a plurality of positions. A biasing arrangement 607 operatively connects the carrier 611 to the mounting member 603 and forwardly biases the carrier 611 and support 605. The engagement between the engagement member 615 and an engaged engagement feature 621 increases upon application of rearward force to the support.

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A CHAIR AND SUPPORTS

FIELD OF THE INVENTION

The invention relates generally to chairs and associated supports. More particularly, although not exclusively, the invention relates to office chairs.

BACKGROUND TO THE INVENTION

Traditionally chairs have been designed to support an occupant in a single 'correct' seating position. More recently, chairs have been provided with recline mechanisms between the support frame, seat and/or back of the chair, which enable the seat and back to move relative to the support frame so that an occupant can move from an upright to a reclined position. Such chairs sometimes also include additional flexibility or adjustments, to enable an occupant to sit in a less standard side-sitting or angled position while still being fully supported by the chair.

Unlike most traditional chairs which have plush-looking cushioning, the more recent adjustable chairs are targeted at the 'progressive' end of the market. The appearance of those modern chairs, can, in some instances, challenge a user's understanding, as the chairs will often look highly mechanistic and won't have the perceived volume and comfort of a cushioned textile-covered chair. Additionally, some people can associate a modern mechanistic chair design with high cost, meaning they may be less likely to want to purchase the chair, particularly in times of financial hardship.

There is a need for a chair that has a more conventional and traditional appearance, while still providing the ergonomic benefits and functionality of the more modern 'progressive' chairs. There is also a need for such a chair at a low cost point.

Chairs are also often provided with adjustable supports, such as lumbar, head or neck support assemblies. Often, the supports are height adjustable. Typically, there are two types of adjustment mechanisms for such supports. The first type requires the release of an actuator by a user, to release a position lock and enable the user to adjust the position of the support. Such arrangements are typically mechanically complex and may be expensive. An alternative type of support may be adjusted through the use of force, with the force that is manually applied by a user to adjust the position of the support overriding friction provided within the adjustment mechanism. Often, the purpose of such a support is to apply a forwardly-directed support force to an occupant when the occupant applies a

rearward force against the support with a body part. With a friction-type mechanism, if the occupant force is not applied directly rearwardly and instead comprises an up or down component, the user can inadvertently cause the height of the support to adjust when leaning back against the support.

It is an object of at least preferred embodiments of the present invention to provide a chair or component that addresses at least one of the disadvantages outlined above, or that at least provides the public with a useful choice.

SUMMARY OF THE INVENTION

In accordance with a first aspect of the present invention, there is provided an adjustable support assembly for use in a chair, the support assembly comprising:

a mounting member;

a support for supporting part of the body of a chair occupant;

a carrier slidably carrying the support, the support comprising a plurality of engagement features and the carrier comprising an engagement member that is selectively engageable with the engagement features to enable the support to be selectively positioned relative to the carrier at a plurality of positions; and

a biasing arrangement operatively connecting the carrier to the mounting member and configured to forwardly bias the carrier and support;

wherein the engagement between the engagement member and an engaged engagement features increases upon application of rearward force to the support.

In an embodiment, the biasing arrangement comprises a biasing member that acts on the engagement member to bias the engagement member toward the support. In an embodiment, the biasing member resists rearward movement of the engagement member toward the mounting member more than it resists rearward movement of the carrier toward the mounting member, upon application of the rearward force to the support.

In an embodiment, the biasing arrangement comprises: an intermediate member operatively connected to the mounting member and to the carrier; a first biasing member arranged between the mounting member and the intermediate member; and a second biasing member arranged between the carrier and the intermediate member.

In an embodiment, the first and second biasing members are oppositely oriented torsion springs.

In an embodiment, the intermediate member is pivotable relative to the mounting member about a first axis and the carrier is pivotable relative to the intermediate member about a second substantially parallel axis. In an embodiment, the adjustable support further comprises at least one link arm with a first end that is pivotable relative to either the mounting member or the intermediate member and a second end that is slidable relative to the other of the mounting member or the intermediate member. In an embodiment, the adjustable support comprises two link arms, each arm having a first end slidable in a slot on the mounting member and a second end pivotable about the intermediate member second axis.

In an embodiment, the engagement member engages the engagement features in a forward-rearward direction.

In an embodiment, the support is tiltable relative to the mounting member.

In an embodiment, the support is height adjustable.

In an embodiment, the engagement member is resilient.

In an embodiment, the carrier comprises a guide for slidably engaging a complementary guide feature on a rear side of the support. In an embodiment, the guide feature on the support comprises a guide projection or flange, and the carrier comprises at least one guide channel for slidably receiving the guide projection or flange.

In an embodiment, the guide feature on the support is provided by a guide member fixed to the support.

In an embodiment, the engagement features comprise rearward facing, arcuate notches; and the engagement member comprises an arcuate forwardly directed projection.

In an embodiment, the support is a lumbar support. Alternatively, the support could be a different type of support such as a head or neck support for example.

In an embodiment, the support is forwardly concave in plan view, and comprises a central, substantially vertical recess to accommodate the spine of a user.

In an embodiment, the mounting member is configured for mounting to a back frame of a chair.

In accordance with a second aspect of the present invention, there is provided a chair comprising a back frame having two side members, and an adjustable support as outlined in relation to the first aspect above, wherein the mounting member is attached to the two side members.

In an embodiment, the mounting member is fixed relative to the two side members. Alternatively, the mounting member could be moveable relative to the side members.

In an embodiment, the back frame supports a compliant back portion, and the support is positioned rear of the compliant back portion.

In an embodiment, the support is rearwardly spaced from the back portion in the absence of a rearward load on the back portion, and at least a part of the back portion is moved rearward to contact the support upon application of a sufficient rearward force to the compliant back portion.

In accordance with a third aspect of the present invention, there is provided a moulded article suitable for strain orientation, the article comprising:

a plurality of first elongate straps formed in a first layer;

a plurality of second elongate straps formed in a second layer, so that at least some of the first elongate straps overlap with at least some of the second elongate straps; and

a plurality of joiner members that are integrally moulded with the first elongate straps and with the second elongate straps, and that connect between the first elongate straps and the second elongate straps in the regions in which the first elongate straps and the second elongate straps overlap.

In an embodiment, at least a portion of the first elongate straps, at least a portion of the second elongate straps, and at least a portion of the joiner members are suitable for strain orientation. In an embodiment, substantially the entire first elongate straps, substantially the entire second elongate straps, and substantially the entire joiner members are suitable for strain orientation.

In an embodiment, the first elongate straps comprise necked regions adjacent the joiner members, to compensate for a reduction in strain orientation due to the additional material of the joiner members. In an embodiment, the necked regions are formed by notches or recesses extending into sides of the first elongate straps. In an embodiment, the notches or recesses are configured such that post-strain orientation, the sides of the first elongate straps are substantially parallel along substantially their entire lengths.

In an embodiment, the second elongate straps comprise necked regions adjacent the joiner members, to compensate for a reduction in strain orientation due to the additional material of the joiner members. In an embodiment, the necked regions are formed by notches or recesses extending into sides of the second elongate straps. In an embodiment, the notches or recesses are configured such that post-strain orientation, the sides of the second elongate straps are substantially parallel along substantially their entire lengths.

In an embodiment, the moulded article is formed from a polymeric resin. As used herein, a 'polymeric resin' is a plastic raw material suitable for injection moulding. The resin may be a single plastic material, or may comprise a plurality of plastic materials. In an embodiment, the moulded article is moulded from a resin comprising a thermoplastic polyester elastomer.

In an embodiment, the thermoplastic polyester elastomer comprises a block copolymer. In an embodiment, the block copolymer comprises a hard segment and a soft segment. In an embodiment, the thermoplastic polyester elastomer is a block copolymer of polybutylene terephthalate and polyether glycol.

In an embodiment, the resin is selected such that the moulded article, prior to strain orientation, has a hardness in the range of about 30D to about 55D when tested in accordance with ASTM 2240. In an embodiment, the resin is selected such that prior to strain orientation, the moulded article has a hardness in the range of about 30D to about 46D, preferably in the range of about 35D to about 45D, preferably in the range of about 36D to about 44D, more preferably in the range of about 37D to about 43D, more preferably in the range of about 38D to about 42D, more preferably in the range of about 39D to about 41D, most preferably about 40D.

The thermoplastic polyester resin is preferably one of HYTREL 4069, HYTREL 4556, HYTREL 5526, HYTREL 5556, HYTREL 3078. The resin may additionally include stabilisers and/or

additives to achieve desired properties, for example to improve its resistance to UV light, fire, heat aging, moisture, and/or to make the resin a suitable colour.

It will be appreciated that the article could be moulded from other resins having suitable properties.

The first elongate straps may comprise a plurality of elongate straps extending in a first generally longitudinal direction. The second elongate straps may comprise a plurality of elongate straps extending in a second direction that is generally transverse to the first generally longitudinal direction, for example. Alternatively, the straps may be oriented in any suitable way relative to one another. It is preferred that the first elongate straps in the first layer extend longitudinally, and the second elongate straps in the second layer extend transversely.

The generally longitudinally extending elongate straps may differ from the generally transversely extending elongate straps. For example, the generally longitudinally extending elongate straps may have a smaller cross-section than the generally transversely extending elongate straps. However, it is preferred that the cross-sections of the generally longitudinally extending elongate straps are substantially the same as the generally transversely extending elongate straps, at least in the unnecked regions of the straps.

Preferably, at least some of the elongate straps of the moulded article have a cross-sectional dimension of about 12 mm or less, more preferably of about 2.5 mm or less. Preferably, at least a majority of the elongate straps of the moulded article have a cross-sectional dimension of about 12 mm or less, more preferably of about 5 mm or less, more preferably of about 2.5 mm or less. Preferably, at least some of the elongate straps of the moulded article have a depth of about 1.5 mm or about 2 mm.

In an embodiment, the pre-strain orientation depth of each strap is about 1.5 mm or about 2 mm, the generally transversely extending straps have a cross-sectional width (in the longitudinal direction) in the unnecked regions of about 12 mm and in the necked regions of about 10 mm, and the generally longitudinally extending straps have a cross-sectional width (in the transverse direction) in the unnecked regions of about 12 mm and in the necked regions of about 9.4 mm. Preferably, the dimensions are configured such that post-strain orientation, the depth of each strap is about 1.0 mm, the generally transversely extending straps have a cross-sectional width (in the longitudinal direction) in the necked and

unnecked regions of about 8 mm, and the generally longitudinally extending straps have a cross-sectional width (in the transverse direction) in the necked and unnecked regions of about 8 mm.

It will be appreciated that the entire moulded article may be formed of the first elongate straps and the second elongate straps. Preferably, at least a major part of the moulded article is formed of the first elongate straps and the second elongate straps.

Alternatively, only part of the moulded article may be formed of the first and second elongate straps, and the moulded article may additionally be provided with attachment features that are integrally moulded into the article.

At least part of the moulded article may have a curved profile that is formed as part of the moulding process. By way of example only, at least part of the moulded article may have a curved side profile and/or a curved top profile that is formed as part of the moulding process. As an alternative, the moulded article may be substantially flat but may for example be held in a contoured non-flat shape when supported by a frame in use.

Preferably, at least part of the article is capable of being stretched to at least about 400%, preferably at least about 450%, preferably at least about 500%, preferably at least about 600%, preferably at least about 700%, preferably at least about 800%, preferably at least about 900%, of an initial dimension without failure, such that strain orientation occurs. Preferably the straps are stretched to about 450% of their initial lengths to cause strain orientation, and have a post-relaxation length of about 210% of their initial lengths.

The article may be a support surface for a chair. For example, the article may be a back support or seat support for a chair that is subsequently mounted to a frame to support the membrane to form a compliant suspended support surface. However, the method may be used to form any other suitable type of article.

In accordance with a fourth aspect of the present invention, there is provided a method of assembling a support, comprising:

providing a frame;

providing a moulded article as outlined in relation to the third aspect above, wherein at least part of the moulded article has an as-moulded dimension less than a corresponding dimension of the frame;

stretching said at least part of the article so as to have a stretched dimension greater than the corresponding dimension of the frame and such that strain orientation of at least a portion of the first elongate straps and at least a portion of the second elongate straps occurs;

relaxing said at least part of the article so as to have a post-relaxation dimension between the as-moulded dimension and the stretched dimension;

and supporting the article from the frame.

In an embodiment, the frame comprises an opening that is at least partly bounded by frame members, and the method comprises supporting the article from the frame with part of the article extending across the opening, to form a compliant suspended support surface. For example, the frame may comprise side members and upper and lower members (or front and rear members in the case of a seat frame), and the frame members may bound one or more openings that are covered by the article when supported by the frame.

In an embodiment, the first elongate straps comprise generally longitudinally extending straps, and the second elongate straps comprise generally transversely extending straps. In an embodiment, the method comprises stretching and relaxing the generally longitudinally extending straps before stretching and relaxing the generally transversely extending straps. In an alternative embodiment, the method comprises stretching and relaxing the generally transversely extending straps before stretching and relaxing the generally longitudinally extending straps. In yet another embodiment, the method comprises stretching and relaxing the generally transversely extending straps concurrently with stretching and relaxing the generally longitudinally extending straps.

In an embodiment, the step of stretching at least part of the article results in stretching of the joiner members such that strain orientation of the joiner members occurs. In an embodiment, the joiner members are strain oriented in both a longitudinal direction and a transverse direction.

In an embodiment, the joiner members are elongate members having as moulded dimensions of 18.5 mm length, 1.0 mm width, and 2.0 mm depth (to form a gap between the connected straps of 2.0 mm). In an embodiment, the joiner members have a post-strain orientation relaxed dimensions of about 28.5 mm long, 0.8 mm wide, and 1.8 mm deep. The joiner members could alternatively have different dimensions or could be any other suitable shape.

In an embodiment, the first elongate straps comprise necked regions adjacent the joiner members to compensate for a reduction in strain orientation due to the additional material of the joiner members. In an embodiment, the necked regions are formed by notches or recesses extending into sides of the first elongate straps, and wherein the sides of the first elongate straps in the relaxed article are substantially parallel along substantially their entire lengths.

In an embodiment, the second elongate straps comprise necked regions adjacent the joiner members to compensate for a reduction in strain orientation due to the additional material of the joiner members. In an embodiment, the necked regions are formed by notches or recesses extending into sides of the second elongate straps, and wherein the sides of the second elongate straps in the relaxed article are substantially parallel along substantially their entire lengths.

The article may be stretched and relaxed in both the transverse and longitudinal dimensions, or in any other suitable direction. The step of stretching may comprise stretching the article in 360º. That is particularly useful if the article comprises an irregular pattern of members and/or diagonal members.

The method may comprise stretching and relaxing the entire article, or may comprise stretching and relaxing part of the article. That is, in the finished support, some parts of the article may have been strain oriented, and other parts may not have been strain oriented. In an embodiment, substantially all of the first and second elongate straps and joiner members of the article have been strain orientated in two directions, and the remainder of the article may not have been strain oriented.

Depending on the material used, in one embodiment the straps are stretched to between about 4 and about 5 times their as-moulded lengths, and preferably about 4.5 times. In an embodiment, the post-strain orientation relaxed lengths of the straps is between about 1.5 and about 2.7 times the as moulded length, preferably about 2.1 times the as-moulded length.

The step of relaxing and supporting may occur concurrently. For example, the article may comprise pockets or the like to capture respective parts of the frame, and the parts may be captured by the pockets as the article is relaxed. Alternatively, the article may be

connected to the frame after relaxing the article. For example, following relaxing of the article, the article may be stretched a small amount and then supported from the frame. The stretched dimension for supporting the article from the frame is preferably about 1.1 times its post-strain orientation relaxed dimension, but that will depend on the frame configuration and the preferred strap tension.

The article may be directly connected to the frame such as by portions of one of the article and the frame being received in respective complementary recesses of the other of the article and the frame. For example, the article may be provided with integrally moulded joiner members around at least part of its periphery and that receive hooks or projections on the frame to connect the article to the frame. Alternatively, separate fasteners could be used to connect the article and the frame. As another alternative, one or more retaining strips could be used to connect the article to the frame. Preferably, the article is directly connected to the frame by attachment features that are integrally moulded with the article as part of the moulding process, from the same material as the remainder of the article. The part of the article having the integral attachment features would generally not be strain oriented.

In an embodiment, a surface texture is inmolded on the article as part of the moulding method.

The method may comprise stretching different parts of the article different amounts, to obtain varying properties in the article. However, in a preferred embodiment, the percentage stretch of the first elongate straps is substantially the same as the percentage stretch of the second elongate straps, so they undergo substantially the same amount of strain orientation.

One or more of the first elongate straps may differ in length from other(s) of the first elongate straps. However, each of the first elongate straps is preferably stretched by substantially the same percentage increase in length, to provide substantially the same amount of strain orientation in each of the first elongate straps.

One or more of the second elongate straps may differ in length from other(s) of the second elongate straps. However, each of the second elongate straps is preferably stretched by substantially the same percentage increase in length, to provide substantially the same amount of strain orientation in each of the second elongate straps.

In accordance with a fifth aspect of the present invention, there is provided a back portion for a chair when assembled using the method as outlined in relation to the fourth aspect above.

In accordance with a sixth aspect of the present invention, there is provided a seat portion for a chair when assembled using the method as outlined in relation to the fourth aspect above.

In accordance with a seventh aspect of the present invention there is provided a chair comprising:

a supporting frame;

a seat portion for supporting a seated occupant;

a back portion for supporting the back of a seated occupant and that is reclinable relative to the supporting frame; and

a recline mechanism configured to lift the seat portion upon a reclining action of the back portion, the recline mechanism comprising a back support arm operatively connected to the back portion and that is pivotally connected to the supporting frame and is pivotally connected to a relatively forward portion of the seat portion, and a rocker arm that is pivotally connected to the supporting frame, pivotally connected to a relatively rearward portion of the seat portion, and operatively connected to the back support arm to move relative to the back support arm.

In an embodiment, the seat portion moves upwardly and rearwardly when the back portion is reclined. The seat portion may initially move upwardly and forwardly from its initial position during initial recline of the back portion, and then move upwardly and rearwardly so as to move upwardly and rearwardly overall from its initial position.

In an embodiment, the seat portion has a rearward tilt angle when the back portion is not reclined, and the seat portion has a greater rearward tilt angle when the back portion is fully reclined.

In an embodiment, the rocker arm is downwardly forwardly angled when the back portion is not reclined, and is upwardly forwardly angled when the back portion is fully reclined.

In an embodiment, a portion of the back support arm is approximately horizontal when the back portion is not reclined, and is upwardly forwardly angled when the back portion is fully reclined.

In an embodiment, the rocker arm is downwardly forwardly angled when the back portion is not reclined, and is upwardly forwardly angled when the back portion is fully reclined, and wherein a portion of the back support arm is approximately horizontal when the back portion is not reclined, and is upwardly forwardly angled when the back portion is fully reclined, wherein the upward and forward angle of the rocker arm is greater than the upward and forward angle of the portion of the back support arm. In an embodiment, the downward and forward angle of the rocker arm is about 13 degrees below horizontal, and the upward and forward angle of the rocker arm is about 24 degrees above horizontal, and wherein the upward and forward angle of the portion of the back support arm is about 17 degrees above horizontal.

In an embodiment, the pivot connection of the back support arm and the supporting frame is forward of the operative connection of the rocker arm to the supporting frame. In an embodiment, the pivot connection of the rocker arm and the supporting frame is positioned at or adjacent a rear portion of the supporting frame. In an embodiment, the pivot connection of the back support arm and the supporting frame is positioned adjacent and forward of the pivot connection of the rocker arm and the supporting frame. In an embodiment, the pivot connection of the rocker arm and the seat portion is generally aligned with the pivot connection of the back support arm and the supporting frame, in a forward-rearward direction of the chair.

In an embodiment, the pivot connection of the back support arm to the relatively forward portion of the seat portion comprises a pivot and slide connection.

In an embodiment, the rocker arm is operatively connected to the back support arm via a connecting link that is pivotally connected to the back support arm and pivotally connected to the rocker arm. In an embodiment, the pivot connection of the rocker arm and the connecting link is positioned substantially vertically above the pivot connection of the connecting link and the back support arm, when the back portion is not reclined.

In an embodiment, the rocker arm is operatively connected to the back support arm via a pivot and slide connection. In an embodiment, the pivot and slide connection comprises a

pin on the rocker arm and a slot in the back support arm. In an embodiment, the pivot and slide connection comprises a roller rotatably mounted on the rocker arm and slidable along a surface of the back support arm.

In an embodiment, the recline mechanism comprises two back support arms operatively connected to the back portion and that are pivotally connected to the supporting frame and are pivotally connected to the relatively forward portion of the seat portion, two rocker arms that are pivotally connected to the supporting frame, pivotally connected to a relatively rearward portion of the seat portion, and operatively connected to a respective one of the back support arms. In an embodiment, the two rocker arms are movably connected relative to the back support arms via two connecting links that are each pivotally connected to a respective one of the back support arms and to a respective one of the rocker arms.

In an embodiment, the supporting frame comprises a transom having a base and a pair of spaced apart side walls, and wherein a portion of each back support arm is positioned inwardly of the side walls of the transom. In an embodiment, each back support arm is pivotally connected to respective one of the side walls of the transom.

In an embodiment, the seat portion comprises a seat support and a seating surface for supporting a seated occupant, wherein the seating surface is selectively moveable in a forward and rearward direction relative to the seat support, and wherein the rocker arm(s) and the back support arm(s) are pivotally connected to the seat support.

In an embodiment, the chair further comprises a recline resistance mechanism to resist movement of the back portion toward the reclined position, wherein the amount of resistance provided by the recline resistance mechanism is selectively adjustable.

In an embodiment, the seat comprises a shell beneath the seating surface and having a central recess in the underside of the shell, and wherein the recline mechanism is substantially housed in the central recess when the back portion is not reclined.

In an embodiment, a vertical height of the recline mechanism is about 40 mm when the back portion is not reclined.

In an embodiment, a forward end of the rocker arm is configured to engage with the seat portion to provide a recline stop that defines the maximum rearward recline of the back portion.

In an embodiment, a forward end of the back support arm is configured to engage with the supporting frame to provide an upright stop that defines the upright position of the back portion.

In accordance with an eighth aspect of the present invention, there is provided a chair comprising:

a supporting frame;

a seat portion for supporting a seated occupant;

a back portion for supporting the back of a seated occupant, the back portion being reclinable relative to the supporting frame between a generally upright position and a generally reclined position; and

a recline resistance mechanism to resist movement of the back portion toward the generally reclined position, the recline resistance mechanism comprising a resistance device operatively connected to one of the back portion, the seat portion, or the supporting frame, the recline resistance mechanism further comprising a first retainer and a second retainer that are both operatively connected to another one of the back portion, the seat portion, or the supporting frame, wherein the second retainer is movable to adjust a reaction point between the resistance device and said another one of the back portion, seat portion, or supporting frame, to vary the amount of recline resistance provided by the recline resistance mechanism, wherein the first retainer preloads the resistance device when the back portion is in the generally upright position, and wherein the second retainer is movable to at least one position wherein in the reclined position of the back portion, the reaction point is provided by the second retainer.

In an embodiment, movement of the second retainer does not alter the preload on the resistance device when the back portion is in the generally upright position.

In an embodiment, the first retainer engages the resistance device such that the recline resistance mechanism provides a first level of recline resistance. In an embodiment, the second retainer is movable to a position in which it provides a second level of recline resistance that differs from the first level of recline resistance provided by the first retainer. In an embodiment, the first level of recline resistance provided by the first retainer is a

relatively low level of recline resistance, and the second level of recline resistance provided by the second retainer is a relatively high level of recline resistance.

In an embodiment, the second retainer is selectively movable between an engaged position in which the second retainer engages the resistance device when the back portion is reclined from the generally upright position, and a disengaged position. In an embodiment, in the engaged position, the second retainer does not engage the resistance device when the back portion is in the generally upright position.

In an embodiment, the first retainer contacts the resistance device when the back portion is not reclined, whether or not the second retainer is selectively engaged.

In an embodiment, at least one of the retainers is movable relative to the resistance device between a plurality of engagement positions, to provide differing levels of recline resistance.

In an embodiment, the resistance device is operatively connected to the back portion, and the first and second retainers are operatively connected to the supporting frame.

In an embodiment, the resistance device comprises a leaf spring. In an embodiment, the leaf spring has an effective length, a reaction length, and an amount of deflection when the back portion is in the generally reclined position, and wherein in a first position of the second retainer, the effective length, the reaction length, and the amount of deflection are all greater than if the second retainer is in a second position, such that the level of resistance provided by the recline resistance device is relatively high when the second retainer is in the first position and relatively low when the second retainer is in the second position.

In an embodiment, the first position is an engaged position in which the second retainer engages the leaf spring when the back portion is reclined from the generally upright position, and the second position is a disengaged position. Alternatively, the first and second positions may be different engaged positions in which the second retainer engages the leaf spring when the back is reclined from the generally upright position.

In an embodiment, the leaf spring is operatively connected to the back portion to move with the back portion and the first and second retainers are operatively connected to the

supporting frame. In an embodiment, the second retainer is pivotally connected to the supporting frame and is selectively engageable with a forward end of the leaf spring.

In an embodiment, the leaf spring is operatively connected to the supporting frame, and the first and second retainers are operatively connected to the back portion to move with the back portion.

In an embodiment, the resistance device comprises a torsion spring. In an embodiment, the torsion spring comprises a leg portion, and the first retainer engages the leg portion.

In an embodiment, the second retainer is movable to engage and disengage an end of the leg portion and wherein the effective spring rate of the torsion spring and thereby the recline resistance is higher when the second retainer is engaged with the end of the leg portion.

In an embodiment, the torsion spring further comprises another leg portion that is operatively connected to the back portion. In an embodiment, the torsion spring comprises a body and two leg portions, and wherein the body is positioned on or spaced apart from the pivot axis of the back portion to the supporting frame.

In an embodiment, the resistance device comprises a plurality of springs, and wherein the first retainer and/or the second retainer is/are engageable with the plurality of springs. By way of example, the springs could be leaf springs, could be torsion springs, or could differ from each other.

The term 'comprising' as used in this specification means 'consisting at least in part of'. When interpreting each statement in this specification that includes the term 'comprising', features other than that or those prefaced by the term may also be present. Related terms such as 'comprise' and 'comprises' are to be interpreted in the same manner.

As used herein the term 'and/or' means 'and' or 'or', or both.

As used herein '(s)' following a noun means the plural and/or singular forms of the noun

It is intended that reference to a range of numbers disclosed herein (for example, 1 to 10) also incorporates reference to all rational numbers within that range (for example, 1, 1.1, 2,

3, 3.9, 4, 5, 6, 6.5, 7, 8, 9 and 10) and also any range of rational numbers within that range (for example, 2 to 8, 1.5 to 5.5 and 3.1 to 4.7) and, therefore, all sub-ranges of all ranges expressly disclosed herein are hereby expressly disclosed. These are only examples of what is specifically intended and all possible combinations of numerical values between the lowest value and the highest value enumerated are to be considered to be expressly stated in this application in a similar manner.

The chair may be any suitable form of chair. For example, the chair may be an office chair. The chair could be a different type of chair, including but not limited to a vehicle seat such as a car seat, aircraft seat, or boat seat, or a lounge chair or theatre chair.

Optional features of different embodiments of the invention are described in the accompanying dependent claims.

To those skilled in the art to which the invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the scope of the invention as defined in the appended claims. The disclosures and the descriptions herein are purely illustrative and are not intended to be in any sense limiting. Where specific integers are mentioned herein which have known equivalents in the art to which this invention relates, such known equivalents are deemed to be incorporated herein as if individually set forth.

The invention consists in the foregoing and also envisages constructions of which the following gives examples only.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be more fully understood, some embodiments will now be described by way of example with reference to the accompanying figures in which:

Figure 1 is a perspective view of a preferred form chair;

Figure 2 is a front elevation view of the chair of Figure 1;

Figure 3 is a side elevation view of the chair of Figures 1 and 2;

Figure 4 is a rear elevation view of the chair of Figures 1 to 3;

Figure 5 is a plan view of the chair of Figures 1 to 4;

Figure 6 is a bottom view of the chair of Figures 1 to 5;

Figure 7 is a schematic side elevation view showing the back portion 501 and seat portion 151 in an upright position in broken lines, and in a fully reclined position in solid lines;

Figure 8 is a perspective view of an alternative preferred form chair having a high back;

Figure 9 is a front elevation of the chair of Figure 8;

Figure 10 is a side elevation of the chair of Figures 8 and 9;

Figure 11 is a rear elevation of the chair of Figures 8 to 10;

Figure 12 is a schematic diagram showing the connections between the links in a first preferred form back recline mechanism of the first or second preferred form chair with the back portion in an upright position;

Figure 13 is a diagram corresponding to Figure 12 but with the back portion in a reclined position;

Figure 14 is a diagram corresponding to Figure 13 and showing the effective pivot point of the seat during recline of the back portion;

Figure 15 is a side view of the recline mechanism of Figures 12 to 14, with the back portion in an upright position;

Figure 16 is a view corresponding to Figure 15, with the back portion in a partially reclined position;

Figure 17 is a view corresponding to Figures 15 and 16, with the back portion in a fully reclined position;

Figure 18 is a schematic diagram showing the connections between the links in a second preferred form back recline mechanism of the first or second preferred form chair, with the back portion in an upright position;

Figure 19 is a diagram corresponding to Figure 18 but with the back portion in a reclined position;

Figure 20 is a side view of the recline mechanism of Figures 18 and 19, with the back portion in an upright position;

Figure 21 is a view corresponding to Figure 20, with the back portion in a partially reclined position;

Figure 22 is a view corresponding to Figures 20 and 21, with the back portion in a fully reclined position;

Figure 23 is an underside plan view of one of the preferred form chairs, showing the seat portion in a forwardmost depth adjusted position;

Figure 24 is an underside plan view similar to Figure 23, but showing the seat portion in a rearmost depth adjusted position;

Figure 25 is a perspective view showing a first preferred form recline resistance mechanism (RRM) of the recline mechanism of Figures 12 to 17 (but which also has application, for example, in the recline mechanism of 18 to 22), with the back portion upright and the RRM in a high resistance configuration;

Figure 26 is a view corresponding to Figure 25, but with the back portion reclined;

Figure 27 is an exploded perspective view of the recline mechanism of Figures 12 to 17 and the RRM of Figures 25 and 26;

Figure 28 is a plan view of the RRM of Figure 25;

Figure 29 is a view corresponding to Figure 25, but with the RRM in a low resistance configuration;

Figure 30 is a view corresponding to Figure 29, with the back portion reclined;

Figure 31 is a section view of the arrangement of Figure 25;

Figure 32(a) is a section view of the arrangement of Figure 30;

Figure 32(b) is a section view of the arrangement of Figure 26;

Figure 33 is a perspective view showing a second preferred form RRM of the recline mechanism of Figures 12 to 17 (but which also has application, for example, in the recline mechanism of 18 to 22), with the back portion upright and the RRM in a high resistance configuration;

Figure 34 is a view corresponding to Figure 33, but with the RRM in a low resistance configuration;

Figure 35 is a section view of the arrangement of Figure 34;

Figure 36 is the view of Figure 34, but with the back portion reclined;

Figure 37 is a front elevation view of a preferred form left side arm support assembly of the chair of Figures 1 to 7 or 8 to 11;

Figure 38 is a side elevation view of the arm support assembly of Figure 37;

Figure 39 is a partial exploded view showing the height adjustment mechanism of the arm support assembly of Figures 37 and 38 with the arm pad removed;

Figure 40 is a section view of the arm support assembly of Figures 37 to 39 with the arm pad shown and showing the arm body in the sleeve;

Figure 41 is a section view the arm support assembly of Figures 37 to 40 with the arm pad shown and showing the height adjustment mechanism locked in the lowest position;

Figure 42 is a partial section view similar to Figure 41, with the height adjustment mechanism unlocked in the lowest position;

Figure 43 is the view of Figures 41 and 42 with the height adjustment mechanism unlocked at a mid-height position;

Figure 44 is the view of Figure 42 with the height adjustment mechanism locked at a mid-height position;

Figure 45 is a front perspective view of a back assembly of a preferred form chair;

Figure 46 is a rear perspective view of the back assembly of Figure 45;

Figure 47 is an exploded front perspective view of the back assembly of Figure 45;

Figure 48 is an exploded rear perspective view of the back assembly of Figure 45;

Figure 49(a) is a rear perspective view of the back frame of the back assembly of Figure 45, and Figures 49(b) and (c) are enlarged detail views of the back frame features for connecting the staple-receiving members;

Figure 50(a) is a front perspective view of the staple-receiving members for connecting to the back frame of Figures 49(a) to (c), and Figures 50(b) and (c) are enlarged detail views of the features for connecting the staple-receiving members to the back frame;

Figures 51(a) and (b) are partial section views showing details of the assembly of the back frame of Figures 49(a) to (c) and staple-receiving members of Figures 50(a) to (c), with Figure 51(a) showing a connection at a top portion of the frame and Figure 51(b) showing a connection at a lower portion of the frame;

Figure 52(a) to (c) show the aesthetic cover of the back assembly of Figure 45, with 52(a) being a front perspective view of the aesthetic cover, Figure 52(b) being an enlarged detail view of a tab on an upper portion of the aesthetic cover for connecting the aesthetic cover to the back frame, and Figure 52(c) being an enlarged detail view of a crush dowel on a lower portion of the aesthetic cover for connecting the aesthetic cover to the back frame;

Figures 53(a) to (d) are partial section views showing the assembly of the back frame and aesthetic cover, with Figure 53(a) showing a connection at a top portion of the frame, Figure 53(b) showing a connection at a lower portion of the frame, and Figures 53(c) and 53(d) showing a connection at a side portion of the frame;

Figure 54 is a section view of an upper portion of the back assembly of Figure 45, taken in a vertical plane through the centreline of the back assembly;

Figure 55 is a front perspective view of the support that forms part of the back portion of Figure 45, in an as-moulded form;

Figure 56 is a plan view from the front of the support of Figure 55;

Figure 57 is a detail view from the front of the overlapping intersections between two longitudinally extending straps and two transversely extending straps of the support of Figure 55;

Figure 58 is a rear perspective view of the support of Figure 55;

Figure 59 is a plan view from the back of the support of Figure 55;

Figure 60 is a detail view from behind of the overlapping intersections between one longitudinally extending strap and two transversely extending straps of the support of Figure 55;

Figure 61 is a front perspective view of the support of Figure 55, in a post-strain orientation relaxed configuration;

Figure 62 is a plan view from the front of the support in the configuration of Figure 61;

Figure 63 is a detail view from the front of the overlapping intersection of one longitudinally extending strap and one transversely extending strap in the configuration of Figure 61, showing one of the strap attachment features;

Figures 64(a) to (f) are views showing one of the joiner members that connect the longitudinally extending straps to the transversely extending straps, in the as-moulded form, where 64(a) is a rear perspective view, 64(b) is a front perspective view, 64(c) is a rear plan view, 64(d) is a side elevation in the transverse direction, 64(e) is a front plan view, and 64(f) is a section view taken through line 64f-64f of Figure 64(e);

Figures 65(a) and (b) show exemplary as-moulded dimensions of the necked regions of the transverse straps and longitudinal straps respectively;

Figures 66(a) to (f) are views showing one of the joiner members that connect the longitudinally extending straps to the transversely extending straps, in the configuration of Figure 61, where 66(a) is a rear perspective view, 66(b) is a front perspective view, 66(c) is a rear plan view, 66(d) is a side elevation in the transverse direction, 66(e) is a front plan view, and 66(f) is a section view taken through line 66f-66f of Figure 66(e);

Figures 67(a) and (b) are views showing alternative exemplary as-moulded dimensions of the necked regions of the transverse straps and longitudinal straps respectively;

Figures 68(a) to (d) show features on the back frame for connecting the moulded support to the back frame, where 68(a) is a front perspective view of the back frame, 68(b) is a view of one of the attachment features on the top frame member, 68(c) shows two attachment features on the bottom frame member, and 68(d) shows some of the attachment features on a side frame member;

Figures 69(a) to (d) are similar to Figures 68(a) to (d), but showing some of the elongate strap members attached to the frame, where 69(a) shows the attachment of one of the longitudinal straps to the top frame member, 69(b) shows the attachment of one of the longitudinal straps to the bottom frame member, 69(c) shows the attachment of one of the transverse straps to a side frame member at an upper portion, and 69(d) shows the attachment of one of the transverse straps to a side frame member at a lower portion;

Figure 70 is a rear elevation view showing the support of Figures 55 to 67 attached to the chair back frame and supporting a cushioning member;

Figure 71 is a perspective view of a preferred form lumbar support assembly for use in the chair of Figures 1 to 7 or 8 to 11, with the lumbar support panel adjusted to an intermediate height and biased to a forward position;

Figure 72 is an exploded perspective view of the lumbar support assembly of Figure 71;

Figure 73 is a front view of the lumbar support assembly of Figure 71;

Figure 74 is a plan view of the lumbar support assembly of Figure 71;

Figure 75 is a rear view of the lumbar support assembly of Figure 71;

Figure 76 is a section view of the lumbar support assembly of Figures 71 to 75, taken through section 76-76 of Figure 73;

Figure 77(a) is a section view of the lumbar support assembly of Figures 71 to 76, taken through section 77-77 of Figure 73;

Figure 77(b) is a detail view of part of Figure 77(a);

Figure 78(a) is a section view corresponding to Figure 77(a) but with the lumbar support panel moved rearward upon application of a rearward force by a chair occupant, compressing the biasing mechanism;

Figure 78(b) is a detail view of part of Figure 78(a);

Figure 79 is a section view corresponding to Figure 77(a) but with the lumbar support panel adjusted to a higher position;

Figure 80 is a section view corresponding to Figure 79 but with the lumbar support panel tilted upwards;

Figure 81 is a section view corresponding to Figure 77(a) but with the lumbar support panel adjusted to a lower position;

Figure 82 is a section view corresponding to Figure 81 but with the lumbar support panel tilted downwards;

Figure 83 is an exploded view of components of a preferred form attachment mechanism of the lumbar support assembly of Figures 71 to 82;

Figure 84(a) is a front partial section view showing a first stage of attachment of the lumbar support assembly of Figures 71 to 83 to the back frame of the chair;

Figure 84(b) is a front partial section view similar to Figure 84(a) but showing a second stage of attachment of the lumbar support assembly to the back frame of the chair; and

Figure 84(c) is a front partial section view similar to Figure 84(a) but showing a final stage of attachment of the lumbar support assembly to the back frame of the chair.

DETAILED DESCRIPTION OF PREFERRED FORMS

Since the figures illustrate the preferred form chairs from various different angles as convenient to explain certain parts, an arrow marked 'F' has been inserted into some of the figures where appropriate to indicate a forward direction of the chair. Accordingly the terms forward, rearward, left side, and right side (or similar) should be construed with reference to the forward direction F of the chair, not necessarily with reference to the orientation shown in the particular figure.

The features of the preferred form chairs are described and shown herein to give a full understanding of the components and operation of the preferred form chair. It will be appreciated that not all of the features described herein need be provided in every chair.

Figures 1 to 7 show a chair 101 in accordance with a first preferred form of the present invention. Figures 8 to 11 show a chair 101' in accordance with a second preferred form of the present invention. Both of the chairs may have any one or more of the features described below. The primary difference between the first preferred form chair 101 and the second preferred form chair 101', is that the first preferred form chair is a 'mid-back' chair, with a back portion 501 sized and configured to support a seated occupant's back portion up to approximately their shoulder blade region. The second preferred form chair 101' is a 'high-back' chair, with the back portion 501' sized and configured to support a seated occupant's back portion up to and including their shoulder region. As the chairs are otherwise substantially the same, like reference numerals indicate like parts in the figures, with a prime (') indicating the sections that differ.

Each chair has a supporting frame 102 comprising a base 103 for supporting the chair on a floor surface. In the form shown the base is a castered base 103 having a plurality of radially extending legs 107 extending outwardly from a single central hub. In the form shown, there are five legs. However, it will be appreciated that there may be more or less legs. A caster or roller 109 is rotatably mounted at the end of radially-extending leg 107 opposite to the central hub. The casters enable a chair occupant to move the base 103 and thereby the chair along the ground surface. In an alternative configuration, the chair may comprise a fixed base that does not provide for rolling movement of the chair on the ground surface.

A height adjustable column 111 is coupled to the central hub of the base and extends upwardly therefrom. The height adjustable column can be any suitable type of pneumatic or gas spring, which enables height adjustment of the chair seat portion 171 and back portion 501, 501' relative to the ground surface. A main transom 121 of the supporting frame is coupled to an upper end of the height adjustable column 111, such that height adjustment of the column causes height adjustment of the transom 121 and supported components.

A seat portion 151 for supporting a seated occupant and a back portion 501, 501' supporting the back of a seated occupant are coupled to the transom 121 via a recline mechanism described below, so that the seat portion 151 and back portion are movable relative to the supporting frame. The seat portion 151 and back portion 501 will be described in further detail below.

The chairs 101, 101' may be provided with or without arm support assemblies 401 to support an occupant's arms.

RECLINE MECHANISM

In the preferred form chairs, the back portion 501, 501' of the chair is reclinable relative to the supporting frame 102 between an upright position (Figures 3 and 10) and a reclined position (Figure 7). The chair comprises a recline mechanism 201, 202 coupling the back portion 501, 501' to the seat portion and the transom 121. The recline mechanism is configured to lift the seat portion 151 as the back portion 501, 501' reclines.

Figures 12 to 17 show a first preferred form recline mechanism 201. In this embodiment, the recline mechanism comprises a back support arm 203, a rocker arm 211, and a connector link 215. The back support arm 203 is fixed to the back portion 501, 501' and extends forward from the back portion 501, 501'. The angle between the back frame 503 and the back support arm 203 is preferably fixed and about 90º. The back support arm 203 is a rigid member and has a kinked arrangement, with a rearward section 203a extending forward from its rear end to pivot 219, an upwardly and forwardly angled intermediate section 203b between pivots 219 and 205, and a forward section 203c between pivots 205 and 207. Preferably, a portion 203c of the back support arm 203 is approximately horizontal when the back portion 501, 501' is upright, and is upwardly forwardly angled when the back portion is reclined.

The back support arm 203 is pivotally connected to the transom 121 by a pivot 205, and a front end 203c of the back support arm 203 is pivotally connected to a relatively forward portion of the seat portion 151 via the support 161 by a pivot and slide 207. Preferably, the front end of the back support arm 203 is connected to the front of the seat portion 151. The rocker arm 211 is pivotally connected to the transom 121 by a pivot 213 and has a first relatively forward end pivotally connected to a relatively rearward portion of the seat portion 151 and a second relatively rearward end pivotally connected to the connector link 215, to operatively connect the rocker link 211 to the back support arm 203 to move relative to the back support arm 203.

The pivot connection 213 between the rocker arm 211 and the transom 121 is positioned at or adjacent a rear portion of the transom 121. The pivot connection 205 between the back support arm 203 and the transom 121 is adjacent and forward of the pivot 213 between the rocker arm 211 and the transom 121. The pivot connection 209 between the rocker arm and the seat portion 151 is generally aligned with the pivot connection of the back support arm 203 and the transom 121 in a forward-rearward direction of the chair, in both the fully reclined and fully upright configurations of the back portion.

In the first embodiment 201, the pivot connection 217 of the rocker arm 211 and the connecting link 215 is positioned substantially vertically above the pivot connection 219 of the connecting link 215 and the back support arm 203 both when the back portion is fully upright and fully reclined. As shown in Figures 12 and 13, during recline of the back portion 501 through an angle α of about 18º from upright, the angle γ between the connecting link 215 and the back support arm 203 changes less than about 2º, from about 93.6º to about 95.4º. During that recline, the rocker arm 211 pivots from a downwardly forwardly angled orientation, from an angle θ of about 13º, preferably about 12.7º, below horizontal when the back portion is fully upright, to an upwardly forwardly angled orientation of about 24º, preferably about 23.8º, above horizontal when the back portion is fully reclined. In the reclined configuration, the upward and forward angle θ of the rocker link 211 is greater than the upward and forward angle β of the portion 203c of back support arm 203 that extends from the transom pivot 205 to the seat portion pivot 207. In this embodiment, the upward and forward angle β is about 17.1° in the reclined configuration, and the downward and forward angle β is about 0.8° when the back portion is upright.

Figures 15 to 17 show side views of the recline mechanism of Figures 12 to 14, with the back portion 501, 501' in a fully upright (Figure 15), intermediate (Figure 16), and fully reclined (Figure 17) position.

As shown in Figure 27, the pivot and slide 207 between the back support arm 203 and the seat portion 151 comprises a pin 210 fixed to an underside of a front portion of the seat portion 151, and at least one slot 208 in a front end 203c of the back support arm 203. The slot 208 is a slightly elongated aperture that allows between about 1.5 mm and about 2 mm movement of the pin 210 along the slot 208 during recline. Alternatively, the pivot and slide 207 could comprise any other sliding connection, for example a pin or protrusion at a front end of the back support arm 203 that slides in a slot in the seat portion 103.

Figures 18 to 22 show a second preferred form recline mechanism 202. That embodiment has similar features and functioning to the embodiment of Figures 12 to 17, and like numerals indicate like parts, with a prime (') indicating the sections that differ. This embodiment differs in that, in place of the connector link 215, the rocker link 211' is operatively connected to the back support arm 203' to move relative to the back support arm, via a pivot and slide connection 220. The rocker link 211' is pivoted to the transom 121 at a pivot 213' intermediate its two ends.

The forward-rearward position of the pivot and slide connection 220 is selected to enable the forward portion of the rocker link 211' between the transom pivot 213' and the seat pivot 209 to move through the same angle during recline of the back portion 501, 501' as for the first embodiment, such that the movement imparted to the seat portion 151 on recline of the back portion 501, 501' is substantially the same for both the first and second embodiments 201, 202. The pivot and slide connection 207 between the seat portion 151 and the back support arm 203' is substantially the same for both the first and second embodiments 201, 202. It can be seen that the pivots 220, 205, 207 of the back support arm are more linear in this embodiment than in the embodiment of Figures 12 to 17.

Preferably, the pivot and slide connection 220 comprises a pin 223 on the rocker arm 211' and a slot 225 in the back support arm 203', as shown in Figures 20 to 22. Preferably, between about 2 and about 3 mm, most preferably approximately 2.5 mm of sliding movement is provided by the pivot and slide connection 220. The amount of sliding movement provided by the pivot and slide connection 220 depends on the vertical position of the connection 220 relative to the back support arm 203' and pivot 213'. For a given

fore-aft position of the pivot and slide connection 220, a lower position of the pivot and slide connection will require more sliding movement than a higher position. Alternatively, the sliding connection may comprise any other suitable sliding connection, for example, a roller rotatably mounted on the rocker arm 211' that is slidable along a surface of the back support arm 203'.

The recline mechanisms may comprise a single back support arm 203, 203', rocker arm 211, 211', and/or rocker link 215 or pivot and slide 220, which may be generally centrally mounted in the chair. Preferably, the chair comprises a pair of back support arms 203, 203', a pair of rocker arms 211, 211', and a corresponding pair of rocker links 215 or pivot/slides 220 that are spaced apart across a transverse width of the chair to provide stability to recline mechanism movement. The two back support arms 203, 203' may comprise a single integral member connected via a cross-member, with two forwardly extending arms, or may comprise two separate support arms both operatively connected to the back portion 501, 501'.

As shown in Figures 25 to 30 the transom 121 preferably comprises a pair of spaced apart side walls 227 and a base 229. The back support arms 203, 203' are preferably positioned inwardly of the transom side walls 227, and pivotally connected at pivot 213, 213' to a respective side wall 227. The rocker links 211, 211' are preferably positioned outwardly of the transom side walls.

Figures 15 to 17 and 20 to 22 show side views of the recline mechanism with the back portion 501, 501' upright, partly reclined and fully reclined. During recline, the seat portion 151 first moves upwardly and forward, until the rocker links 211, 211' are horizontal, and then moves upwardly and rearwardly. When the back portion 501, 501' is upright, the seat portion 151 is angled rearwardly 4º. An underside first surface 212a on a front end of the back support arm 203 abuts a portion of the transom 121 to provide an upright stop to define the upright position of the back portion.

As the back portion 501, 501' reclines and the seat portion 151 lifts, the rearward tilt of the seat increases, but at a lesser rate than the angular change of the back portion 501, 501'. The first surface 212a on the back support arm 203 moves out of contact with the transom 121 during recline. Figure 17 shows the seat portion 151 when the back portion 501, 501' is fully reclined. In the fully reclined position, a second upper surface 212b on a front end of the rocker link 211, 211' abuts a surface on the seat portion 151 to provide a recline stop

and define the maximum rearward recline of the back portion 501, 501'. In a preferred embodiment, the seat portion is rearwardly tilted about 4º when the back portion is in the upright position, and rearwardly tilted about 7.8º when the back portion is fully reclined.

It can be seen that the seat portion 151 preferably lifts upwardly and rearwardly and increases in rearward tilt angle, as the back portion 501, 501' is reclined. The lifting of the seat portion provides a 'weight-compensated' recline mechanism, meaning more force is required for a heavier seated occupant to recline the back portion than for a lighter seated occupant to do so. As shown in Figure 14, the effective pivot point 221 of the seat portion relative to the transom 121 is a rearward distance RPD of about 374 mm behind the pivot connection 205 of the back portion to the transom, and is a vertical distance VPD of about 44.2 mm below that pivot connection 205. These dimensions are examples only, and may vary.

Due to the main back support arms 203, 203' extending forward under a major part of the seat portion 151 and connecting to a relatively forward portion of the seat portion, the primary lifting of the seat portion during recline of the back portion 501, 501' is a lifting of the forward portion of the seat portion. The rocker arms 211, 211' by their operative connection to the back support arms 203, 203' act as followers to the movement, and lift the rear portion of the seat portion.

The seat portion 151 comprises a seat support 161 and a seating surface 171 for supporting a seated occupant. In a preferred embodiment, the seating surface 171 is selectively moveable in a forward and rearward direction relative to the seat support 161 to selectively adjust seat depth relative to the back portion 501, 501'. The rocker arms 211, 211' and the back support arms 203, 203' are pivotally connected at pivots 207, 209 to the seat support 161. Alternatively, the seating surface 171 may be fixed to the seat support 161 and not depth adjustable. In the form shown, the seating surface 171 is a cushioned and upholstered surface. Alternatively, it may be a compliant slotted seat panel, or a combination of a slotted seat panel and a cushioned and upholstered surface for example.

The recline mechanism 201, 201' is a low profile mechanism. As shown in Figure 20, the vertical height VHRM between top and bottom surfaces of the recline mechanism is preferably about 40 mm. As shown in Figures 1 to 11, an underside of the seat portion may comprise a shell 181 with a central recess. A substantial portion of the recline mechanism

including the transom 121, is housed within the central recess when the back portion of the chair is upright.

As shown in Figures 6, 9 and 10, three actuators 191a, 191b, 191c are flush-mounted in the underside shell 181, and are provided to enable the occupant to adjust features of the chair by moving the actuators. In one embodiment, the front actuator 191a on the left hand side of the chair adjusts the recline resistance (described in more detail below), the actuator 191b on the right hand side of the chair adjusts the height and depth of the seating surface 171, and the rear actuator 191c on the left hand side of the chair actuates an upright lock 251 to prevent recline of the back portion.

Figures 23 and 24 show details of the seat depth mounting on support 161. Transversely spaced portions of the seat panel 151a capture corresponding portions of the support 161, to slidably mount the panel 151a on the support. The support is provided with a rack comprising a plurality of spaced slots 161a. A catch body 192 is mounted to the panel 151a, and has teeth 192d that are movable transversely into and out of engagement with the slots 161a. When engaged (Figure 24), the depth position of the seating surface 171 is locked relative to the support 161. When disengaged (Figure 23), the depth position of the seating surface 171 can be adjusted by a chair occupant. To adjust the depth, the occupant moves the actuator 191b in one direction from neutral which, via coupling link 192a and its ball 192b and socket 192c connection with the catch body 192, moves the catch body out of engagement from the track connection with the rack. Upon release of the actuator, a biasing force will cause the catch body 192 to reengage with the rack to lock the seating surface in one of a plurality of depth adjusted positions. Movement of the actuator in the other direction from neutral will release the gas spring 111, enabling the height of the seat portion 151 to be adjusted.

As shown in Figure 27, the chair is preferably provided with a generally L-shaped lock member 251 that is operatively connected to the seat portion 151, and is selectively transversely slideable relative to the seat portion 151 and the transom 121. The elongate portion 251a of the lock member 251 extends through an aperture 253 in the seat portion, and is selectively engageable in aperture 255 of the transom 121. A shorter portion 251b of the lock member 251 extends through an aperture in the seat portion and engages an aperture 255a on the other side of the transom 121 to the aperture 255, when the elongate portion is engaged. When the lock member 251 is engaged in the apertures 255a, 255, the seat portion 151 and back portion 501, 501' are locked in the upright position. When

disengaged from the apertures 255a, 255, the seat portion 151 and back portion 501, 501' can be reclined.

RECLINE RESISTANCE MECHANISM

The chair 101, 101' additionally comprises a recline resistance mechanism 301 or 302 to resist movement of the back portion 501, 501' toward the reclined position. The amount of resistance provided by the recline resistance mechanism 301 or 302 is selectively adjustable.

Figure 25 to 32(b) show the first preferred form recline resistance mechanism 301.

The recline resistance mechanism 301 comprises a first retainer 307, a resistance device 305, and a movable second retainer 309. The resistance device comprises a leaf spring 305 operatively fixed at one end to the back portion 501, 501' by being connected to the back support arm 203. The first retainer 307 is attached to the transom 121 and engages an upper surface of the leaf spring 305 at least when the back portion 501, 501' is in the upright position. In the upright position, surface 212a of the back support arm 203 engages a surface of the transom 121 and the first retainer 307 applies a downward force to the leaf spring, preloading the leaf spring 305 and biasing the back portion 501, 501' upright.

The second retainer 309 comprises a saddle that is pivotally mounted to the transom 121 and selectively pivotable between a disengaged position (Figures 29, 30, 32(a)) and an engaged position (Figures 25, 26, 28, 31, 32(b)). When the second retainer 309 is in the disengaged position, it is out of contact with the leaf spring throughout any movement of the leaf spring 305 during recline of the back portion 501, 501'. In that disengaged configuration, when the back portion 501 is reclined relative to the transom, the leaf spring deflects to resist the recline. The leaf spring reacts against the transom at the first retainer 307 to provide the deflection, as shown in Figure 32(a). When the second retainer 309 is in the engaged position, it is positioned over a top surface of the leaf spring 305, forward of the first retainer 307. The second retainer 309 does not apply a downward force to, or preload, the leaf spring 305 when the back portion 501, 501' is in the upright position. Preferably, when the back portion 501, 501' is in the upright position, the second retainer 309 does not contact the top surface of the leaf spring 305.

Preferably, when engaged, the second retainer 309 comes into contact with the spring 305 after between about 3° and 5° of recline of the back portion. When the back portion 501,

501' is reclined relative to the transom with the second retainer 309 engaged, the leaf spring 305 deflects to resist the recline and, beyond about 3° to 5° of recline, reacts against the transom 121 at the second retainer 309. The leaf spring 305 moves out of contact and away from the first retainer 307 as the back portion 501, 501' reclines, as shown in Figure 32(b).

As shown in Figure 27, a housing bracket 319 operatively connects the back portion 501, 501' to the recline mechanism 201 and the recline resistance mechanism 301. A bottom portion of the back portion 501, 501' is fixed to this housing bracket 319, by fasteners such as bolts for example. The housing bracket 319 is also fixed to the back support arm 203 by fasteners such as bolts. The connecting link 215 of the recline mechanism is pivotally connected to the back support arm 203 at pivot 219. One end of the leaf spring 305 is positioned within the housing bracket 319 and located in a forward/rearward direction relative to the housing bracket with a pin 320. The housing bracket 319 comprises two spaced apart transverse rods positioned within the housing. A first rod 323 is positioned towards a lower, front portion of the housing bracket 319, and a second rod 321 is positioned above and rear of the first rod 323. The leaf spring extends into the housing bracket, over the first rod 323 and under the second rod 321 such that the first and second rods effectively hold the leaf spring in cantilevered relation to the housing bracket 319 and thereby to the back portion 501, 501'. The rods 321, 323 react against the recline force of the spring as the back portion 501, 501' is reclined. The rods 321, 323 increase the effective length of the spring 305 compared to a straight cantilevered connection of the spring 305 to the housing 319, and also reduce stress concentrations on the spring adjacent the housing.

In a preferred embodiment, the leaf spring 305 comprises a composite material, for example unidirectional glass fibre-reinforced epoxy composite. Alternatively, the leaf spring may comprise spring steel for example.

It can be seen in Figure 31 that the leaf spring 305 has an effective length BR when only the first retainer 307 is engaged, and a longer effective length BS when the second retainer 309 is engaged (and the back portion 501, 501' is being reclined). The leaf spring 305 also has a first reaction length PR between the main pivot 205 of the back portion 501, 501' to the main transom 121 when only the first retainer 307 is engaged, and a second longer reaction length PS when the second retainer 309 is engaged (and the back portion 501, 501' is being reclined).

Referring now to Figures 32(a) and 32(b), when only the first retainer 307 is engaged, the spring deflects by a first amount D1 and the back portion is reclined, whereas with the second retainer engaged, the same point of the leaf spring 305 deflects a larger second amount D2. The result is that with the second retainer 309 engaged, the spring's effective length, reaction length, and amount of deflection are all greater during recline of the back portion, than when only the first retainer is engaged. Because the effective length of the leaf spring 305 is longer with the second retainer 309 engaged, that provides a lower spring rate than with only the first retainer 307 engaged. However, the longer reaction length PS and greater spring deflection D2 overcome the lower spring rate of the effectively longer spring.

Because the first retainer 307 preloads the spring, and the second retainer 309 does not contact the spring when it is brought into the engaged position and the back portion 501, 501' is upright, no force on the spring 305 needs to be overcome to adjust the position of the second retainer 309.

As shown schematically in Figure 28 for example, the second retainer 309 is adjusted by a Bowden cable 315. The cable has a cable housing and an inner cable portion that is movable relative to the housing. The inner portion 317 is coupled to an actuator 191a on the underside of the seat portion for use by the seated occupant. When the occupant moves the actuator with their hand, that causes movement of the inner portion of the cable 317. That will cause movement of the other end of the inner portion of the cable, and associated pivoting of the second retainer 309 into or out of engagement with the leaf spring 305. The free end of the leaf spring 305 comprises a retainer catch 313 that latches the second retainer 309 when the second retainer is in the engaged position and the back portion 501, 501' is reclined. When the second retainer 309 is engaged with the leaf spring 305, the second retainer is able to pivot relative to the transom to rotate with the end of the leaf spring as the back portion 501, 501' is reclined. The retainer catch 313 prevents the second retainer from inadvertently pivoting out of engagement with the leaf spring 305 during recline of the back portion 501, 501'.

As can be seen from Figures 32(a) and 32(b), if the back portion 501, 501' of the chair is reclined when the second retainer 309 is in the disengaged position, and the user attempts to move the second retainer 309 into the engaged position of Figure 32(b), the second retainer 309 would impact on the end of the raised leaf spring 305. Similarly, if the user

attempts to move the second retainer 309 out of engagement with the leaf spring 305 when the back portion 501, 501' of the chair is reclined, the force applied by the leaf spring 305 against the second retainer 309 would be too high to allow disengagement of the second retainer 309 from the spring. Accordingly, as shown schematically in Figure 28, the cable includes a first biasing device 318 such as a coil spring, which enables the occupant to pre-set the second retainer 309 into or out of engagement with the leaf spring 305 when the back portion 501, 501' is reclined, and which will cause the adjustment to occur only once the back portion has been returned to the upright position and the second retainer 309 can engage or disengage from the leaf spring 305. This is achieved by way of a second biasing device such as a coil spring 318a that is provided on a portion of the cable 315.

The second biasing device 318a is stiffer than the first biasing device 318 and in normal use, when the retainer is engaged or disengaged, the second biasing device 318a is uncompressed. When the second retainer 309 is disengaged and the back portion is reclined, if the occupant pre-sets the second retainer 309 into engagement with the leaf spring 305, the second retainer will try to engage the leaf spring but will not be able to pivot into position due to contact with the end of the leaf spring. Instead the second biasing device 318a will compress and when the chair is returned to upright the second biasing device 318a will pull the second retainer 309 into engagement with the leaf spring 305. Similarly, when the second retainer 309 is engaged with the leaf spring 305 and the back portion is reclined, if the occupant pre-sets the second retainer 309 to disengage the leaf spring 305, the second retainer will try to disengage but will not be able to pivot out of engagement. Instead the cable 315 will become slack. When the chair is returned to upright the first biasing device 318 will push the second retainer 309 out of engagement with the leaf spring 305.

The above description describes one preferred form of the recline resistance mechanism 301 only. In an alternative embodiment, rather than being pivotally connected to the transom 121, the second retainer 309 may be slidable relative to the leaf spring 305 to alter the reaction point of the spring 305 against the transom 121. In such an embodiment, when the back portion 501, 501' is in the generally upright position, the second retainer 309 would be freely slidable relative to the spring without altering the preload on the spring 305. Further, in addition to the first 307 and second 309 retainers, there may be one or more additional retainers engageable with the leaf spring 305 to provide further levels of recline resistance.

The preferred embodiment shown in the Figures 25 to 32(b) comprises a single leaf spring 305. Alternatively, the recline resistance mechanism 301 may comprise two or more leaf springs. The first 307 and second 309 and any additional retainers may engage only a single one of those springs, or may engage more than one spring at the same time. For example, in an embodiment having two leaf springs each positioned towards an opposite side of the transom 121, each leaf spring may comprise a respective first retainer 307 attached to the transom 121. A second retainer 309 pivotally attached to the transom may comprise two saddles arranged to engage both of the springs when the second retainer is adjusted to the high resistance position.

Figures 33 to 36 show a second preferred form recline resistance mechanism 302. The features and functioning of this embodiment are similar to the embodiment described above, and like numerals indicate like parts. In this embodiment, rather than using a leaf spring 305, the resistance device is a torsion spring 325. The torsion spring 325 comprises a first leg 326a operatively connected to the transom, and a second leg 326b operatively connected to the back portion. The second leg 326b comprises a bent end that extends transversely and is received in an aperture in the back support arm 203. In the form shown, the torsion spring 325 is a double coil torsion spring, with two legs 326b operatively connected to the back portion, and two legs 326a operatively connected to the transom 121. In a preferred embodiment, the pivot of the torsion spring is positioned behind the pivot 205 of the back portion. Alternatively, the pivot of the torsion spring could be coincident with the pivot 205 (as shown), or forward of the pivot 205. As in the above described leaf spring embodiment, a first retainer 307' fixed to the transom 121 engages a top surface of the torsion spring legs 326a to operatively connect the spring legs 326a to the transom 121 and apply a preload to the torsion spring 325 when the back portion 501, 501' is in the upright position and to provide a first recline resistance when the back portion 501, 501' is reclined. A second retainer 309' in the form of a hook is pivotally attached to the transom 121 at pivot 311', and is pivotable to engage a cross member between the legs 326a when the back portion 501, 501' is in the generally upright configuration to increase the recline resistance during recline of the back portion.

In embodiments where the pivot of the torsion spring is positioned rearward of the back portion pivot 205, the legs 326a of the torsion spring interact with the retainers in a similar manner to the leaf spring embodiment. That is, with the second retainer 309' engaged, the spring's reaction length and amount of deflection are greater during recline of the back portion than when only the first retainer 307' is engaged. Because the effective length of

the spring legs 326a is longer with the second retainer 309' engaged, that provides a lower spring rate than with only the first retainer 307' engaged. However, the longer reaction length and greater spring deflection overcome the lower spring rate of the effectively longer spring.

In alternative embodiments, rather than being operatively connected between the back portion 501, 501' and the transom 121, the resistance mechanisms 301, 302 may be operatively connected between the seat portion 151 and the transom 121 or between the back portion 501, 501' and the seat portion 151. Additionally or alternatively, the recline resistance mechanisms could be used in chairs having the second preferred form recline mechanism 201' described above, or in chairs having other types of recline mechanisms.

ARM ASSEMBLIES

The chair 101, 101' has a pair of arm assemblies 401 positioned one on either side of the seat assembly 151. A preferred form arm assembly is shown in Figures 37 and 38. Each arm assembly 401 comprises a support assembly 402 and an arm rest 403. The arm rest 403 may be fixed in position relative to the support assembly 402 so that the arm rest is only height adjustable. Alternatively, the arm rest 403 may be generally horizontally movable relative to the support assembly 402 as well as height adjustable. By way of example, the arm rest 403 may be selectively movable relative to the support assembly in a forward and rearward direction, in a side-to-side direction, and/or pivotally about a substantially vertical axis.

In the form shown, the supports 402 are connected to the back portion 501, 501' so that the arm rests move with the back portion as it reclines. Alternatively, the supports 402 could connect to a different part of the chair, such as the seat portion 151 or the supporting frame (e.g. the transom 121).

The support assembly 402 supporting the movable arm rest 403 is preferably height adjustable and is mounted to a chair 101, 101'. Referring to Figures 39 to 44, the height adjustable support assembly 402 preferably comprises a support body 406, a sleeve 405 that receives the body, and a lever 411. The body 406 is selectively height adjustable in the sleeve 413 by actuation of the lever, to adjust the height of the arm rest 403 relative to the chair 101, 101'.

The sleeve 405 comprises two inner sleeve portions 415, 417, that sit within an outer sleeve member 413 and are held in place by a mounting plate 419. Preferably one of the inner sleeve portions 417 comprises a collar 417a that fits over the other inner sleeve portion 415 and the mounting plate 419, to ensure correct alignment of the three pieces, and for aesthetics. Alternatively the collar 417a may be a separate cover member. The inner surface of each inner sleeve portion 415, 417 comprises a detented groove 416, 418 with an elongate, vertical groove portion 416b, 418b and a plurality of detents 416a, 416b. In the embodiment shown, the detents 416a, 418a comprise horizontal notches extending rearwardly from the elongate vertical slots 416b, 418b.

The support body 406 comprises an elongate hollow curved substantially vertical tubular portion 406a and a forwardly extending substantially horizontal cantilevered portion 406b extending from the top of the hollow portion 406a. The hollow portion 406a of the support body 403 is received by the sleeve 405, 413, 415, 417. The cantilevered portion 406b operatively supports the arm rest 402. The arm cap member 407 attaches to and covers the top of both the cantilevered 406b and elongate hollow portions 406a of the support body 406 by fasteners (not shown).

The support body 406 is preferably a moulded plastic member. A steel reinforcement member 421 is positioned within the body 406.

The lever 411 is an inverted L-shaped member positioned within the support body 406 and pivotable relative to the body 406 about a pivot 407a that is formed by a pin 423 extending through apertures in the lever 411 and the arm cap 407. One leg of the lever is positioned within the elongate hollow portion 406a of the support body and the other leg of the lever is positioned in the cantilevered portion 406b of the support body. The lever 411 is attached to the reinforcement member 421 and the cap member 407, or otherwise operatively pivotally attached to the support body 406.

A lower end of the lever 411 comprises a guide protrusion 427 and a lock pin 429. The lock pin 429 passes through the centre of the protrusion and through slots (not shown) provided on either side of the body 406. The lock pin 429 extends into the detented grooves 416, 418 on the inner sleeve portions 415, 417. The protrusion moves forward and rearward in the slots in the body 406 as the lever 411 is pivoted about its pivot pin 423. The two ends of the slots in the body and the grooves 416, 418 act as stops against the protrusion 427 to limit pivoting of the lever 411. The reinforcement member 421 defines a further slot 425

that provides clearance for the protrusion 427 on the lever so that the guide protrusion 427 can move relative to the reinforcement member 421 as the lever 411 pivots.

The lever 411 comprises an actuator portion 410 at its upper and forward end. An opening in the underside of the cantilevered portion 406b of the support body 406 exposes the actuator portion 410. Preferably, the actuator portion protrudes through that opening to enable the actuator portion 410 to be readily located by a user. Pressing or pulling upwardly on or releasing the actuator portion 410 causes the lever 411 to pivot about pivot 423. As the lever 411 pivots, the protrusion 427 slides in the reinforcement member slot 425 and the lock pin 429 slides in slots 406c in the body to move within the detented grooves 416, 418 to engage and disengage the detents 416a, 418a.

Figure 41 shows the support assembly locked in the lowest position, where the lock pin 429 is engaged with the lowermost detents 416a, 418a. A biasing device 424, which in the form shown is a coil spring, is positioned between the actuator portion 410 and the arm body cap 407 to bias the actuator portion 410 downwards and thereby bias the lever 411 into the locked position where the lock pin engages in the detents 416a, 418a. Applying upwards pressure to the actuator portion 410 pivots the lever 411 to a released position in which the lock pin 429 is disengaged from the detents 416a, 418a and free to slide within elongate slots 416b, 418b. Alternatively, a biasing member may be positioned between a different portion of the lever 411 and the housing 406, 407 to bias the lever into a locked or a released position. Any suitable type of biasing device could be used.

Figures 42 and 43 show the lever 411 and lock pin 429 in the released position. When the lever and pin are in the released position, the arm assembly body 406 is free to slide within the sleeve 405 between the upper and lower limits, to adjust the height of the arm rest. For example, the arm assembly is adjustable from the lowermost position shown in Figure 42 to the position shown in Figure 43 by pulling or pushing the arm rest 403 or arm body 406 upward. When the actuator portion 410 is released from the position shown in Figure 43, the spring 424 biases the lever 411 back towards the locked position, moving the lock pin 429 into a detent 416a, 418a to lock the height of the arm rest as shown in Figure 44.

The arm rest is adjustable relative to the sleeve 405 to a plurality of heights corresponding to the number of detents 416a, 418b. For example, in the embodiment shown the detented grooves 416, 418 each comprise ten vertically spaced notches and the arm rest is movable between ten different heights. It will be appreciated that the sleeve may comprise more or

fewer than ten detents to enable adjustment of the arm rest 403 between more or fewer positions.

To assemble the support assembly 402, the lever 411 and reinforcement plate 421 are arranged with the lever protrusion 427 in the reinforcement plate slot 425 and pinned to the cap member 407 at pivot 407a by pin 423. The lever and plate 421 are then placed in the support body 406. The rotation mechanism described above is connected to the cover 407 before or after attaching the lever 411 and reinforcement plate 421. The cap member 407 is then screwed to the support body 406b. The lock pin is then inserted through the slots in the elongate hollow portion of the arm body 406 and through a complementary aperture in the lever protrusion 427. The inner sleeve portions 415, 417 and mounting plate 419 are then assembled around the elongate portion of the arm body 406 so that the two ends of the lock pin 429 are positioned in the respective detented slots 416, 418. The inner sleeve portions 415, 417 and mounting plate 419 are then slid into the outer sleeve 415.

The mounting plate 419 has aligned, threaded apertures 420 for mounting the sleeve assembly 405 and thereby the arm support assembly to the chair 101, 101'. Apertures (not shown) are also provided at the back of the outer sleeve 413 that are aligned with the apertures 420 in the mounting plate 419 to receive fasteners 420a such as cap screws for example. The sleeve assembly 405 is mounted to the back portion 501, 501' of the chair by feeding the cap screws through apertures in the back portion 501, 501' from the back of the chair, and into the threaded apertures 420 on the mounting plate 419, effectively clamping the sleeve 405 between the mounting plate 419 and the chair back.

The back side of the outer sleeve 413 is preferably shaped to sit substantially flush against the respective frame member 504a of the chair back 501. For example, in the embodiment shown, the back of the sleeve 419 is concave to sit flush with a convex back frame member 504a.

It can be seen from Figures 37 to 44 that the height adjustment mechanism (other than the actuator portion 410) is substantially hidden from view from the exterior of the arm support assembly, thereby providing a pleasing aesthetic for the arm support assembly. That is despite the 405 only having a small height relative to the support body 406.

In an alternative embodiment, the support 402 may be a non-height adjustable support and may comprise a single member mountable to the chair 101. Alternatively, the support may

be height adjustable but not comprise an arm rest that is angularly adjustable and/or adjustable forward-rearward or laterally.

BACK PORTION

Back construction

Figures 45 to 70 illustrate a preferred form back assembly 501. The back assembly 501 comprises a back frame 503 having side frame members 504a and upper 504b and lower 504c frame members defining an opening 503a. A support 531, which is described in further detail below, is attached to the frame 503 and suspended across the frame opening 503a. A cushion assembly 507 is positioned in front of the frame 503 and against a front surface of the support 531. One or more staple-receiving members 511, 512 are fixed to a rear side of the frame 503 for connecting the cushioning portion 507 to the frame 503. An aesthetic cover 517 is positioned on a rear side of the back assembly to cover the connections between the frame 503, the cushioning assembly 507, and the staple-receiving member(s) 511, 512.

A forwardly protruding connecting portion 505 is connected to the lower frame member 504c to connect the back assembly 501 to the recline mechanism 201. The connecting portion 505 connects to the back support arm 203 of the recline mechanism described above, enabling the back portion to be reclined relative to the transom. Alternatively, the back support arm 203 and the connecting portion 505 of the back frame may be integral. In an alternative embodiment, the back assembly 501 may be fixedly connected to the transom or seat portion, or may be connected to the transom by way of an alternative mechanism so that recline or movement of the back assembly 501 is the same as or differs from that described above in relation to the recline mechanisms 201, 201'.

The back frame 503 defines a substantially rectangular opening 503a. The support 531 comprises a plurality of spaced apart elongate longitudinally extending straps 533 and a plurality of spaced apart transversely extending straps 535. The longitudinal straps 533 and the transverse straps 535 each comprise two opposite end connectors 545 each having an aperture 547. The longitudinal and transverse straps connect to the back frame 503 by hooks 561 such that the support 531 is suspended across the aperture 503a, providing a support surface for the cushioning assembly 507.

The back frame 503 and back assembly 501 are preferably forwardly concave about a vertical axis, and at least a lower portion of the back frame and back assembly are

preferably forwardly convex about a horizontal transverse axis, to follow the natural curvature of a user's back.

The cushioning assembly 507 comprises a front upholstery sheet 509a, a cushion 508, and a rear upholstery sheet 509b. The cushion 508 is preferably a foam member and may comprise moulded or cut out portions to accommodate part of the back frame 503 and the attachment hooks 561 for the support 531. The upholstery sheets could be any suitable type, such as fabric, leather, or synthetic leather for example. The front upholstery sheet 509a is glued to a front surface of the cushion, and the rear upholstery sheet 509b is glued to the rear surface of the cushion. The cushion 508 is at least as large as the opening 503a defined by the back frame 503, and is preferably sized to substantially cover a front surface of the back frame 503 and the opening 503a. The cushion 508 may be slightly larger than the front surface of the back frame 503 so that the peripheral portion of the cushion 508 wraps around the edge of the back frame 503. The front upholstery sheet is preferably larger than the front surface of the cushion such that the edges of the front upholstery sheet can be wrapped around the sides of the cushion 508 and partly behind the cushion 508.

As best seen in Figures 49(a) to (c), a rear surface of the back frame 503 comprises a plurality of hollow cylindrical protrusions 515, 516. The upper protrusions 515 are shallower than the lower protrusions 516, to enable the upper frame member 504b to be lower profile than the lower frame member 504c. The staple-receiving members 511, 512 each comprise a front surface with a plurality of forwardly protruding complementary crush dowels 513, 514 as shown in Figures 50(a) to (c). The crush dowels 513, 514 have an outer diameter that is slightly larger than the inner diameter of the hollow projections 515, 516 on the rear of the back frame. To connect the staple-receiving members to the back frame 503, the dowels 513, 514 are pushed into the corresponding hollow projections 515, 516 on the frame, deforming at least a portion of each dowel. Figures 51(a) and 51(b) illustrate the step of assembling the staple-receiving members 511, 512 to the frame 503. In the embodiment shown, the dowels 513, 514 comprise ribs about their periphery. At least some of these ribs are flattened when the dowels 513, 514 are forced into the cylindrical protrusions 515, 516 on the back frame 503, forming a tight friction fit between the staple-receiving members 511, 512 and the frame 503.

The staple-receiving members 511, 512 and dowels 513, 514 preferably comprise a thermoplastic polymeric material with a lower hardness than the back frame 503. By way

of example, the staple-receiving members may be formed of polypropylene, and the frame may be formed of 30% glass fibre reinforced PET. The deformation of the dowels 513, 514 is typically a plastic deformation, such that the staple-receiving members 511, 512 cannot be firmly reattached if they are removed. In alternative embodiments, the staple-receiving members 511, 512 could be attached to the frame 503 by other means, for example using fasteners, adhesive, or other snap-type connections. Alternatively, the frame could receive the staples directly. As another alternative, the front upholstery sheet could be fastened to the frame using any suitable means, such as those described above for example.

The staple-receiving members 511, 512 provide a surface for stapling the cushioning assembly 507 to the back frame 503. Figure 54 shows the attachment of the cushioning assembly 507 to an upper portion of the back frame 503. In the embodiment shown, the front upholstery sheet 509a wraps around the edges of the cushion 508, and behind the back frame 503 and staple-receiving members 511, 512. The front upholstery sheet 509a is then stapled to the rear side of the staple-receiving members 511, 512. The staple-receiving members provide a surface that is softer than the back frame 503 for receiving staples. In an alternative embodiment, the rear upholstery member 509b may also wrap around the edge of the back frame 503 and be stapled to the staple-receiving members 511, 512 together with the front upholstery sheet 509a. Alternatively or additionally the cushion 508 and/or the rear upholstery sheet 509b may be glued to the front surface of the back frame 503.

An aesthetic cover 517 shown in Figure 52 is attached to the rear side of the back frame 503 to cover the stapled portion of the front upholstery sheet 509a, the staple-receiving members 511, 512, and the rear side of the back frame. The aesthetic cover 517 comprises an opening 517a that is approximately the same size, or slightly smaller than, the back frame opening 503a so that the support 531 and back upholstery sheet 509b are visible from behind the back portion. The opening in the aesthetic cover 517 also allows portions of the cushioning assembly 507 and support 531 to deflect rearwardly beyond the frame 503 and aesthetic cover 517 during support of a user.

As shown in Figure 52(a) and 53(a), an upper portion of the aesthetic cover 517 comprises a plurality of upwardly projecting tabs 518. The tabs 518 are for engaging with corresponding recess(es) 521 on a front surface of the back frame 503, as shown in Figure 53(a). A lower portion of the aesthetic cover 517 comprises a plurality of forwardly projecting crush dowels 519 as shown in Figures 52(c) and 53(b). Side portions of the

aesthetic cover 517 comprise a plurality of outwardly directed tabs 520a and outer projections 520b. Corresponding catch features 522 on the side members of the back frame are receivable in the space between the outwardly directed tabs 520a and outer projections 520b. A lower portion of the back frame 503 comprises a plurality of hollow cylindrical protrusions 506. The crush dowels 519 are similar to those described above with respect to the staple-receiving members 511, 512.

The aesthetic cover 517 is attached to the back frame 503 by first positioning the upper portion of the aesthetic cover 517 relative to the upper back frame member so that the recess(es) 521 is/are behind the tabs 518 (Figure 53(a)), snapping the side catch features 522 between the side tabs 520a and projections 520b (Figure 53(c) and 53(d)), then pressing the crush dowels 519 into the respective hollow protrusions 506 on the back frame (Figure 53(b)), deforming the crush dowels 519.

The 'high back' back portion 501' will be formed in the same way as the back portion 501. However, the upper portion of the back frame 503 will have a 'blade' above the opening, which will support the upper end of the cushioning assembly. The cushioning assembly may have a pocket or similar to receive the blade to assist with mounting the cushioning assembly to the blade of the frame.

Moulded support

Figure 70 is a rear view of a preferred form chair showing the support 531 supporting the cushioning assembly member 507 in the back portion 501. The support has the appearance of a plurality of individual longitudinal straps 533 overlaid over a plurality of individual transverse straps 535. While a support comprising a plurality of individual straps has aesthetic advantages, such an arrangement presents a number of assembly and performance disadvantages compared to a one-piece moulded support. Individually attaching many separate straps to a frame is more labour intensive and, where the straps are different lengths presents difficulties in ensuring the straps are in the correct order and orientation. In use, parallel straps are susceptible to twisting or to moving relative to each other, losing the aesthetically appealing grid arrangement.

Figures 55 to 70 show a preferred form moulded support 531 for attaching to the frame 503 to form the support shown in Figure 70 having the appearance of individual straps.

Figures 55 to 60, 64(a) to (f), and 65(a) and (b) show the support 531 as moulded. The moulded support 531 is substantially flat and comprises a plurality of elongate longitudinal straps 533 and a plurality of elongate transverse straps 535. The transverse straps 535 form a first layer, and the longitudinal straps 533 overlap with the transverse straps 535 to form a second layer that overlies the first layer. Integrally moulded joiner members 536 connect the transverse and longitudinal straps 535, 533 and are positioned at the overlapping portions of the straps 533, 535. Preferably each longitudinal strap is attached to each transverse strap by the joiner members 536.

In the as moulded form, the longitudinal and transverse straps 533, 535 preferably have substantially the same cross-sectional width and thickness, at least in the unnecked regions. By way of example, as shown in Figure 65(a) and (b), the straps may have a width WUT, WUL in the unnecked regions of 12 mm, and may have a depth of about 1 mm along their necked and unnecked regions. Alternatively, the longitudinal straps may have different cross-sectional dimensions to the transverse straps if different properties are desired in the longitudinal direction to the transverse direction, or if a combination or differently sized straps are desired for aesthetic reasons.

The lengths of the longitudinal straps 533 may vary to fit a frame 503 with non-parallel upper and lower frame members, or to accommodate differing degrees of curvature in the longitudinal straps 533 in the assembled form. Similarly, the lengths of the transverse straps 535 may vary for the same reasons with respect to the side members of the frame.

The transverse straps 535 and the longitudinal straps 533 may be evenly spaced, or the spacing between adjacent straps may vary. In the form shown, the transverse straps are spaced more sparsely towards the upper portion of the support 531 and are spaced closer together in the portion of the support that corresponds to the lumbar portion of the chair back portion. The support will be less compliant where the straps are closer together, to provide a greater level of support.

The joiner members 536, best seen in Figures 64(a) to 64(f) and 66(a) to 66(f), are preferably elongate in the transverse direction. In one embodiment, as moulded, the joiner members measure 18.5 mm in the transverse strap direction, 1.0 mm in the longitudinal strap direction, and 2.0 mm deep (to form a gap between the straps of 2.0 mm). The joiner members 536 project from a front face of the transverse straps 535 and connect to a rear face 533 of the longitudinal straps.

Both the transverse and longitudinal straps are necked on either side of each joiner members 536 by way or notches or recesses in the sides of the straps. In the form shown, the transverse straps 535 comprise necked regions 539 that comprise recesses extending substantially the length of the joiner members 536. By way of example, the necked regions may have a length LNT of 17.9 mm, and the width WNT of the transverse strap between the recesses may be 10.0 mm, as shown in Figure 65(a).

The longitudinal straps 533 comprise necked regions 537 that, in the form shown, comprise notches. The necked regions as moulded, are longer than the thickness of the joiners 536 but, as moulded, are smaller than the width of the respective transverse strap 535. The necking 539 on the transverse straps 535 is shallower than the necking 537 on the longitudinal straps 533. By way of example, the width WNL of the necked regions between the notches may be 9.4 mm, and the notches may each have a length LNL of about 4.1 mm.

The dimensions of the necked areas are selected to allow the strap to have substantially parallel sides after it has been relaxed post-strain orientation, as described in further detail below. The configuration shown in Figures 65(a) and 65(b) is one example configuration for straps that will be stretched to 450% of their as-moulded lengths to achieve strain orientation. The ratio of the two width dimensions will increase or decrease depending on the intended stretching percentage.

Figure 67 is a view similar to Figure 65 but showing alternative exemplary dimensions of one of the neck areas. In this embodiment, the dimensions LNT', WUT', WNT', WUL', and WNL' are the same as the respective dimensions LNT, WUT, WNT, WUL, and WNL described with reference to Figure 65. In this embodiment, LNL' is a shorter dimension of 3.5 mm compared to the 4.1 mm of LNL of Figure 65. This version has radiuses LR of about 1.25 mm in the region where the necked area 537 meets the straight sides of the longitudinal strap 533. The larger radiuses further assist with obtaining substantially parallel sides in the strap 533 after the strap has been relaxed post-strain orientation. In this embodiment, each strap has a main body depth of about 1.5 mm along the necked and unnecked regions, and the elongate ribs extending along the straps may each have an additional depth of about 0.5 mm. Post-strain orientation, the main body depth of each strap, excluding the elongate rib, will be about 1.0 mm.

The selected ratio for the transverse straps in these embodiments, is 0.833 (10/12 = 0.833). If the stretching percentage was to increase then the ratio of the necked width WNT to the strap width WUT would decrease. For example, if the stretching percentage increased to 600%, the necked width WNT might be reduced to 8.7 giving a ratio of 0.725 (8.7/12). Alternatively, if the stretching percentage was to decrease the ratio of necked width WNT to strap width WUT would increase. For example if the stretching percentage decreased to 400%, the necked width WNT might be increased to 10.2 giving a ratio of 0.85 (10.2/12).

The same principle applies to the necked area on the longitudinal straps with the dimensions shown being intended for the strap to have substantially parallel sides after relaxing following from stretching to 450%. The selected ratio for the longitudinal strap for an elongation to 450% is 0.783 (9.4/12).

The other dimensions (necked region lengths LNT which in this embodiment = 17.9 mm and LNL which in this embodiment = 4.1 mm) are related to the dimensions of the joiner itself.

The elongate ribs shown on the front surfaces of the straps in Figure 63 aid stretching and strain orientation, and aid moulding material flow where the joiner meets the straps.

It will be appreciated that the configurations and dimensions of the joiner members, straps, and necked regions may vary without departing from the scope of this aspect of the invention.

The support 531 can be moulded using any suitable method known to a person skilled in the art. By way of example, the support could be injection moulded using the method described in our PCT publication number WO 2009/1260851, and the contents of that specification are incorporated herein in their entirety by way of reference. As the preferred form support doesn't have the fine members described in that publication, the support could alternatively be moulded using more conventional moulding parameters.

The support 531 is moulded from one or more materials that are suitable for strain orientation. Examples of suitable materials include some of the HYTREL materials available from Du Pont. In an as-formed HYTREL article, the polymer chains in the material are relatively random. By stretching the article, the polymer chains become relatively aligned. That phenomenon is strain orientation. Strain orientation changes the material properties.

Typically, the material becomes stronger and more elastic; that is the elastic limit is increased in comparison to the as-formed material. Additionally, the article generally lengthens in the direction of stretching and reduces in cross-section.

In the preferred form, the material is a thermoplastic polyester elastomer. Preferably, the thermoplastic polyester elastomer is a block copolymer comprising a hard (crystalline) segment of polybutylene terephthalate and a soft (amorphous) segment based on long chain polyether glycols. Preferably, the thermoplastic polyester elastomer resin is selected such that the article formed by the moulding method, once fully cured and prior to strain orientation, has a hardness in the range of about 35D to about 55D when tested in accordance with ASTM 2240. More preferably, the thermoplastic polyester elastomer resin is selected such that the article has a hardness in the range of about 30D to about 46D, more preferably in the range of about 35D to about 45D, preferably in the range of about 36D to about 44D, more preferably in the range of about 37D to about 43D, more preferably in the range of about 38D to about 42D, more preferably in the range of about 39D to about 41D, most preferably about 40D.

The thermoplastic polyester resin is preferably one of HYTREL 4069, HYTREL 4556, HYTREL 5526, HYTREL 5556, HYTREL 3078. Most preferably, the resin is HYTREL 4069. The resin may additionally include stabilisers and/or additives to achieve desired properties, for example to improve its resistance to UV light, fire, heat aging, moisture, and/or to make the resin a suitable colour.

The moulded article of the present invention could be formed from any other resins having suitable properties.

The moulded support of Figures 55 to 60 is then stretched in both directions as represented by arrows SL, ST to form the elongated support 531 shown in Figures 61 to 63 and 70. In this elongation step, the straps 533, 535 are each stretched SL, ST in their longitudinal direction to lengthen the straps. This elongation causes strain orientation of the material in the straps, as well as in the joiner members 536. There is less strain orientation in the necked regions 537, 539 of the straps adjacent the joiner members 536, due to the increased material thickness and the resulting reduction in elongation. When the straps are fully stretched, the regions 537, 539 are the widest parts of the straps. As the support is relaxed, the sides of the straps relax to be substantially parallel along their lengths, including in regions 537, 539. The dimensions of the stretched support during this step are

greater than the dimensions of the frame that the support is to be attached to. That is, the longitudinal straps 533 are stretched SL to a length greater than the distance between the upper and lower portions 504b, 504c of the frame, and the transverse straps 535 are stretched ST to a length greater than the dimensions between the frame side members 504a.

Preferably, the stretched length of the straps is between about 4 and about 5 times the as-moulded dimension of the straps, and preferably about 4.5 times the as-moulded dimension. Each strap is preferably stretched by proportionally the same amount. That is, the straps might each be stretched to 450% of their initial moulded length, for example. That ensures that any straps that are moulded to have the same cross sectional dimensions but different lengths, will also have substantially the same cross sectional dimensions in their stretched form, and the proportional difference in length between the straps will be maintained. The elongated straps will therefore also have the same strain orientation and properties despite their differing lengths. Alternatively, if different properties are desired for different straps, for example if more compliance is required at different points in the support, the straps may be elongated to different extents.

The straps may be elongated one at a time. Alternatively all of the longitudinal straps 533 may be elongated together, followed by all of the transverse straps, or conversely all of the transverse straps may be elongated together, followed by all of the longitudinal straps 535. As another alternative, all of the longitudinal and transverse straps may be elongated simultaneously.

After the straps are elongated, the tension applied to the straps is released and the straps relax back down to an un-tensioned state. Figures 61 to 63 and 66 show the support 531 in the relaxed state. Due to the alignment of the material in the straps, the length of the relaxed straps is longer than the initial length of the straps in their moulded form. In the relaxed state, the dimensions of the stretched support during this step are smaller than the dimensions of the frame that the support is to be attached to. That is, the longitudinal straps 533 are shorter than the length between the upper and lower frame members, and the transverse straps 535 are shorter than the dimensions between the frame side members.

As can be seen in Figures 61, 62, and 66, in the post-elongation relaxed state, the sides of the transverse straps 535 are parallel, and the sides of at least the portions of the

longitudinal straps 533 that are visible from the transverse strap side of the support, are parallel. This gives the appearance of individual straps from behind the back portion of the chair. Preferably, the sides of the longitudinal straps are parallel along their entire lengths. During elongation of the straps, the width of both the necked portions of the straps and the unnecked portions of the straps decrease. However, the reduction in width is greater in the unnecked portions due to greater strain orientation. This compensates for the smaller reduction in width of the necked portions such that the width of the necked portions is substantially the same as the width of the unnecked portions post-strain orientation.

The necking 539 on the transverse straps 535 is has a more gentle curvature than the necking 537 on the longitudinal straps 533. It is desirable that the joiner members 536 are oriented so that the necking in the longitudinal direction of the joiner members 536 is on the transverse straps 535 that form the rearmost layer of the support 531. This is because after strain orientation, the edges of the straps may not be perfectly parallel in the necked regions 537, 539 adjacent the joiner members 536. Any difference in the width of the strain oriented straps in the necked regions tends to be less pronounced with the more gently-curved necked regions. Therefore, it is desirable that the straps with the more tightly curved necked regions are the straps that form the front layer of the support, such that any irregularities in the widths of those straps at the necked regions are obscured by the rearmost straps 535 from behind, and by the cushioning assembly from the front.

In an alternative configuration where the support 531 is uncovered to provide an exposed occupant supporting surface in use and is visible from the front portion of the chair, the cover could effectively be reversed so that the transverse straps 535 with the more gentle curvature necking are positioned in front of the longitudinal straps 533. Alternatively, the longitudinal straps may be positioned in front of the transverse straps, but the joiner members 536 may be reoriented so they are elongate in the longitudinal direction, and the longitudinal straps may be provided with the more gentle curvature necking.

Preferably, the post-stretching relaxation lengths of the straps RL, RT is between about 1.5 and about 2.7 times the as-moulded dimension, preferably about 2.1 times the respective as-moulded strap lengths IL, IT. Following strain orientation, both the transverse and longitudinal straps will be longer than prior to strain orientation, and will have a smaller cross-section, both in a width and depth direction. For example, the depth of the straps may reduce from 1.5 mm to 1.0 mm. This is evident from the figures by the increased distance between the transverse and longitudinal straps. That is, the lengths of the SL, ST

straps will be greater than the initial lengths IL, IT, and the strap cross-sections will be smaller than the initial strap cross-sections. The post-stretching relaxation lengths RL, RT will be smaller than the lengths of the stretched SL, ST straps, but greater than the initial lengths IL, IT. The post-stretching relaxation strap cross-sections will be between the initial strap cross-sections and the stretched strap cross-sections.

In the preferred form shown, the as-moulded length of the longest longitudinal strap 533 is about 255 mm. That is stretched out to 1147.5 mm, but could be stretched any suitable amount relative to its starting length, such as between about 4x and 9x its starting length. Similarly, in the form shown, the as-moulded length of the longest transverse strap 535 is about 210 mm. That is stretched out to 945 mm, but could be stretched any suitable amount relative to its starting length, such as between about 4x and 9x its starting length. The longest longitudinal strap is then relaxed to 519 mm, and the longest transverse strap is relaxed to 426 mm. The relaxed lengths (and therefore the initial moulded lengths and the extent of stretching) will vary for different frame configurations or different desired final product tensions.

The sizes of the joiner members 536 also change due to the strain orientation that occurs when stretching the longitudinal straps 533 and the elongate straps 535. For example, the joiner members 536 may initially measure 18.5 mm long, 1.0 mm wide, and 2.0 mm deep (the dimension between straps), and may measure 28.5 mm long, 0.8 mm wide, and 1.8 mm deep after elongation. These width and depth measurements are taken through the centre of the joiner members. These are values at the centre of the joiner members, as the joiner members will have radii where they intersect with the transverse and longitudinal straps for moulding and strength purposes. The joiner members 536 are strain oriented in both the longitudinal and transverse directions of the support, as a result of stretching both the longitudinal straps 533 and the transverse straps 535. The reduction in width of the joiner members from 1.0 mm to 0.8 mm is less than it would be if the joiner members were not strain oriented in a direction across the width of the joiner members a result of stretching the longitudinal straps 533.

While the joiner members are shown as being longer than the width of the longitudinal straps, that is primarily for moulding purposes. The joiner members could be any other suitable shape or size.

Each of the transverse and longitudinal straps comprises an attachment portion 545 at each of its ends. The attachment portions 545 are integrally formed as part of the moulding

process, and are used to attach the cover to the frame 503. In the form shown, the attachment portion 545 comprises a portion of increased thickness having an aperture 547. During stretching of the support 531, the attachment portions are generally not elongated to any great extent, so strain orientation does not occur or does not occur to a great extent in the regions of the side attachment features and the material in those portions remains substantially unaligned.

Figures 68(a) to 69(d) shows a preferred attachment of the support 531 to the back frame 503. The back frame is provided with a plurality of hooks 561 that are integrally moulded as part of the frame. In the preferred form, the hooks are spaced apart around the perimeter of the frame and each define a recess between the hook and the frame.

The hooks are provided on a front face of the top frame member 504b, on a front face of the side frame members 504a, and in a rear face of the bottom frame member 504c. The hooks face outwardly from a centre of the back portion, so tension in the support 531 keeps the support engaged with the hooks in use. At least some of the hooks are provided in recesses 563 in the frame, with the recesses sized to receive the integral connectors 545 on the straps. The top and side hooks shown in Figure 69a may be provided in recesses, or may be surface-mounted as shown.

The support can be mounted to the back frame by inserting the hooks 561 through the apertures 547 that are provided on the attachment portions 545.

The spacing of the hooks 561 on the side portions 504a of the frame corresponds to the spacing of the transverse straps 535. The spacing of the hooks on the upper and lower frame members 504b, 504c corresponds to the spacing of the longitudinal straps 533. The spacing of the hooks may be even for evenly spaced straps, or may vary if the spacing of straps varies, to provide greater support in one portion of the support. For example, in the form shown, the hooks on the side portions of the frame are more closely spaced near the lumbar region of the back portion, to provide greater support to the lumbar region of a user.

To mount the support to the frame, one end 545 of each of the transverse straps 535 is hooked to the frame. The straps are then stretched and the opposite ends of each strap at hooked to the frame. This process is then repeated for the longitudinal straps 533 which are positioned in front of the transverse straps. Alternatively, the support may be stretched

again to or beyond its final dimensions and then connected to the frame. Alternatively, the support could be relaxed onto the frame after expanding the cover to strain orientate the straps.

The attachment features could all be provided on a front face of the frame, on a rear face of the frame, or on a combination thereof. Rather than being hooks, the attachment features could instead be projections. However, hooks are preferred to provide a more positive engagement.

In an alternative embodiment, the attachment features on the frame may primarily serve a locating function. The support could additionally be secured to the frame by any suitable means, such as adhesive, fasteners, or welding the support to the frame for example.

In the completed article, the longitudinally extending straps 533 extend between upper and lower transverse back frame members (or between front and rear seat frame members in the case of a seat), and the transverse members 535 substantially extend between side frame members. The end result in at least preferred embodiments is a compliant suspended support surface that is pliable, and has good creep resistance and tensile strength.

In the form shown, the straps 533, 535 are substantially flat members. Alternatively, the straps or the moulded support 531 may have a curved profile formed as part of the moulding process. By way of example only, at least part of the article may have a curved side profile and/or a curved top profile that is formed as part of the moulding process. By moulding the article, it can readily be formed with a three dimensional profile. The contour of the support may be changed by attachment of the support to a contoured frame. For example, in the form shown, the flat moulded support 531 has a forwardly convex form when it has been attached to the forwardly convex back frame.

The moulded support 535 has been described above in reference to a support for the back portion of a chair. Alternatively, the moulded support may have other applications. The moulded article may be a support surface for a chair, for example. Preferably, the seat or back frame comprises an opening that is at least partly bounded by frame members, and the method comprises supporting the moulded article from the frame with part of the moulded article extending across the opening, to form a compliant suspended support surface.

If the article is to be used as seat surface rather than a back surface, the thickness of the straps 533, 535 may be greater than mentioned above; for example about twice the thickness mentioned above. Alternatively or additionally, the widths of the elongate straps 533, 535 could be greater than mentioned above; for example about twice the widths mentioned above.

However, the moulded article may be any other suitable type of article. By way of example only, the articles could have application as or in: resistance members in exercise equipment; contact sport helmets; helmet and hat liners; harnesses for backpacks, climbing, safety, paraponting, bungee jumping; support surfaces for baby products including car seats, bouncy beds, baby buggies, cots; trampolines such as springs, mats, minitramps, fire trampolines; other furniture such as dental chairs, aeroplane seating, stadium seating, outdoor furniture; bedding, such as mattress replacements, mattress support surfaces, or pillows; automotive seating, soft tailgates, canopies; hammocks; wake board, snow board, and/or ski bindings; bicycle seats; luggage stowage in transport; hitting surfaces of racquets for sports such as tennis, squash, badminton; wetsuits such as flexible inserts; yachting, such as a catamaran trampoline surface. For such alternative applications, the elongate straps 533, 535 could have significantly different cross-sectional dimensions and lengths from those mentioned above. The extent to which the straps are elongated may also vary. For example, for higher load capacities, the members could have larger cross-sections.

The above describes preferred forms of the moulded support, and modifications can be made thereto without departing from the scope of this aspect of the present invention. For example, the moulded article is described as being a support for the back of a reclining office chair. However, it will be appreciated that such an article can readily be incorporated into different types of chairs, such as dental chairs, meeting seats, vehicle seats, stadium seats, theatre seats, aircraft or other vehicle seats for example. The supporting frame could be modified accordingly, so as to be fixed to the ground or a wall panel for example for a theatre seat.

It will also be appreciated that the principles of this aspect of the invention could be used to provide straps that, in the post-strain orientation form, have a desired shape where the straps are not parallel along their sides. For example, it may be desired to form straps that have specific undulations along their lengths. In such a configuration, the dimensions of the

necked regions relative to the unnecked regions will be varied relative to the intended amount of stretching of the straps to cause strain orientation.

For example, rather than being formed as a moulded support 531, the straps 533, 535 of the back portion could be separate extruded straps that are strain oriented and connected to the back frame to provide support for the cushioning assembly 507. However, the moulded integral support 531 is preferred, as the joiner members 535 link the straps 533, 535 to each other, and prevent the straps from moving significantly relative to each other. If separate straps are used, they would need to be separately tethered to each other to prevent excessive independent movement of the straps, such as via adhesive, welding, or the like. Therefore, the preferred form moulded support described above provides significant manufacturing efficiencies over this alternative form.

As another example, the moulded support 531 is described as being used to support a cushioning assembly on a frame. Instead, the moulded support 531 could form the body-contacting surface that supports the seated occupant.

Other example modifications to the moulded article and its use are listed in the 'Summary of the Invention' section.

LUMBAR SUPPORT

The chair 101, 101' has a lumbar support assembly 601 arranged with the back assembly 501 to provide support to the lumbar region of a user's back. A preferred form lumbar support assembly is shown in Figures 71 to 84(c). The lumbar support assembly 601 comprises a lumbar support member or pad 605 operatively connected to a mounting member 603 via a carrier 611 and biasing mechanism 607. The mounting member 603 in turn attaches to the back assembly 501, 501' to mount the lumbar support member 605 rear of a user support surface 551 of the back assembly using attachment mechanisms 609, as will be described below. The biasing mechanism 607 forwardly biases the carrier 611 and lumbar support member 605. Figures 73 to 75 show the support assembly in front, top and rear elevation.

In a preferred embodiment, the lumbar support member or pad 605 comprises polycarbonate, and the mounting member 603 comprises polypropylene. The other components of the support assembly may comprise other suitable materials such as moulded nylon or steel for example.

The lumbar support member 605 is slidably mounted on the carrier 611 for selectively vertically adjusting the position of the lumbar support relative to the mounting member 603. The lumbar support member 605 comprises an elongate guide portion 617 on a rear side of the lumbar support member. The guide portion may be fixedly or otherwise attached to the lumbar support member 605, or may be integral with the lumbar support member 605. Preferably the guide portion 617 is centrally positioned on the support member 605. The guide portion 617 comprises two laterally extending guide flanges 619 and the carrier 611 comprises two complementary channels 613 with open top and bottom ends that slidably receive the guide flanges 619, such that the lumbar support member 605 can slide relative to the carrier 611.

The guide portion 617 comprises a central section having a series of vertically spaced engagement features which, in the form shown, are rearward-facing notches 623. Figure 75 is a rear elevation of the support assembly 601 and shows the series of notches 623. The carrier 611 comprises an engagement member which, in the embodiment shown, is a forwardly projecting detent 615 that is engageable with the notches 623 to fix the height of the lumbar support member 605 relative to the carrier 611. The detent 615 is preferably resilient and resiliently moves relative to the remainder of the carrier 611 to engage and disengage respective notches as the height of the lumbar support member 605 is adjusted, such that the lumbar support member 605 is selectively adjustable relative to the carrier 613 between a plurality of heights. When sufficient upward or downward force is applied to the lumbar support member 605, that will override the forward bias force of the detent 615 and enable the vertical adjustment to occur. The lumbar support member 605 comprises two rearwardly-directed grasping handles 606 at its lower edge to enable a user to easily adjust the height of the lumbar support member 605.

Preferably, the detent 615 and the notches 623 are arcuate for smooth adjustment and to reduce noise between the detent 615 and notches 623 during height adjustment of the lumbar support member 605. Alternatively, the notches 623 and detents 615 may be other shapes, for example they may comprise angled surfaces.

In an alternative embodiment the carrier 611 may comprise an engagement feature comprising a notch on a moveable member, and the engagement features on the support member 605 may comprise a plurality of protrusions for engaging the notch. It will be appreciated that the carrier 611 may have more than one engagement feature to engage in

the plurality of engagement features on the support member 605. Similarly, it will be appreciated that instead of flanges and a channel, the lumbar support member 605 and carrier 611 may comprise alternative complementary guide features. For example, the carrier 611 may comprise lateral guide projections and the lumbar support member 605 may comprise complementary channels or slots for receiving those projections.

The section views of Figures 76, 77(a), and 77(b) show the assembled biasing mechanism 607 according to a preferred form embodiment. In that embodiment, the biasing mechanism 607 comprises an intermediate member 625 operatively connected to the mounting member 603 and the carrier 611. The intermediate member 625 is preferably pivotally connected to the mounting member 603 at a first pivot 631, 633 and pivotally connected to the carrier 611 at a second substantially parallel pivot 626, 627 via a pin 629. In the embodiment shown, the pivot 633 on the mounting member 603 is provided in three protruding tabs. Alternatively two or more than three tabs may be provided.

A first biasing member 639 is arranged between the mounting member 603 and the intermediate member 625 for biasing the intermediate member angularly away from the mounting member 603. A second biasing member 641 is arranged between the detent 615 and the intermediate member 625 for angularly biasing the detent 615 away from the intermediate member 625 and into engagement with the notches 623. The section view of Figures 77(a) and 77(b) are taken through the centre of the detent 615 and shows the second biasing member 641 biasing the detent into engagement with one of the notches 623.

Preferably, the first and second biasing members 639, 641 are oppositely oriented torsion springs, each having two angled legs. The first torsion spring 639 is preferably mounted about the first pivot 631 of the intermediate member, with a first leg 639a contacting the mounting member 603 and a second leg 639b contacting the intermediate member 625. The second torsion spring 641 is preferably mounted about the pivot pin 629, with a first leg 641a of the second torsion spring 641 contacting detent 615 on the carrier 611 and a second leg 641b contacting the intermediate member 625.

The biasing mechanism 607 further comprises two link arms 635 each having a first end 635a pivotable about the pivot 626, 627 between the carrier 611 and the intermediate member 625 at pivot pin 629. The first ends 635a of the link arms comprise apertures for receiving the pin 629. The two link arms 635 each have a second end 635b pivotally and

slidably mounted in a slot 637 on the mounting member 603. The slot 637 is preferably perpendicular to the pivot 631 between the intermediate member 625 and the mounting member 603, such that the second ends 635b of the link arms 635 can move towards or away from the pivot axis 631 as the intermediate member 625 pivots relative to the mounting member 603. The link arms 635 limit movement of the intermediate member away from the mounting member due to the preload. In an alternative embodiment, the link arm second ends 635b may be pivotally attached to the mounting member 603 and slidable relative to the intermediate member 625.

The biasing mechanism 607 resists rearward movement of the lumbar support member 605 as a user leans into the back portion 501, 501' of the chair. Upon application of rearward force to the lumbar support member 605, the biasing mechanism 607 resists rearward movement of the detent 615 toward the mounting member 603 more than it resists rearward movement of the carrier 611 toward the mounting member 603. The second biasing member 641 acting on the detent 615 biases the detent into engagement with the notches 623 and causes the engagement between the detent and an engaged notch to increase upon rearward movement of the lumbar support 605.

The section views of Figures 78(a) and 78(b) show the support member in a rearward position, with the detent 615 biased further into engagement with a notch 623. The increased engagement means more force is required to slide the lumbar support member 605 relative to the carrier 611 when rearward force is applied to the support member 605. This ensures the lumbar support member 605 is less likely to inadvertently move relative to the carrier 611 while a rearward force is being applied to the lumbar support member 605 such as during support of the lumbar region of a user in the chair. This is particularly useful with a highly compliant back portion 501, 501', where an occupant can readily 'sink in' to the back portion and could inadvertently apply a downward force to the lumbar support member 605 as well as a rearward force.

In addition to resisting rearward movement, the biasing mechanism 607 described above and shown in the accompanying drawings enables the lumbar support member 605 to tilt relative to the mounting member 603. In an alternative embodiment of the lumbar support assembly, the biasing mechanism may bias the detent away from the mounting member 603 without enabling the lumbar support member 605 to be tilted. For example, the carrier 611 may be movable or slidable horizontally towards the mounting member 603, but not angularly tiltable. In such an embodiment, the biasing mechanism may comprise a biasing

device such as a spring arranged directly between the mounting member 603 and the detent 615 or other engagement feature on the carrier 611. A feature 636 (Figure 72) on the mounting member 603 limits rearward motion of the biasing mechanism 607 by stopping the intermediate member 625.

In the embodiment shown, the first and second pivots 631, 629 of the intermediate support member 625 are substantially horizontal to allow the support to tilt up and down to conform to the angle of a user's back as they move in the chair. In an alternative embodiment, the pivot axes may instead be substantially vertical, for example, to enable the lumbar support member 605 to tilt sideways to conform to the back of a user twisting in the chair.

Figure 79 shows the lumbar support member 605 adjusted to a high vertical and biased forward position with no rearward load applied to the lumbar support member 605. Figure 80 shows the lumbar support member 605 in that arrangement tilted upwards upon application of a rearward force to a central or upper portion of the lumbar support member. It can be seen that the detent is biased further into engagement with a notch 623 when the upper end of the lumbar support member 605 is tilted rearward. Figure 81 shows the lumbar support member 605 adjusted to a low vertical and biased forward position with no rearward load applied to the lumbar support member 605. Figure 82 shows the lumbar support member 605 in that arrangement tilted downwards upon application of a rearward force to a central or lower portion of the lumbar support member.

The shape of a preferred form lumbar support member 605 can be seen in plan view in Figure 74 and section views in Figures 76 to 82. The lumbar support member 605 is forwardly concave in horizontal section, to curve around the back of a user, and forwardly convex in vertical section to accommodate rearward curvature of a user's back. An elongate substantially vertical recess 605' is provided in a central region of the lumbar support member 605, to provide clearance for a user's spine.

The mounting member 603 positions the lumbar support member 605 behind a rear part 551 of the user support surface of the back portion 501, 501'. In the absence of a rearward load on the back portion 501, 501' of the chair, the lumbar support member 605 is spaced behind and out of contact with the rear part 551 of the user support surface back portion 501, 501'. The spacing is sufficiently small that upon application of a rearward force to the user support surface when a user leans into the back portion 501, 501', at least a part 551 of the back portion flexes rearward relative to the back frame 503 to contact the lumbar

support member 605. The lumbar support member 605 provides support to the lumbar region of the user's back by providing additional resistance to rearward movement in the lumbar region.

In the form shown, the mounting member 603 is a rigid beam and is preferably curved, but alternatively may be u-shaped, for example. The ends of the mounting member 603 attach to the side members 504a of the back frame 503 so that the mounting member 603 extends rearwardly from the frame. In the embodiment shown, the mounting member 603 comprises two attachment mechanisms 609 at each end for attaching the mounting member to the frame side members 504a.

Components of the preferred form attachment mechanisms 609 are shown in the exploded view of Figure 72, and in more detail in Figure 83. The method of using one of the attachment mechanisms 609 is shown in Figures 84(a) to 84(c). Each attachment mechanism 609 comprises a lock shuttle 651, a first lock member 653 with lock hook(s) 653a having lock projections 653a', a second lock member 655 with lock pin(s) 655a, a guide pin 657, a lock slider 659, and a lock retainer cover 661. The first lock member 653 could have one, two, three, or more lock hooks, with the second lock member 655 having a corresponding number of lock pins 655a. A lock mechanism channel 663 with lower and upper horizontal guide ribs 663a, 663b is provided in the front face of the mounting member 603 toward each end of the mounting member.

The lock mechanisms 609 are selectively moveable between a retracted unlocked position in which they do not project significantly, or at all, beyond the ends of the mounting member 603, and a projecting locking position where they project beyond the ends of the mounting member 603 to attach the mounting member 603 to the frame side members 504a. The lock slider 659 is provided with a suitable region for grasping, such as a forwardly directed projection 660 for example, to enable a user to actuate the locking mechanism.

In the assembled mounting member/locking mechanism, the lock shuttle 651 is positioned in the lock mechanism channel 663. The lock shuttle 651 is slidable vertically between the lower and upper horizontal guide ribs 663a, 663b, but is not slidable horizontally. The lock shuttle has rearward channels 651b that engage with vertical ribs 663c in the channel to enable the vertical sliding movement of the shuttle.

The first lock member 653 is positioned in front of the shuttle, with its lock hook(s) 653a directed toward the end of the mounting member 603. The second lock member 655 is positioned in front of the first lock member, with its lock pin(s) 655a directed toward the end of the mounting member. A protrusion 655b on the second lock member 655 is positioned inwardly along the beam from a protrusion 651a on the shuttle, to act as an inhibitor to outward movement of the second lock member 655. The guide pin 657 extends through the aligned slots in the second lock member, first lock member, and lock shuttle. The lock slider 659 is positioned in front of the second lock member, and has rearwardly projecting walls that surround the first lock member and second lock member. The head of the guide pin 657 is positioned in a cavity 659a in the lock slider 659, which is preferably vertically elongate to enable vertical movement of the guide pin 657 relative to the lock slider.

The lock retainer cover 661 is positioned in front of the lock slider 659, and has walls that generally surround the other components of the locking mechanism. The lock retainer cover 661 is fixed to the mounting member 603 via any suitable means, such as clips, adhesive, and/or ultrasonic welding for example. The lock retainer cover keeps the lock mechanism assembled with the mounting member 603.

The assembly at each end of the mounting member 603 will be substantially the same, with the components being mirror images of each other.

It can be seen that the lock shuttle 651 has a substantially linear and substantially horizontal channel 652. The first lock member 653 has a channel 654 that has an inner angled portion to initially extend outwardly and upwardly from its innermost end, and then has a substantially linear and substantially horizontal portion. The second lock member 655 has a channel 656 that initially extends substantially linearly and substantially horizontally outwardly from its innermost end, and then has an outer angled portion that extends outwardly and upwardly. The guide pin 657 extends through the channels 652, 654, 656 as discussed above.

To attach the mounting member 603 to the frame side members 504a, the mounting member 603 is placed behind the back support 531 and generally aligned with locking apertures or recesses 665 in the frame side members 504a. The ends of the mounting member 603 are provided with locator features 604 to locate the ends of the mounting member in a desired position relative to one of the transverse straps 553. The recesses

665 are provided with engagement shoulders 667. The lock sliders 659 are initially in their innermost positions so that the lock mechanisms 609 are in their retracted unlocked positions as shown in Figure 84(a). The lock shuttle 651 will be in its lowest vertical position in the lock mechanism channel 663 in the mounting member 603.

During initial outward movement of the lock sliders 659, the guide pins 657 are located in the inner angled portions of the slots 654 of first lock members 653 and slide along the horizontal portions of the slots 656 of the second lock members. The first lock members 653 move outwardly so that their lock hooks 653a are positioned in the recesses 665. The engagement of the protrusion 651a on the shuttle with the protrusion 655b on the second lock member will inhibit or prevent outward movement of the second lock member 655 during initial outward movement of the first lock member 653. There is sufficient clearance between the lock hooks 653a and the entrances to the recesses 665 that the lock hooks 653a can be clear of the engagement shoulders 667, but then manually moved down into position behind the shoulders to the position shown in Figure 84(b).

Further outward movement of the lock sliders 659 causes the guide pins 657 to be located in the angled outer portions of the slots 656 in the second lock members 655, and to slide along the linear horizontal portion of the slots 654 in the first lock members 653. As the guide pin 657 is lifted in the slots 654, 656, the guide pin also lifts the shuttle 651 in the lock mechanism channel 663, so that the protrusions 651a, 655b are disengaged and the second lock member can move outwardly. The vertically slidable shuttles 651 also assist with avoiding binding of the guide pins 657 in the slots. The lock pins 655a extend beside the against the lock hooks 653a, to the position shown in Figure 83(c). The lock projections 653a' are positioned outwardly of the engagement shoulders 667. There is insufficient clearance between the lock pins 655a and look hooks 653a and the entrances to the recesses 665, for the lock projections 653a' to move sufficiently to clear the engagement shoulders 667. The mounting member 603 is thereby attached to the back frame.

To remove the mounting member 603 from the frame, the process is reversed. In particular, the user will move the lock sliders 659 inwardly which will initially retract the second lock members 655 so that the lock pins 655a move away from the lock hooks 653a. The mounting member 603 can then be moved vertically so that the lock projections 653a' can clear the engagement shoulders 667. Further inward movement of the lock sliders 659 will cause the lock hooks 653a to retract from the recesses 665 so that the mounting member 603 can be removed from the frame.

It will be appreciated that the mechanism could readily be inverted, so that the lock hooks 653a are upper members with upwardly directed lock projections 653a', and the lock pins 655a engage the undersides of the lock hooks 653a.

The lumbar support assembly is retrofittable to the back portion 501, 501' by an end user, and is preferably able to be removed from the back portion by the end user.

Rather than using the attachment mechanism described above, alternatively the mounting member 603 could be mounted to the frame side members 504a using clips. The clips may be u-shaped clips that wrap around the front side of the frame 503. To attach the mounting member 603 to the back frame, the mounting member is arranged behind the rear part 551 of the user support surface of the back portion, with the attachment clips in front of the frame and aligned with the side frame members. The mounting member 603 is then pulled rearward relative to the frame until the attachment clips snap into engagement with the frame. Suitable apertures would be provided in the side frame members 504a for receipt of the clips.

In alternative embodiments, the mounting member 603 may be attached to the back frame 503 using other attachment methods. For example, the mounting member 603 may be attached to the frame using fasteners such as screws, adhesive, or welded to the frame. Alternatively, the mounting member 603 and the back frame 503 may be integral. Preferably the mounting member 603 is fixed relative to the side members 504a, but alternatively the mounting member 603 may be adjustable relative to the frame.

Rather than a lumbar support assembly as described above, embodiments of the support assembly could be used to support other portions of the back or body from a back portion of a chair, for example as a head or neck support assembly positioned on a higher region of the back portion 501'.

The above describes preferred forms of the present invention, and modifications can be made thereto without departing from the scope of the present invention. For example, the preferred form features are described and shown with reference to a reclining office chair. However, it will be appreciated that many of the features can readily be incorporated into different types of chairs, such as meeting chairs, vehicle chairs, or theatre chairs for

example. The supporting frame could be modified accordingly, so as to be fixed to the ground or a wall panel for example for a theatre chair.

Additionally, a number of the features described herein can be incorporated into chairs having different features. They need not all be incorporated into the same chair.

Other example modifications are listed in the 'Summary of the Invention' section.

CLAIMS

1. An adjustable support assembly for use in a chair, the support assembly comprising:

a mounting member;

a support for supporting part of the body of a chair occupant;

a carrier slidably carrying the support, the support comprising a plurality of engagement features and the carrier comprising an engagement member that is selectively engageable with the engagement features to enable the support to be selectively positioned relative to the carrier at a plurality of positions; and

a biasing arrangement operatively connecting the carrier to the mounting member and configured to forwardly bias the carrier and support;

wherein the engagement between the engagement member and an engaged engagement feature increases upon application of rearward force to the support.

2. An adjustable support as claimed in claim 1, wherein the biasing arrangement comprises a biasing member that acts on the engagement member to bias the engagement member toward the support.

3. An adjustable support as claimed in claim 2, wherein the biasing member resists rearward movement of the engagement member toward the mounting member more than it resists rearward movement of the carrier toward the mounting member, upon application of the rearward force to the support.

4. An adjustable support as claimed in any one of claims claim 1 to 3, wherein the biasing arrangement comprises:

an intermediate member operatively connected to the mounting member and to the carrier;

a first biasing member arranged between the mounting member and the intermediate member; and

a second biasing member arranged between the carrier and the intermediate member.

5. An adjustable support as claimed in claim 4, wherein the first and second biasing members are oppositely oriented torsion springs.

6. An adjustable support as claimed in claim 4 or 5, wherein the intermediate member is pivotable relative to the mounting member about a first axis and the carrier is

pivotable relative to the intermediate member about a second substantially parallel axis.

7. An adjustable support as claimed in claim 6, further comprising at least one link arm with a first end that is pivotable relative to the mounting member or the intermediate member and a second end that is slidable relative to the other of the mounting member or the intermediate member.

8. An adjustable support as claimed in claim 7 comprising two link arms, each arm having a first end slidable in a slot on the mounting member and a second end pivotable about the intermediate member second axis.

9. An adjustable support as claimed any one of claims 1 to 8, wherein the engagement member engages the engagement features in a forward-rearward direction.

10. An adjustable support as claimed any one of claims 1 to 9, wherein the support is tiltable relative to the mounting member.

11. An adjustable support as claimed any one of claims 1 to 10, wherein the support is height adjustable.

12. An adjustable support as claimed any one of claims 1 to 11, wherein the engagement member is resilient.

13. An adjustable support as claimed any one of claims 1 to 12, wherein the carrier comprises a guide for slidably engaging a complementary guide feature on a rear side of the support.

14. An adjustable support as claimed in claim 13, wherein the guide feature on the support comprises a guide projection or flange, and the carrier comprises at least one guide channel for slidably receiving the guide projection or flange.

15. An adjustable support as claimed in claim 13 or 14, wherein the guide feature on the support is provided by a guide member fixed to the support.

16. An adjustable support as claimed any one of claims 1 to 15, wherein the engagement features comprise rearward facing, arcuate notches; and the engagement member comprises an arcuate forwardly directed projection.

17. An adjustable support as claimed any one of claims 1 to 16, wherein the support is a lumbar support.

18. An adjustable support as claimed in claim 17, wherein the support is forwardly concave in plan view, and comprises a central, substantially vertical recess to accommodate the spine of a user.

19. An adjustable support as claimed in claim 17 or 18, wherein the mounting member is configured for mounting to a back frame of a chair.

20. A chair comprising a back frame having two side members, and an adjustable support as claimed in any one of claims 1 to 19, wherein the mounting member is attached to the two side members.

21. A chair as claimed in claim 20, wherein the mounting member is fixed relative to the two side members.

22. A chair as claimed in claim 20 or 21, wherein the back frame supports a compliant back portion, and the support is positioned rear of the compliant back portion.

23. A chair as claimed in claim 22, wherein, the support is rearwardly spaced from the back portion in the absence of a rearward load on the back portion, and at least a part of the back portion is moved rearward to contact the support upon application of a sufficient rearward force to the compliant back portion.

24. A moulded article suitable for strain orientation, the article comprising:

a plurality of first elongate straps formed in a first layer;

a plurality of second elongate straps formed in a second layer, so that at least some of the first elongate straps overlap with at least some of the second elongate straps; and

a plurality of joiner members that are integrally moulded with the first elongate straps and with the second elongate straps, and that connect between the first

elongate straps and the second elongate straps in the regions in which the first elongate straps and the second elongate straps overlap.

25. A moulded article according to claim 24, wherein at least a portion of the first elongate straps, at least a portion of the second elongate straps, and at least a portion of the joiner members are suitable for strain orientation.

26. A moulded article according to claim 25, wherein substantially the entire first elongate straps, substantially the entire second elongate straps, and substantially the entire joiner members are suitable for strain orientation.

27. A moulded article according to any one of claims 24 to 26, wherein the first elongate straps comprise necked regions adjacent the joiner members, to compensate for a reduction in strain orientation due to the additional material of the joiner members.

28. A moulded article according to claim 27, wherein the necked regions are formed by notches or recesses extending into sides of the first elongate straps.

29. A moulded article according to claim 28, wherein the notches or recesses are configured such that post-strain orientation, the sides of the first elongate straps are substantially parallel along substantially their entire lengths.

30. A moulded article according to any one of claims 24 to 29, wherein the second elongate straps comprise necked regions adjacent the joiner members, to compensate for a reduction in strain orientation due to the additional material of the joiner members.

31. A moulded article according to claim 30, wherein the necked regions are formed by notches or recesses extending into sides of the second elongate straps.

32. A moulded article according to claim 31, wherein the notches or recesses are configured such that post-strain orientation, the sides of the second elongate straps are substantially parallel along substantially their entire lengths.

33. A moulded article according to any one of claims 24 to 32, wherein the first elongate straps comprise generally longitudinally extending straps, and wherein the second elongate straps comprise generally transversely extending straps.

34. A moulded article according to any one of claims 24 to 33, wherein the moulded article is substantially flat.

35. A moulded article according to any one of claims 24 to 34, wherein the moulded article is moulded from a resin comprising a thermoplastic polyester elastomer.

36. A moulded article according to claim 35, wherein the thermoplastic polyester elastomer comprises a block copolymer.

37. A moulded article according to claim 36, wherein the thermoplastic polyester elastomer is a block copolymer of polybutylene terephthalate and polyether.

38. A moulded article according to any one of claims 35 to 37, wherein the resin is selected such that the moulded article has a hardness in the range of about 30D to 55D when tested in accordance with ASTM 2240.

39. A moulded article according to any one of claims 24 to 38, wherein at least part of the article is capable of being stretched to at least about 400% of an initial dimension without failure, such that strain orientation occurs.

40. A method of assembling a support, comprising:

providing a frame;

providing a moulded article according to any one of claims 24 to 39, wherein at least part of the moulded article has an as-moulded dimension less than a corresponding dimension of the frame;

stretching said at least part of the moulded article so as to have a stretched dimension greater than the corresponding dimension of the frame and such that strain orientation of at least a portion of the first elongate straps and at least a portion of the second elongate straps occurs;

relaxing said at least part of the article so as to have a post-relaxation dimension between the as-moulded dimension and the stretched dimension;

and supporting the article from the frame.

41. A method according to claim 40, wherein the frame comprises an opening that is at least partly bounded by frame members, and the method comprises supporting the article from the frame with part of the article extending across the opening, to form a compliant suspended support surface.

42. A method according to claim 40 or 41, wherein the first elongate straps comprise generally longitudinally extending straps, and wherein the second elongate straps comprise generally transversely extending straps.

43. A method according to claim 42, comprising stretching and relaxing the generally longitudinally extending straps before stretching and relaxing the generally transversely extending straps.

44. A method according to claim 42, comprising stretching and relaxing the generally transversely extending straps before stretching and relaxing the generally longitudinally extending straps.

45. A method according to claim 42, comprising stretching and relaxing the generally transversely extending straps concurrently with stretching and relaxing the generally longitudinally extending straps.

46. A method according to any one of claims 40 to 45, wherein the step of stretching at least part of the article results in stretching of the joiner members such that strain orientation of the joiner members occurs.

47. A method according to claim 46, wherein the joiner members are strain oriented in both a longitudinal direction and a transverse direction.

48. A method according to any one of claims 40 to 47, wherein the first elongate straps comprise necked regions adjacent the joiner members to compensate for a reduction in strain orientation due to the additional material of the joiner members.

49. A method according to claim 48, wherein the necked regions are formed by notches or recesses extending into sides of the first elongate straps, and wherein the sides of

the first elongate straps in the relaxed article are substantially parallel along substantially their entire lengths.

50. A method according to any one of claims 40 to 49, wherein the second elongate straps comprise necked regions adjacent the joiner members to compensate for a reduction in strain orientation due to the additional material of the joiner members to compensate for a reduction in strain orientation due to the additional material of the joiner members.

51. A method according to claim 50, wherein the necked regions are formed by notches or recesses extending into sides of the second elongate straps in the relaxed article adjacent the joiner members, and wherein the sides of the second elongate straps are substantially parallel along substantially their entire lengths.

52. A back portion for a chair when assembled using the method of any one of claims 40 to 51.

53. A seat portion for a chair when assembled using the method of any one of claims 40 to 51.

54. A chair comprising:

a supporting frame;

a seat portion for supporting a seated occupant;

a back portion for supporting the back of a seated occupant and that is reclinable relative to the supporting frame; and

a recline mechanism configured to lift the seat portion upon a reclining action of the back portion, the recline mechanism comprising a back support arm operatively connected to the back portion and that is pivotally connected to the supporting frame and is pivotally connected to a relatively forward portion of the seat portion, and a rocker arm that is pivotally connected to the supporting frame, pivotally connected to a relatively rearward portion of the seat portion, and operatively connected to the back support arm to move relative to the back support arm.

55. A chair as claimed in claim 54, wherein the seat portion moves upwardly and rearwardly when the back portion is reclined.

56. A chair as claimed in claim 54 or 55, wherein the seat portion has a rearward tilt angle when the back portion is not reclined, and the seat portion has a greater rearward tilt angle when the back portion is fully reclined.

57. A chair as claimed in any one of claims 54 to 56, wherein the rocker arm is downwardly forwardly angled when the back portion is not reclined, and is upwardly forwardly angled when the back portion is fully reclined.

58. A chair as claimed in any one of claims 54 to 57, wherein a portion of the back support arm is approximately horizontal when the back portion is not reclined, and is upwardly forwardly angled when the back portion is fully reclined.

59. A chair as claimed in any one of claims 54 to 56, wherein the rocker arm is downwardly forwardly angled when the back portion is not reclined, and is upwardly forwardly angled when the back portion is fully reclined, and wherein a portion of the back support arm is approximately horizontal when the back portion is not reclined, and is upwardly forwardly angled when the back portion is fully reclined, wherein the upward and forward angle of the rocker arm is greater than the upward and forward angle of the portion of the back support arm.

60. A chair as claimed in claim 59, wherein the downward and forward angle of the rocker arm is about 13 degrees below horizontal, and the upward and forward angle of the rocker arm is about 24 degrees above horizontal, and wherein the upward and forward angle of the portion of the back support arm is about 17 degrees above horizontal.

61. A chair as claimed in any one of claims 54 to 60, wherein the pivot connection of the back support arm and the supporting frame is forward of the operative connection of the rocker arm to the supporting frame.

62. A chair as claimed in any claim 61, wherein the pivot connection of the rocker arm and the supporting frame is positioned at or adjacent a rear portion of the supporting frame.

63. A chair as claimed in claim 62, wherein the pivot connection of the back support arm and the supporting frame is positioned adjacent and forward of the pivot connection of the rocker arm and the supporting frame.

64. A chair as claimed in claim 63, wherein the pivot connection of the rocker arm and the seat portion is generally aligned with the pivot connection of the back support arm and the supporting frame, in a forward-rearward direction of the chair.

65. A chair as claimed in any one of claims 54 to 64, wherein the pivot connection of the back support arm to the relatively forward portion of the seat portion comprises a pivot and slide connection.

66. A chair as claimed in any one of claims 54 to 65, wherein the rocker arm is operatively connected to the back support arm via a connecting link that is pivotally connected to the back support arm and pivotally connected to the rocker arm.

67. A chair as claimed in claim 66, wherein the pivot connection of the rocker arm and the connecting link is positioned substantially vertically above the pivot connection of the connecting link and the back support arm, when the back portion is not reclined.

68. A chair as claimed in any one of claims 54 to 65, wherein the rocker arm is operatively connected to the back support arm via a pivot and slide connection.

69. A chair as claimed in claim 68, wherein the pivot and slide connection comprises a pin on the rocker arm and a slot in the back support arm.

70. A chair as claimed in claim 68, wherein the pivot and slide connection comprises a roller rotatably mounted on the rocker arm and slidable along a surface of the back support arm.

71. A chair as claimed in any one of claims 54 to 70, wherein the recline mechanism comprises two back support arms operatively connected to the back portion and that are pivotally connected to the supporting frame and are pivotally connected to the relatively forward portion of the seat portion, two rocker arms that are pivotally connected to the supporting frame, pivotally connected to a relatively rearward

portion of the seat portion, and operatively connected to a respective one of the back support arms.

72. A chair as claimed in claim 71, wherein the two rocker arms are movably connected relative to the back support arms via two connecting links that are each pivotally connected to a respective one of the back support arms and to a respective one of the rocker arms.

73. A chair as claimed in claim 71 or 72, wherein the supporting frame comprises a transom having a base and a pair of spaced apart side walls, and wherein a portion of each back support arm is positioned inwardly of the side walls of the transom.

74. A chair as claimed in claim 73, wherein each back support arm is pivotally connected to respective one of the side walls of the transom.

75. A chair as claimed in any one of claims 54 to 74, wherein the seat portion comprises a seat support and a seating surface for supporting a seated occupant, wherein the seating surface is selectively moveable in a forward and rearward direction relative to the seat support, and wherein the rocker arm(s) and the back support arm(s) are pivotally connected to the seat support.

76. A chair as claimed in any one of claims 54 to 75, further comprising a recline resistance mechanism to resist movement of the back portion toward the reclined position, and wherein the amount of resistance provided by the recline resistance mechanism is selectively adjustable.

77. A chair as claimed in any one of claims 54 to 76, wherein the seat comprises a shell beneath the seating surface and having a central recess in the underside of the shell, and wherein the recline mechanism is substantially housed in the central recess when the back portion is not reclined.

78. A chair as claimed in any one of claims 54 to 77, wherein a vertical height of the recline mechanism is about 40 mm when the back portion is not reclined.

79. A chair as claimed in any one of claims 54 to 78, wherein a forward end of the rocker arm is configured to engage with the seat portion to provide a recline stop that defines the maximum rearward recline of the back portion.

80. A chair as claimed in any one of claims 54 to 79, wherein a forward end of the back support arm is configured to engage with the supporting frame to provide an upright stop that defines the upright position of the back portion.

81. A chair comprising:

a supporting frame;

a seat portion for supporting a seated occupant;

a back portion for supporting the back of a seated occupant, the back portion being reclinable relative to the supporting frame between a generally upright position and a generally reclined position; and

a recline resistance mechanism to resist movement of the back portion toward the generally reclined position, the recline resistance mechanism comprising a resistance device operatively connected to one of the back portion, the seat portion, or the supporting frame, the recline resistance mechanism further comprising a first retainer and a second retainer that are both operatively connected to another one of the back portion, the seat portion, or the supporting frame, wherein the second retainer is movable to adjust a reaction point between the resistance device and said another one of the back portion, seat portion, or supporting frame, to vary the amount of recline resistance provided by the recline resistance mechanism, wherein the first retainer preloads the resistance device when the back portion is in the generally upright position, and wherein the second retainer is movable to at least one position wherein in the reclined position of the back portion, the reaction point is provided by the second retainer.

82. A chair as claimed in claim 81, wherein movement of the second retainer does not alter the preload on the resistance device when the back portion is in the generally upright position.

83. A chair as claimed in claim 81 or 82, wherein the first retainer engages the resistance device such that the recline resistance mechanism provides a first level of recline resistance.

84. A chair as claimed in claim 83, wherein the second retainer is movable to a position in which it provides a second level of recline resistance that differs from the first level of recline resistance provided by the first retainer.

85. A chair as claimed in claim 84, wherein the first level of recline resistance provided by the first retainer is a relatively low level of recline resistance, and the second level of recline resistance provided by the second retainer is a relatively high level of recline resistance.

86. A chair as claimed in any one of claims 81 to 85, wherein said second retainer is selectively movable between an engaged position in which the second retainer engages the resistance device when the back portion is reclined from the generally upright position, and a disengaged position.

87. A chair as claimed in claim 86, wherein in the engaged position, the second retainer does not engage the resistance device when the back portion is in the generally upright position.

88. A chair as claimed in any one of claims 81 to 87, wherein the first retainer contacts the resistance device when the back portion is not reclined, whether or not the second retainer is selectively engaged.

89. A chair as claimed in any one of claims 81 to 88, wherein at least one of the retainers is movable relative to the resistance device between a plurality of engagement positions, to provide differing levels of recline resistance.

90. A chair as claimed in claim any one of claims 81 to 89, wherein the resistance device is operatively connected to the back portion, and the first and second retainers are operatively connected to the supporting frame.

91. A chair as claimed in any one of claims 81 to 90, wherein the resistance device comprises a leaf spring.

92. A chair as claimed in claim 91, wherein the leaf spring has an effective length, a reaction length, and an amount of deflection when the back portion is in the generally reclined position, and wherein in a first position of the second retainer, the

effective length, the reaction length, and the amount of deflection are all greater than if the second retainer is in a second position, such that the level of resistance provided by the recline resistance device is relatively high when the second retainer is in the first position and relatively low when the second retainer is in the second position.

93. A chair as claimed in claim 92, wherein the first position is an engaged position in which the second retainer engages the leaf spring when the back portion is reclined from the generally upright position, and the second position is a disengaged position.

94. A chair as claimed in claim 92, wherein the first and second positions are different engaged positions in which the second retainer engages the leaf spring when the back is reclined from the generally upright position.

95. A chair as claimed in any one of claims 91 to 94, wherein the leaf spring is operatively connected to the back portion to move with the back portion and the first and second retainers are operatively connected to the supporting frame.

96. A chair as claimed in claim 95, wherein the second retainer is pivotally connected to the supporting frame and is selectively engageable with a forward end of the leaf spring.

97. A chair as claimed in any one of claims 91 to 94, wherein the leaf spring is operatively connected to the supporting frame, and the first and second retainers are operatively connected to the back portion to move with the back portion.

98. A chair as claimed in any one of claims 81 to 90, wherein the resistance device comprises a torsion spring.

99. A chair as claimed in claim 98, wherein the torsion spring comprises a leg portion, and the first retainer engages the leg portion.

100. A chair as claimed in claim 99, wherein the second retainer is movable to engage and disengage an end of the leg portion and wherein the effective spring rate of the torsion spring and thereby the recline resistance is higher when the second retainer is engaged with the end of the leg portion.

101. A chair as claimed in claim 99 or 100, wherein the torsion spring further comprises another leg portion that is operatively connected to the back portion.

102. A chair as claimed in claim 101, wherein the torsion spring comprises a body and two leg portions, and wherein the body is positioned on or spaced apart from the pivot axis of the back portion to the supporting frame.

103. A chair as claimed in any one of claims 81 to 102, wherein the resistance device comprises a plurality of springs, and wherein the first retainer and/or the second retainer is/are engageable with the plurality of springs.

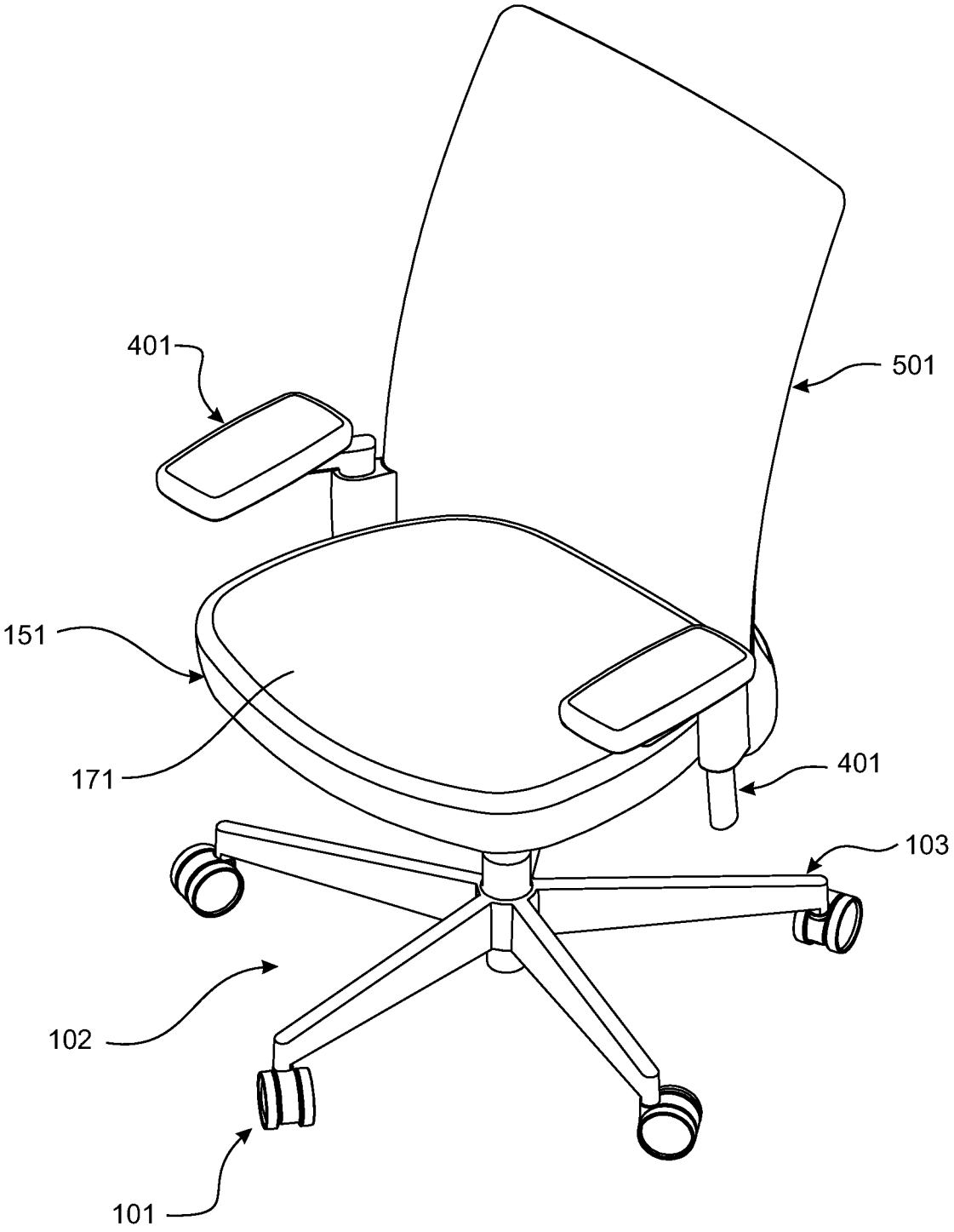


FIGURE 1

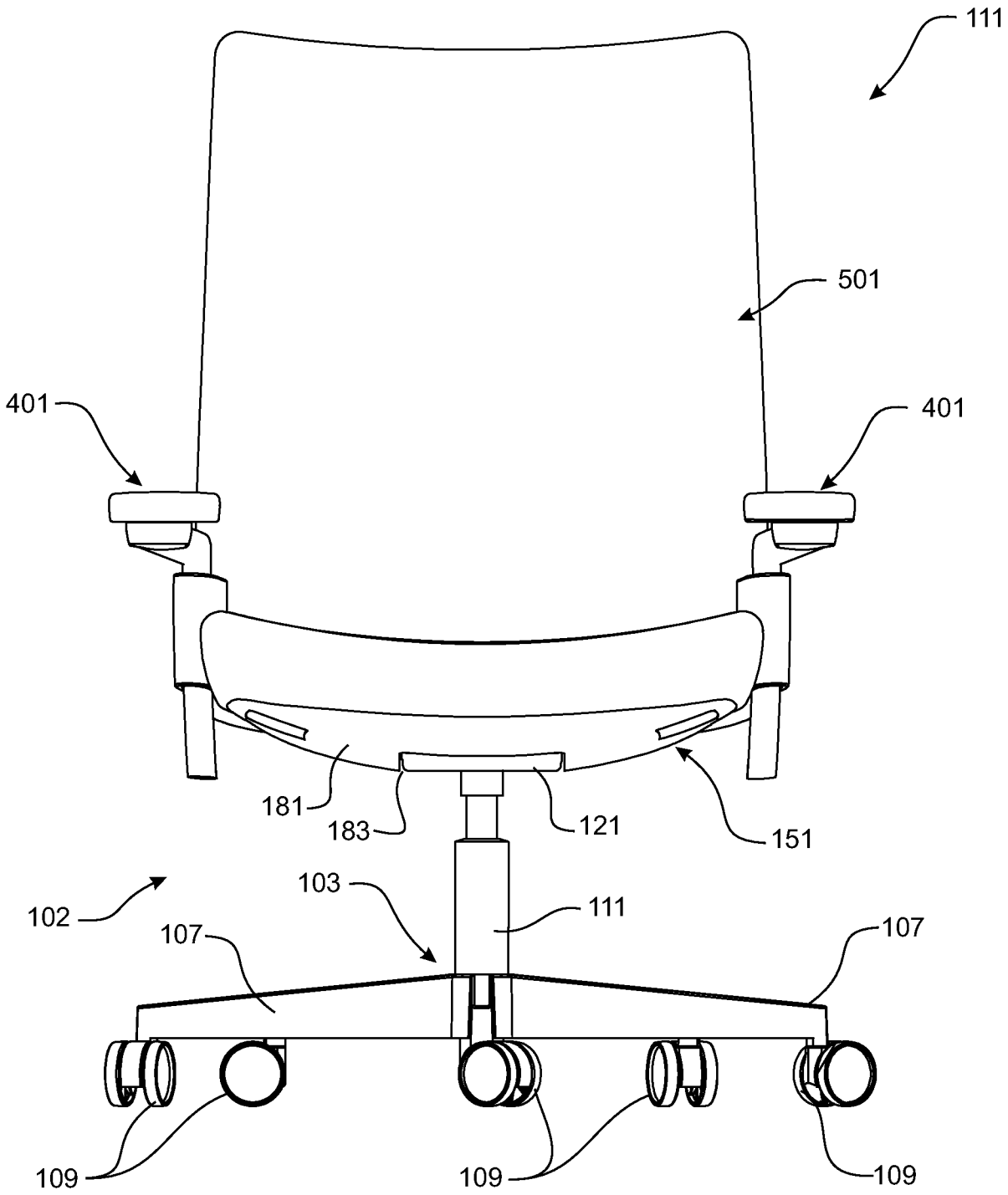


FIGURE 2

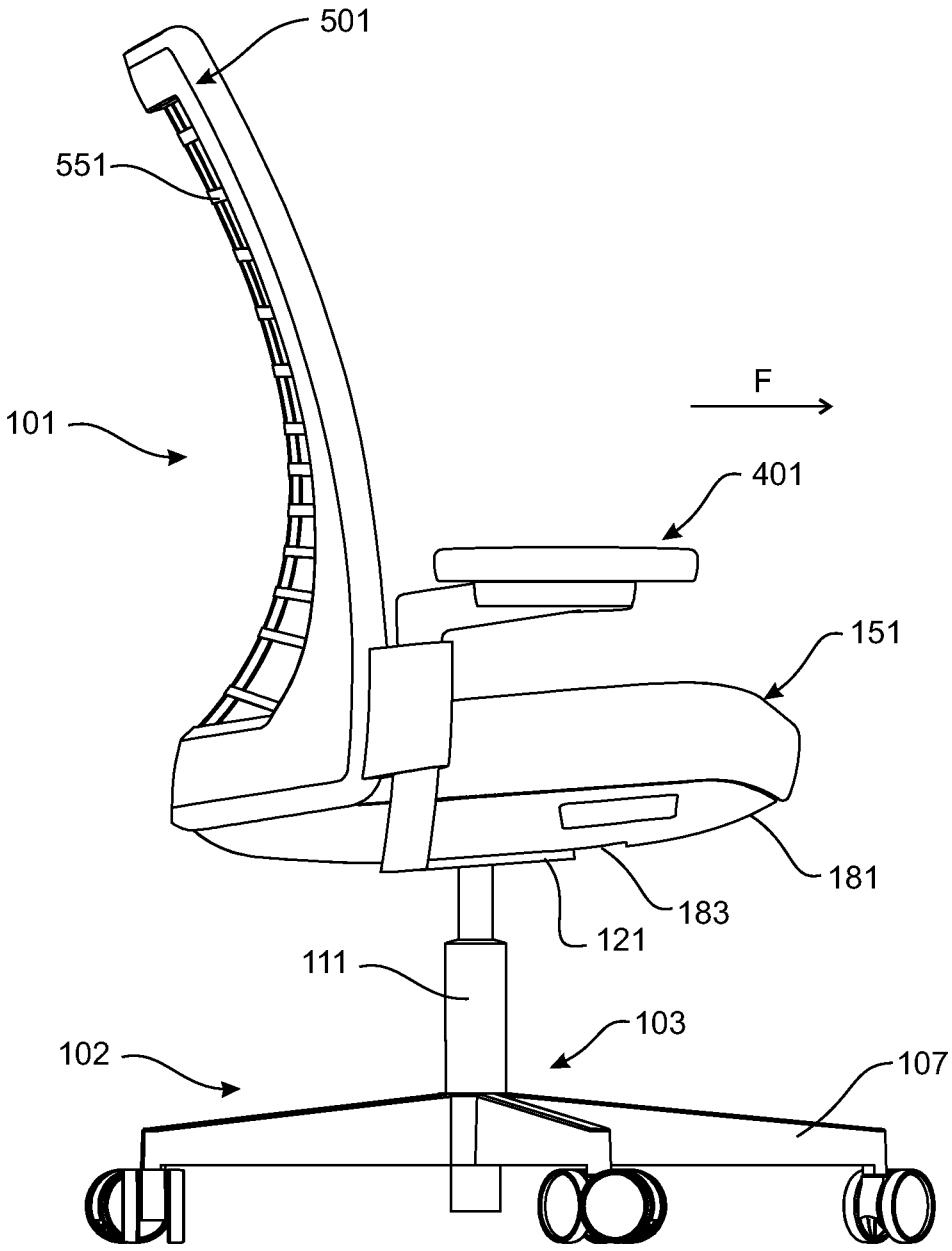


FIGURE 3

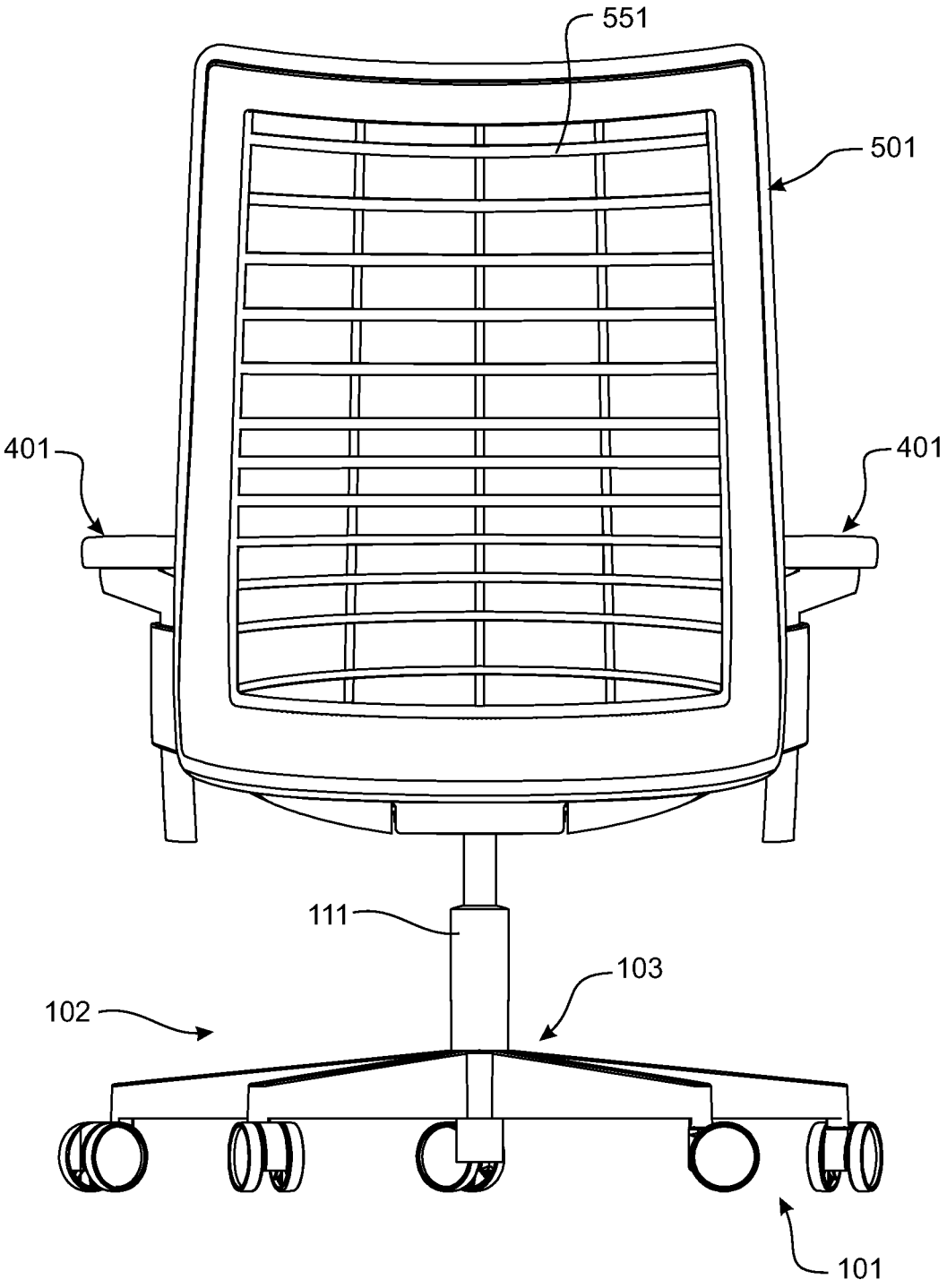


FIGURE 4

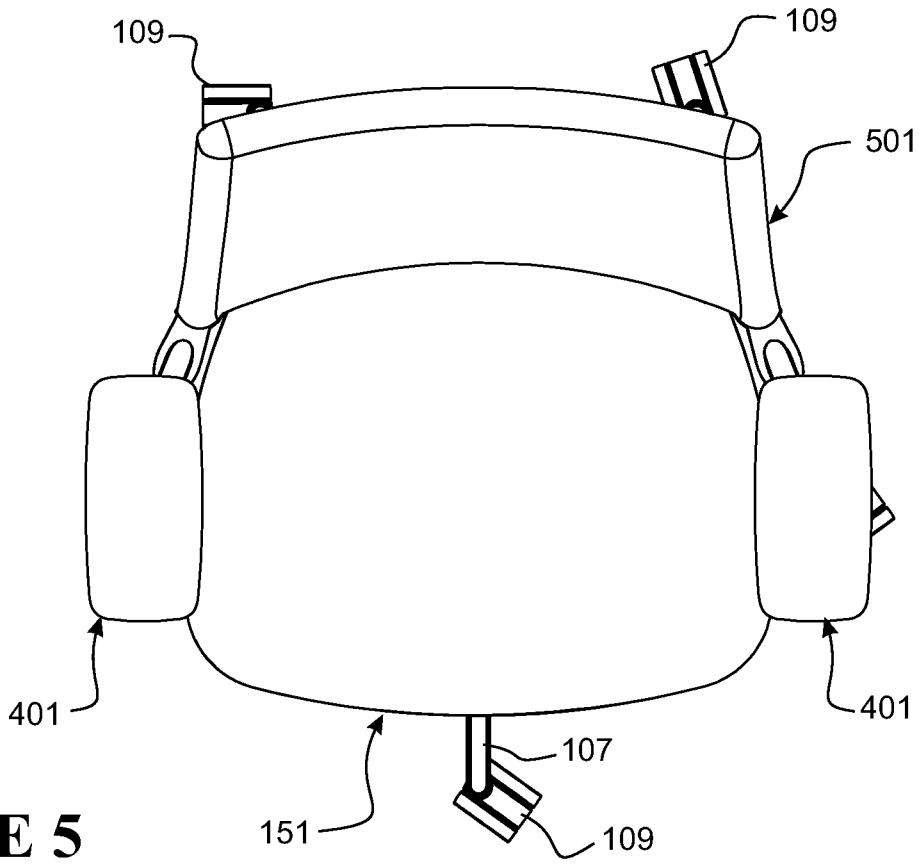


FIGURE 5

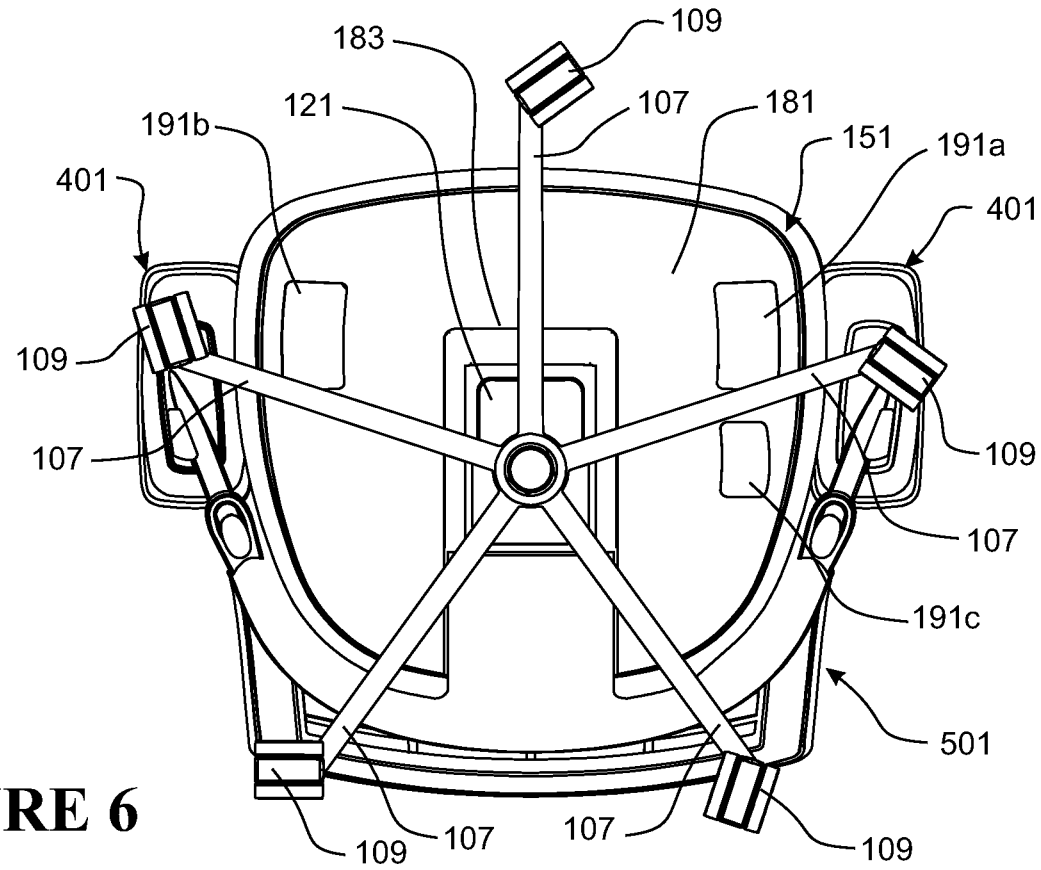


FIGURE 6

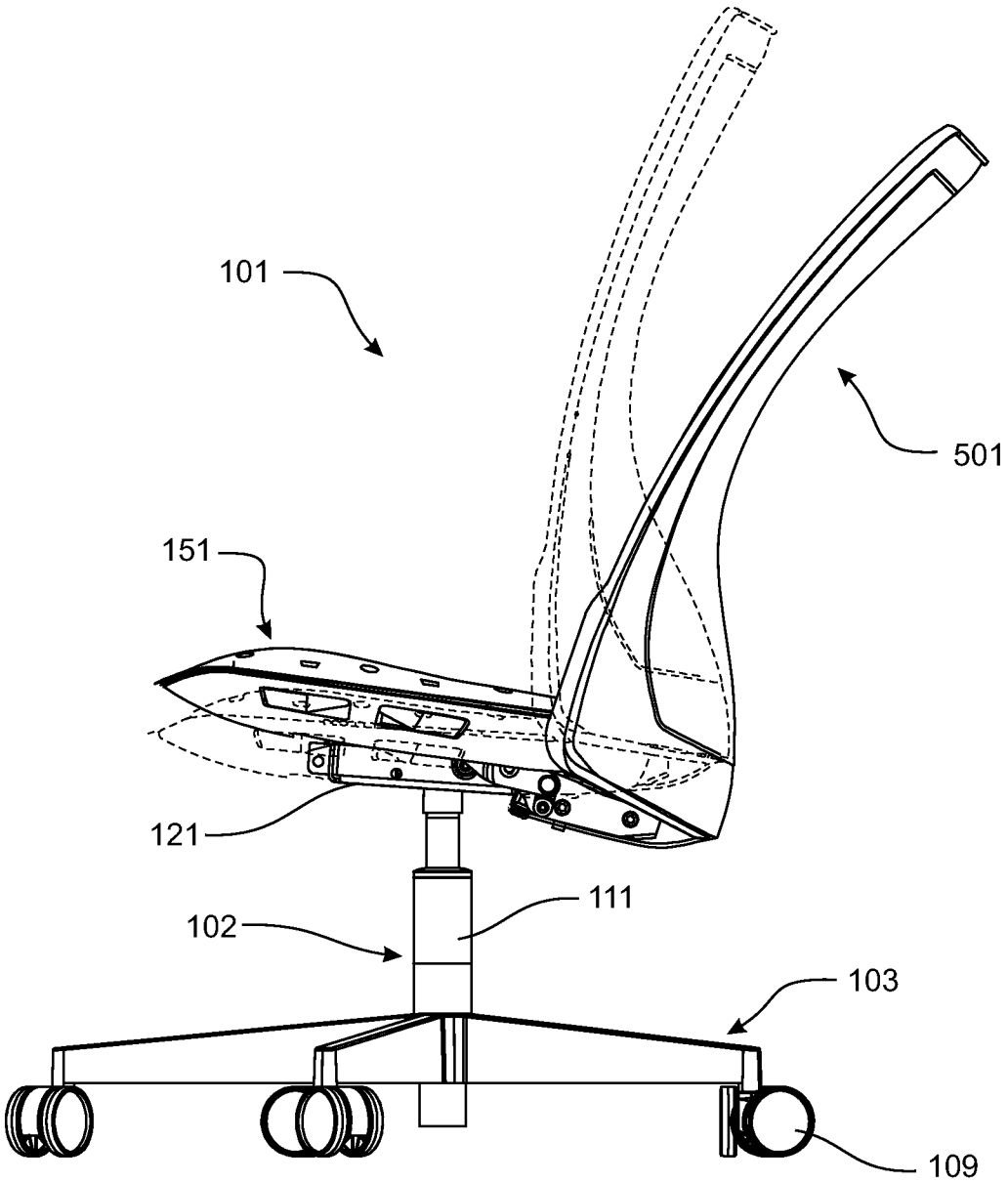


FIGURE 7

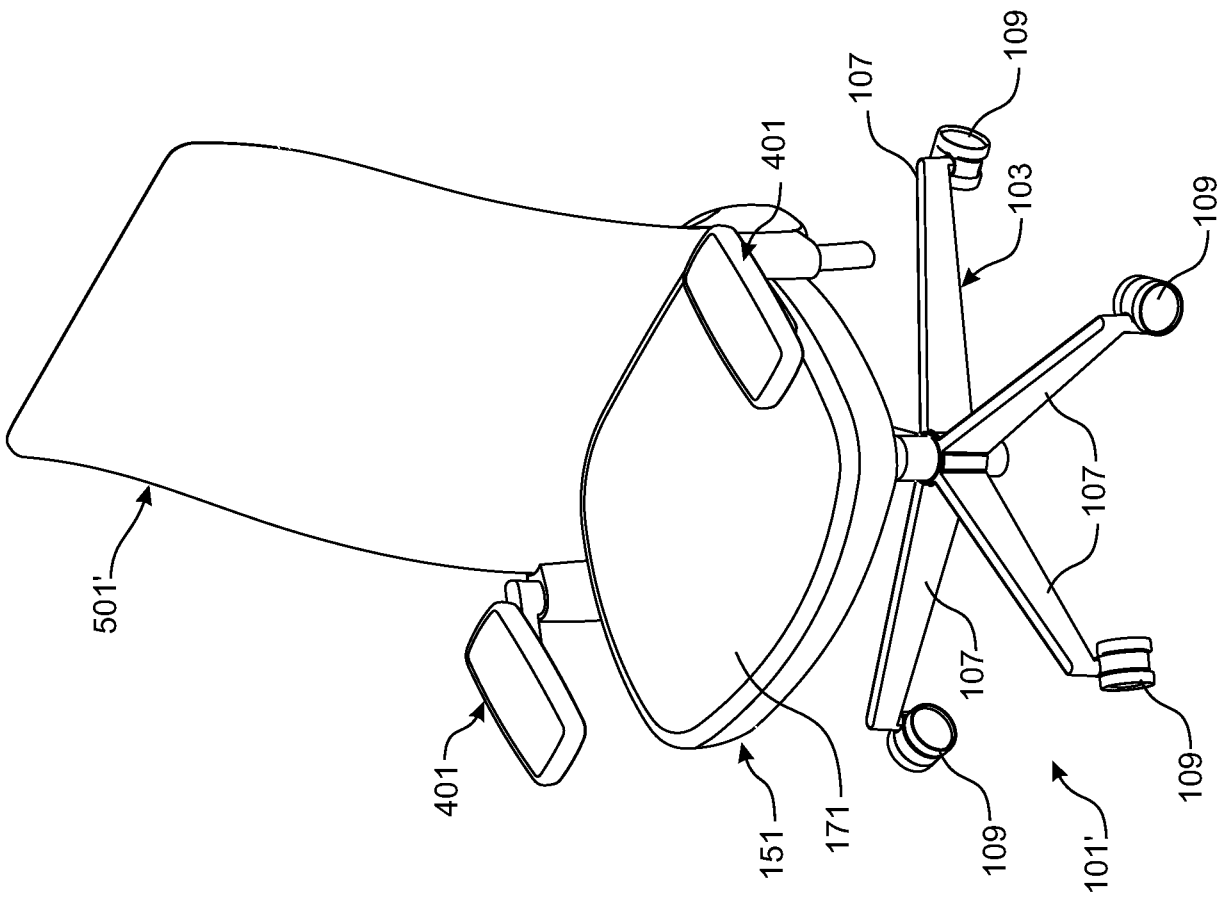


FIGURE 8

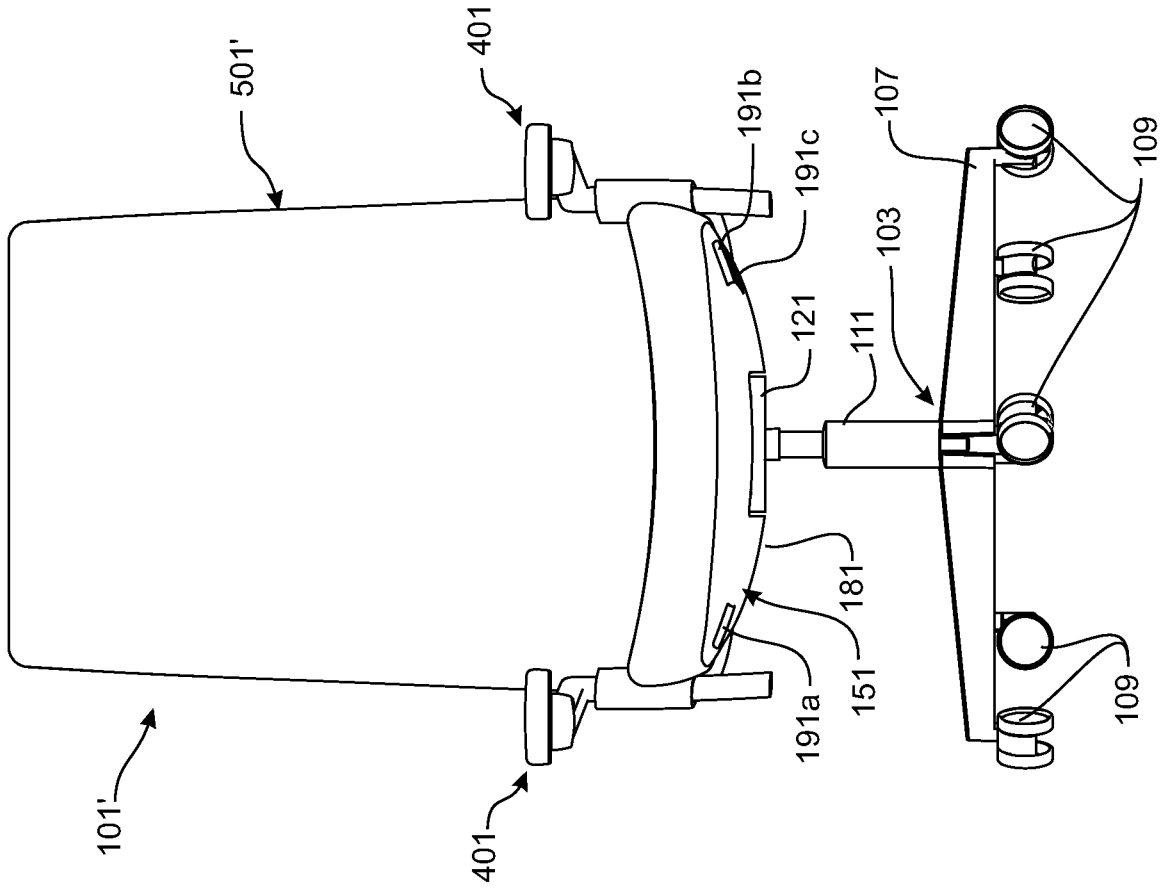


FIGURE 9

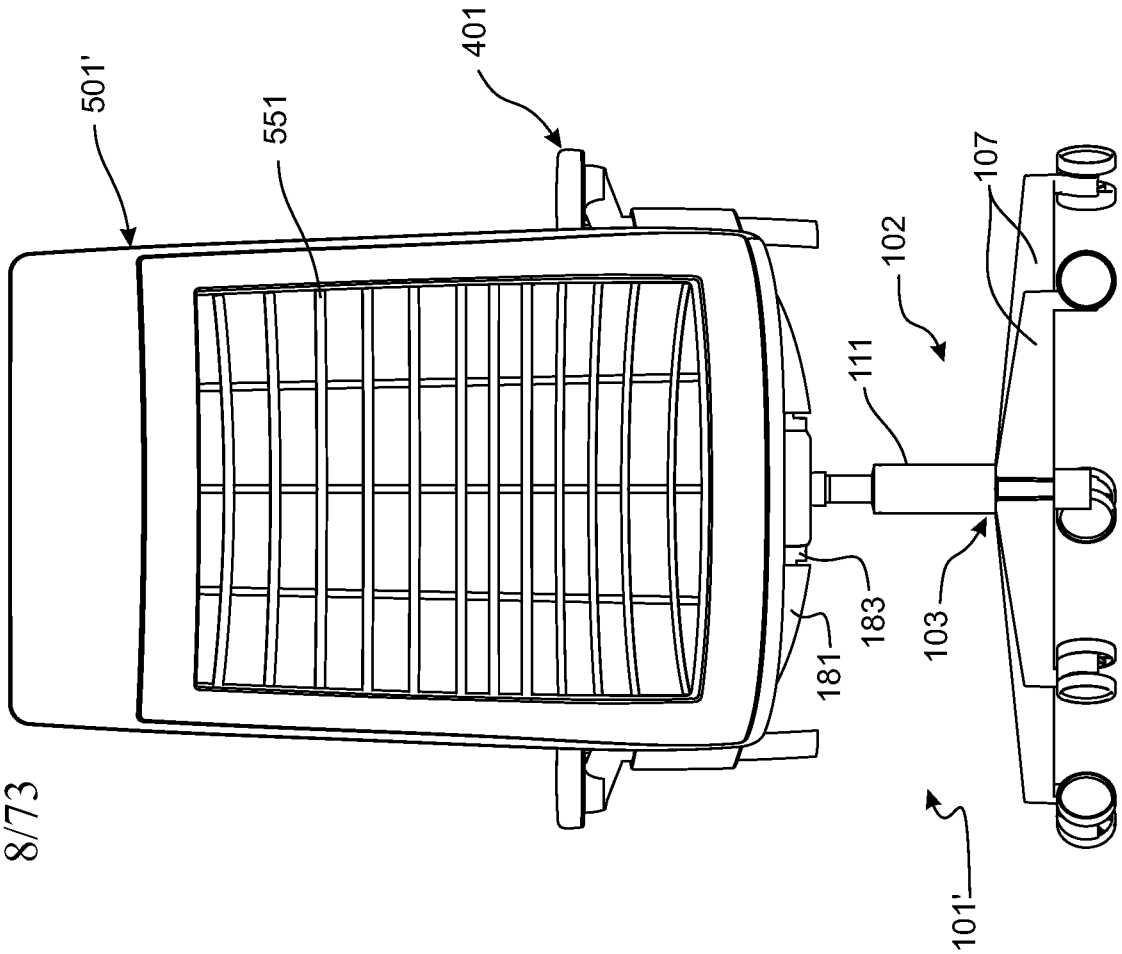


FIGURE 11

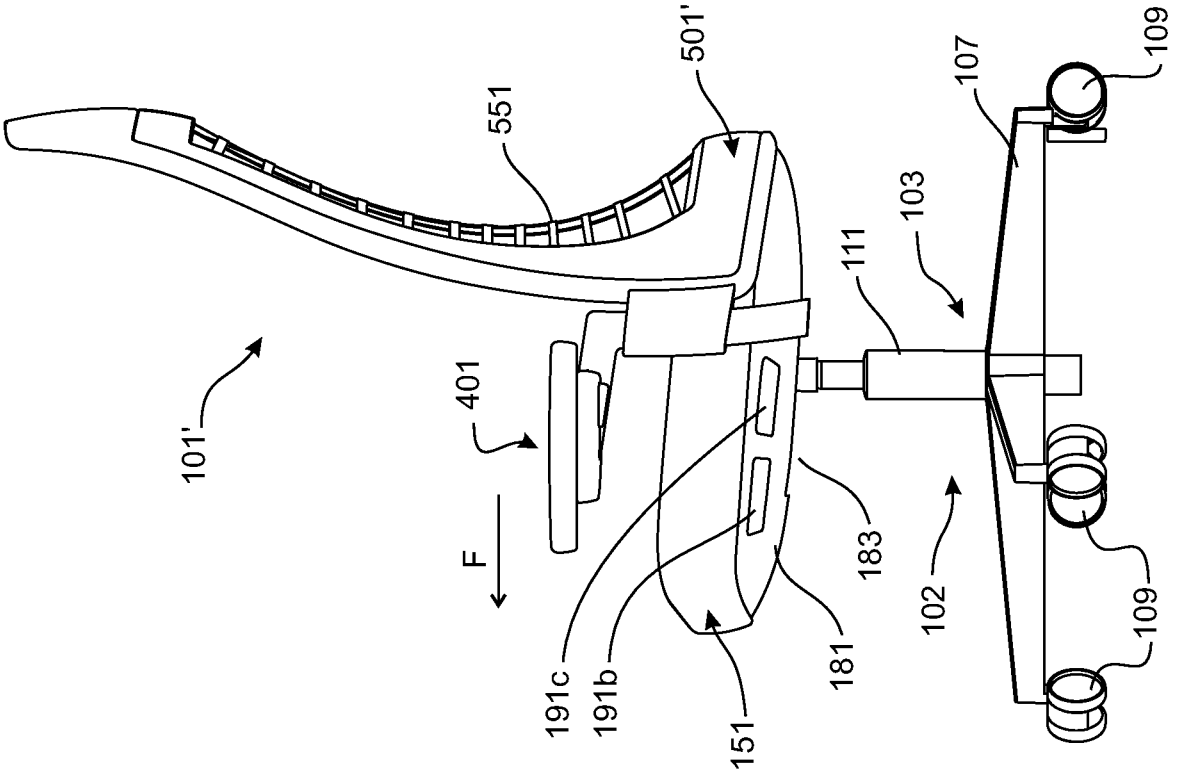


FIGURE 10

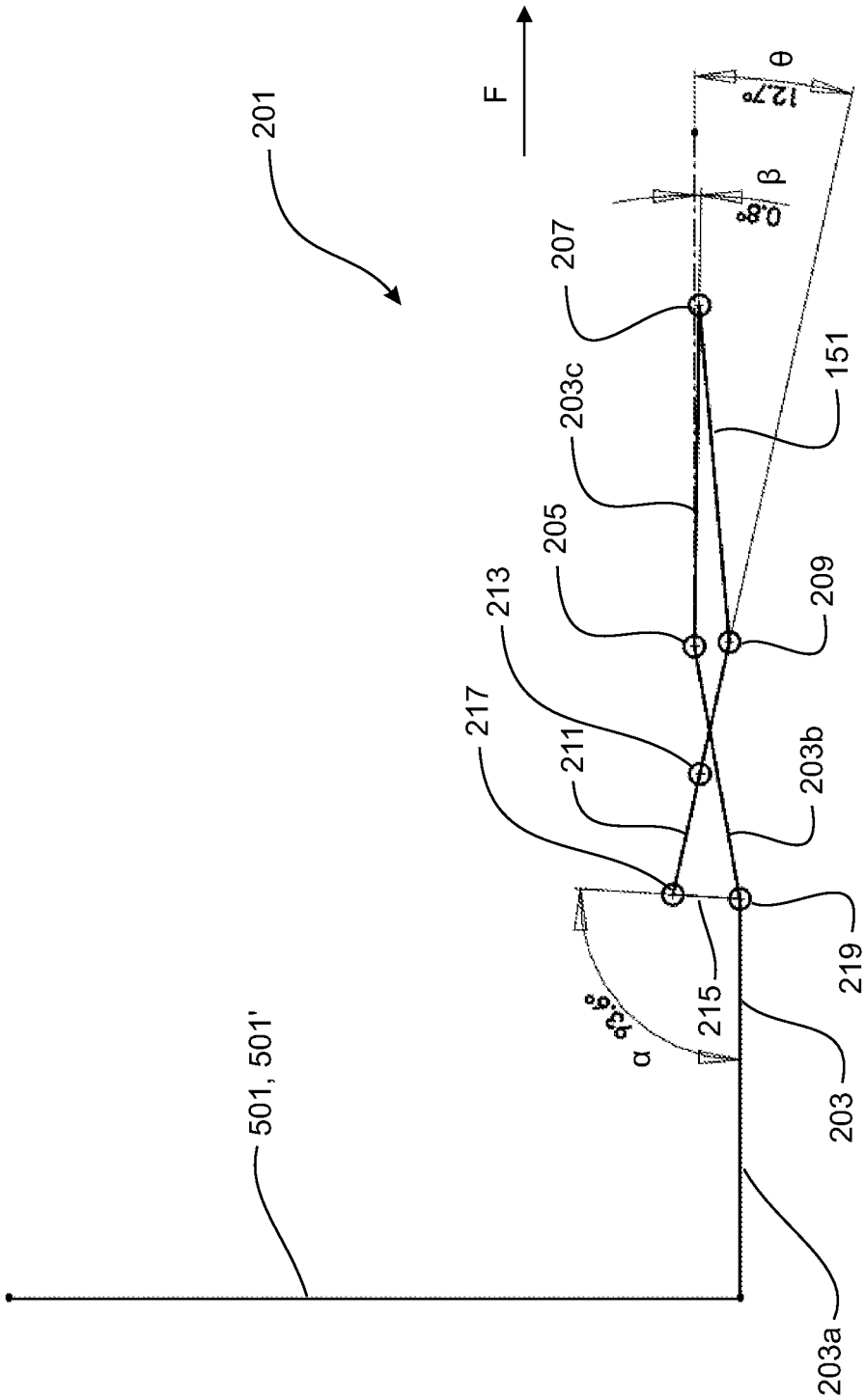

201
F
θ
12.7°
β
0.8°
207
151
203c
205
209
213
217
211
203b
219
215
203
α
65.6°
501, 501'
203a

FIGURE 12

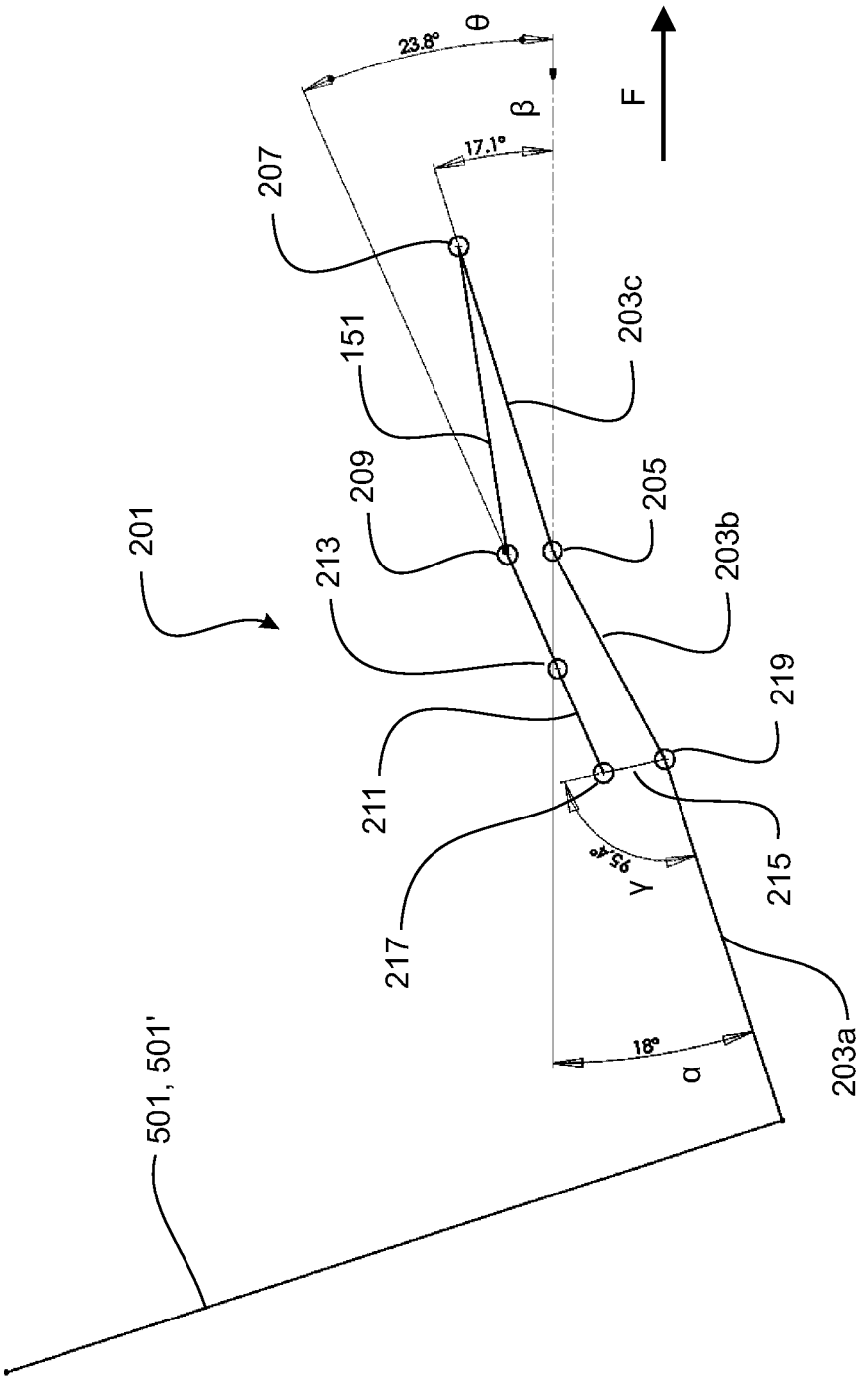

23.8°
θ
β
17.1°
F
207
151
203c
209
205
201
213
203b
219
211
215
217
95.4°
γ
18°
α
203a
501, 501'

FIGURE 13

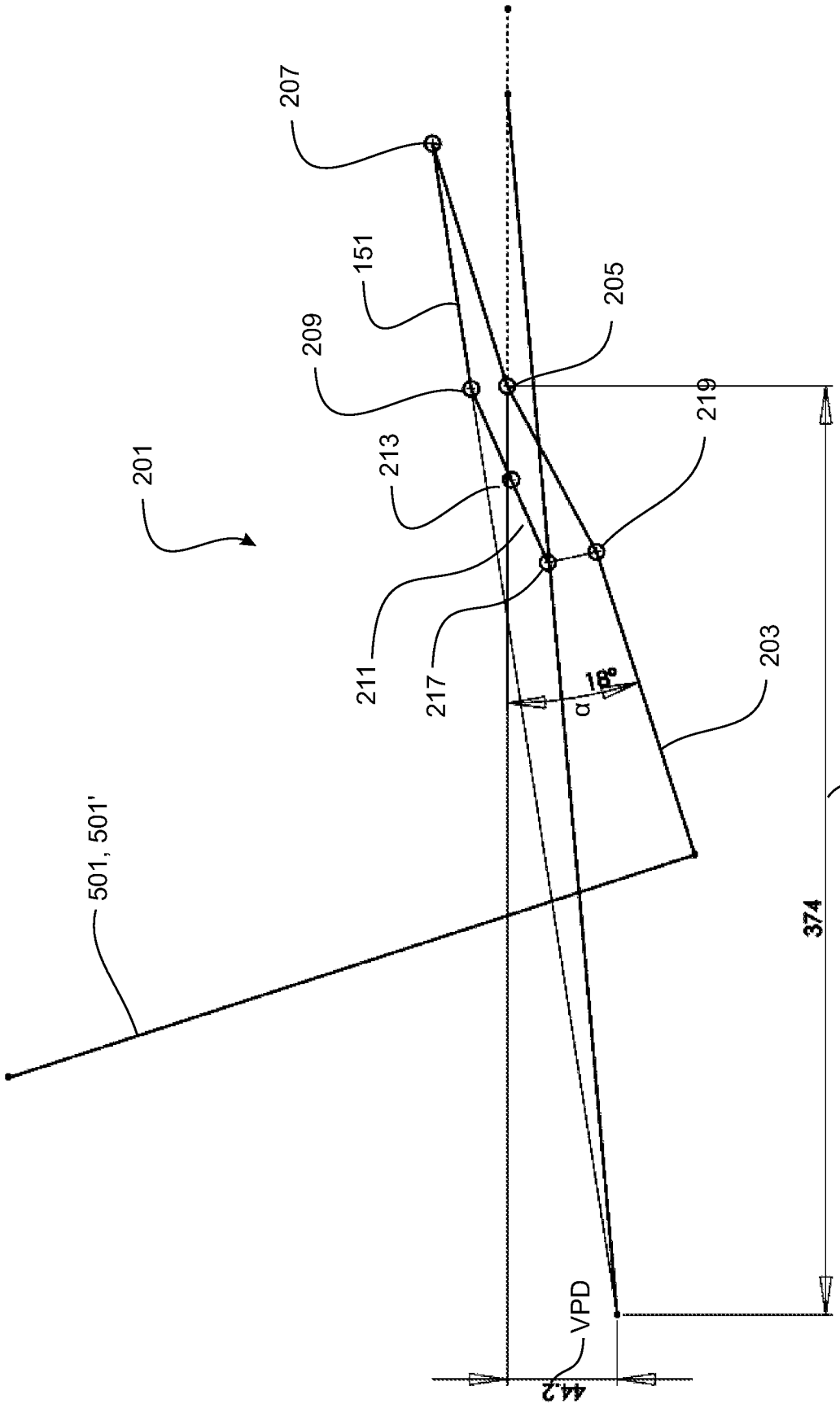

207
151
205
209
219
213
201
211
217
203
18°
α
501, 501'
RPD
374
VPD
44

FIGURE 14

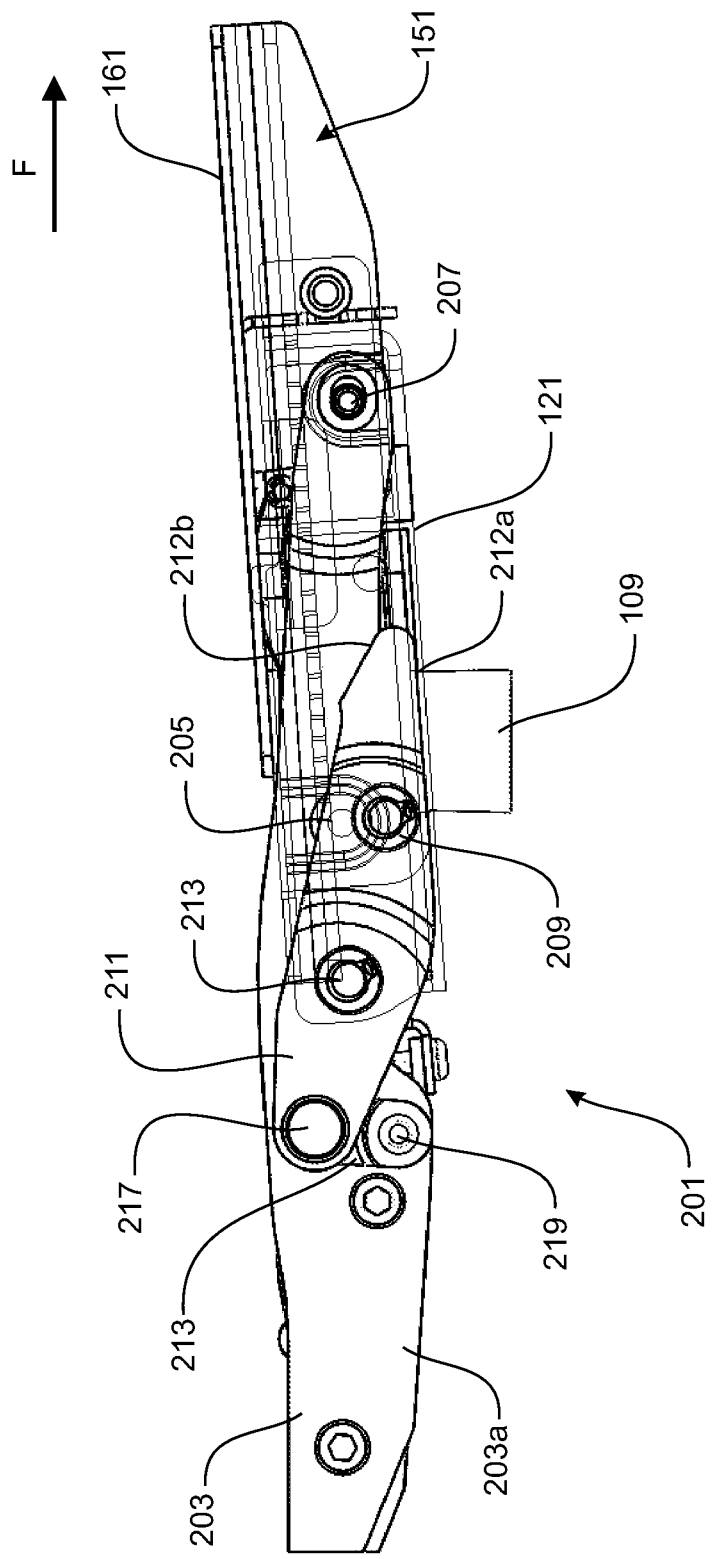

F
161
151
207
121
212b
212a
109
205
213
209
211
217
213
219
201
203
203a

FIGURE 15

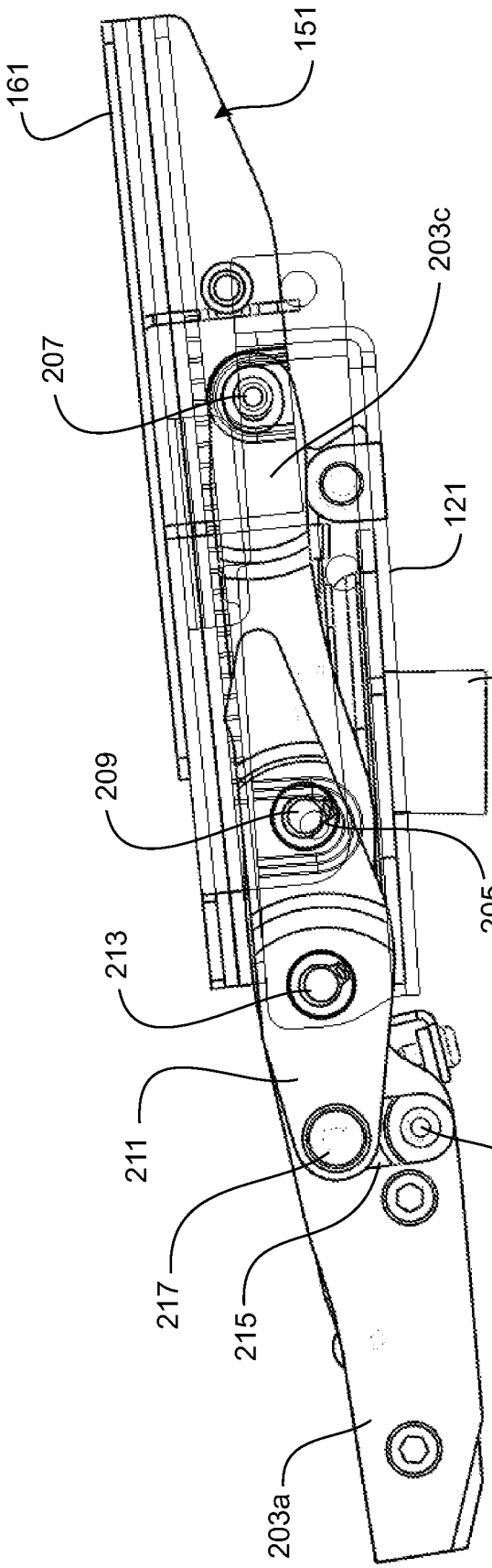


FIGURE 16

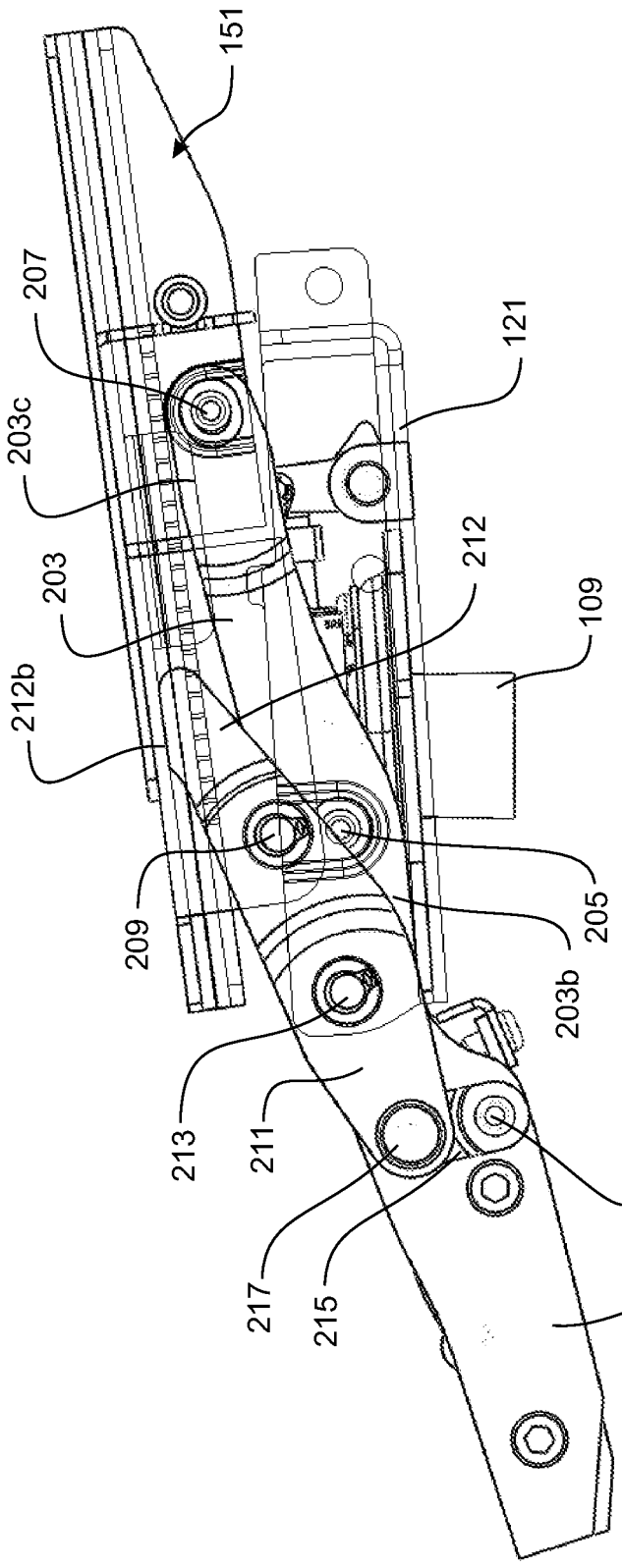

151
207
203c
203
212b
121
212
109
209
205
213
211
203b
201
219
217
215
203a

FIGURE 17

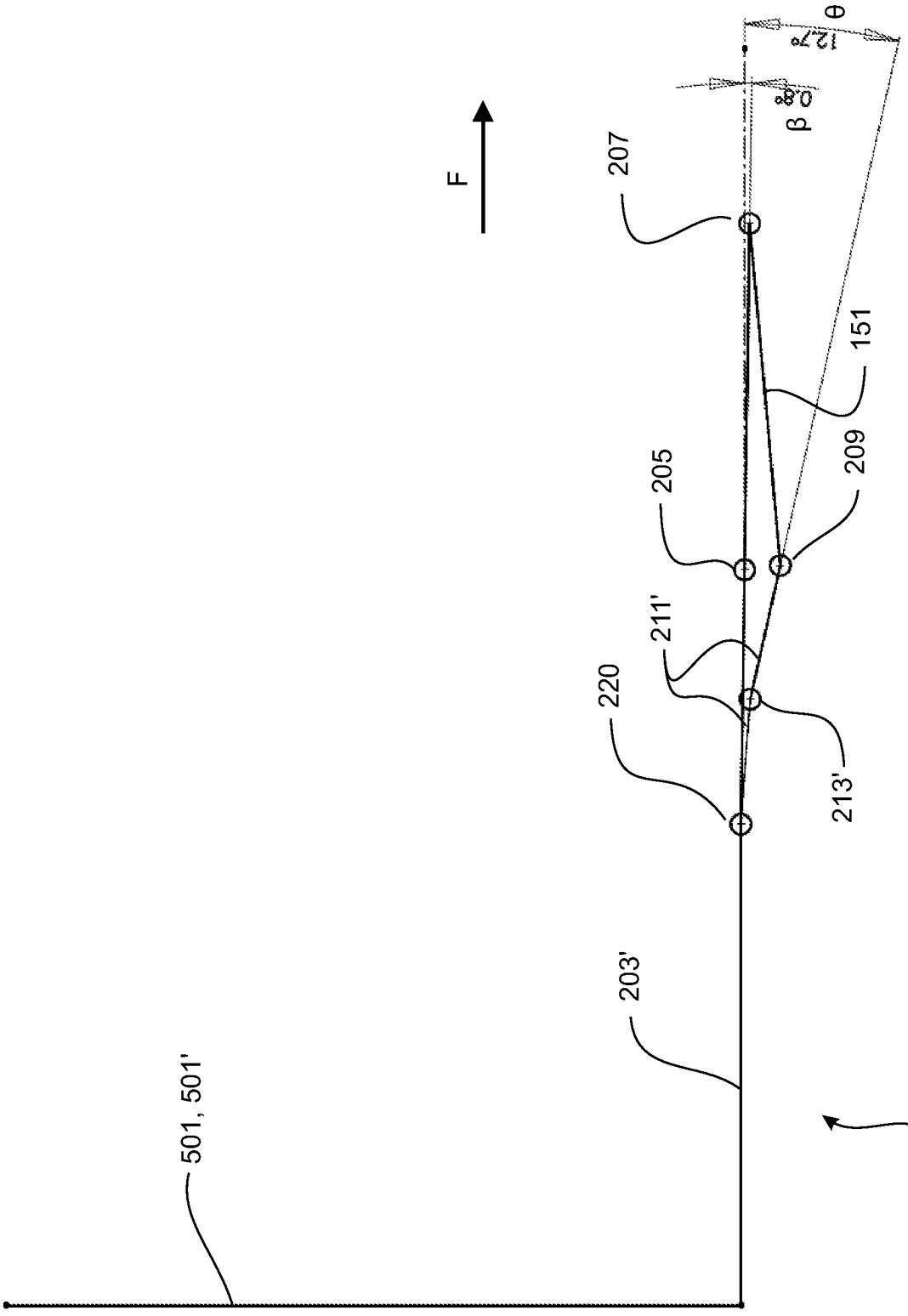


FIGURE 18

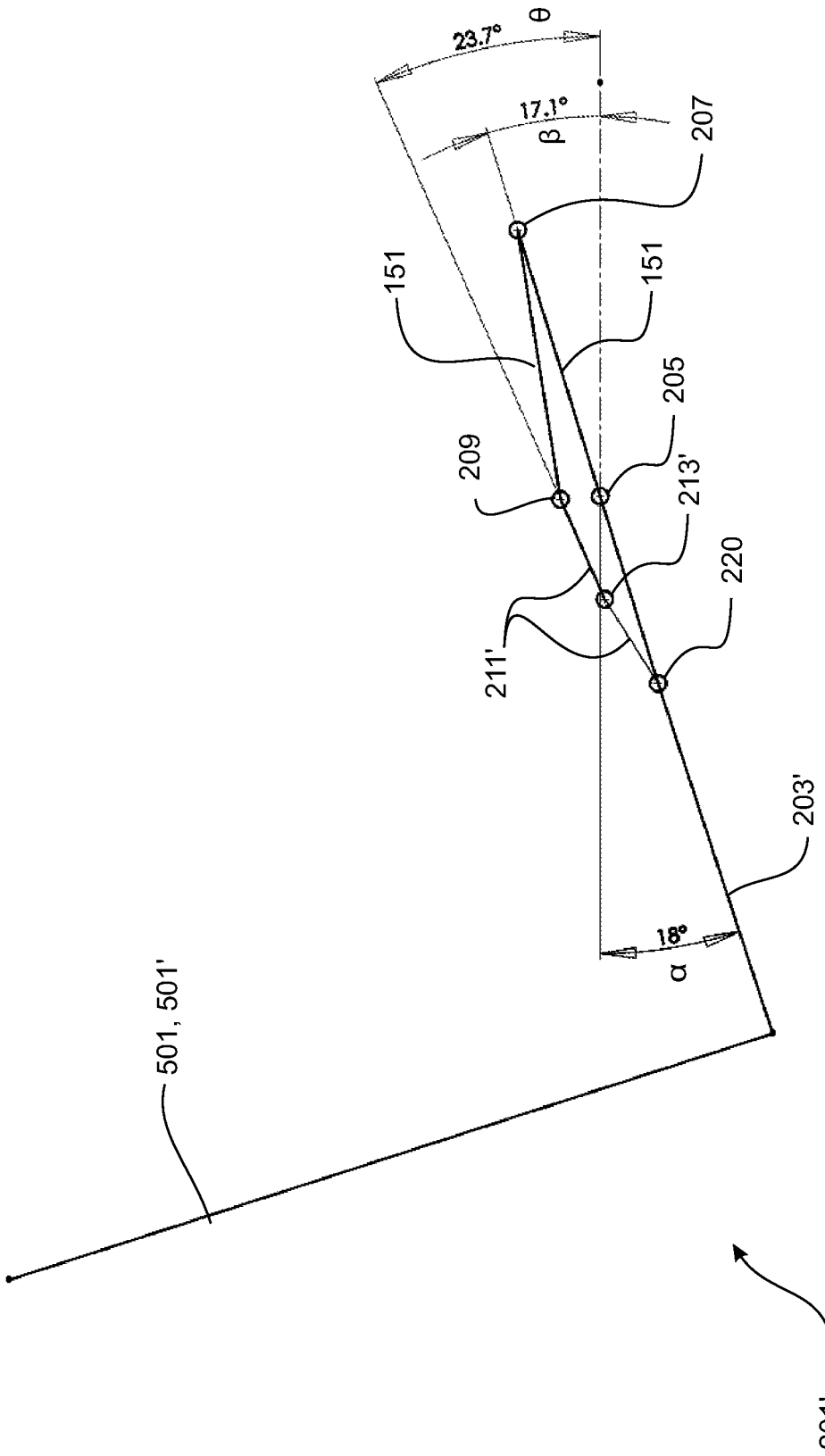


FIGURE 19

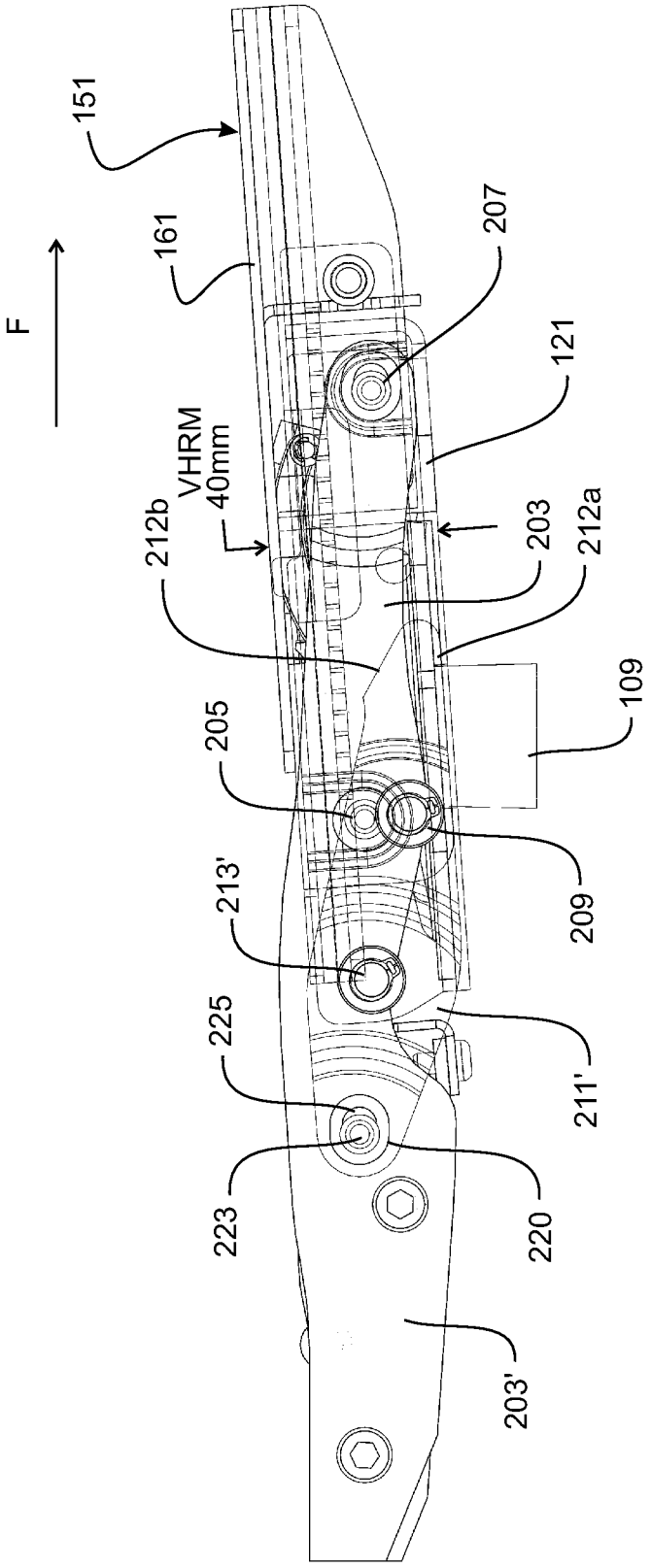

151
161
F
207
121
VHRM
40mm
212b
203
212a
109
205
213'
209
225
211'
223
220
203'
201'

FIGURE 20

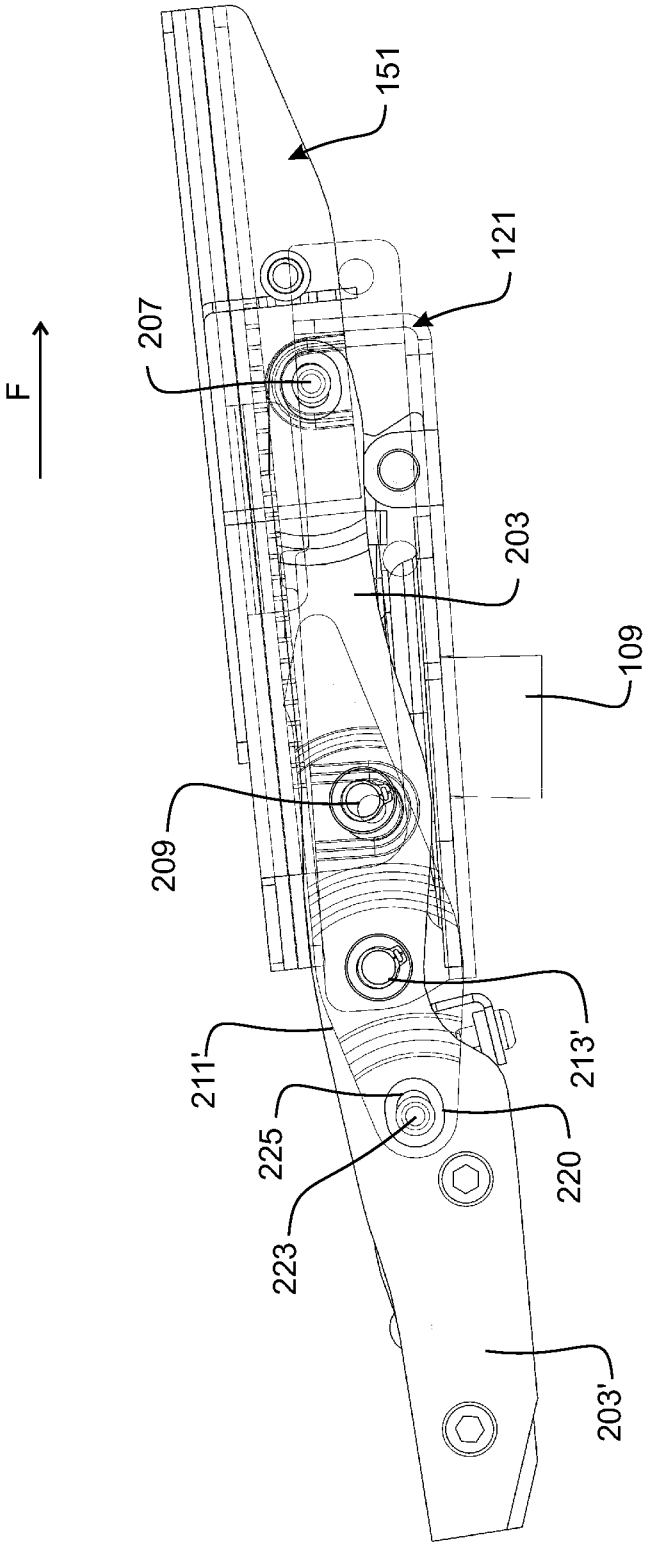


FIGURE 21

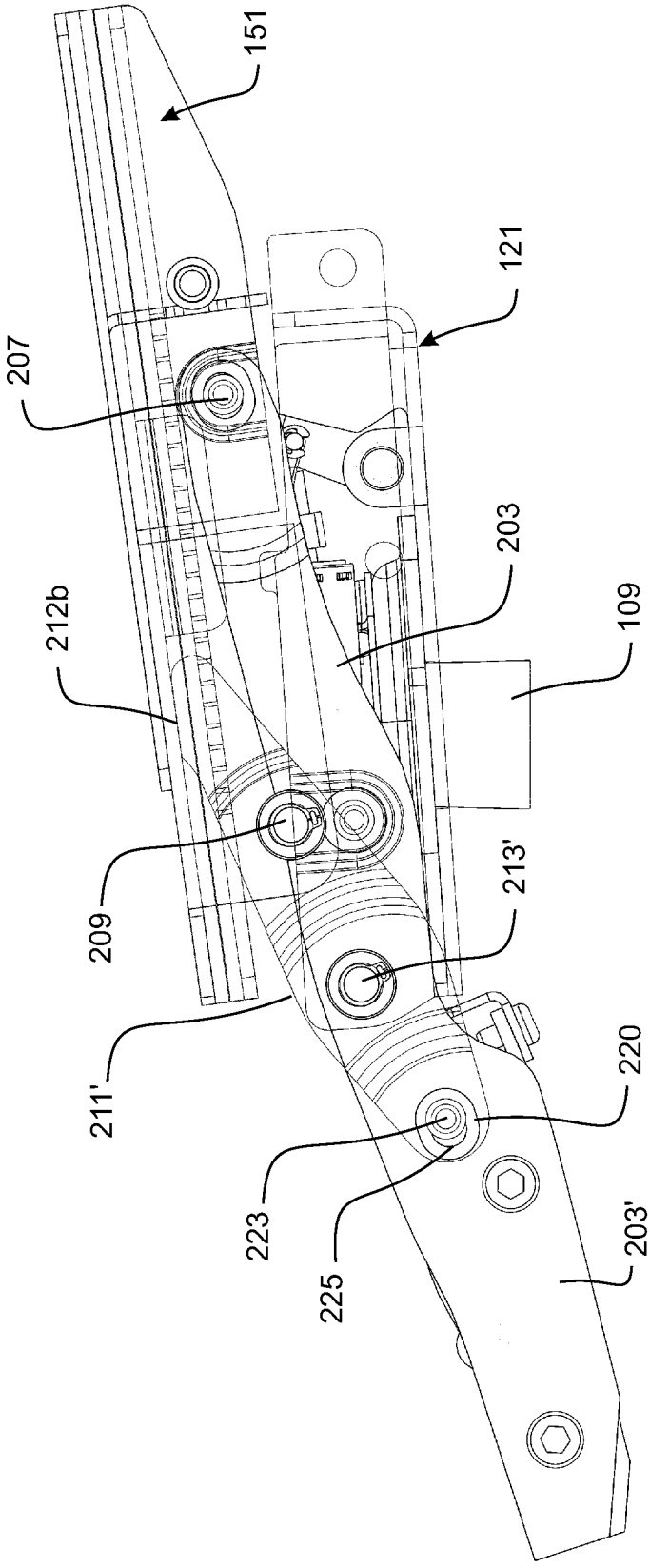


FIGURE 22

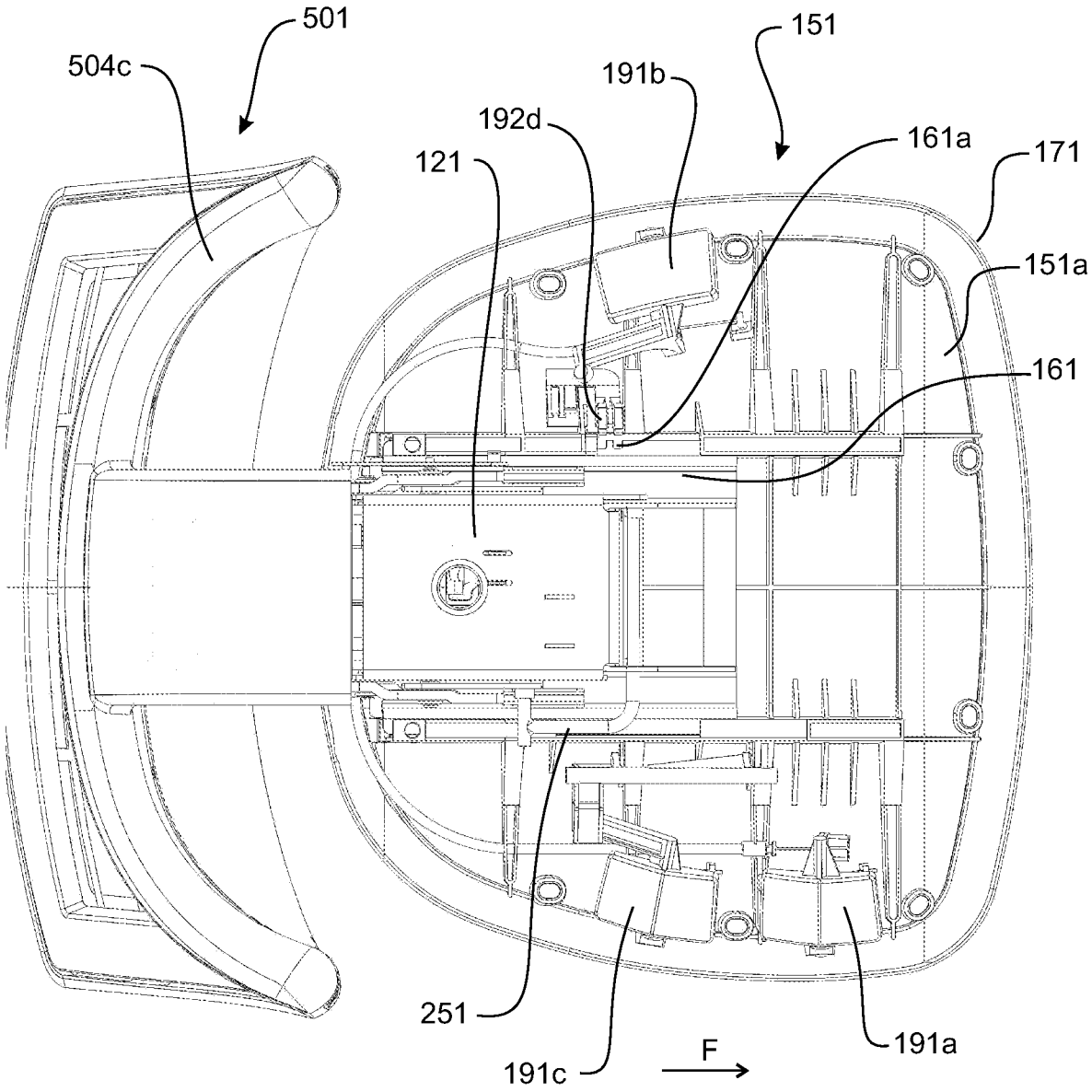


FIGURE 23

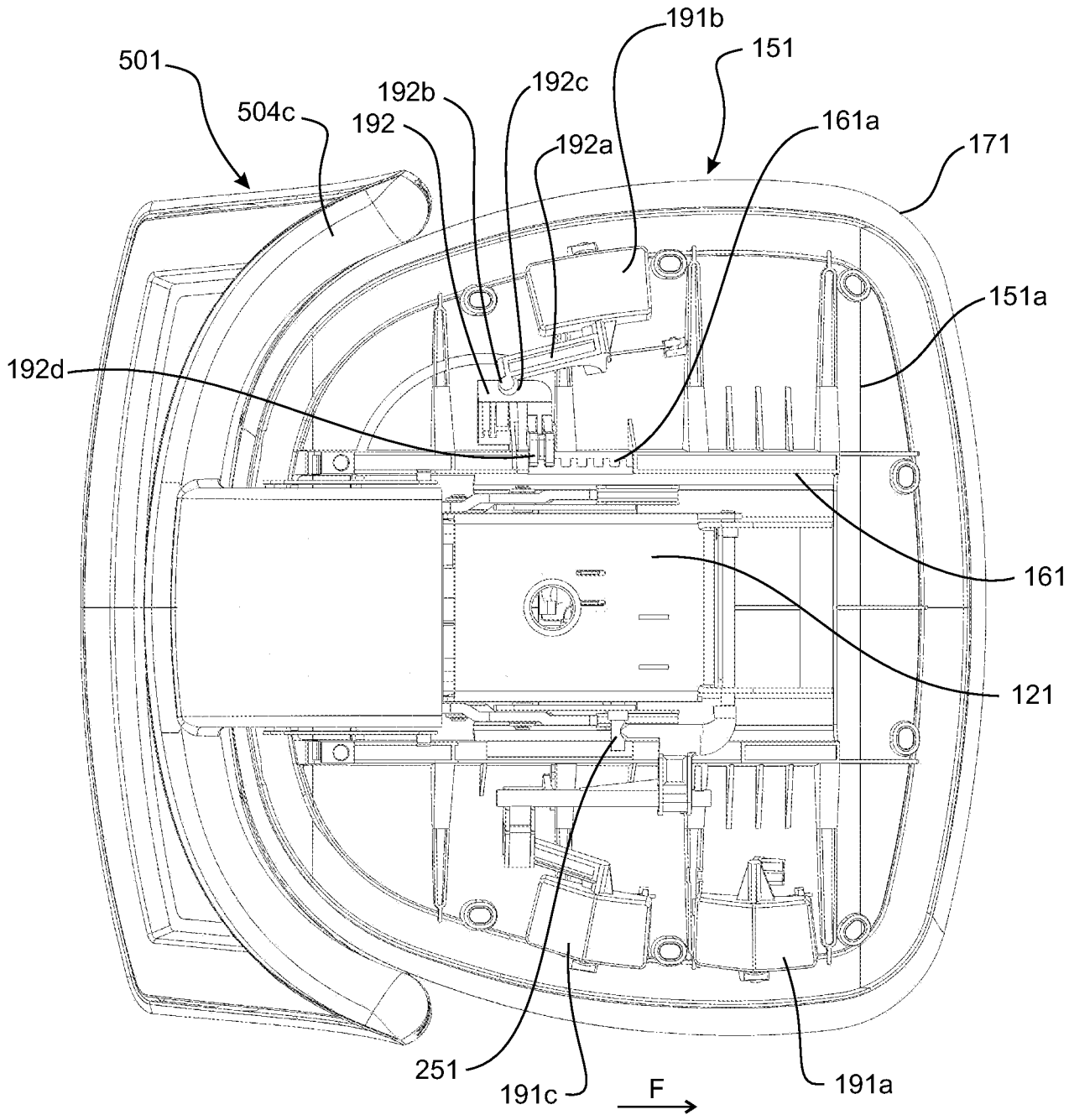

501
504c
192b
192
192c
192a
191b
151
161a
171
151a
192d
161
121
251
191c
F
191a

FIGURE 24

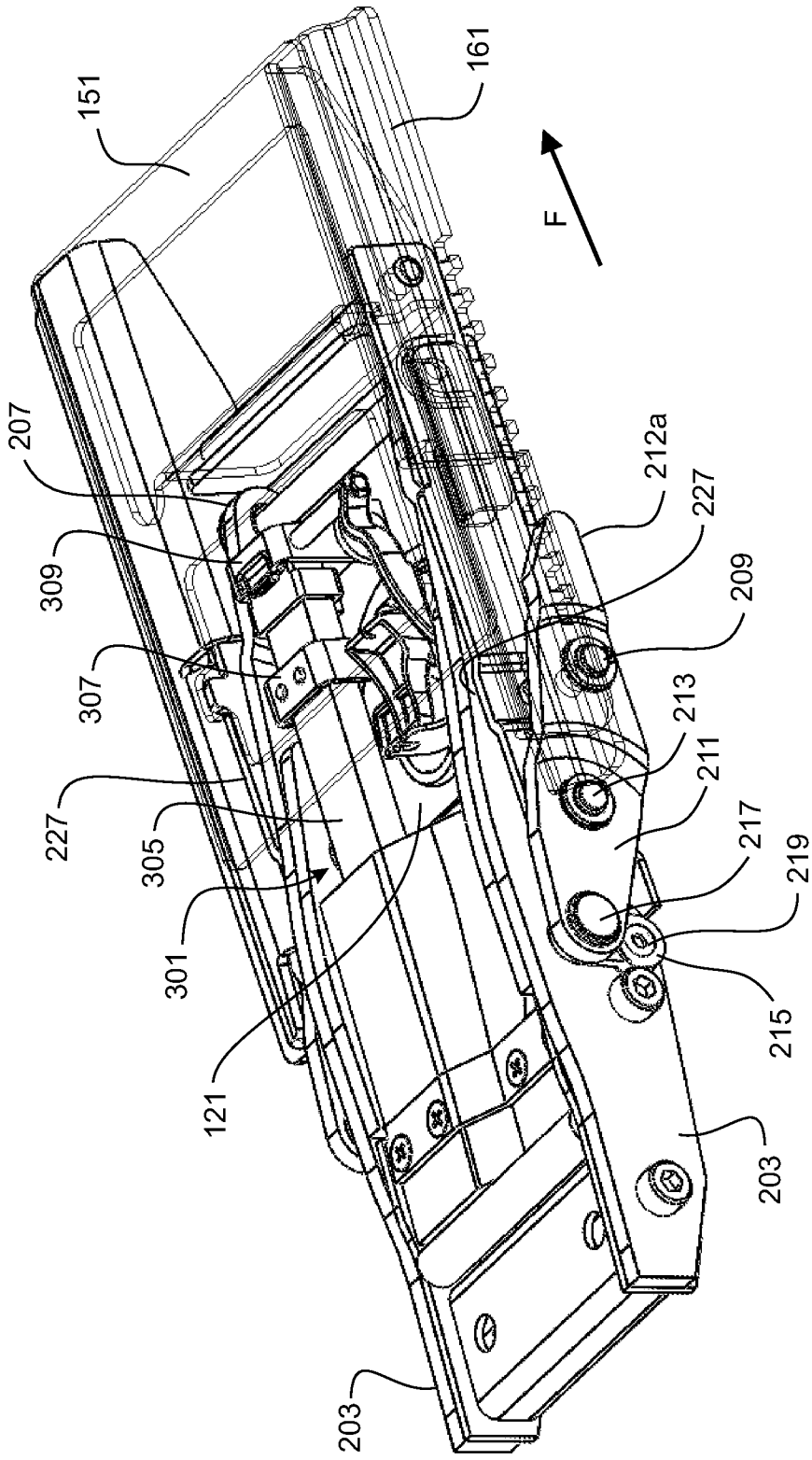

151
161
F
207
212a
227
309
209
307
213
211
227
305
217
219
301
121
215
203
203

FIGURE 25

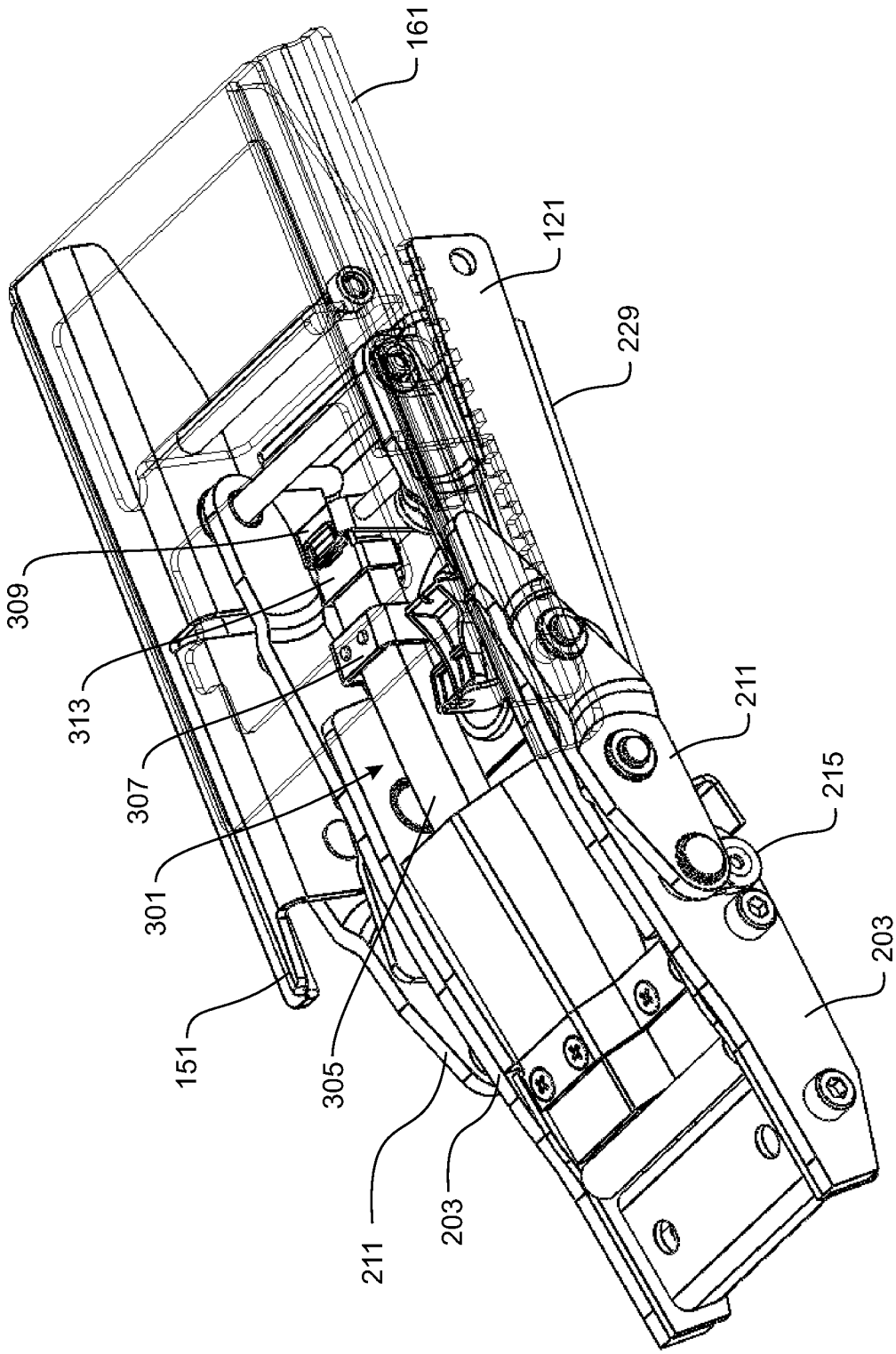


FIGURE 26

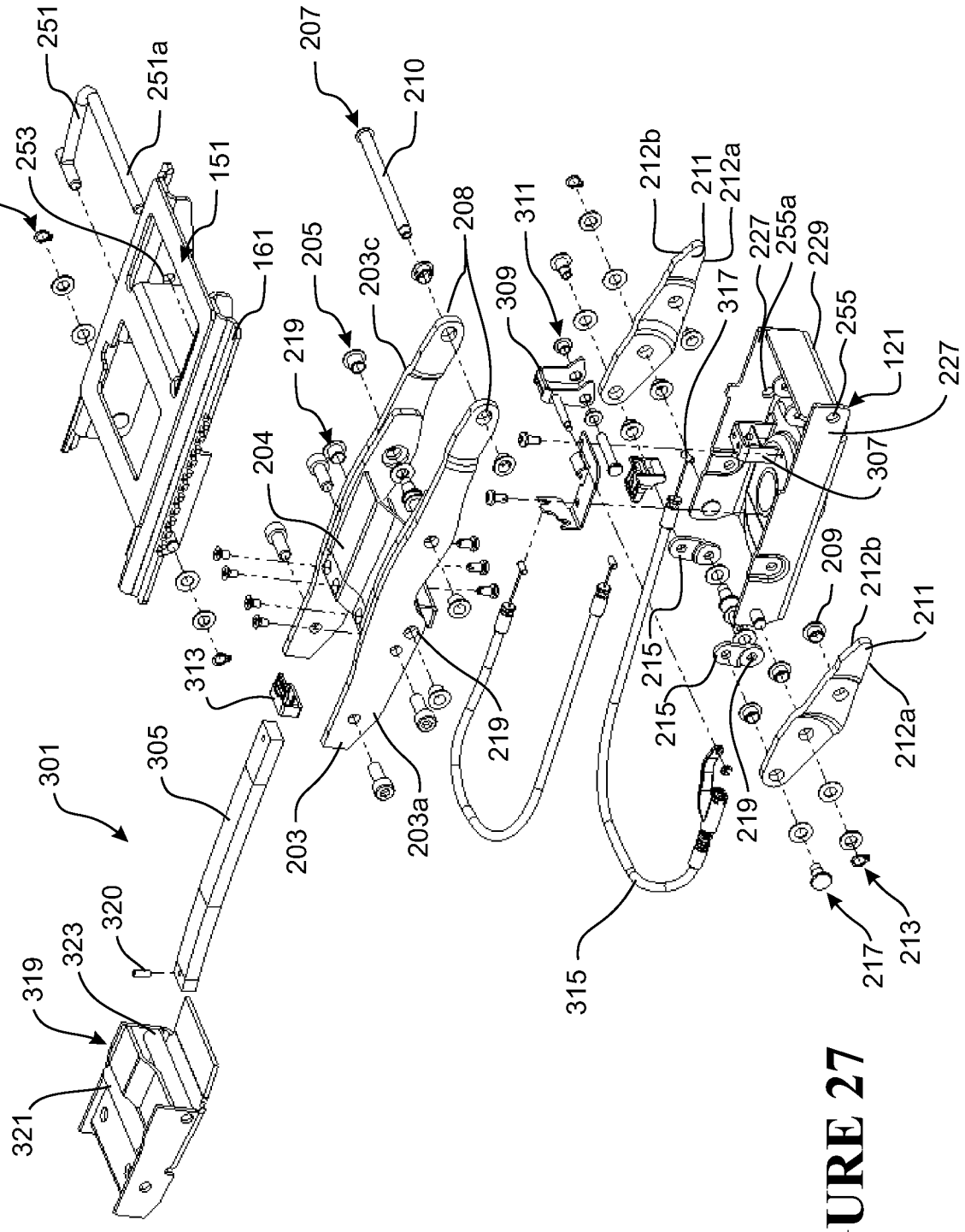

251
251a
209
253
151
161
207
210
205
203c
208
311
212b
211
212a
227
255a
229
255
121
227
309
317
219
204
307
313
305
301
203
203a
219
215
209
212b
211
212a
215
219
315
217
213
320
323
319
321

FIGURE 27

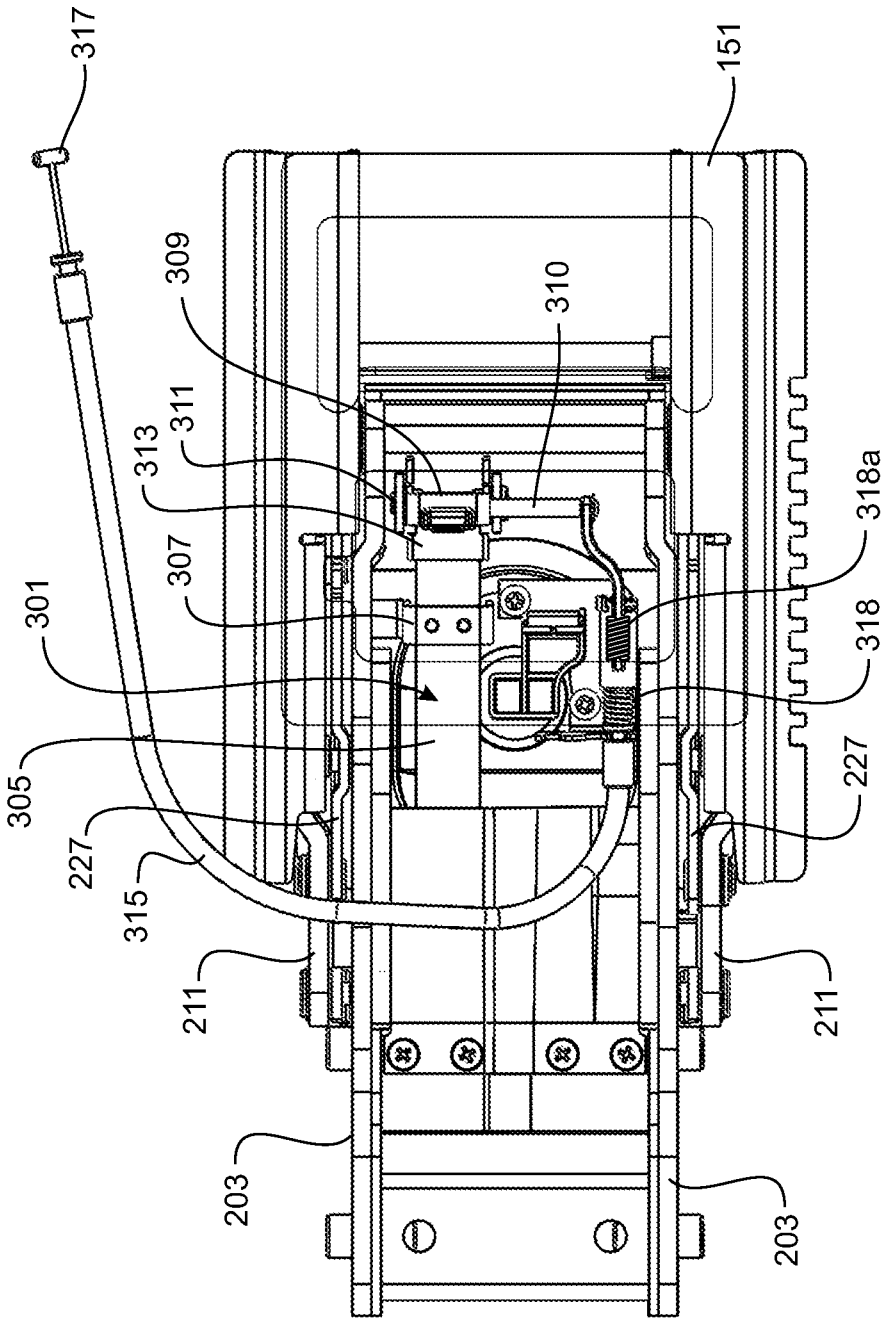


FIGURE 28

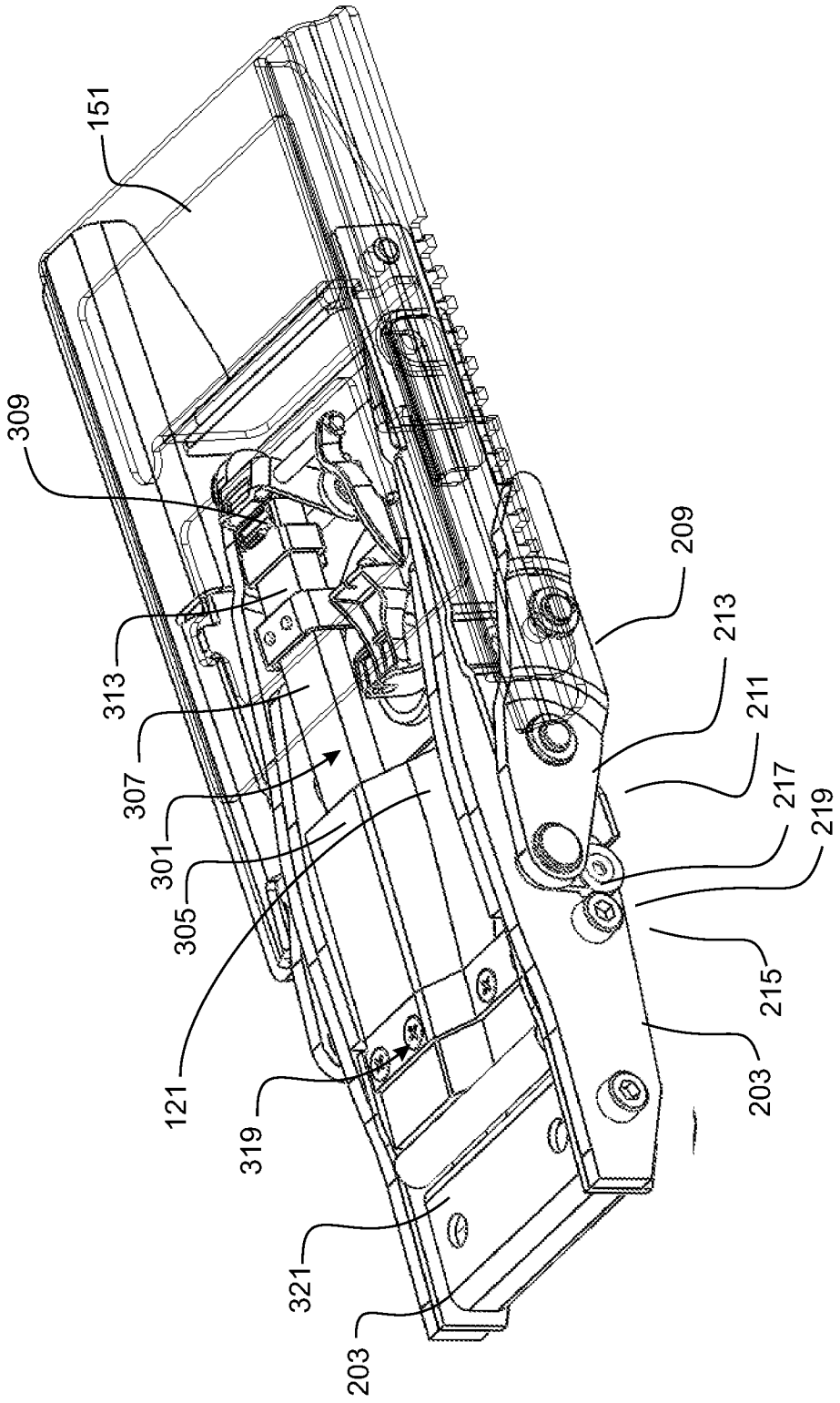

151
309
313
307
301
305
121
319
321
203
209
213
211
217
219
215
203

FIGURE 29

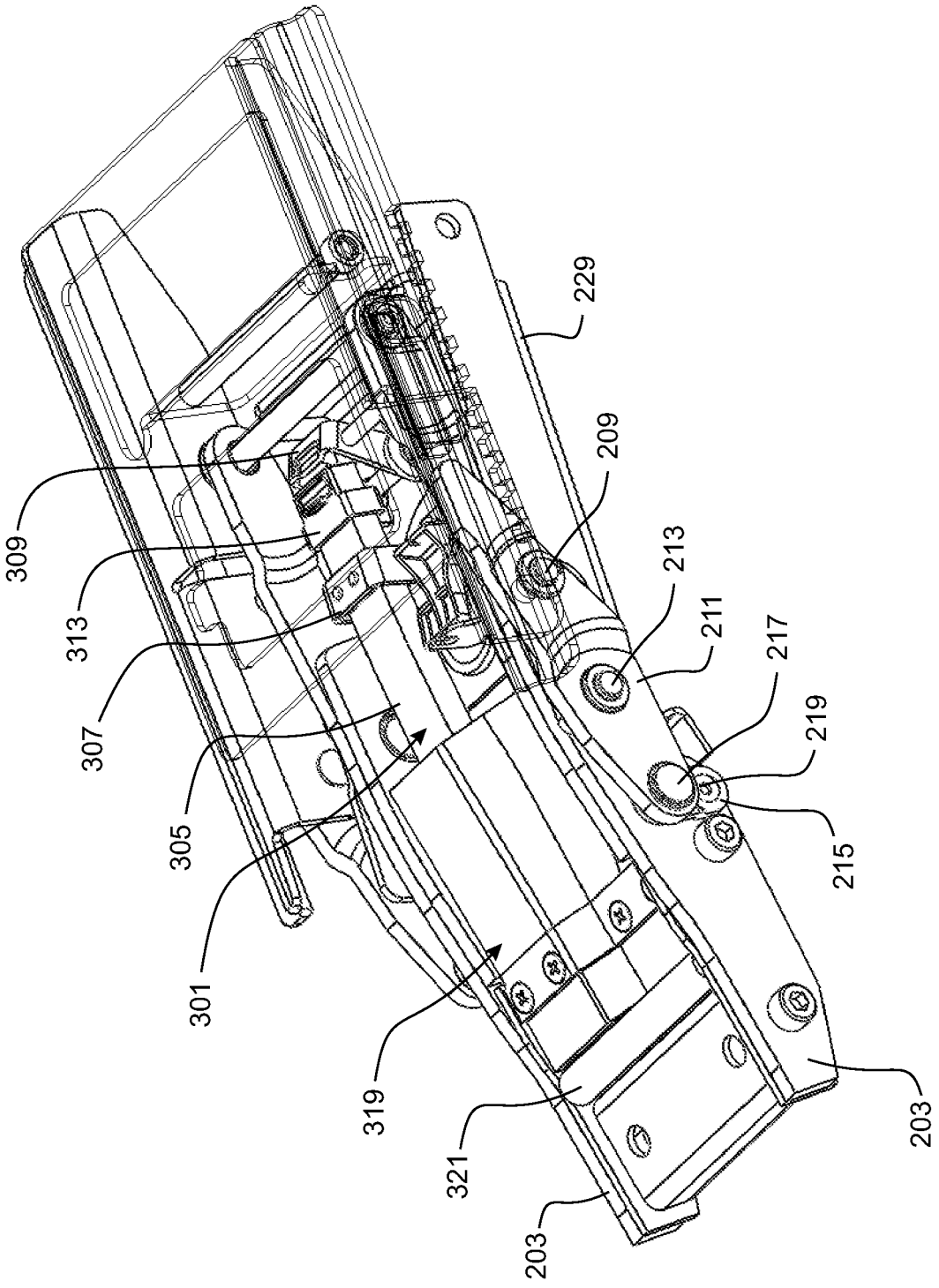


FIGURE 30

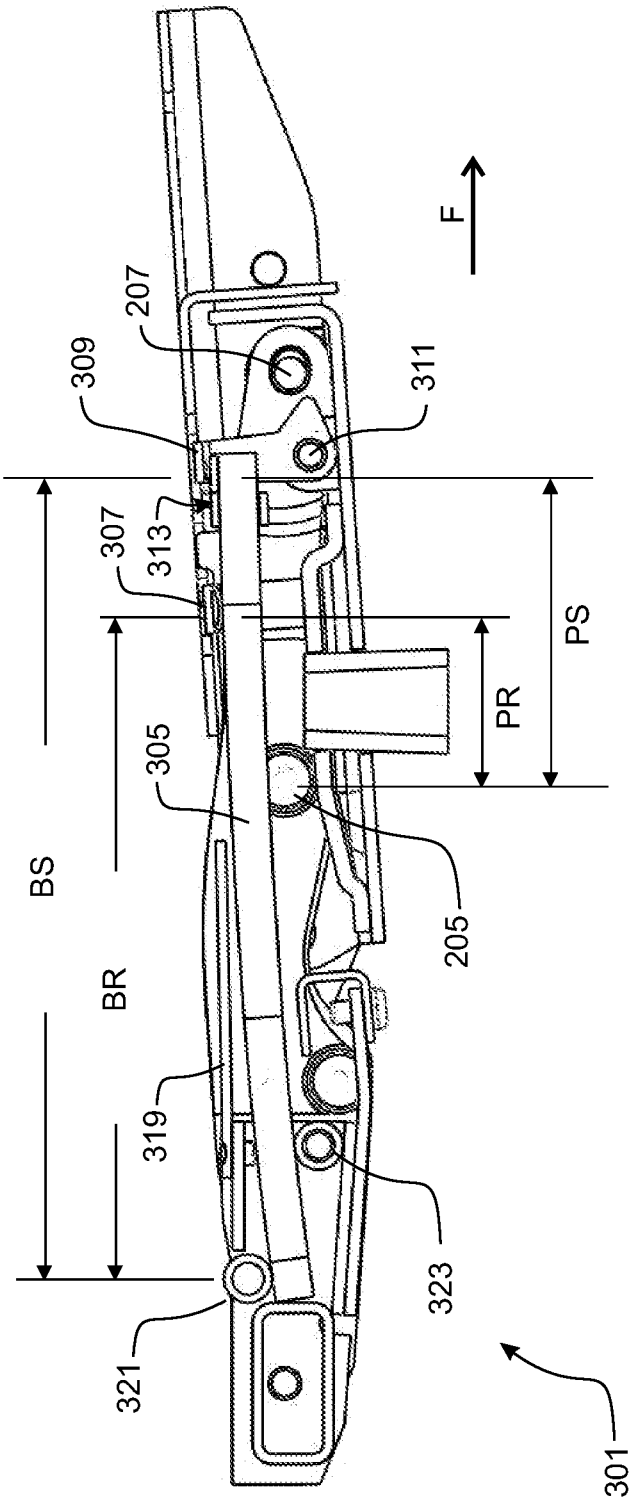


FIGURE 31

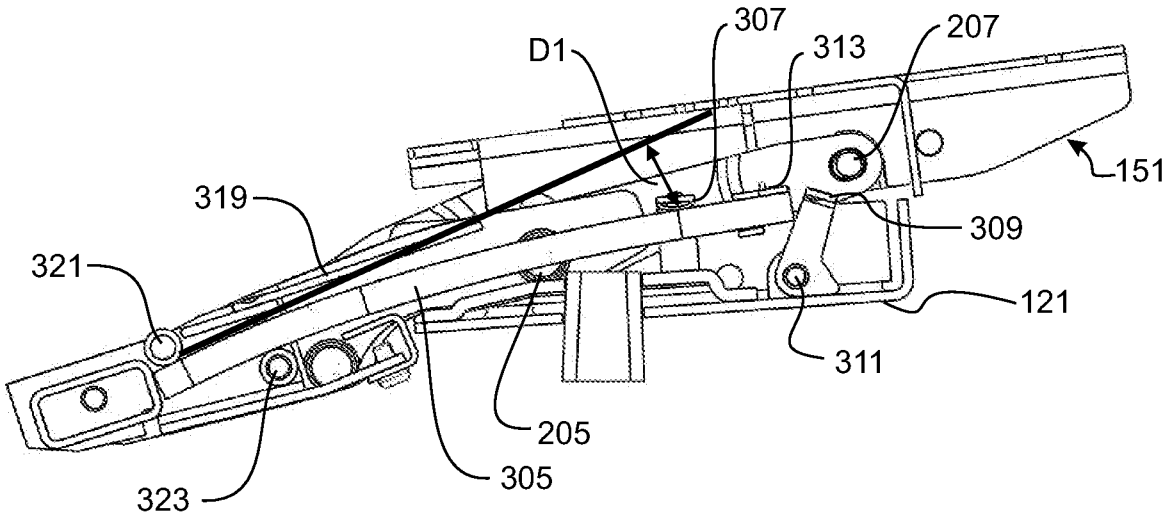


FIGURE 32(a)

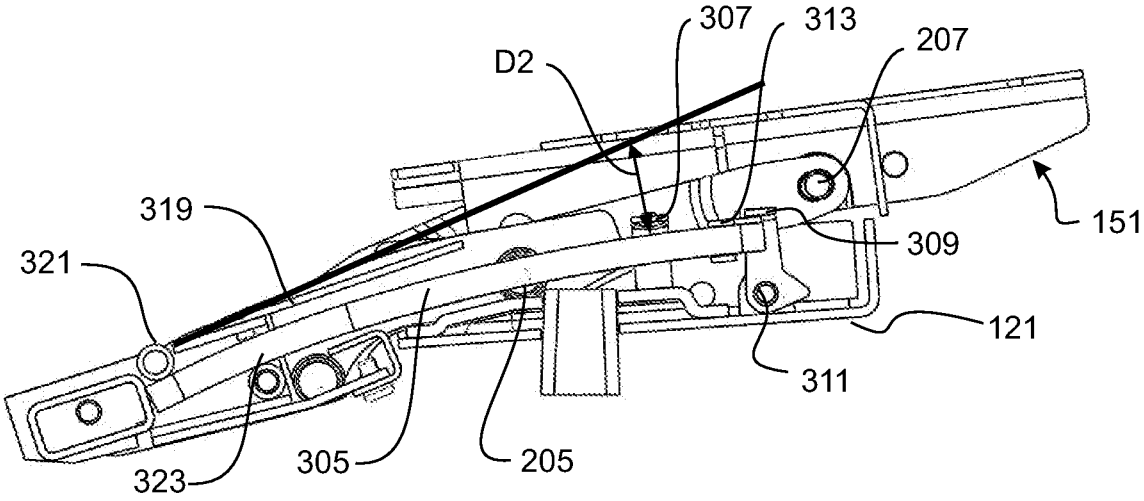


FIGURE 32(b)

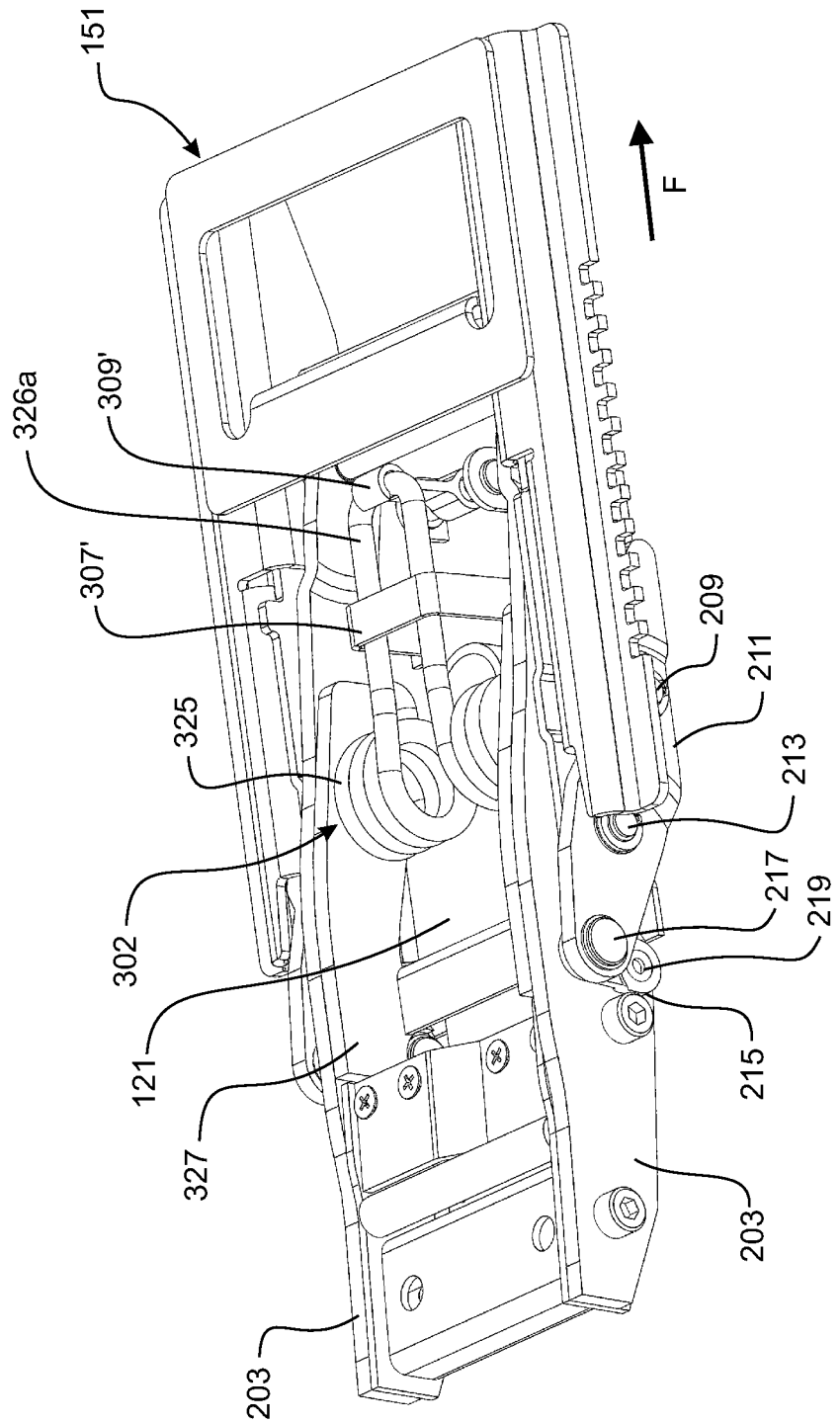

151
F
326a
309'
307'
325
302
121
327
203
203
209
211
213
217
219
215

FIGURE 33

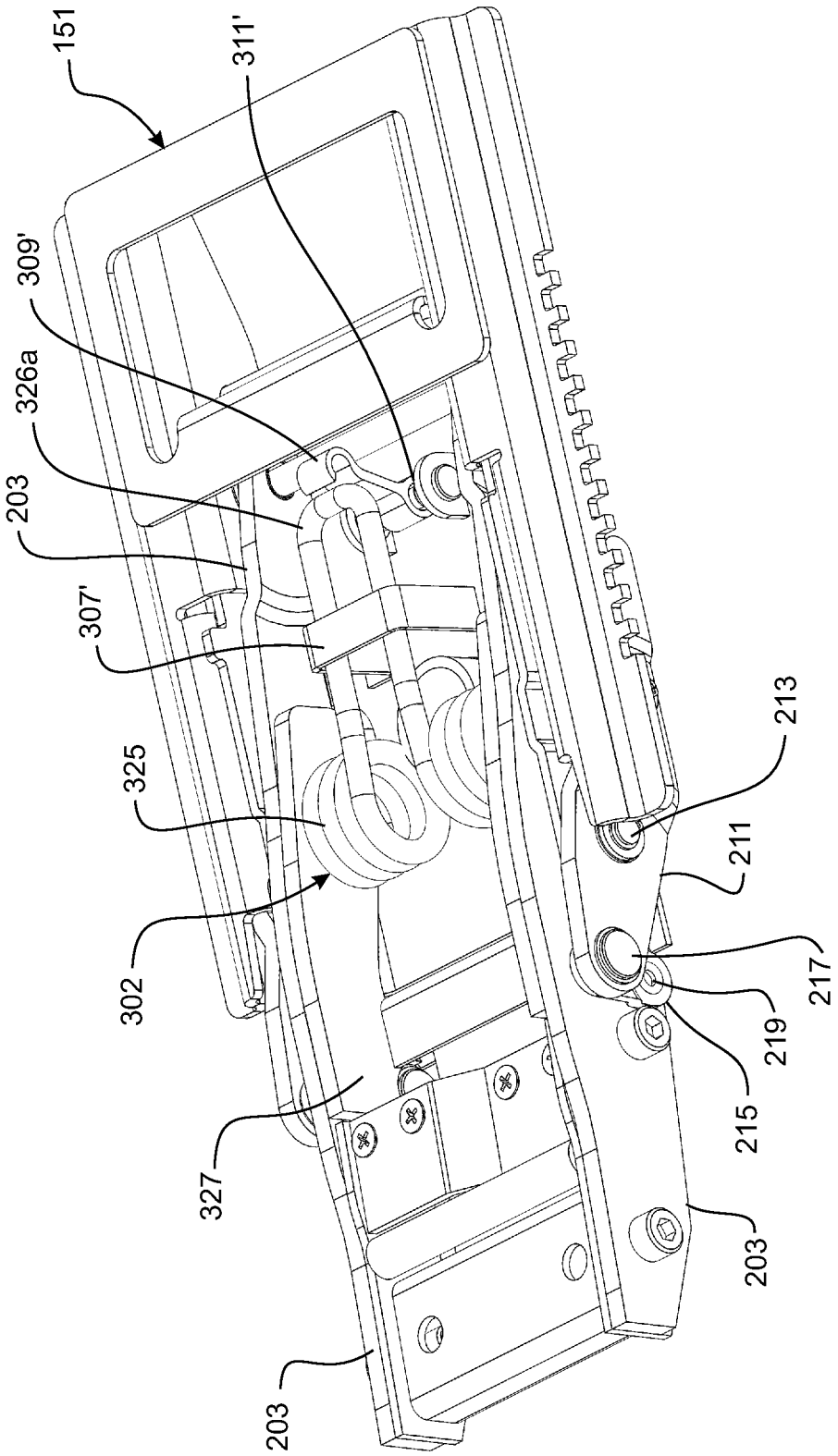


FIGURE 34

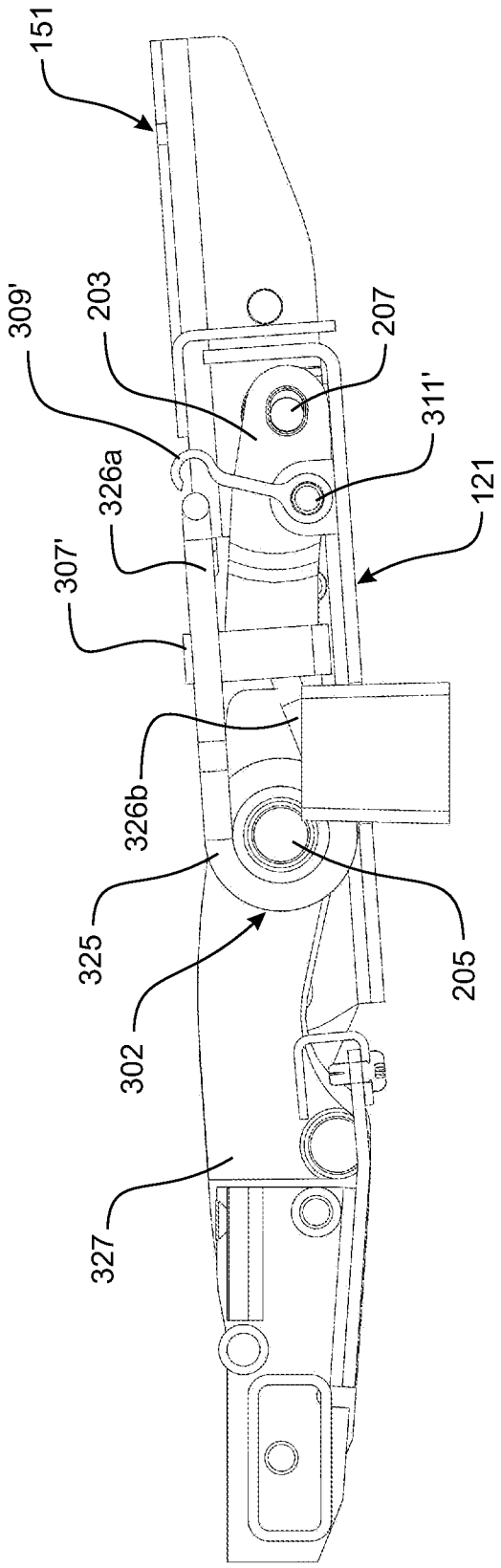


FIGURE 35

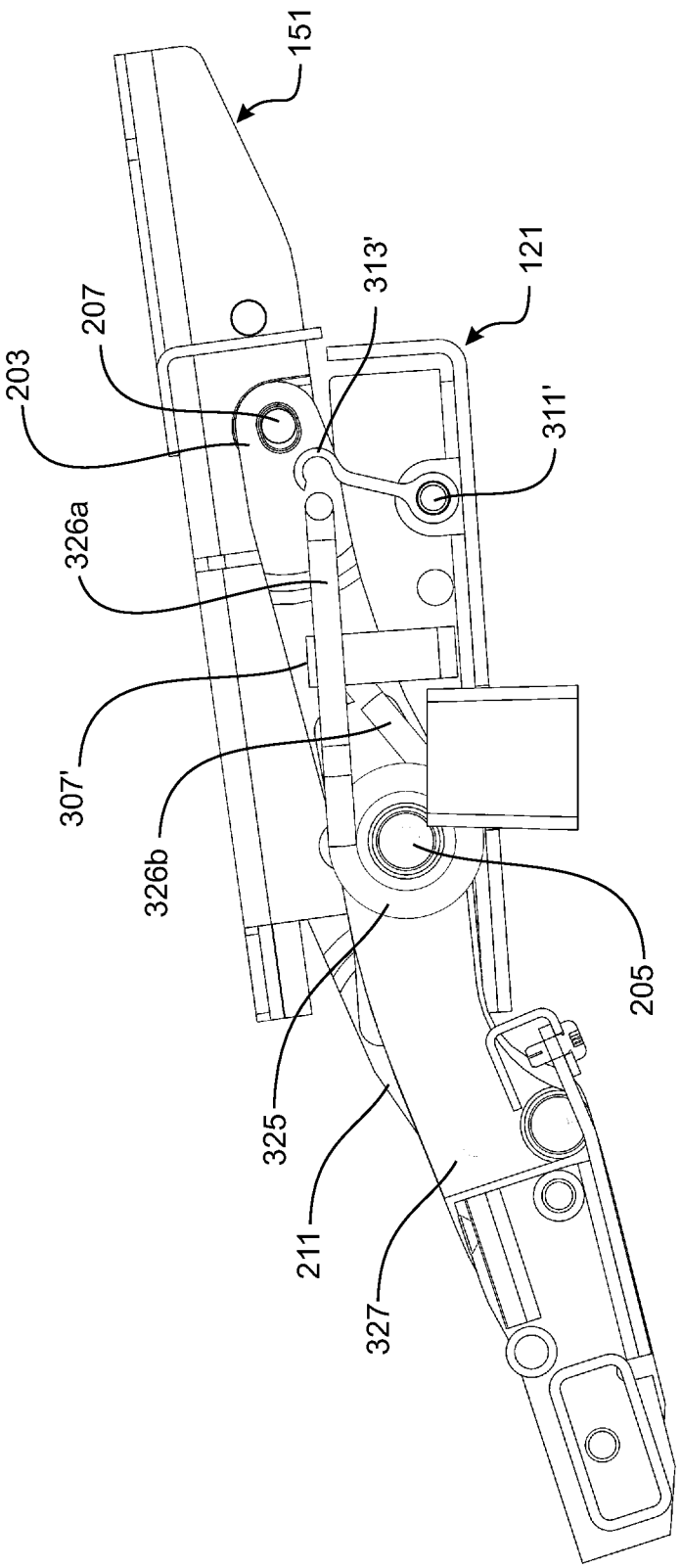


FIGURE 36

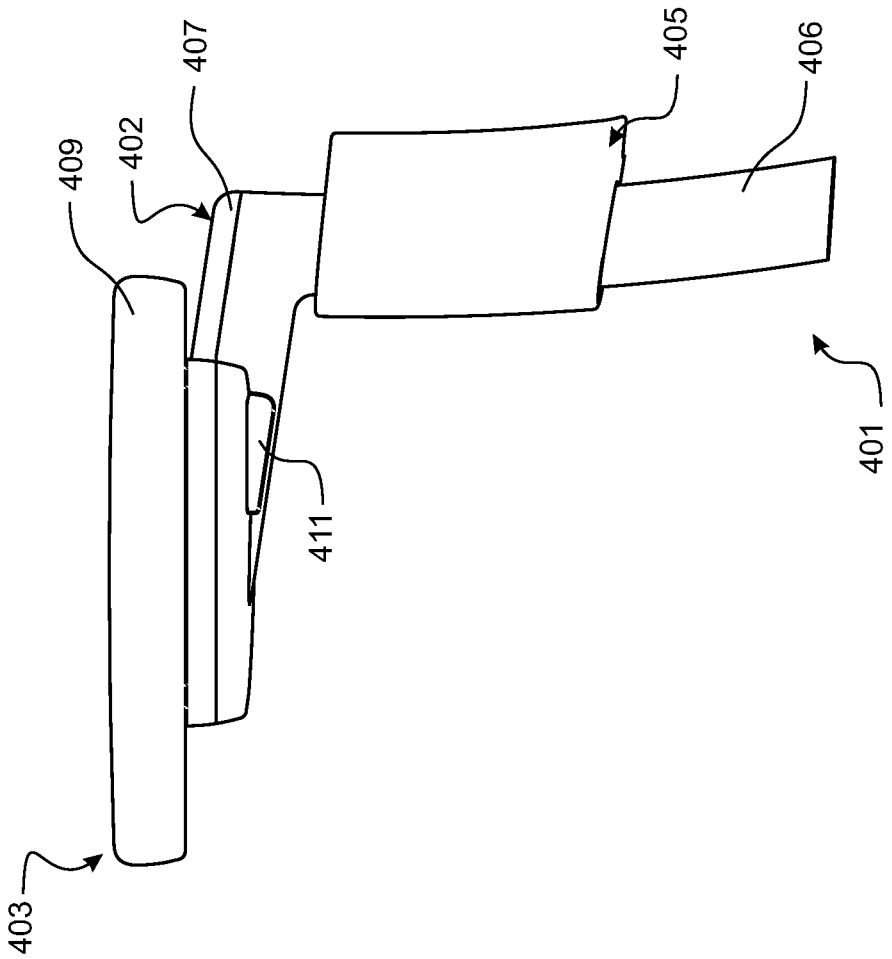


FIGURE 38

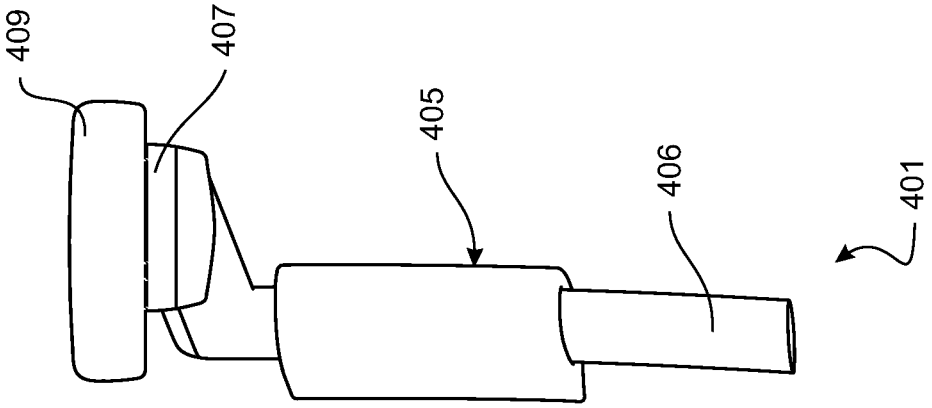


FIGURE 37

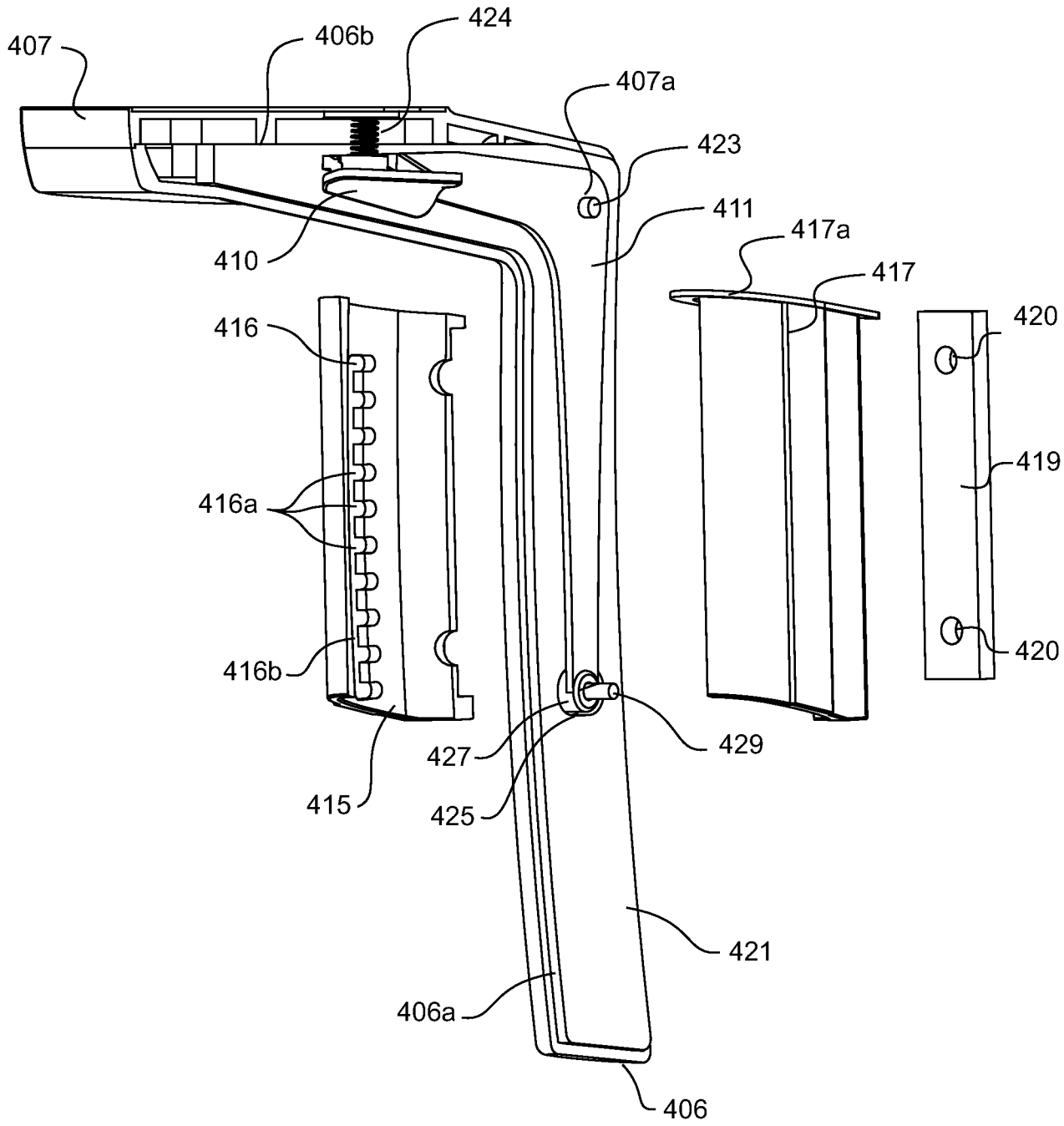

407
406b
424
407a
423
411
417a
417
420
419
420
410
416
416a
416b
415
427
425
429
421
406a
406

FIGURE 39

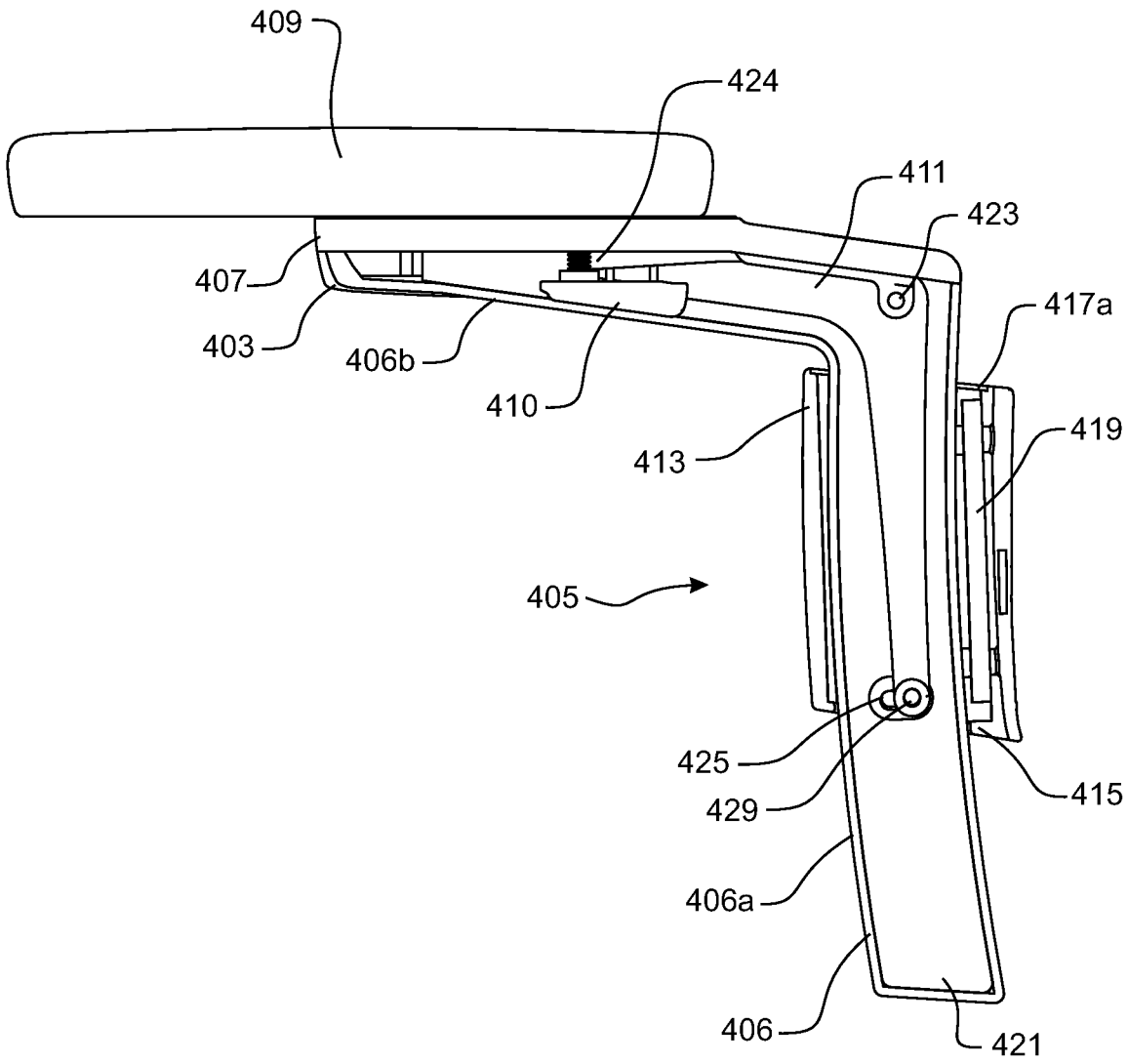

409
424
411
423
407
417a
403
406b
410
419
413
405
425
415
429
406a
406
421

FIGURE 40

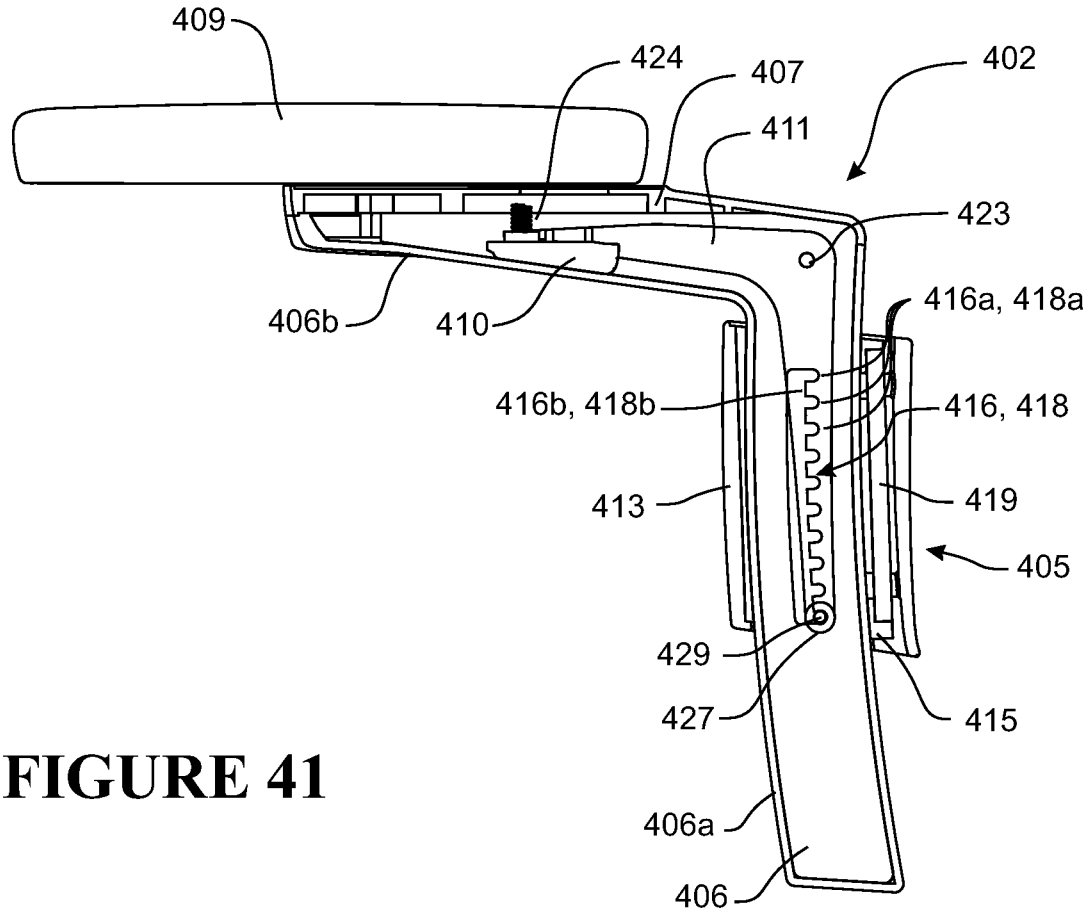


FIGURE 41

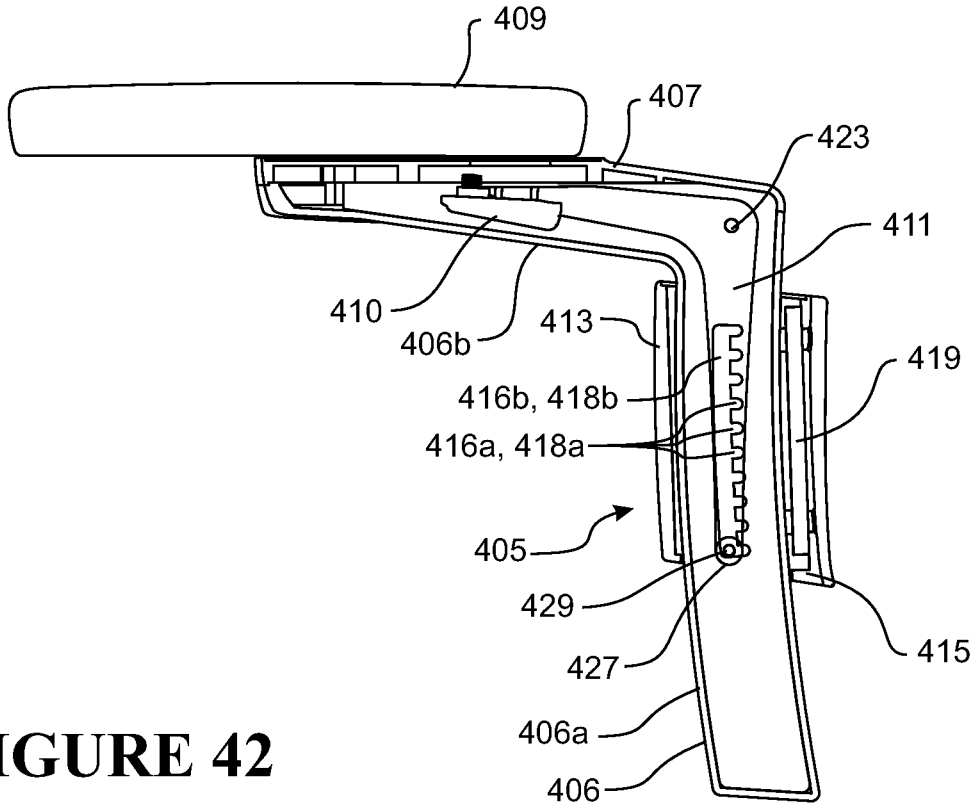


FIGURE 42

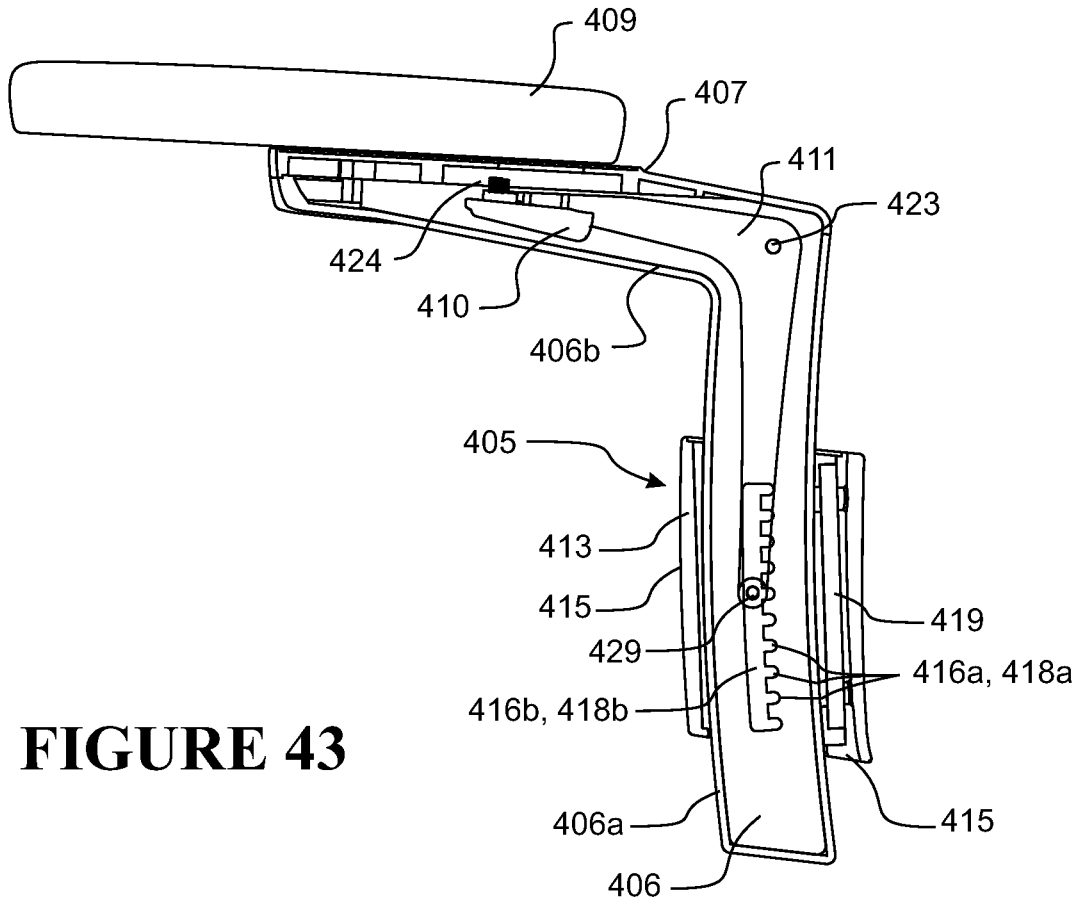


FIGURE 43

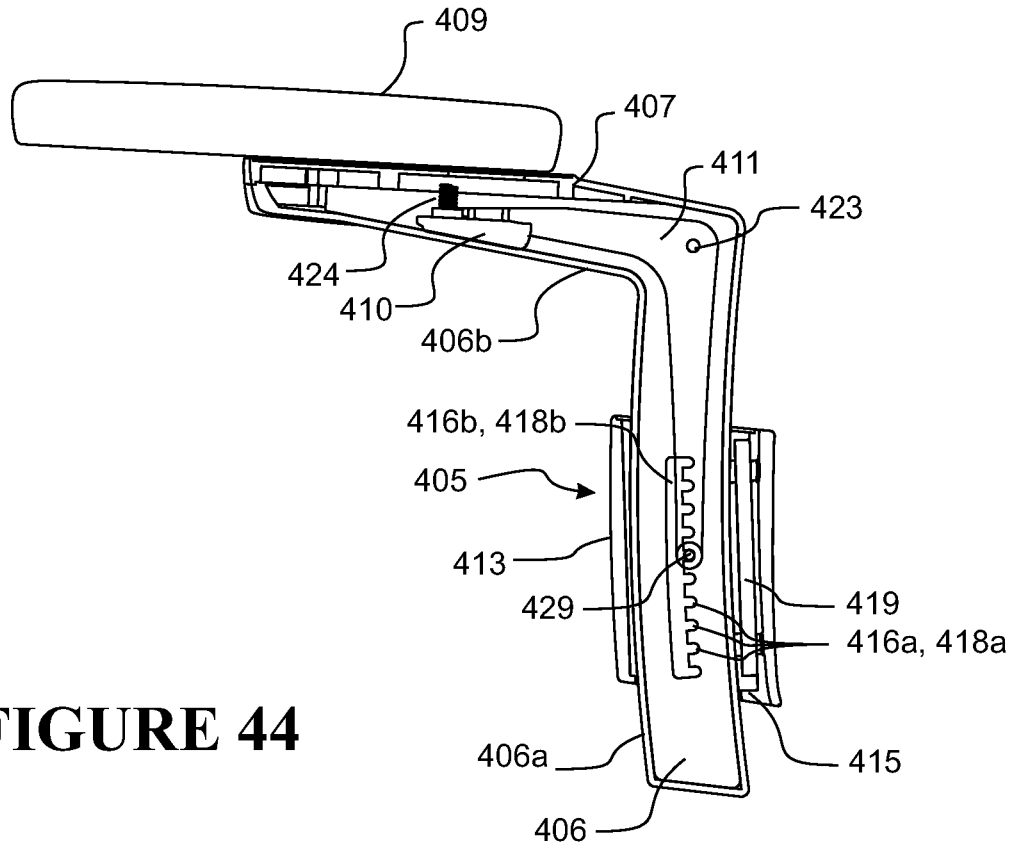


FIGURE 44

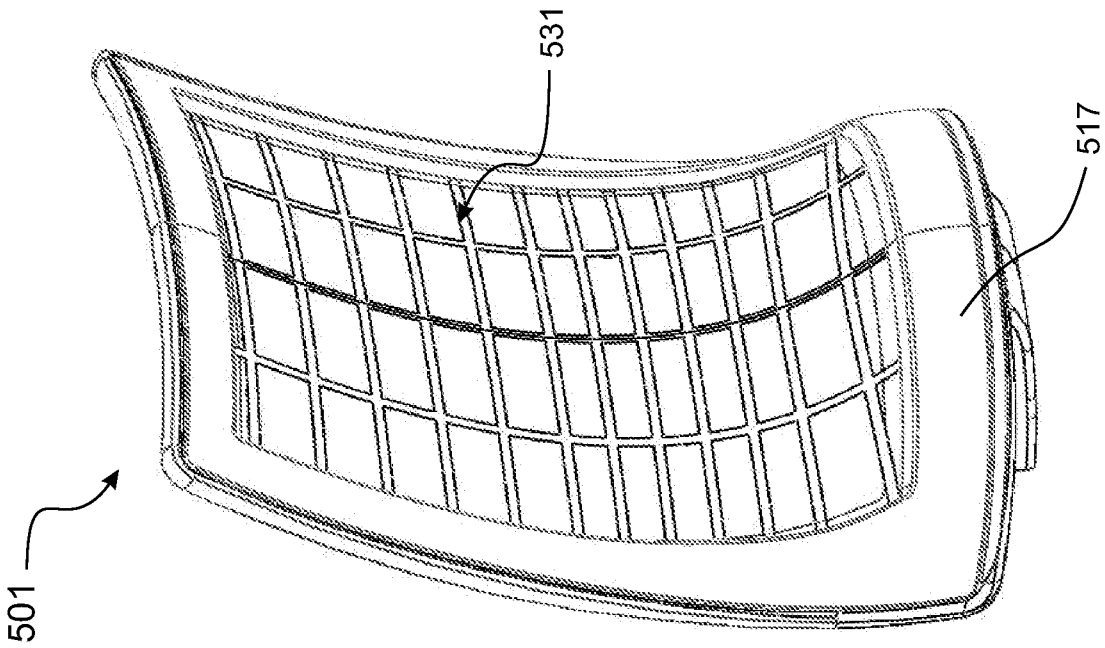


FIGURE 46

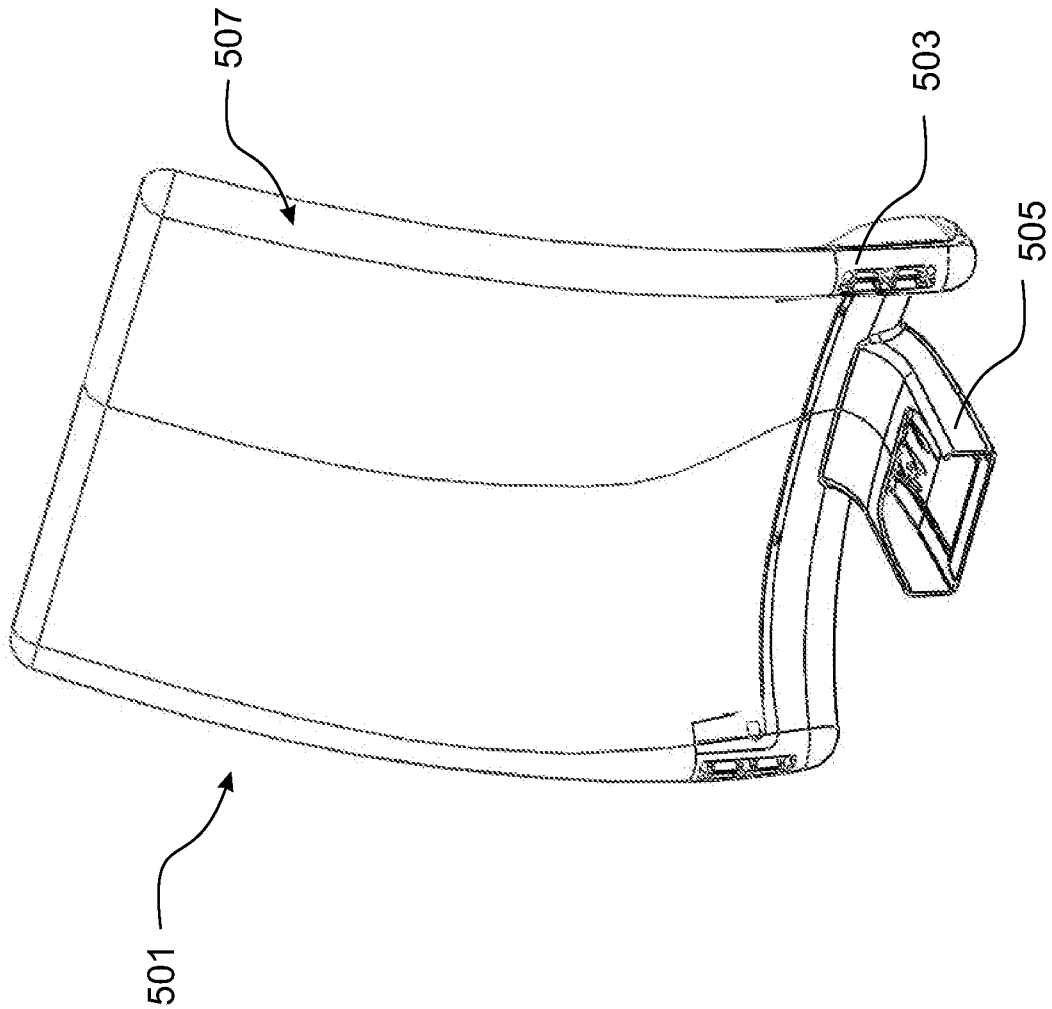


FIGURE 45

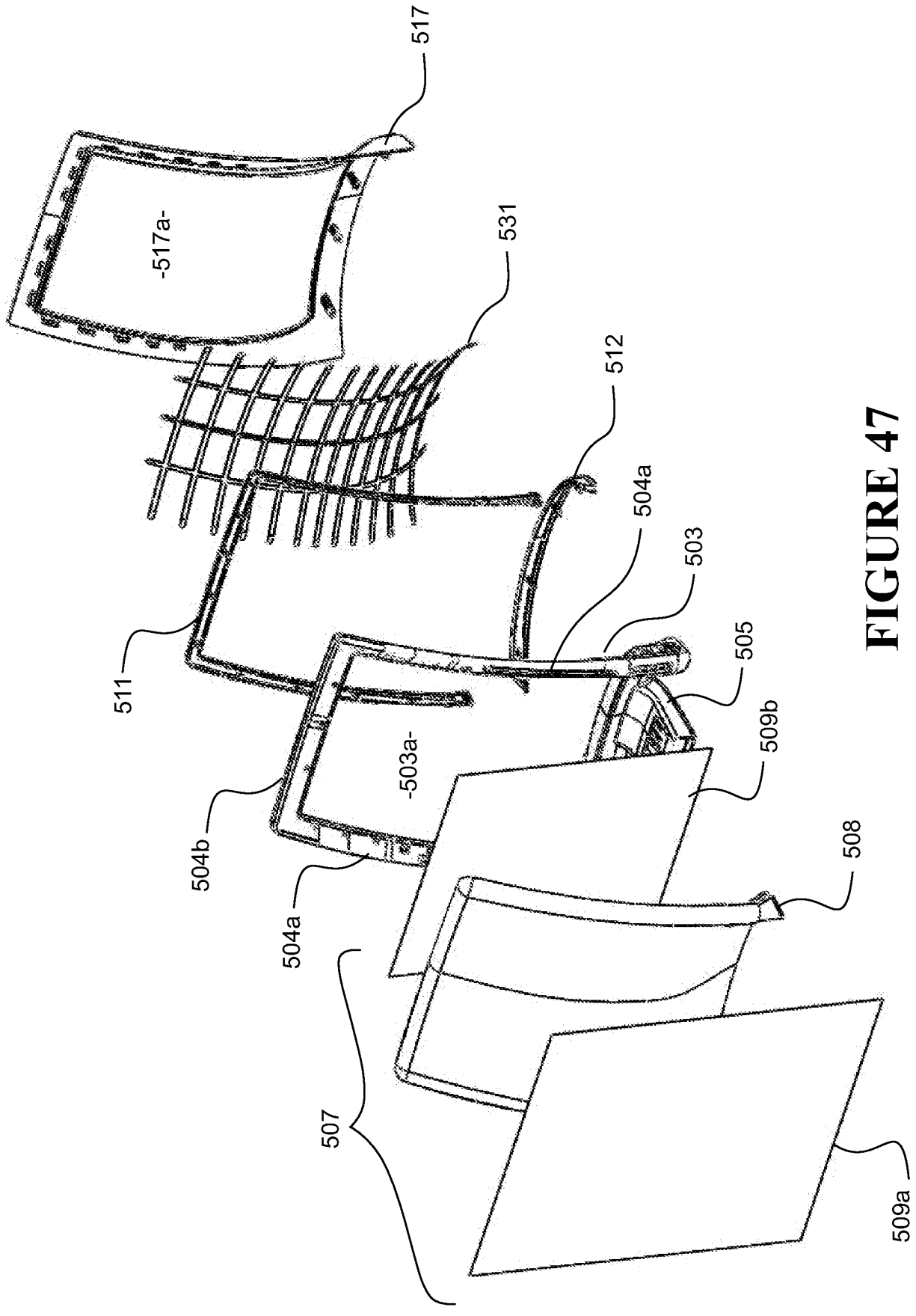

517
-517a-
531
512
504a
503
505
509b
508
511
-503a-
504b
504a
507
509a

FIGURE 47

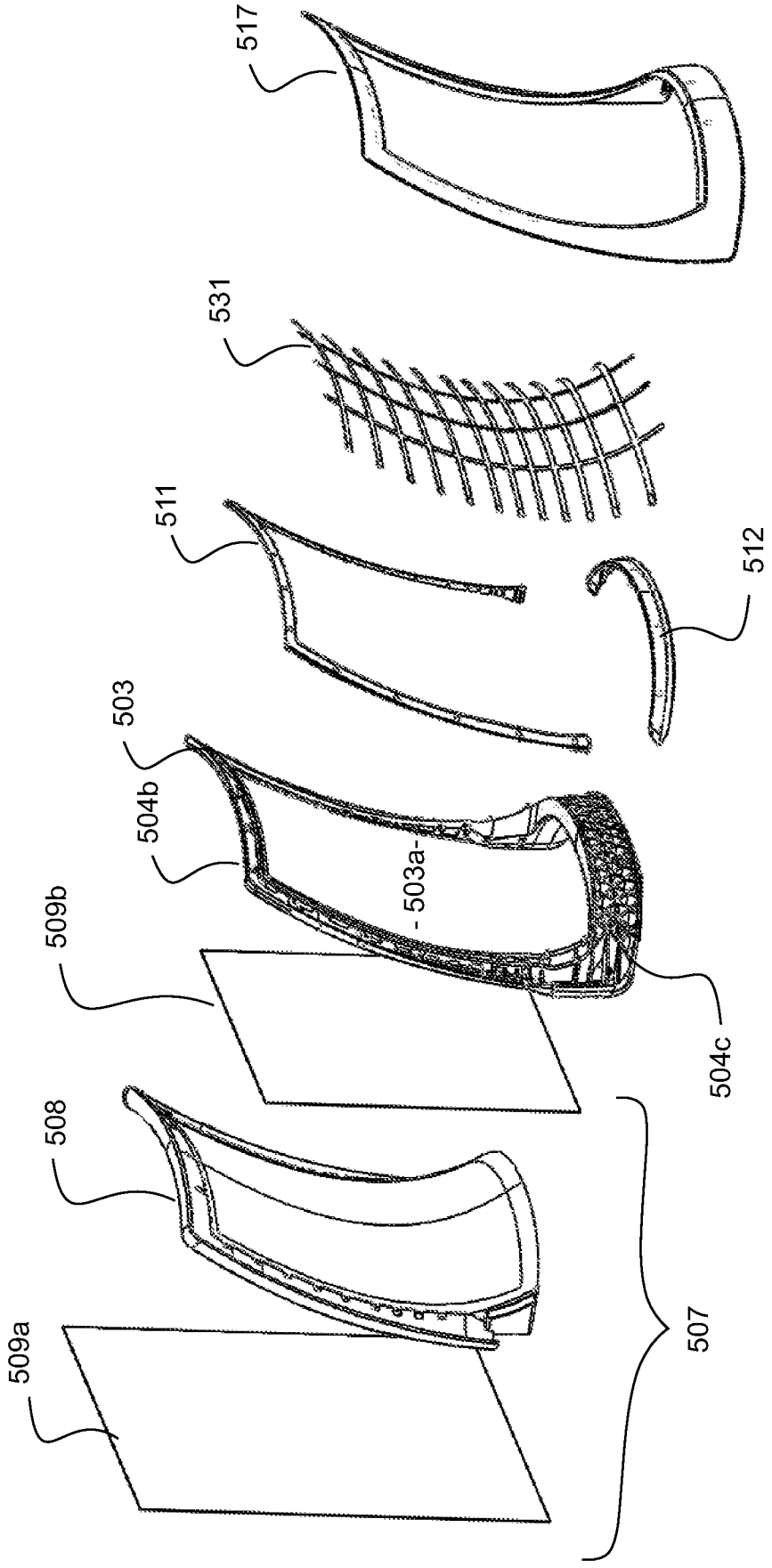


FIGURE 48

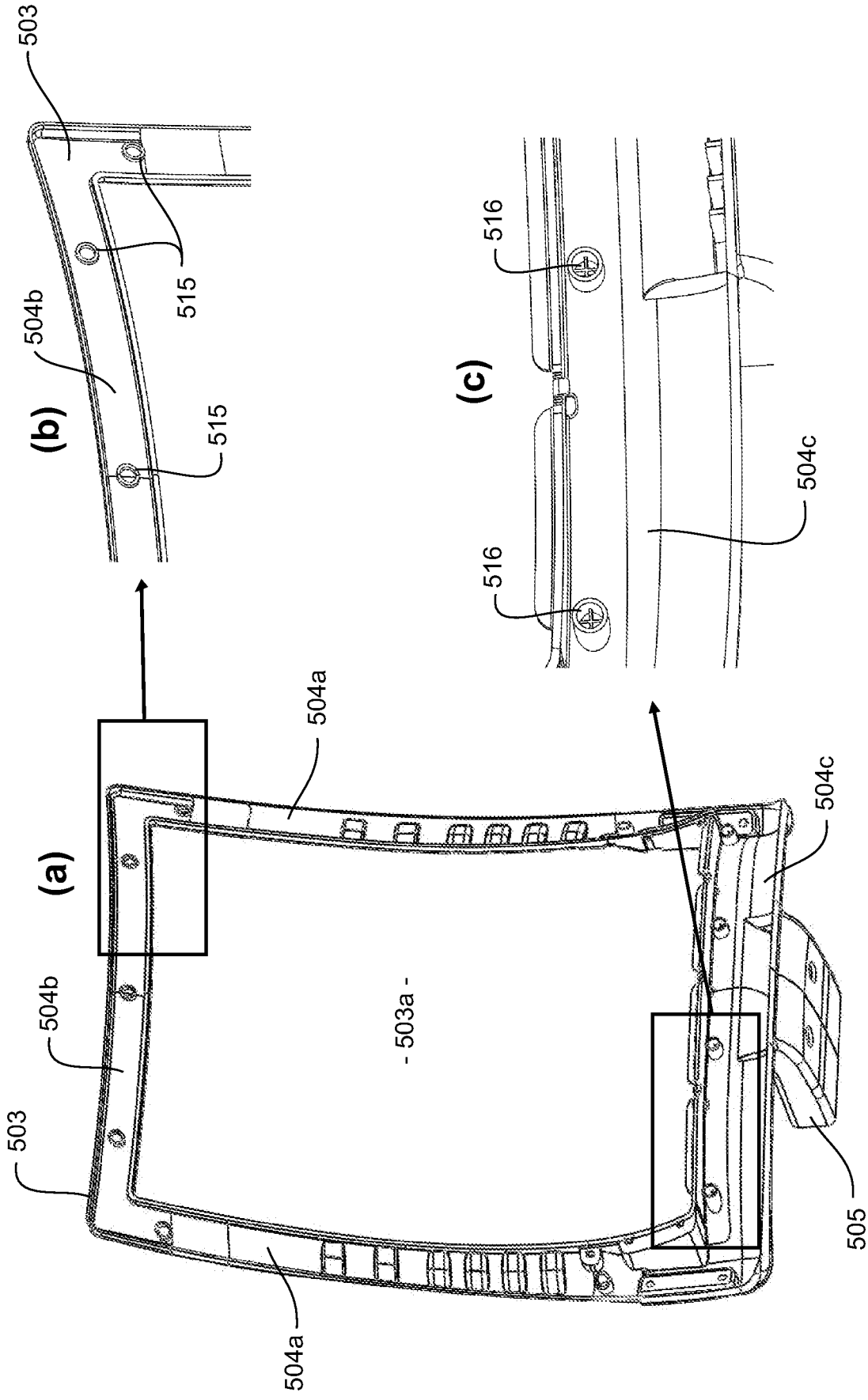

503
504b
515
(b)
515
504b
503
(a)
504a
- 503a -
504a
504c
505
(c)
516
504c
516

FIGURE 49

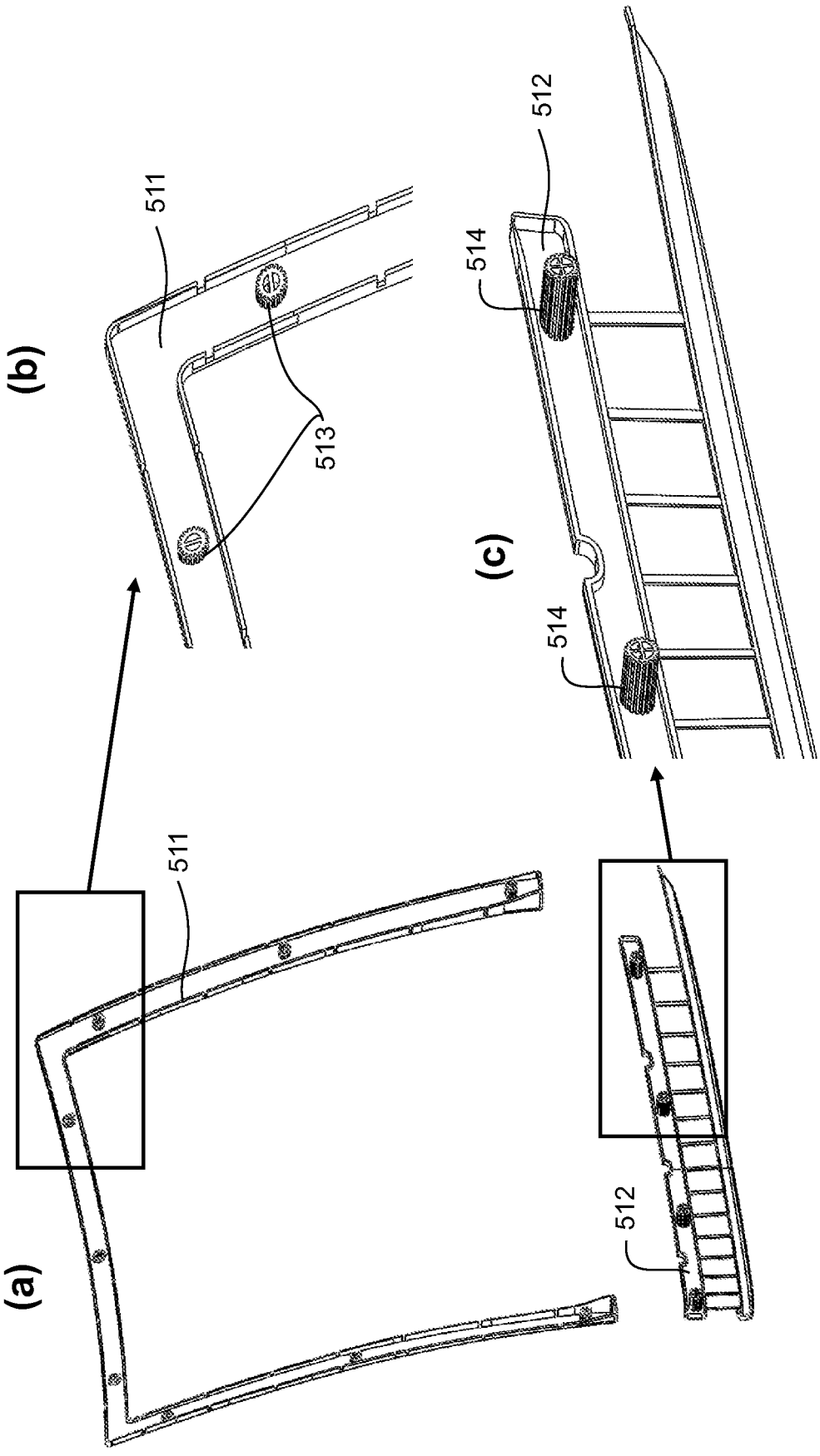


FIGURE 50

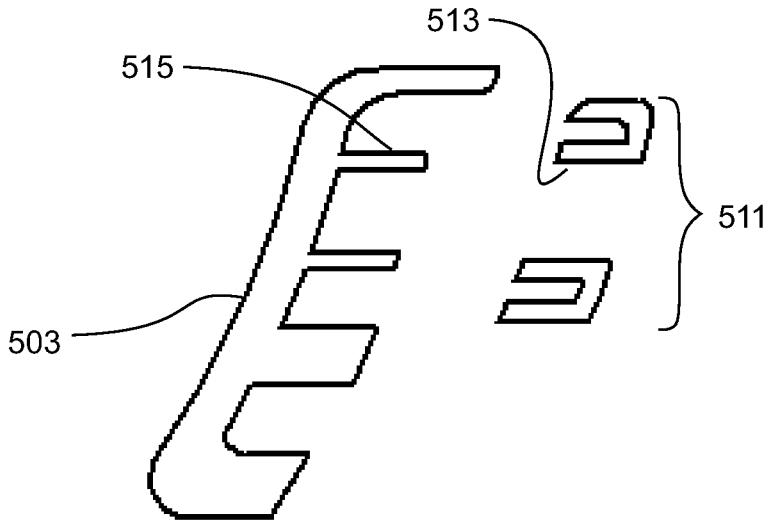


FIGURE 51(a)

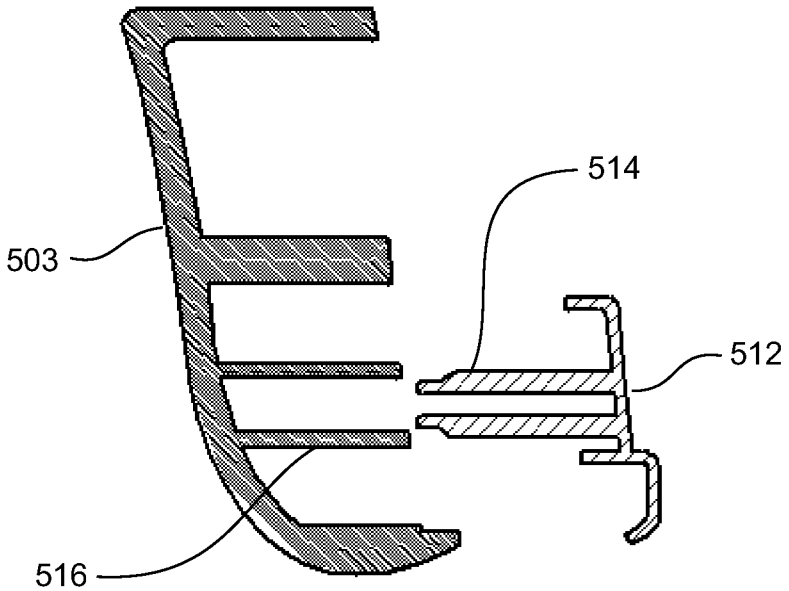


FIGURE 51(b)

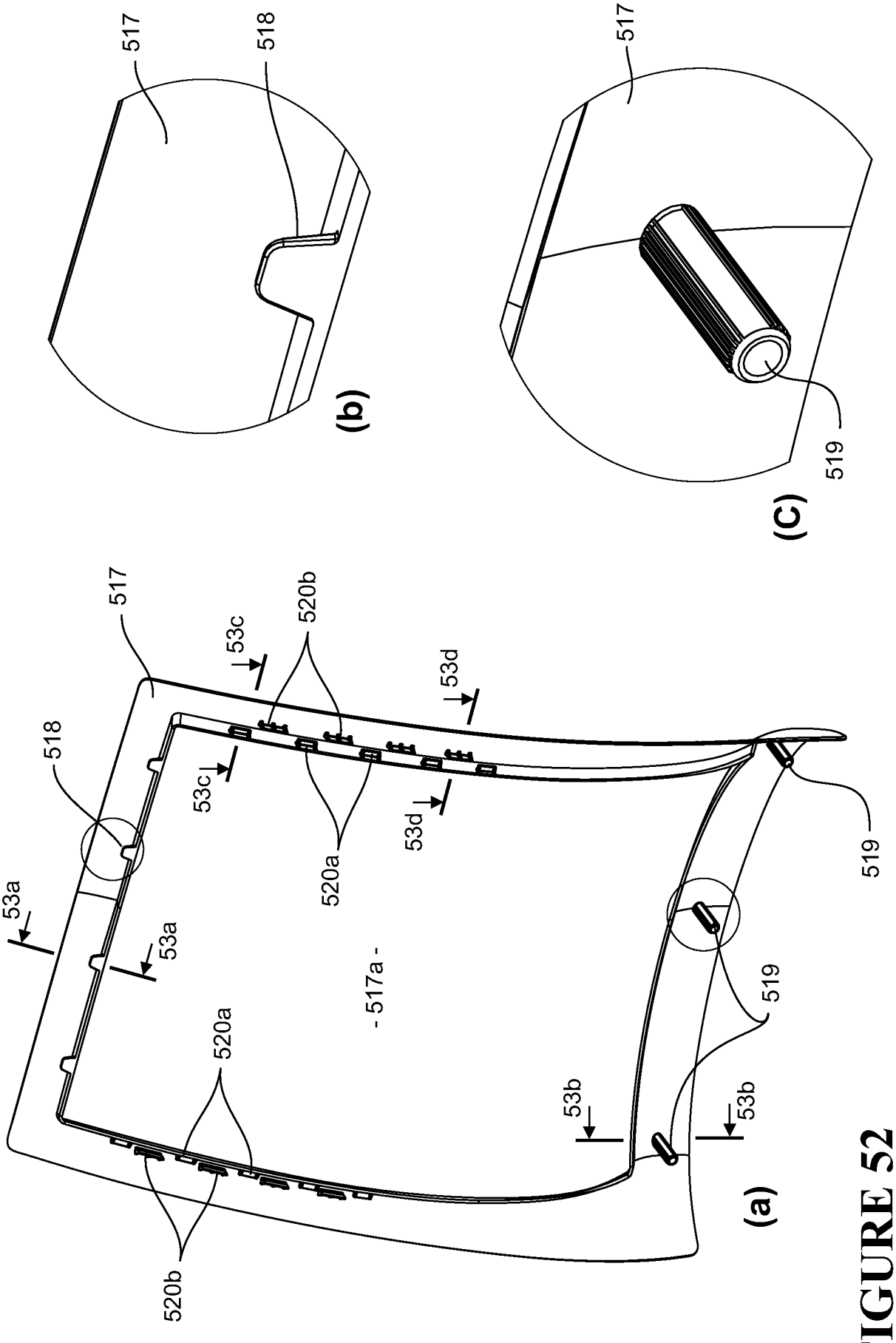

517
518
(b)
517
519
(C)
517
53c
520b
53d
518
53c
53d
520a
53a
519
53a
- 517a -
520a
53b
519
53b
520b
(a)

FIGURE 52

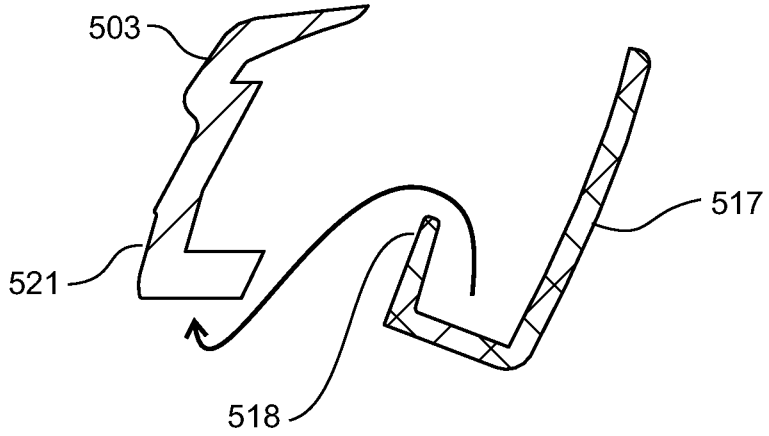


FIGURE 53(a)

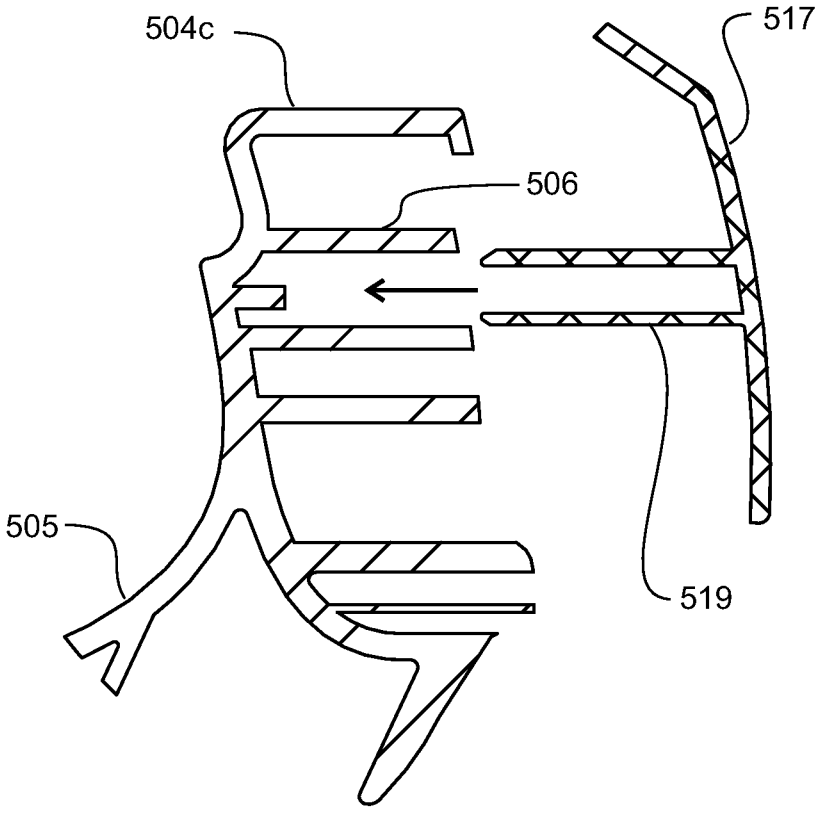


FIGURE 53(b)

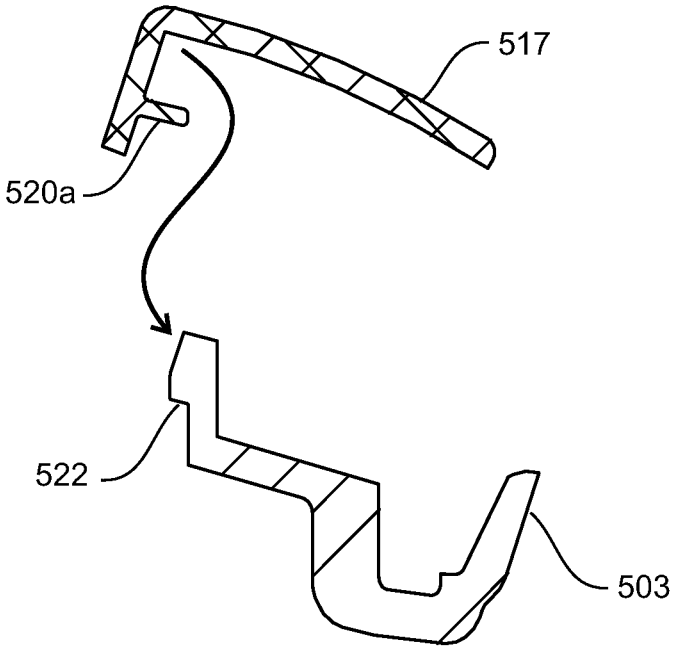


FIGURE 53(c)

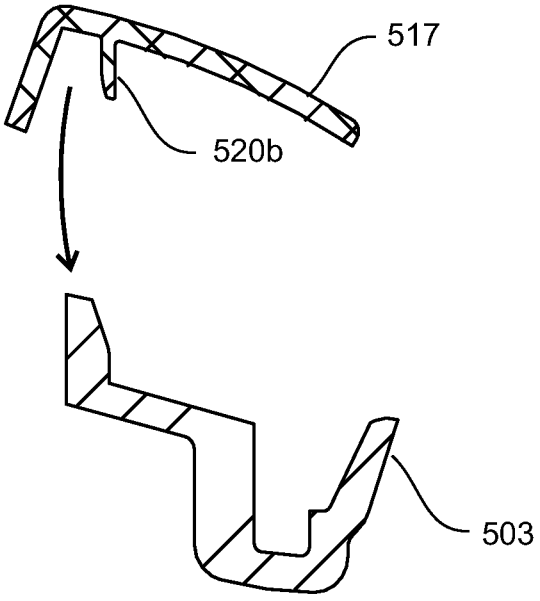


FIGURE 53(d)

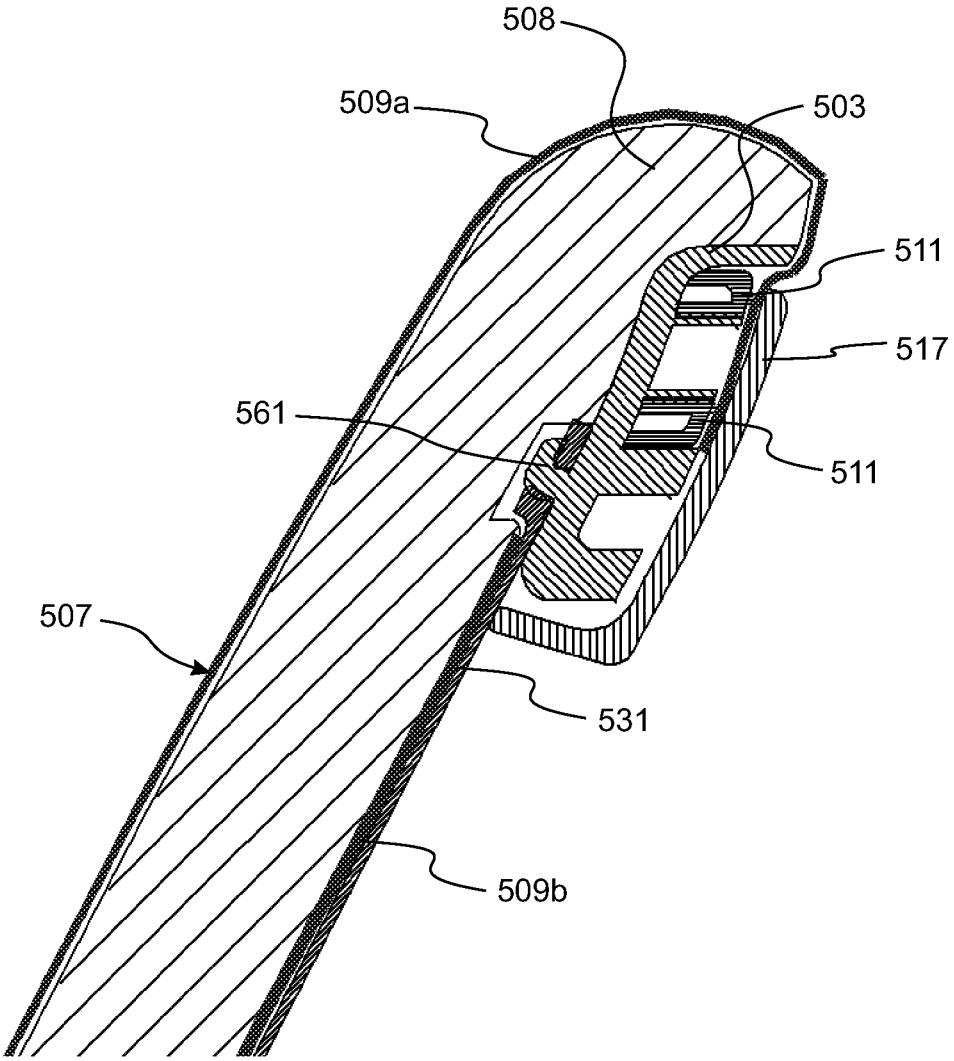


FIGURE 54

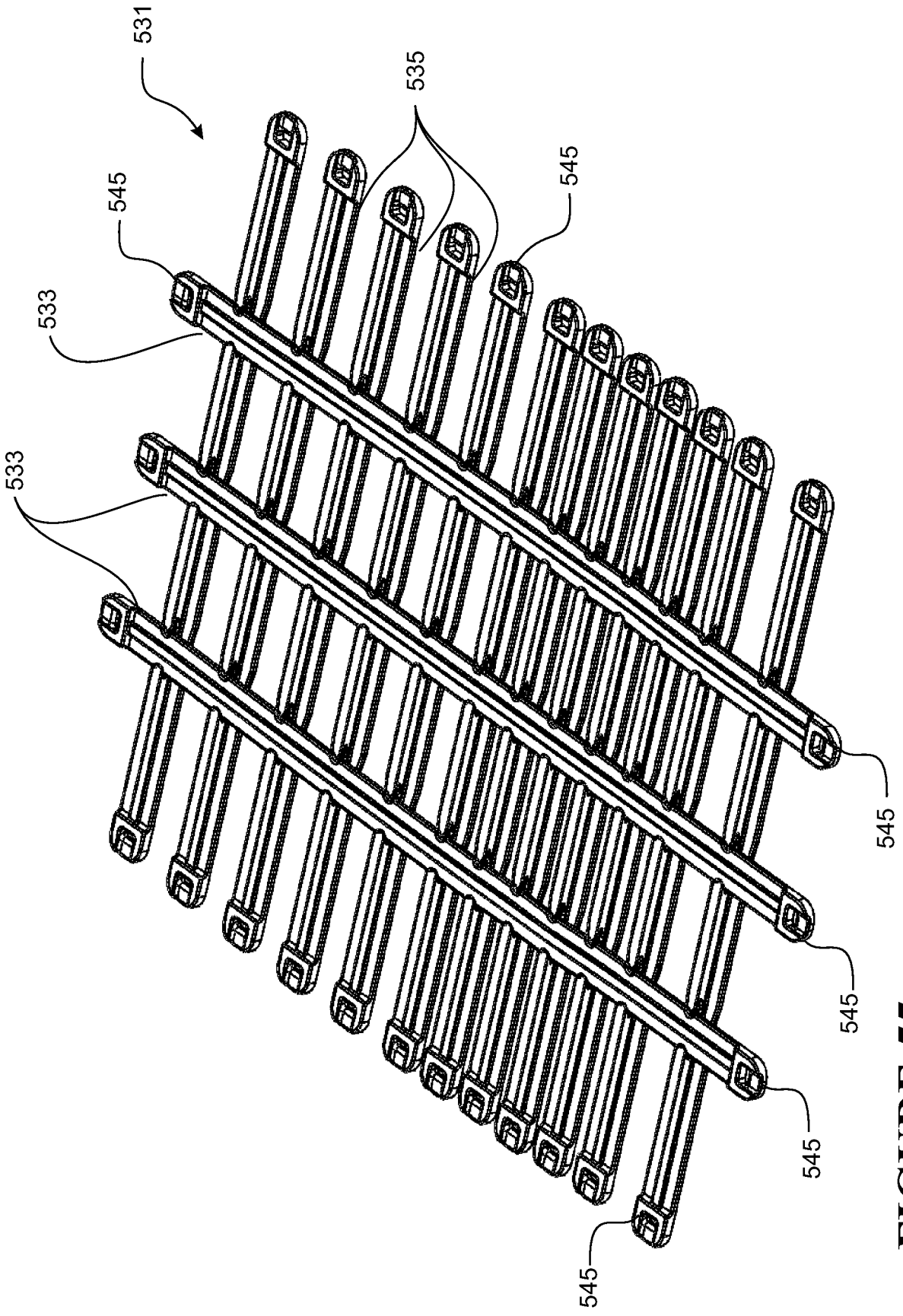


FIGURE 55

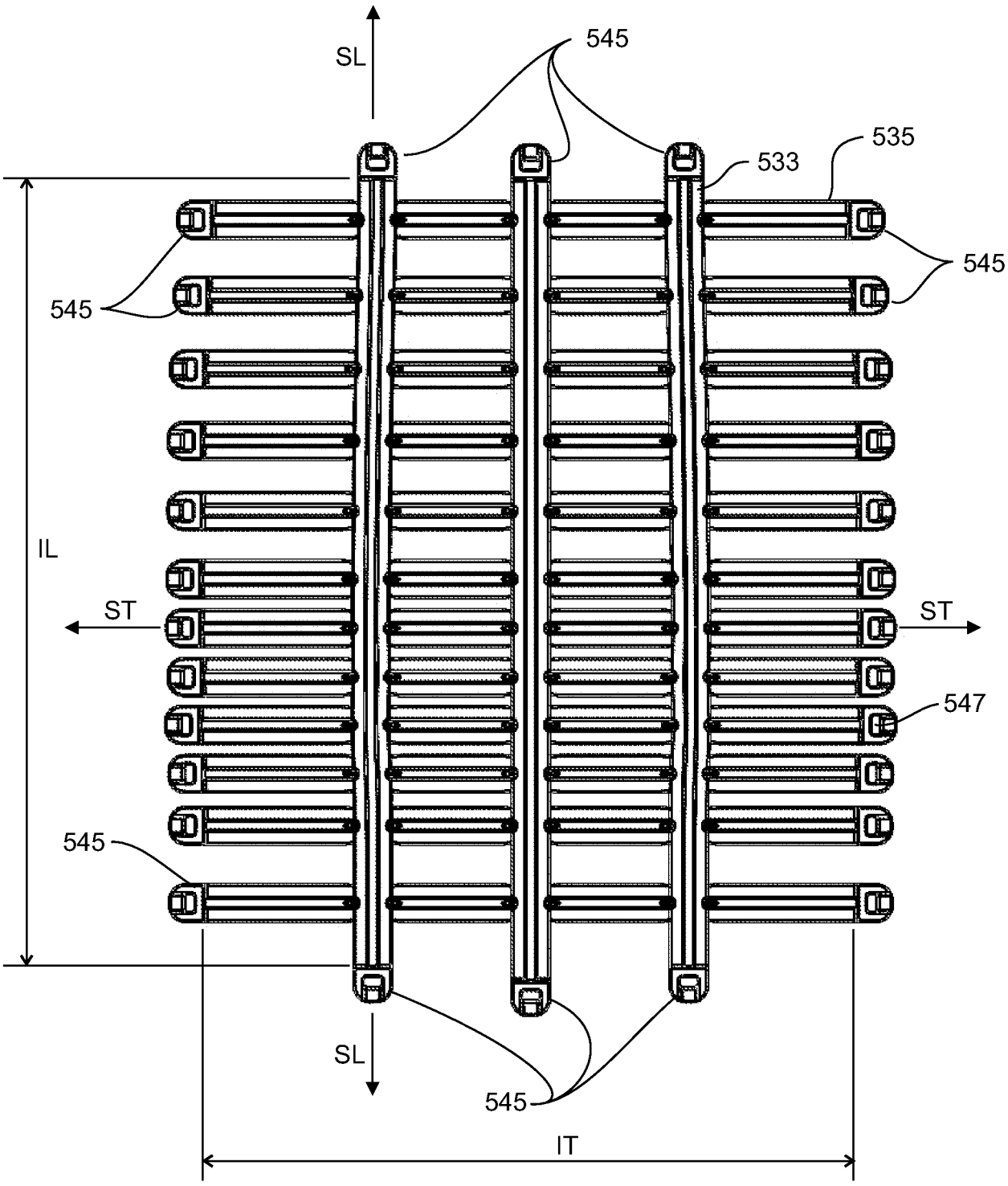


FIGURE 56

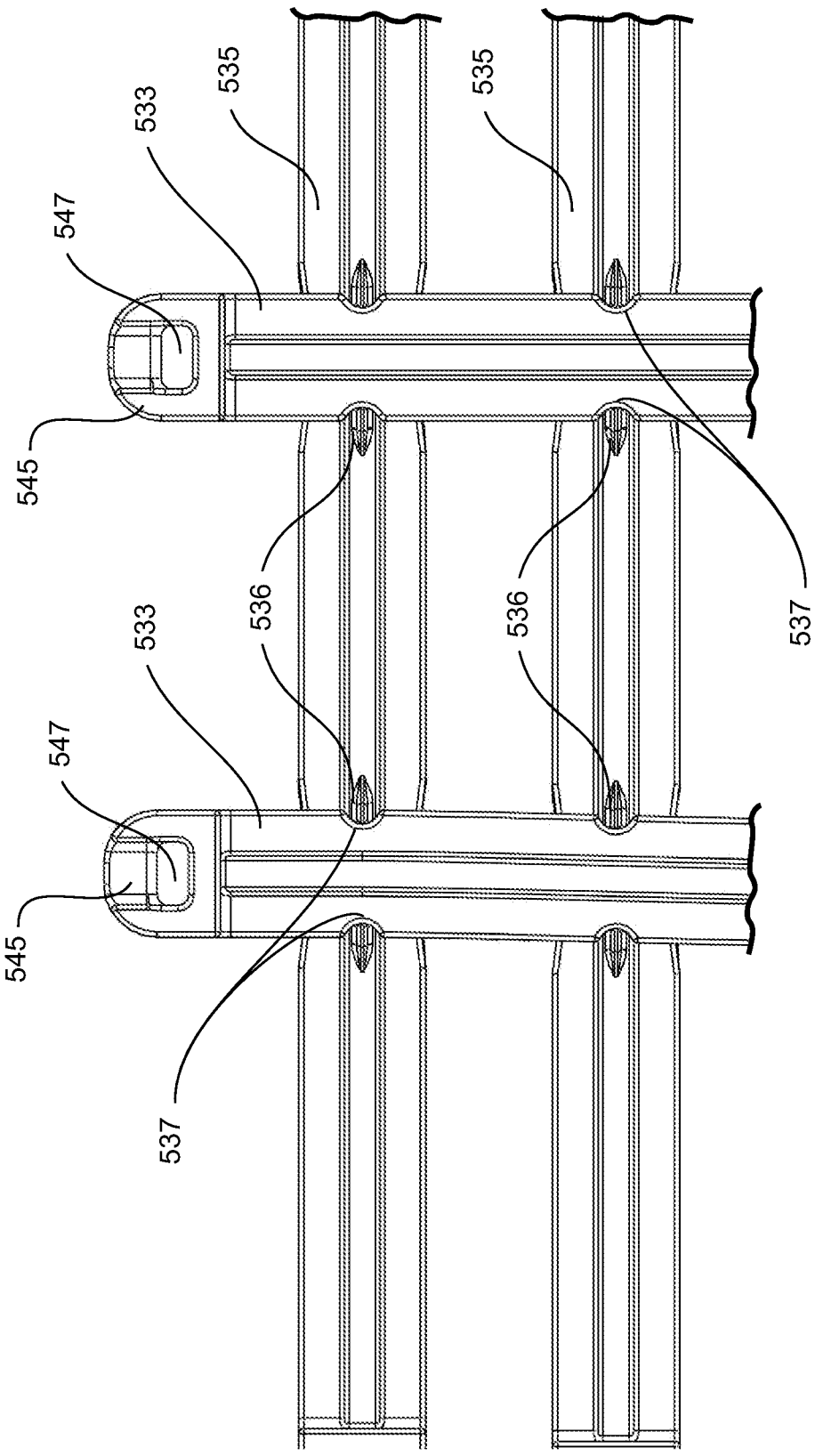


FIGURE 57

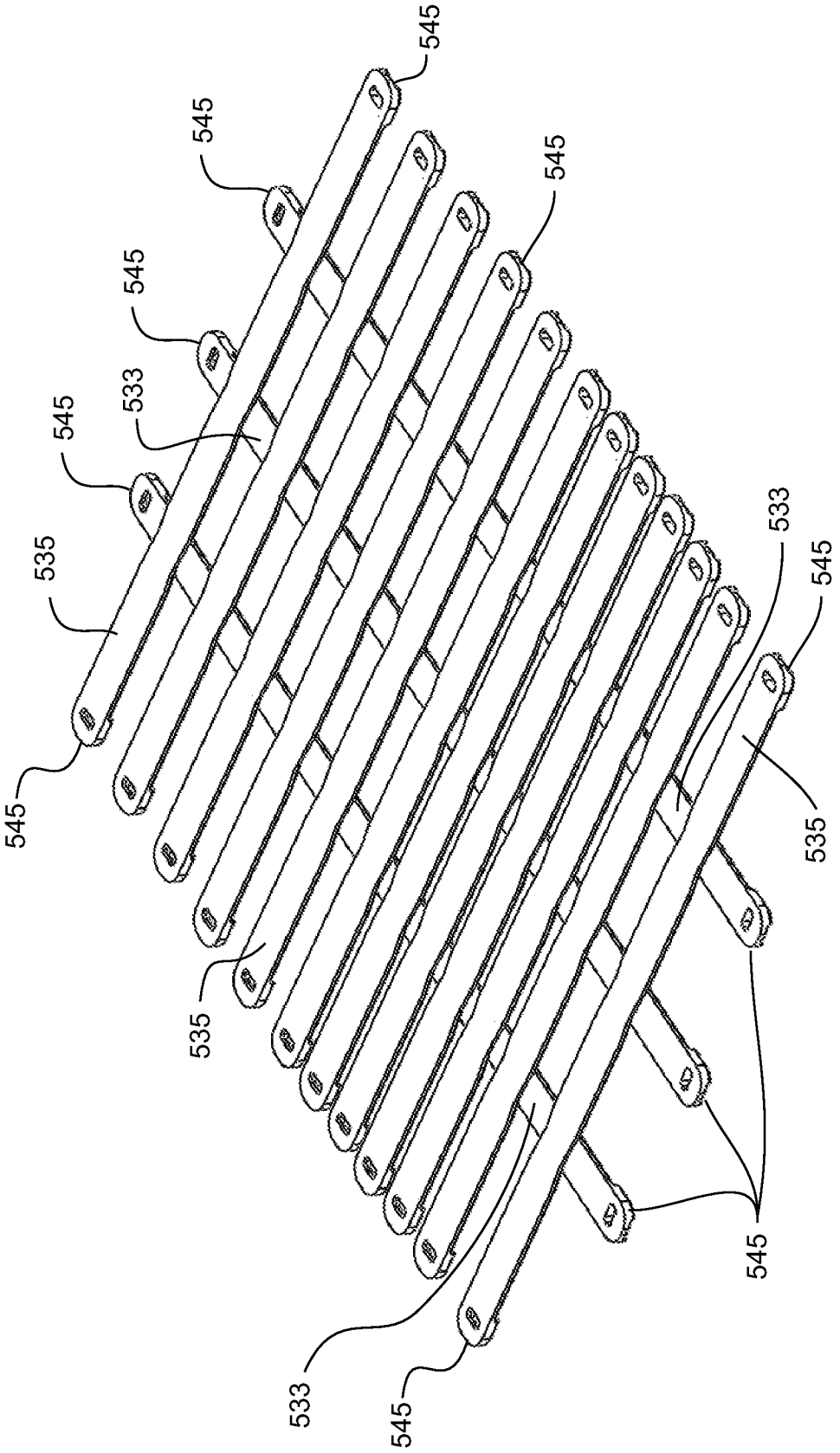


FIGURE 58

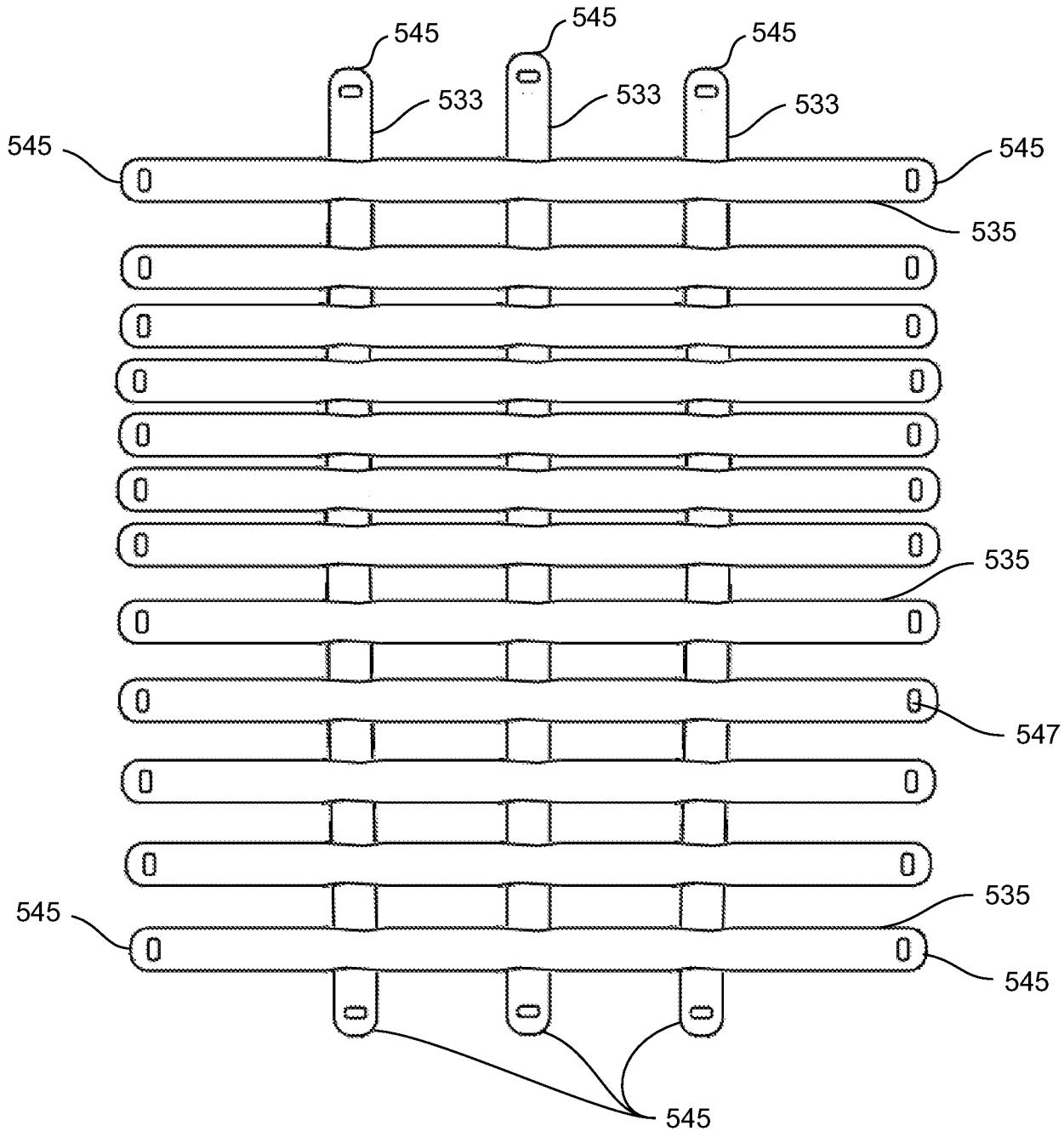


FIGURE 59

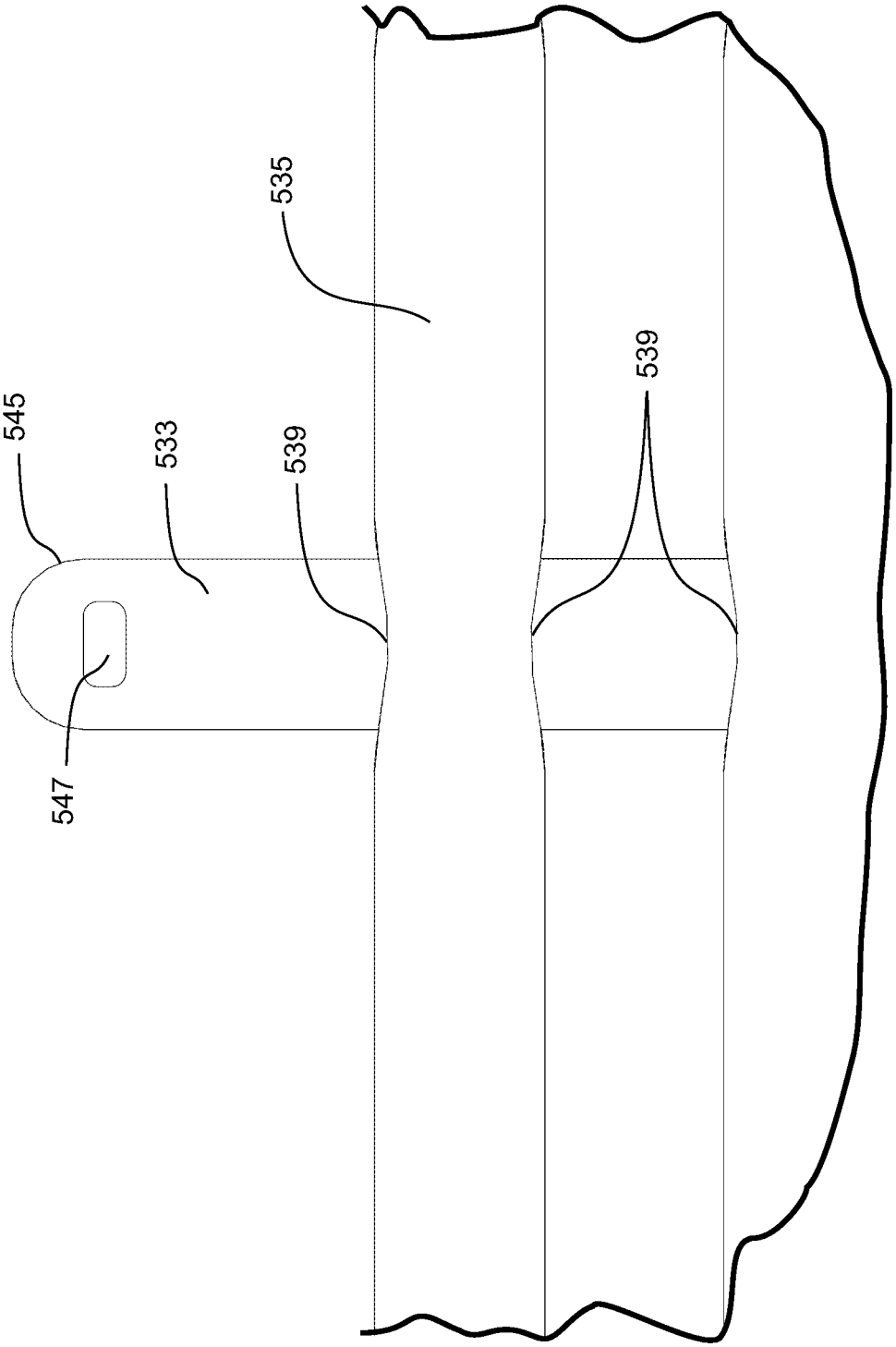


FIGURE 60

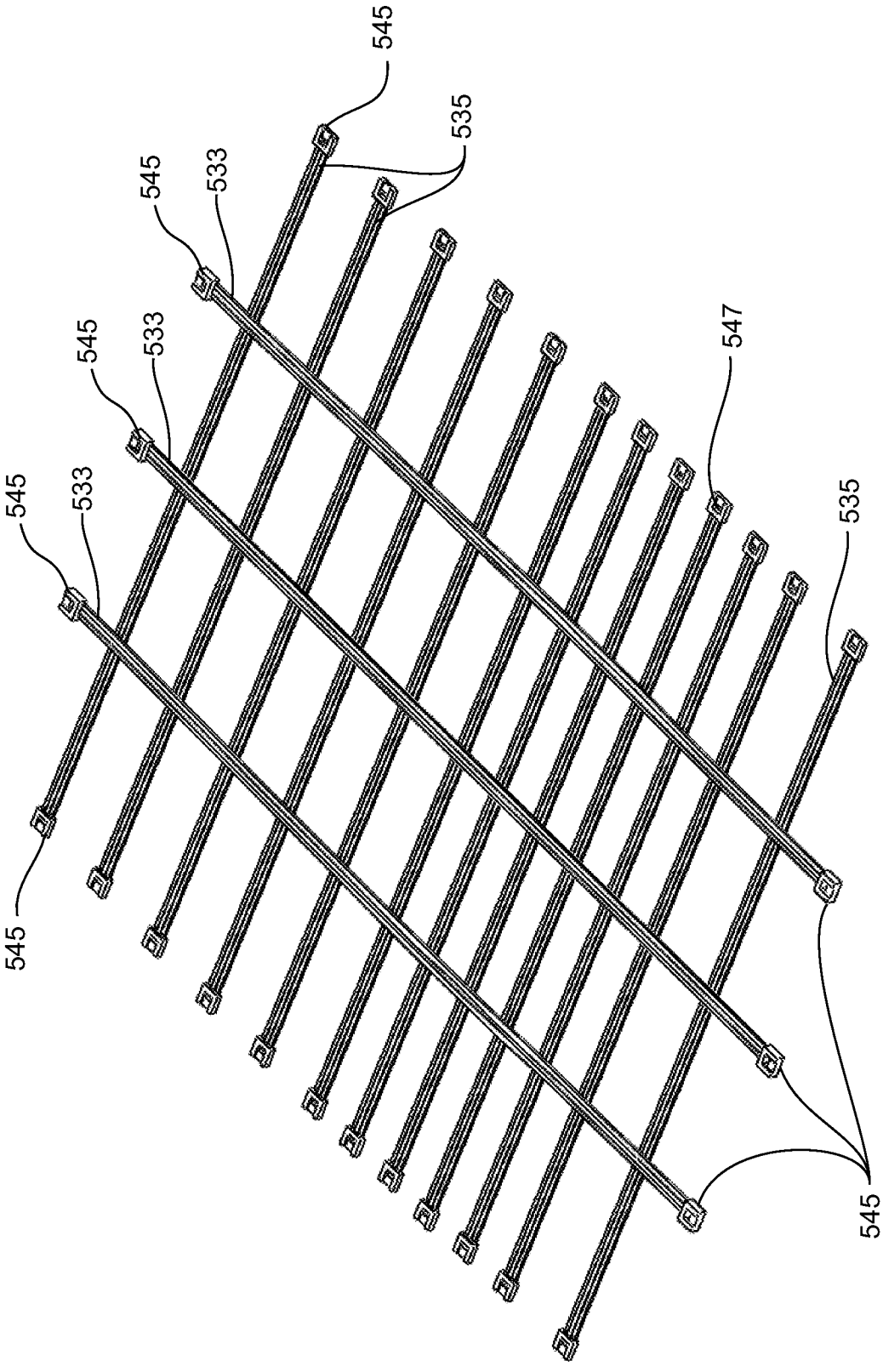


FIGURE 61

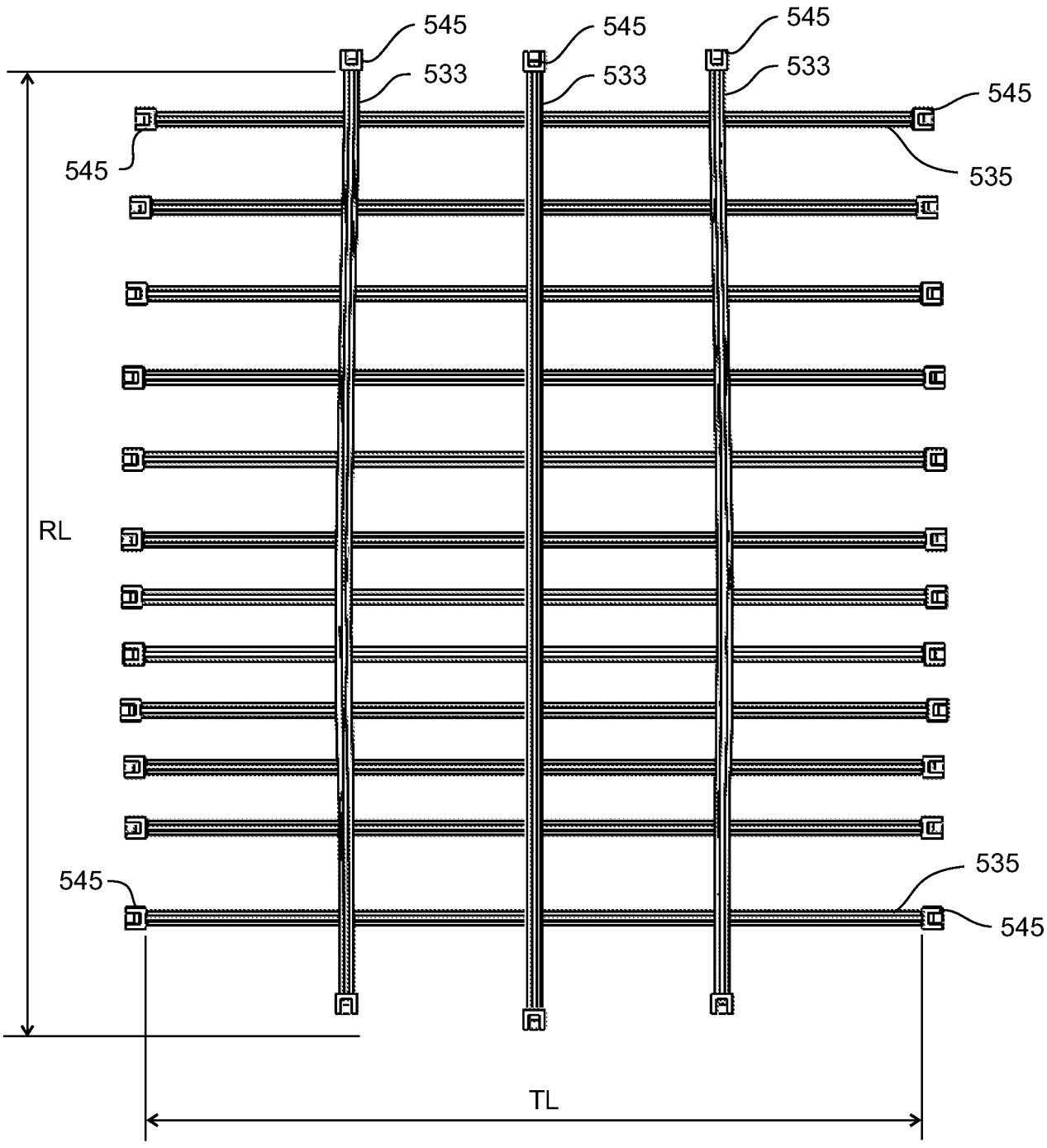


FIGURE 62

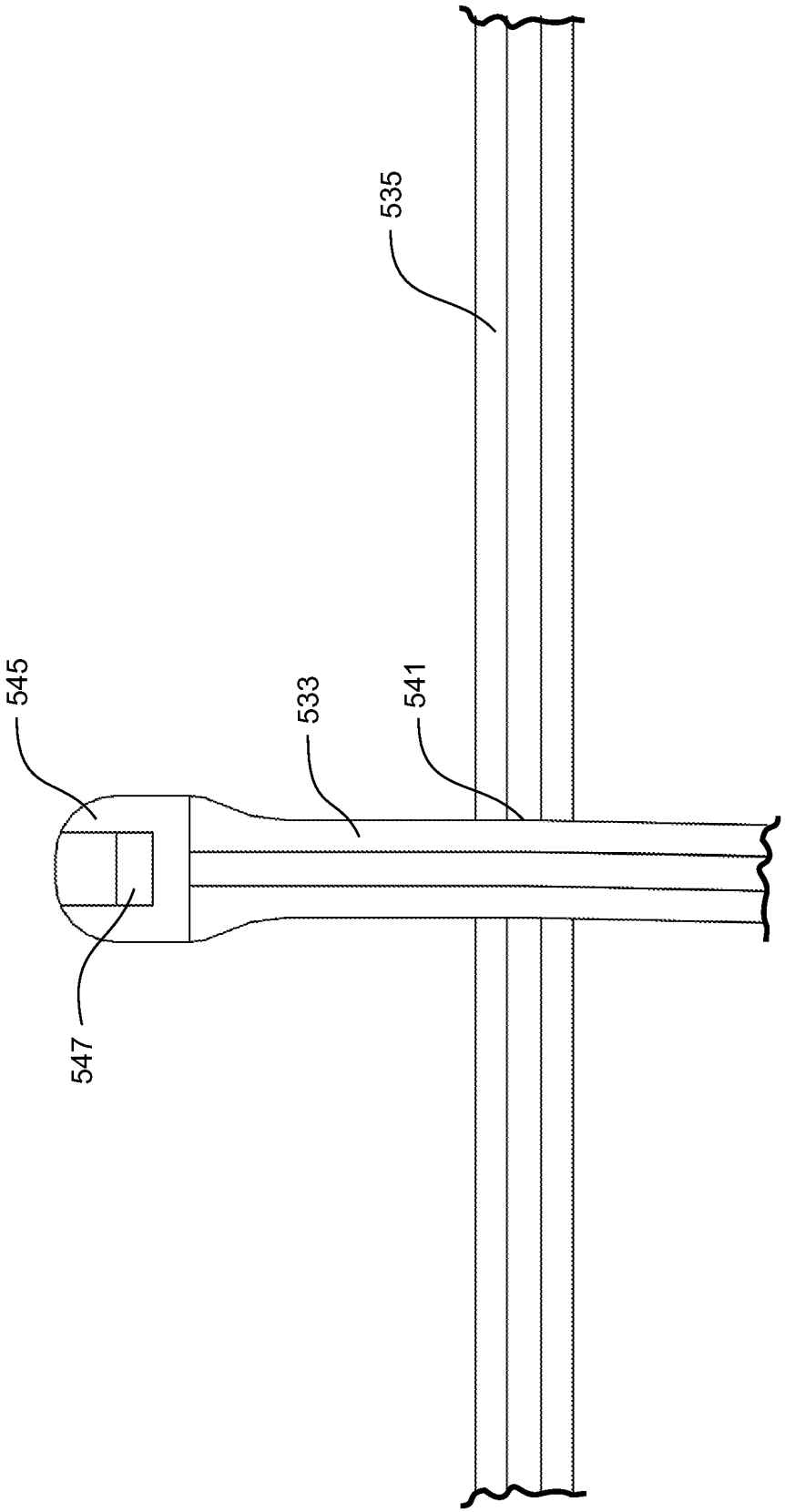
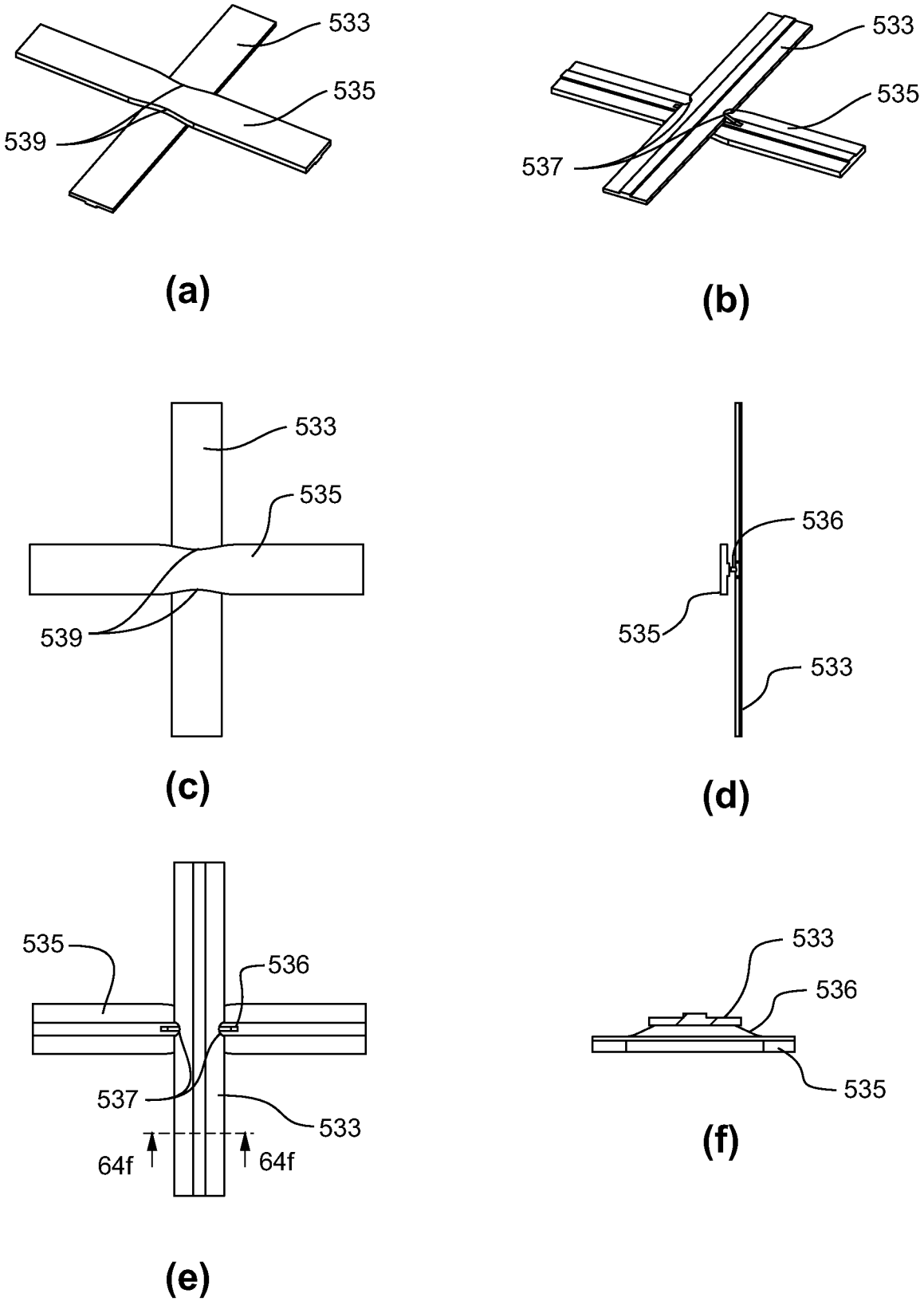


FIGURE 63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(e)
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(f)

FIGURE 64

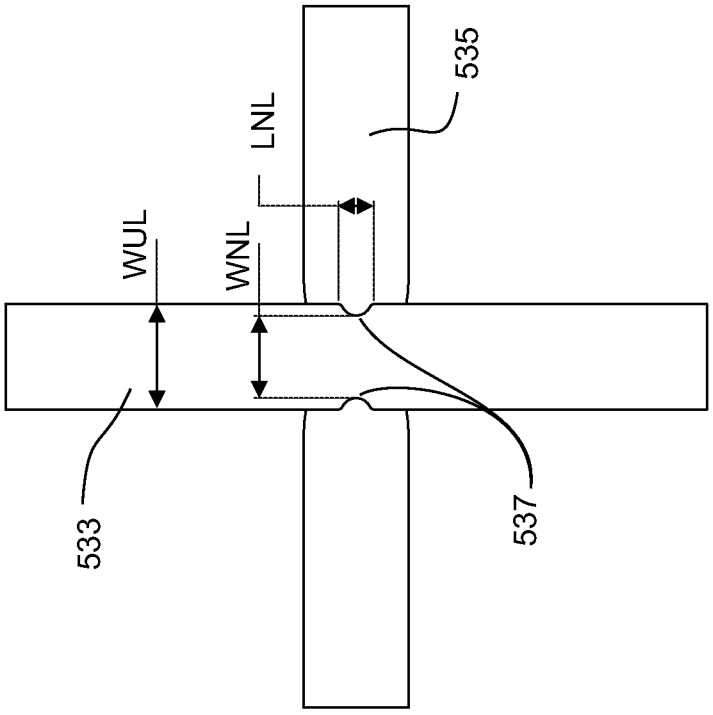


FIGURE 65(b)

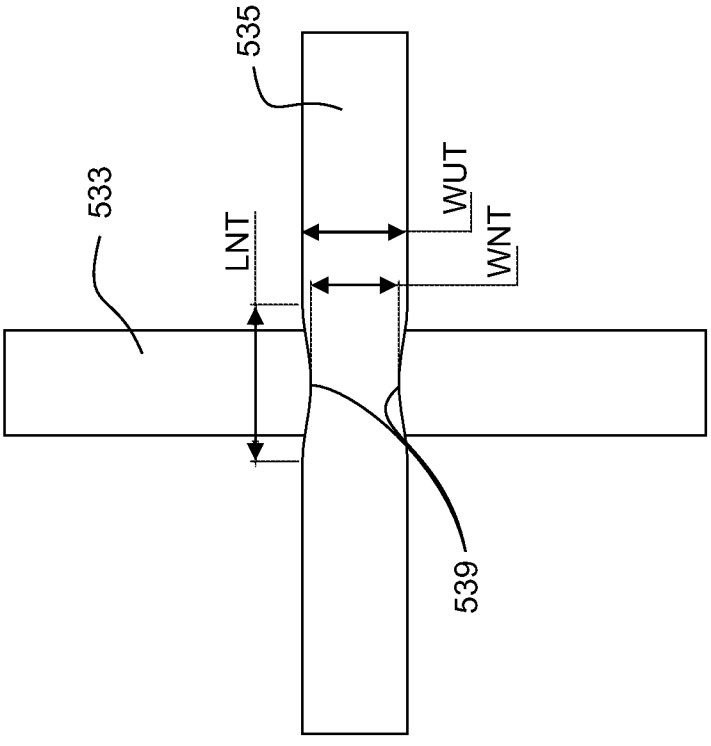
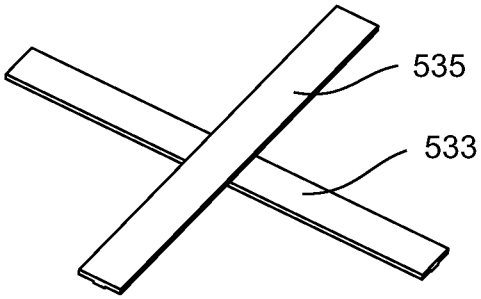
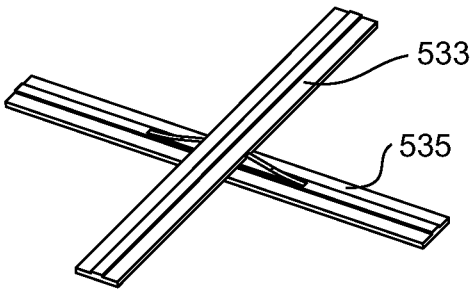


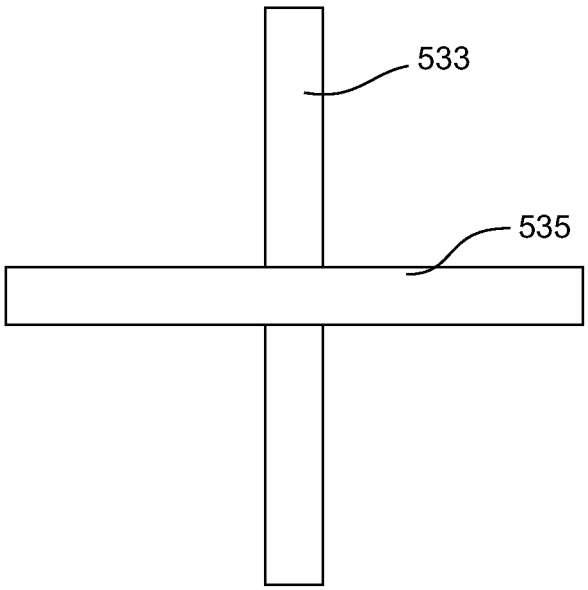
FIGURE 65(a)



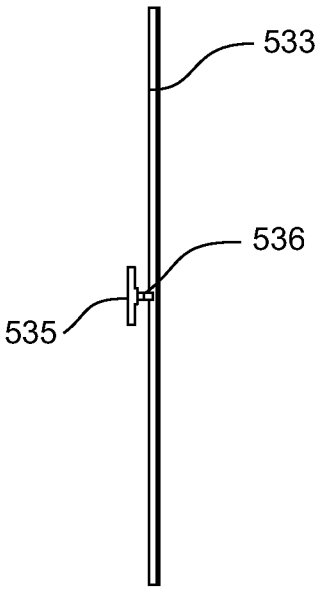
(a)



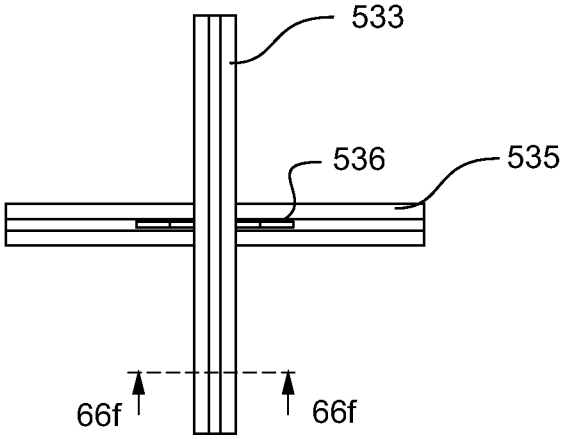
(b)



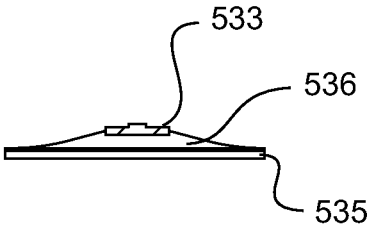
(c)



(d)



(e)



(f)

FIGURE 66

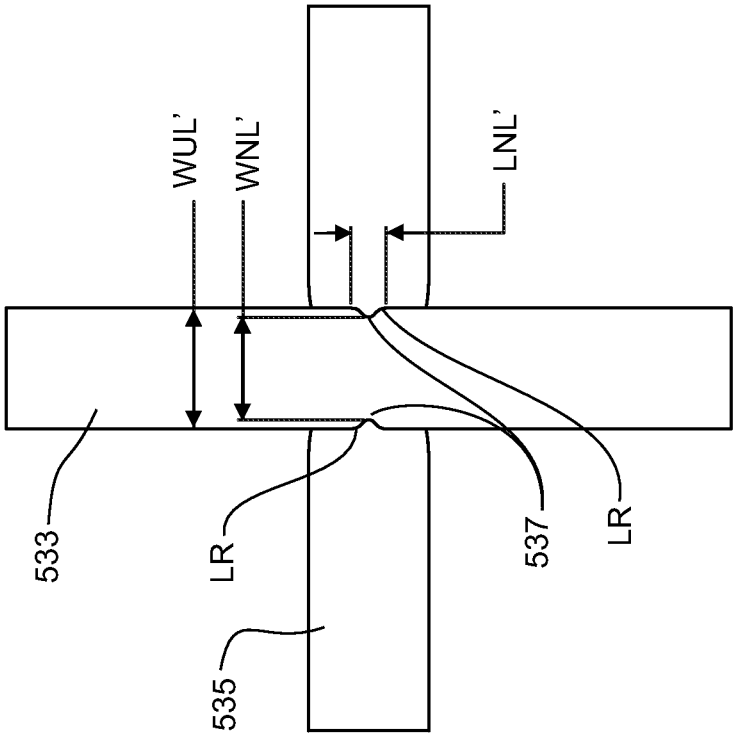


FIGURE 67(b)

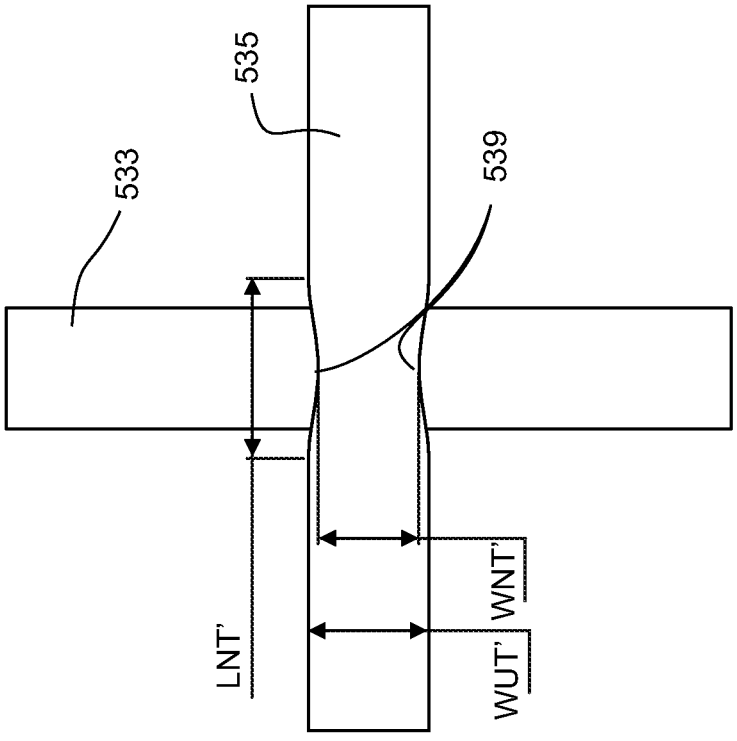
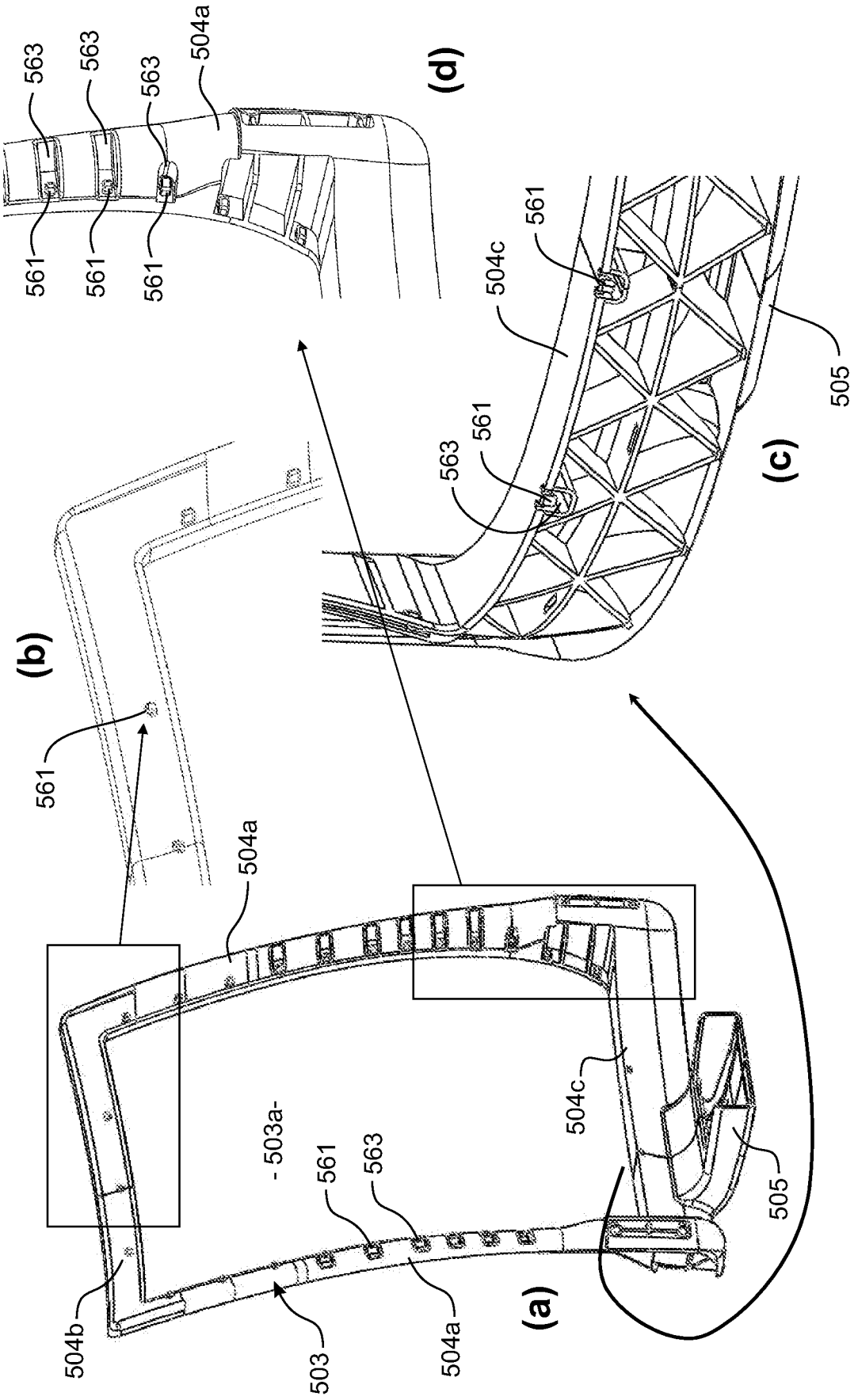


FIGURE 67(a)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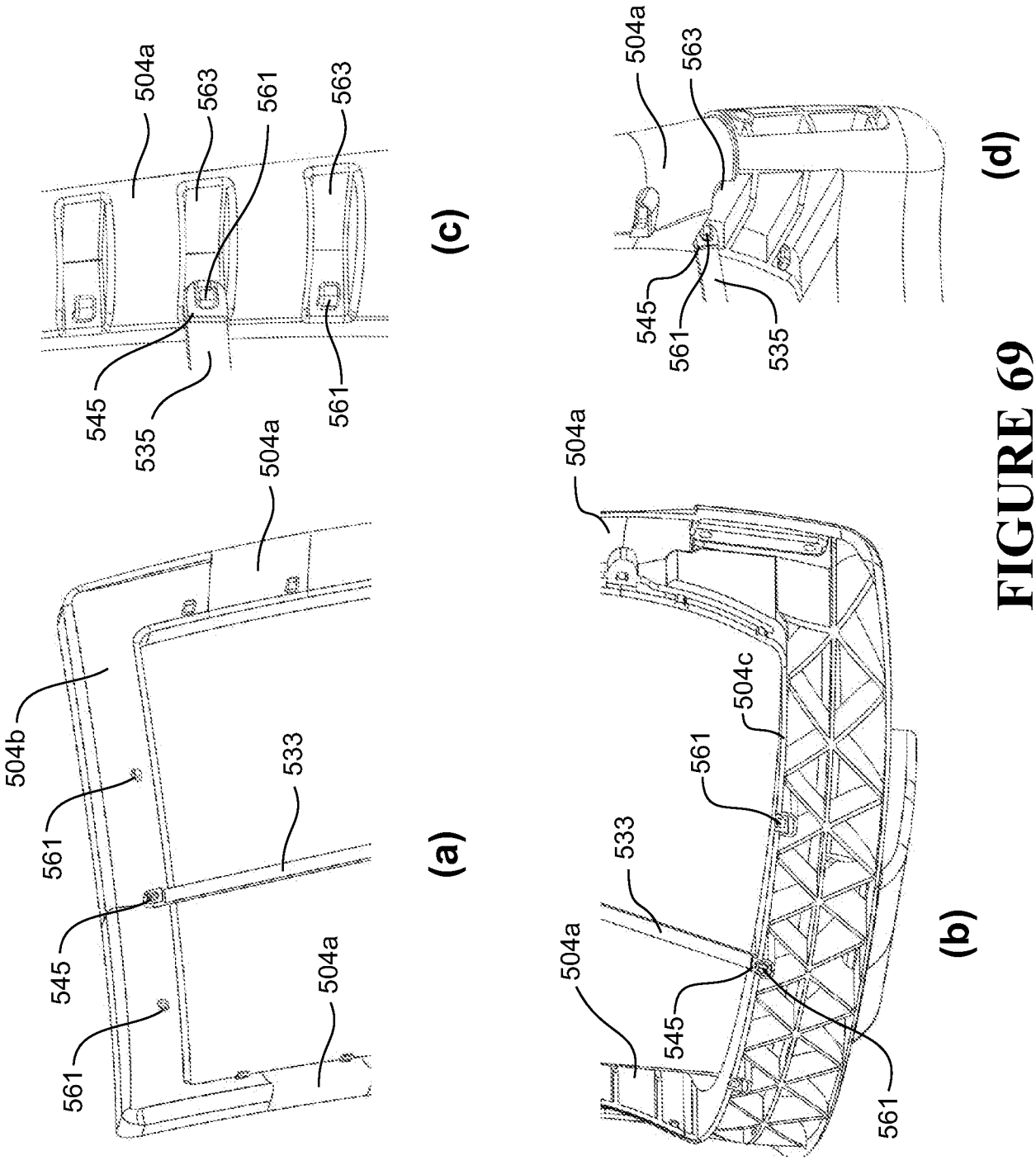
504a
(a)

FIGURE 68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(d)
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504a
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(b)

FIGURE 69

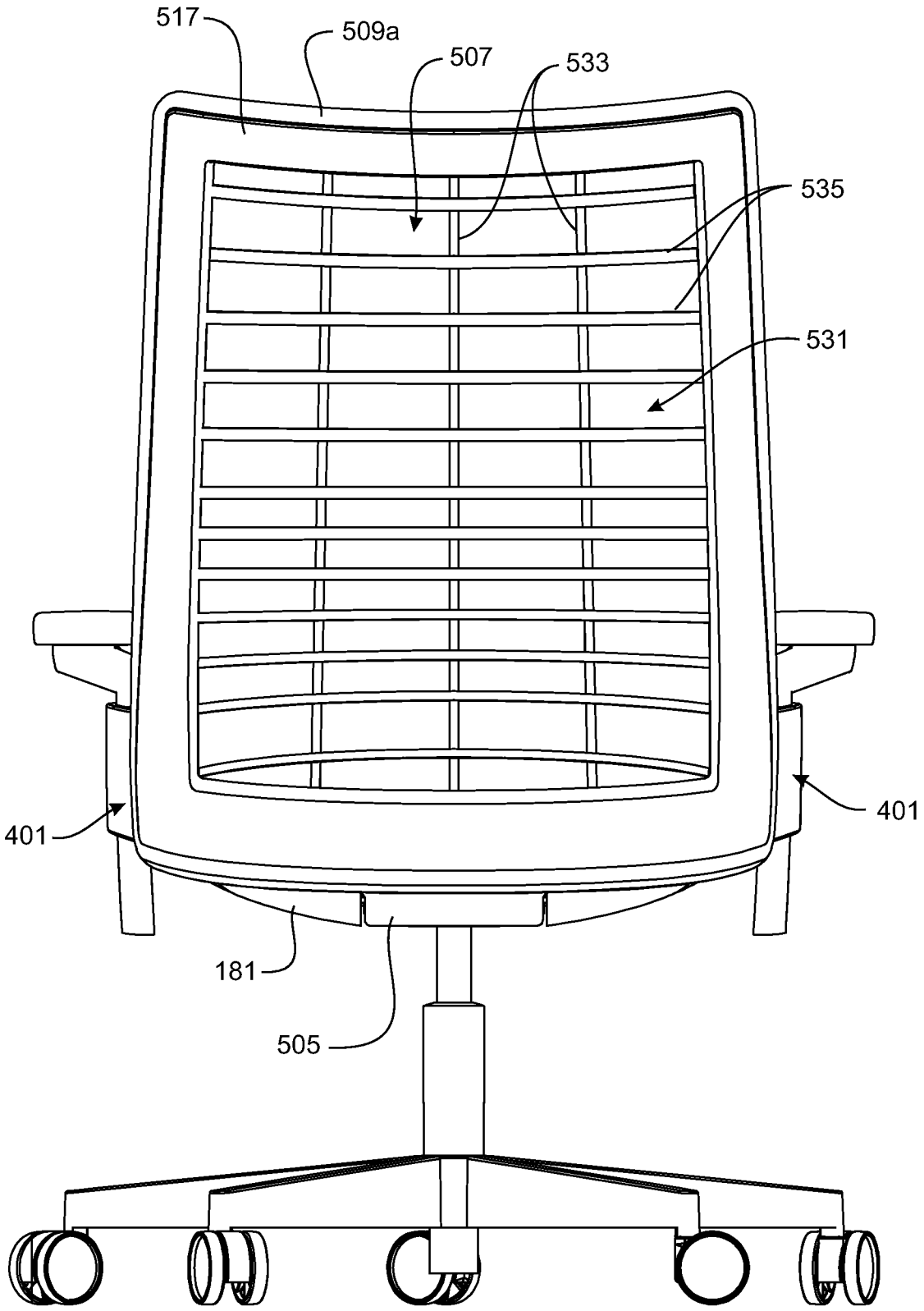

FIGURE 70

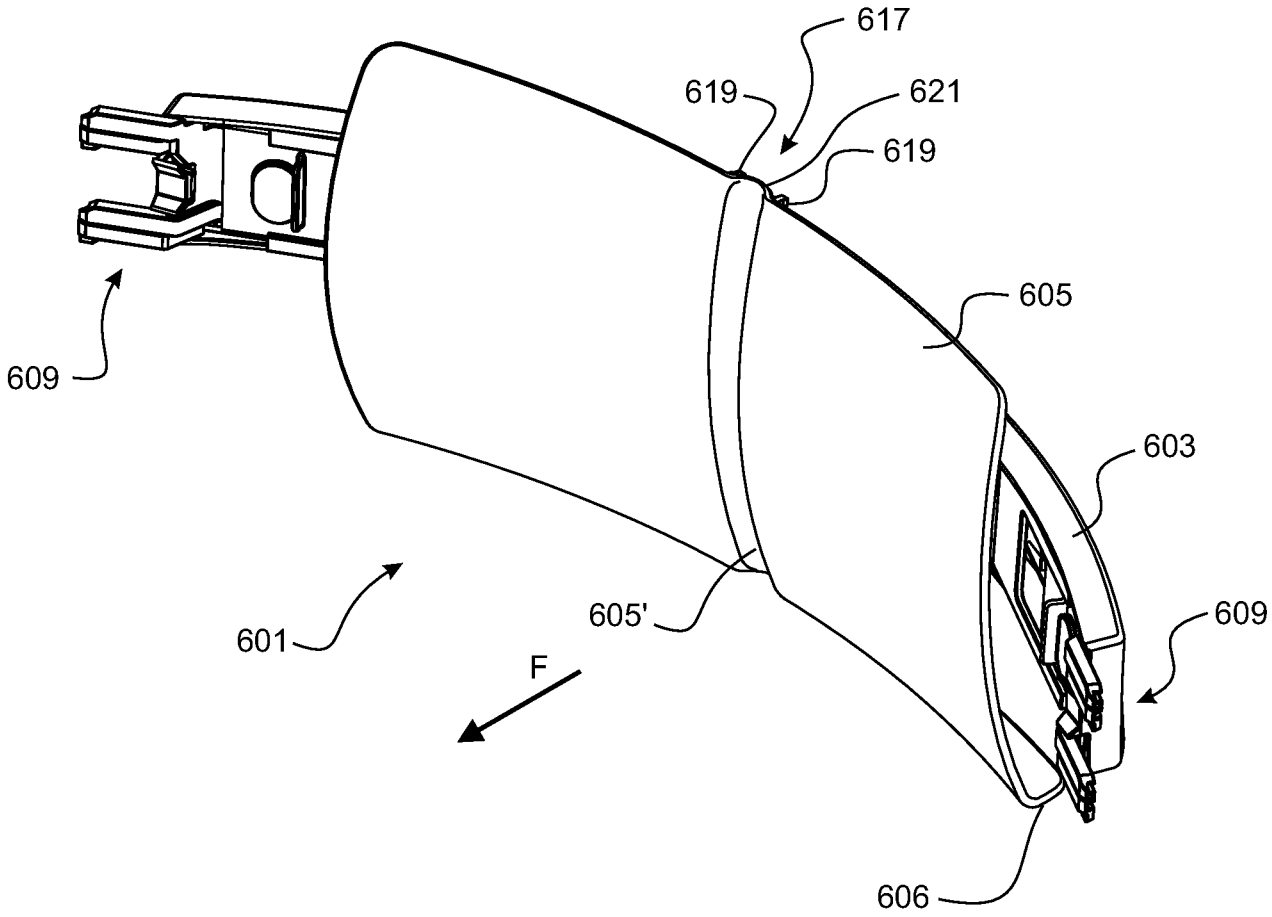

FIGURE 71

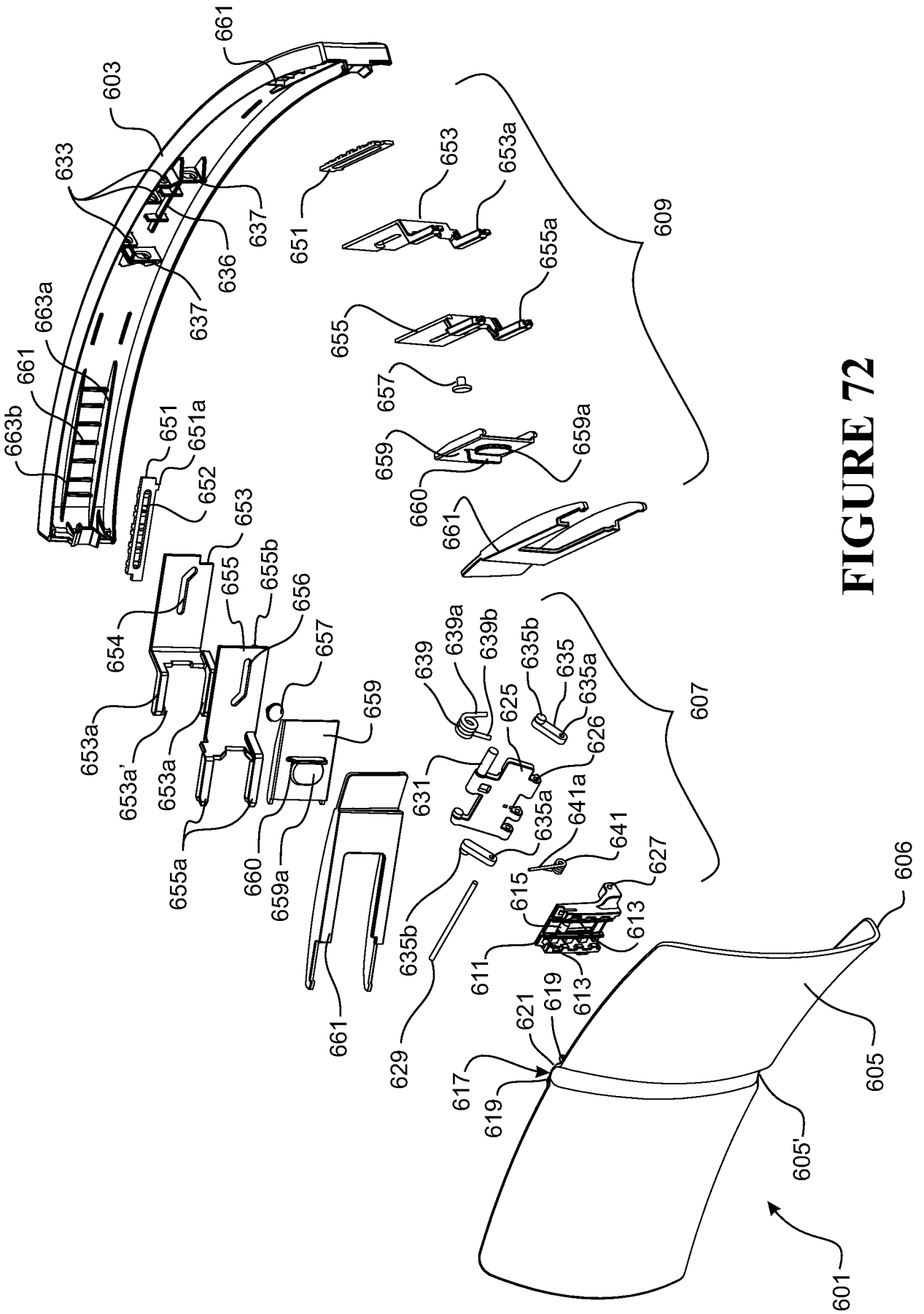
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FIGURE 72

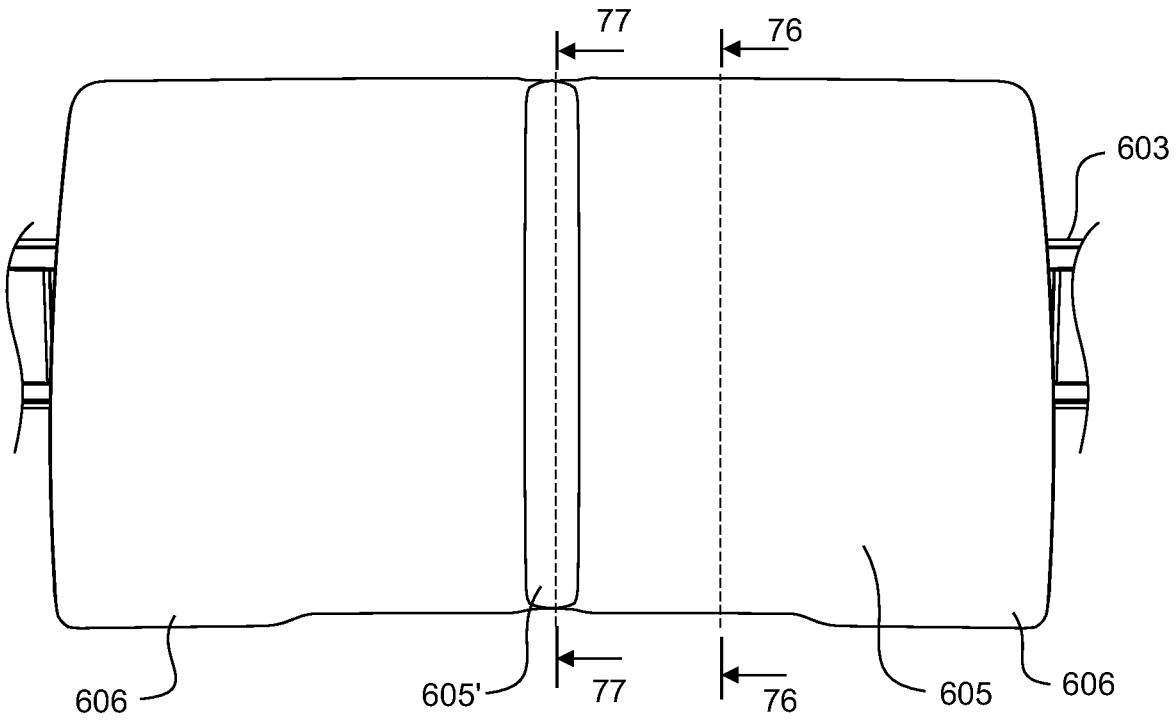


FIGURE 73

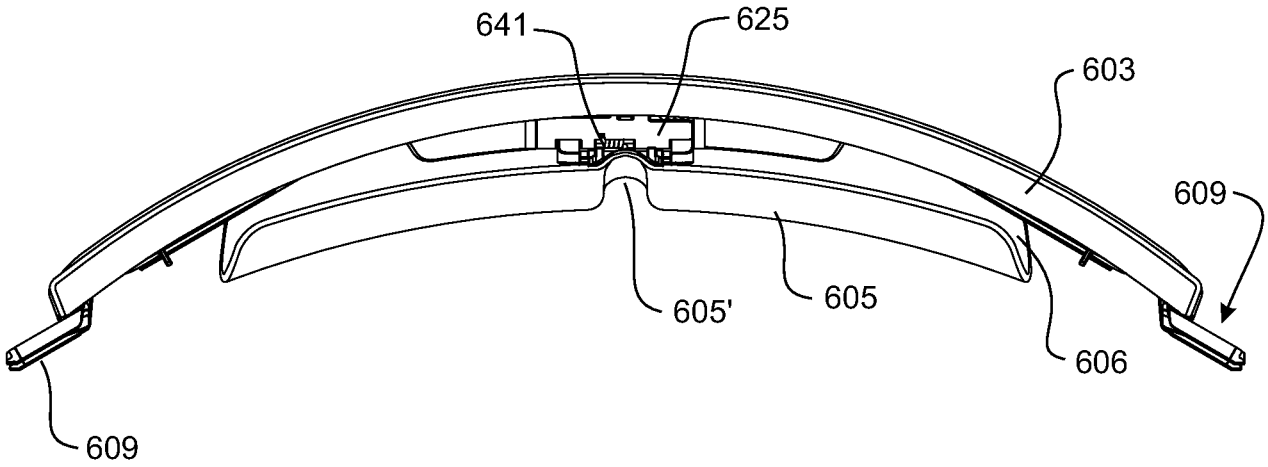


FIGURE 74

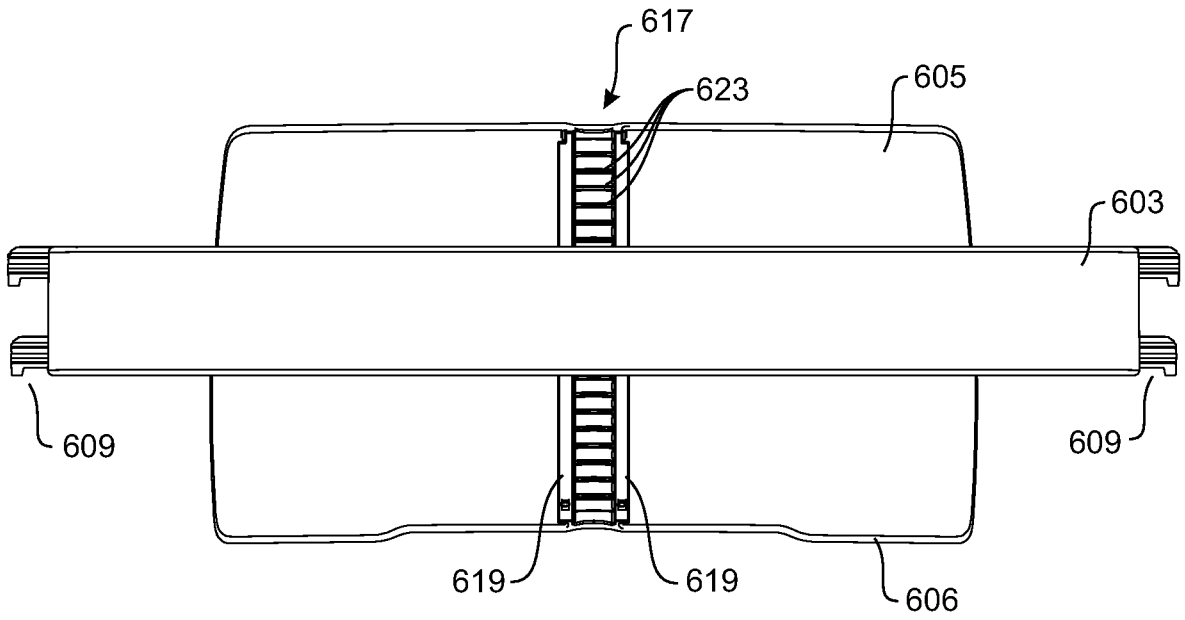


FIGURE 75

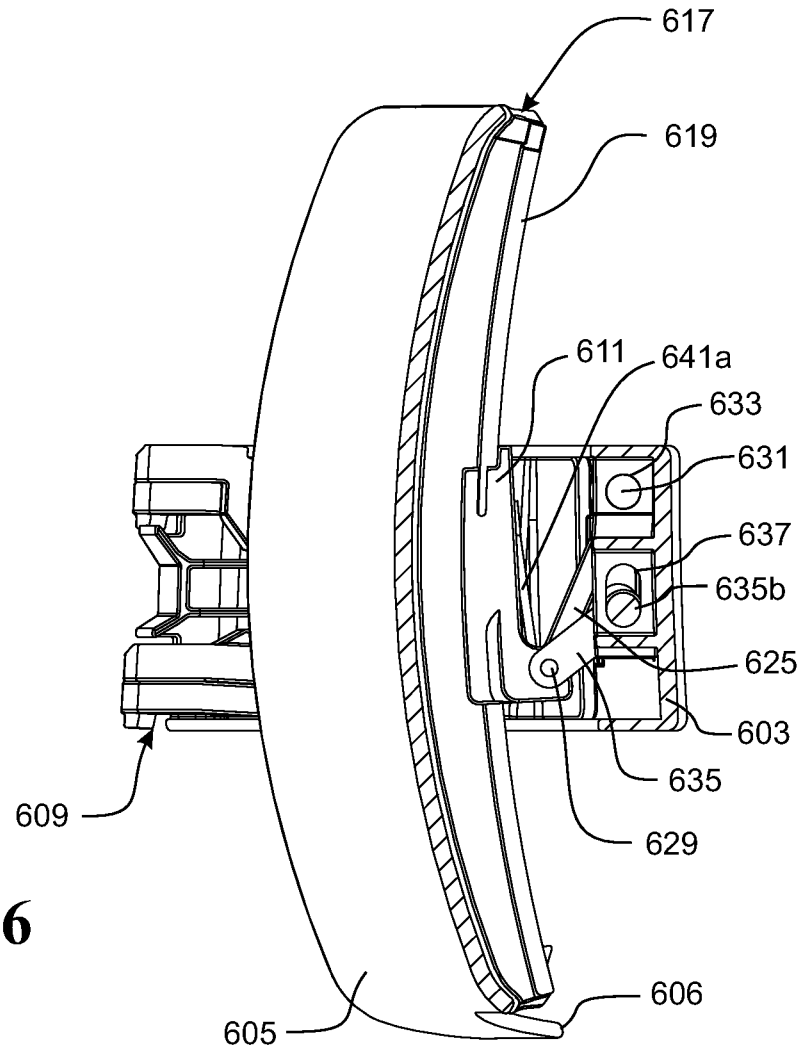


FIGURE 76

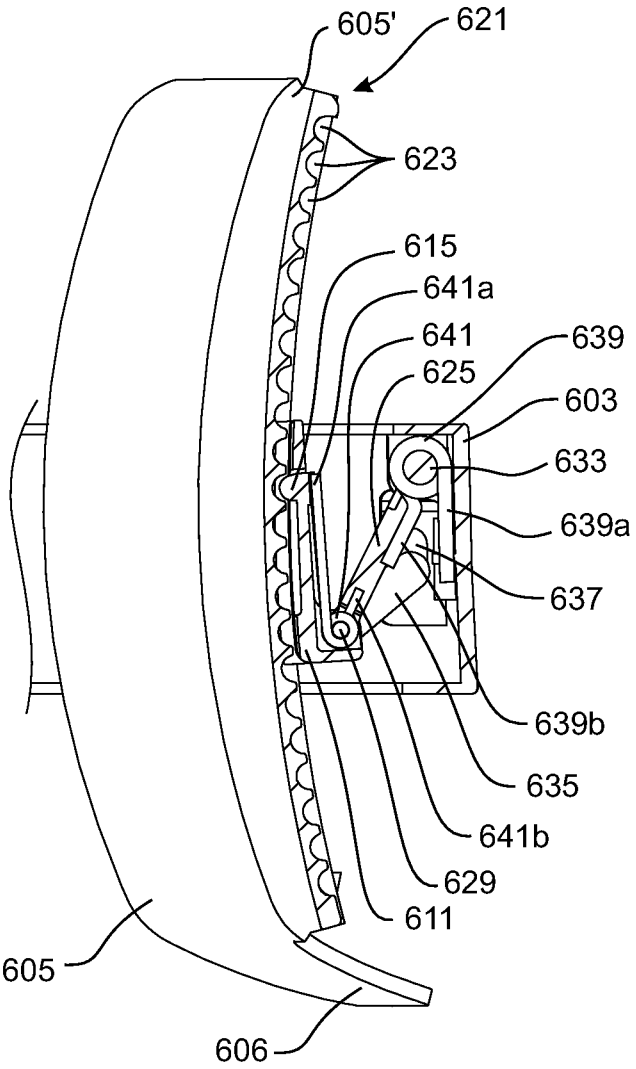


FIGURE 77(a)

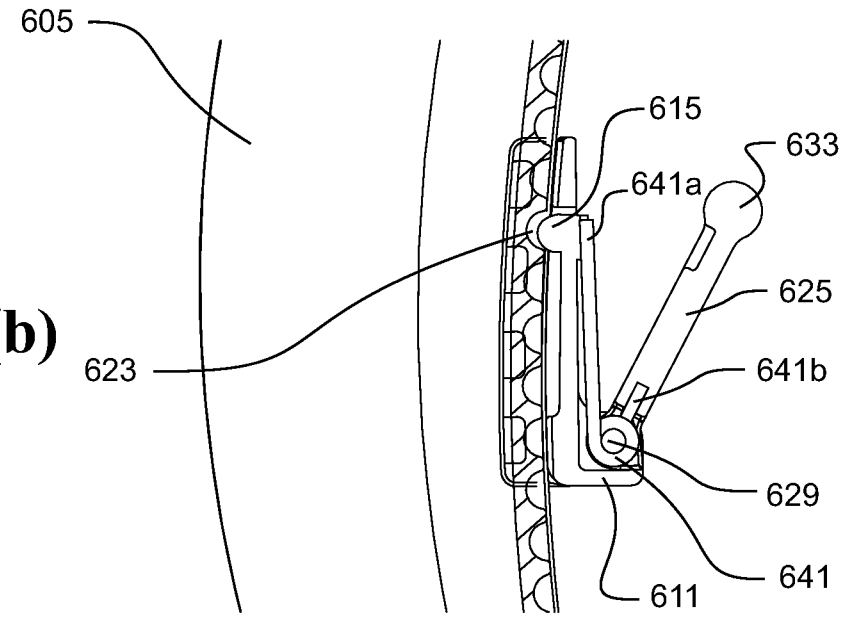


FIGURE 77(b)

FIGURE 78(a)

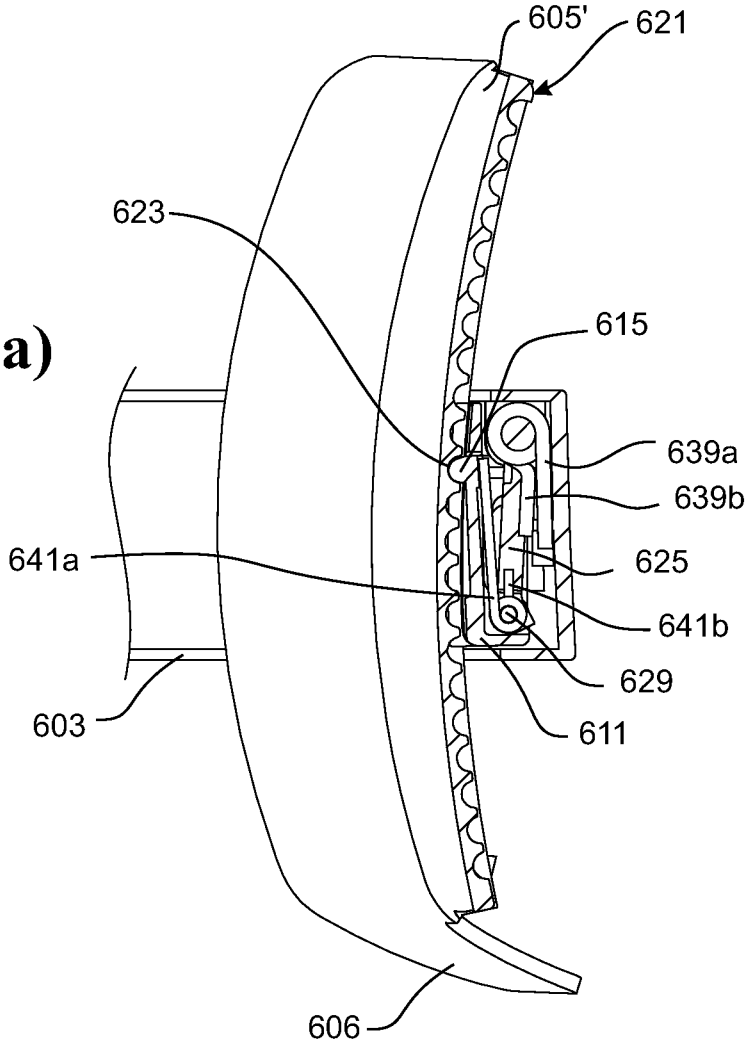
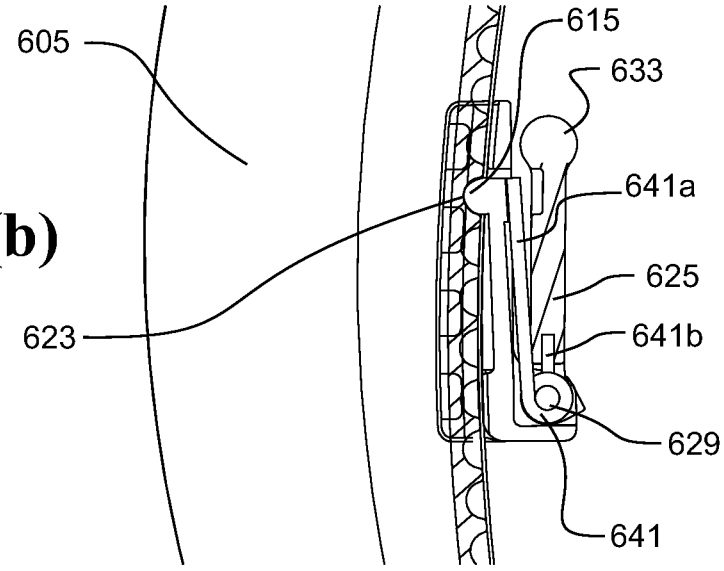


FIGURE 78(b)



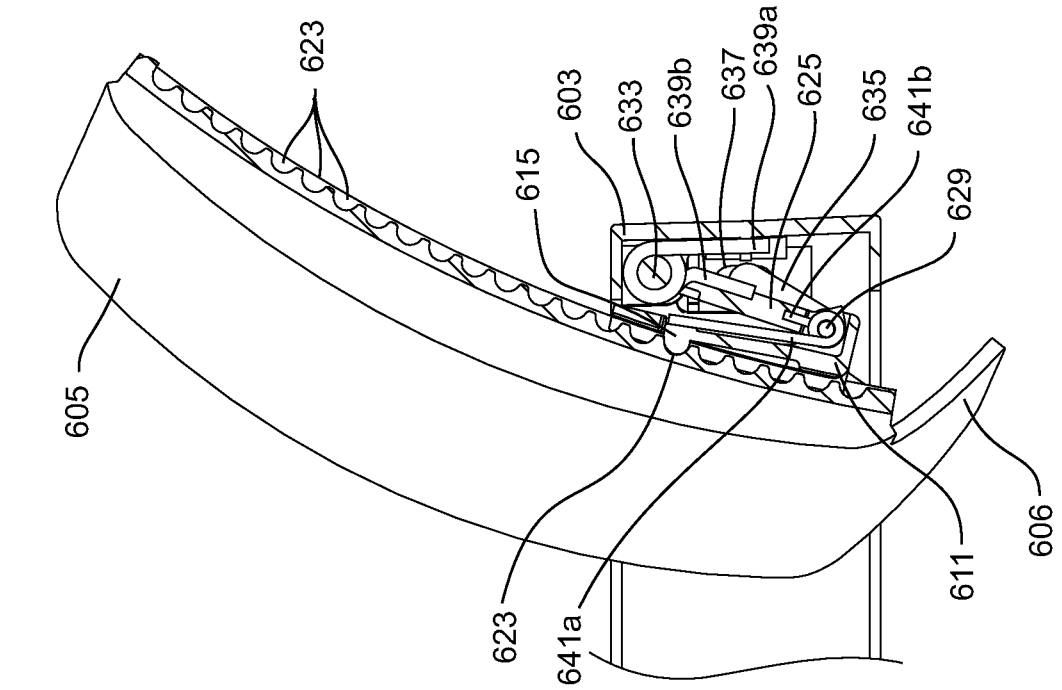


FIGURE 80

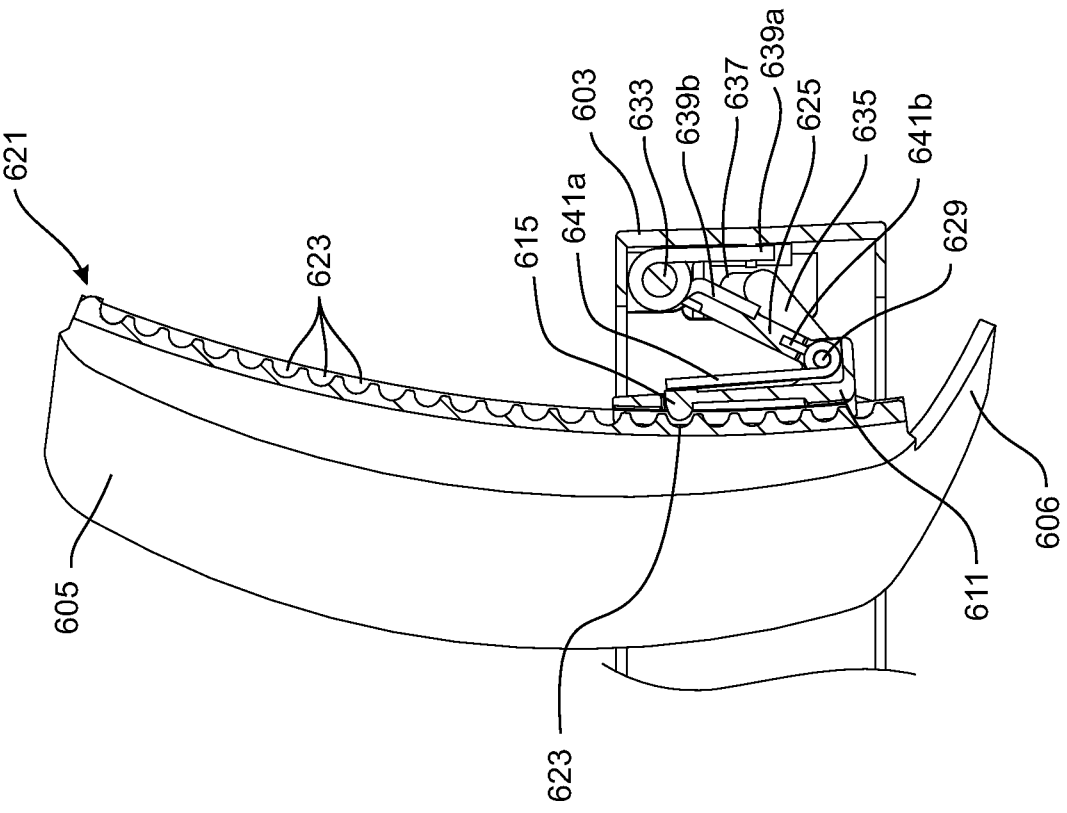


FIGURE 79

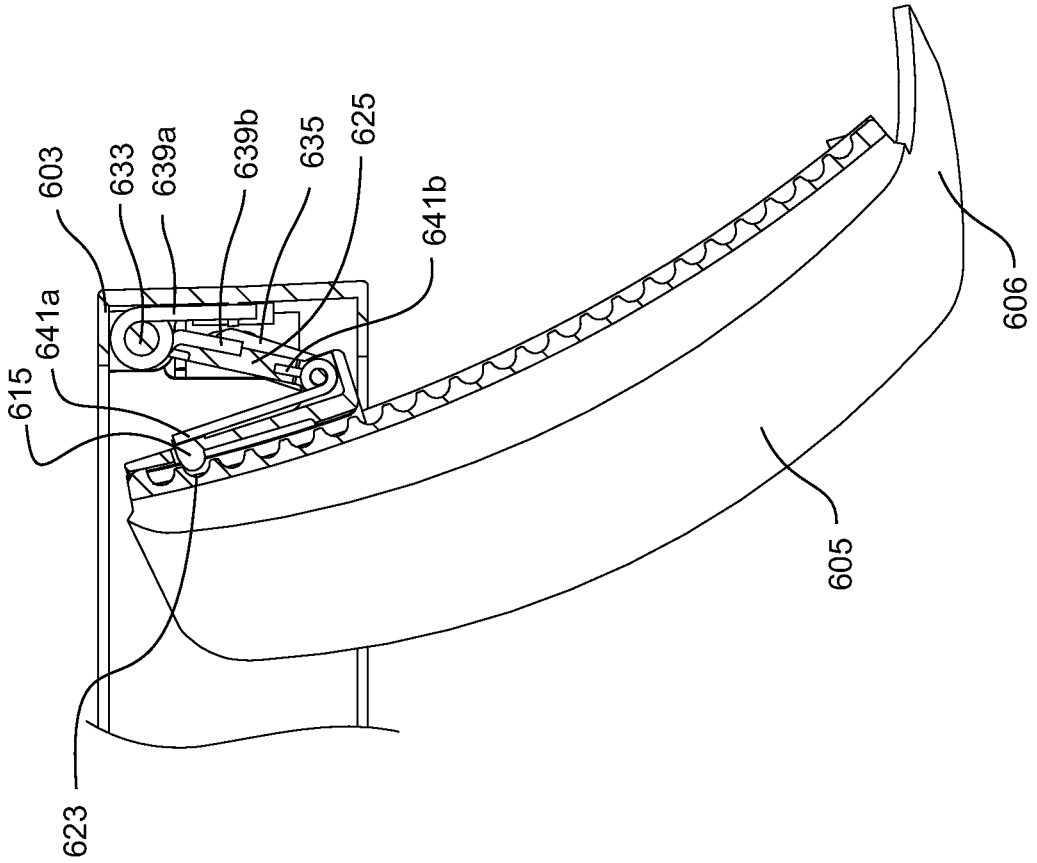


FIGURE 82

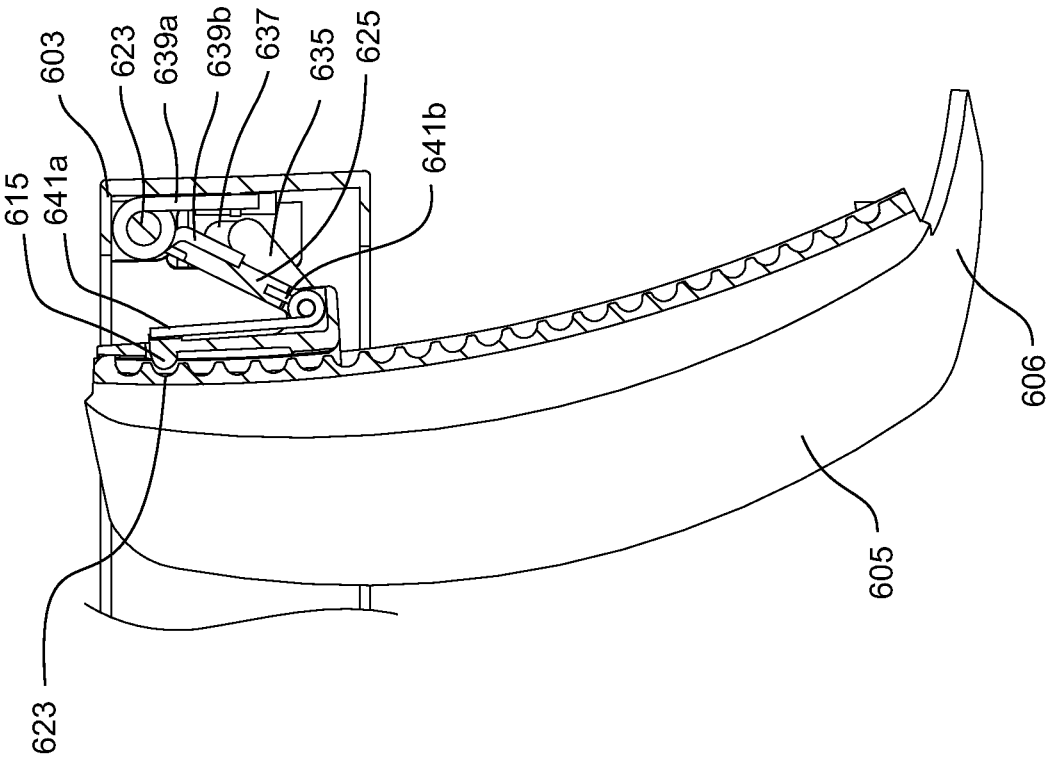


FIGURE 81

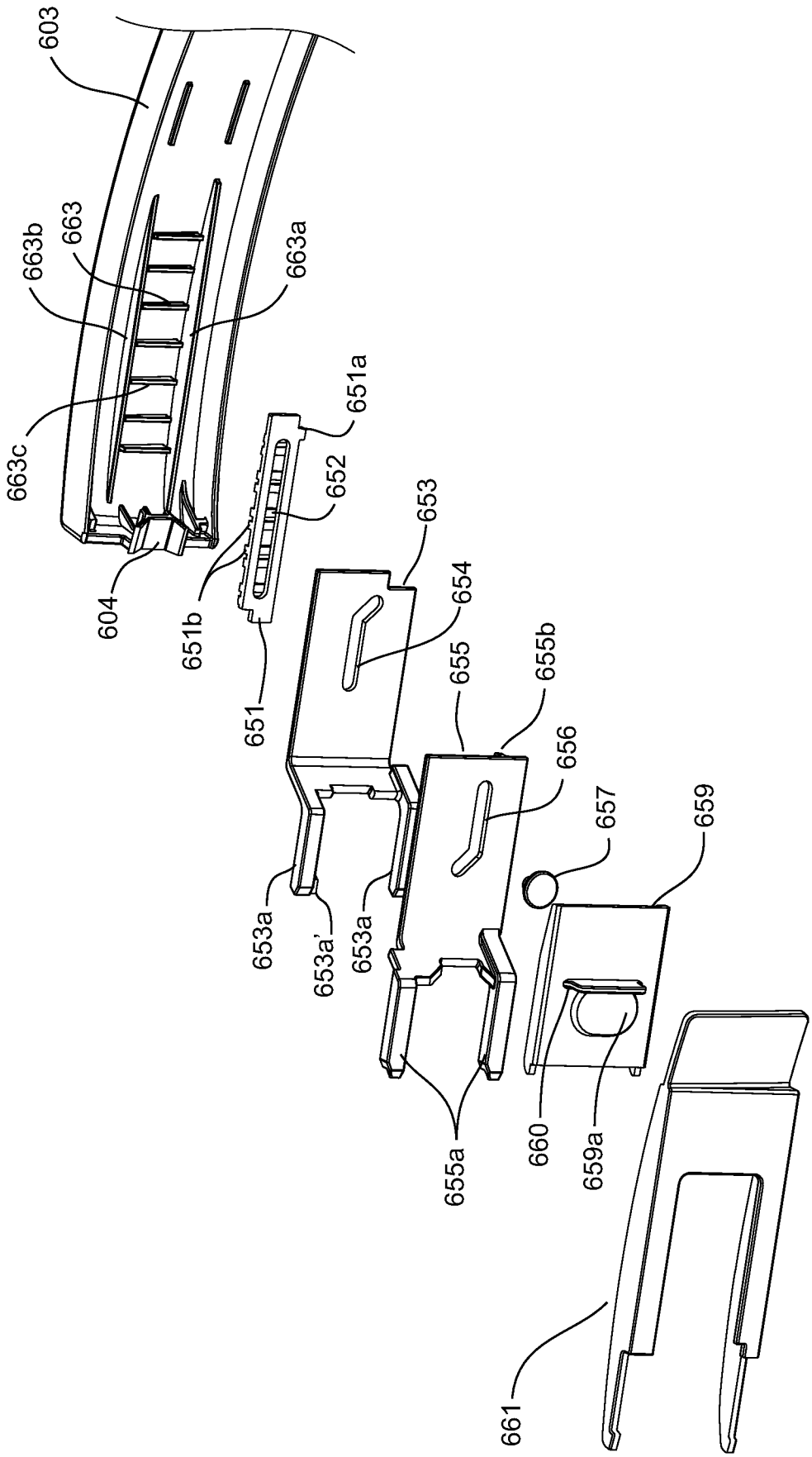

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FIGURE 83

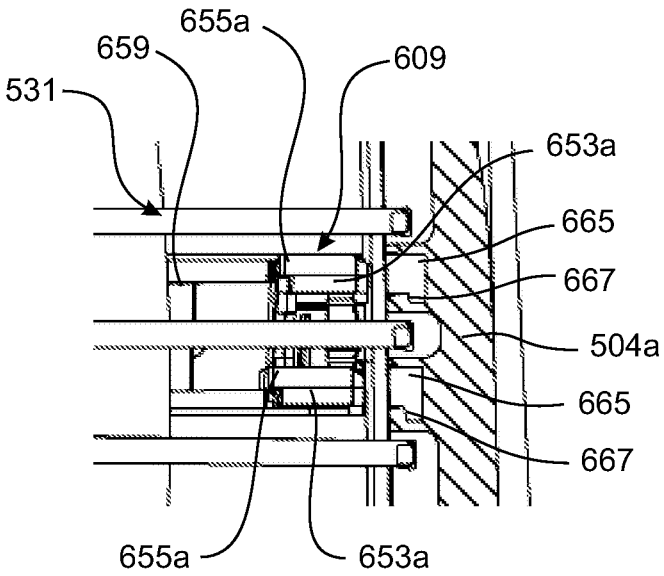

FIGURE 84(a)

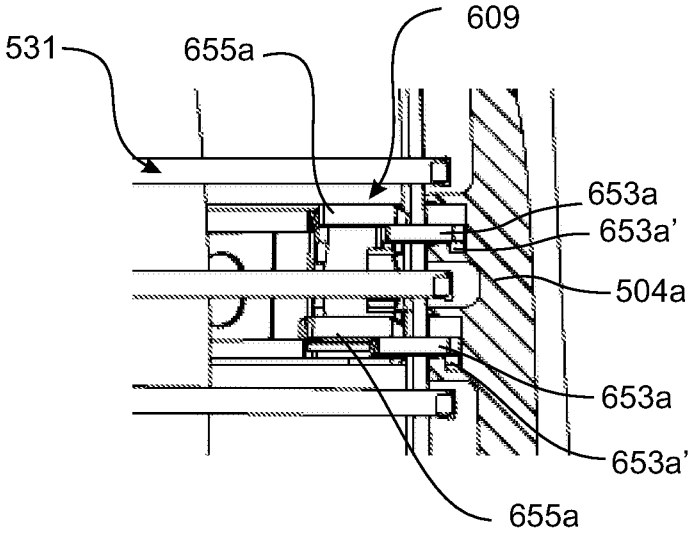

FIGURE 84(b)

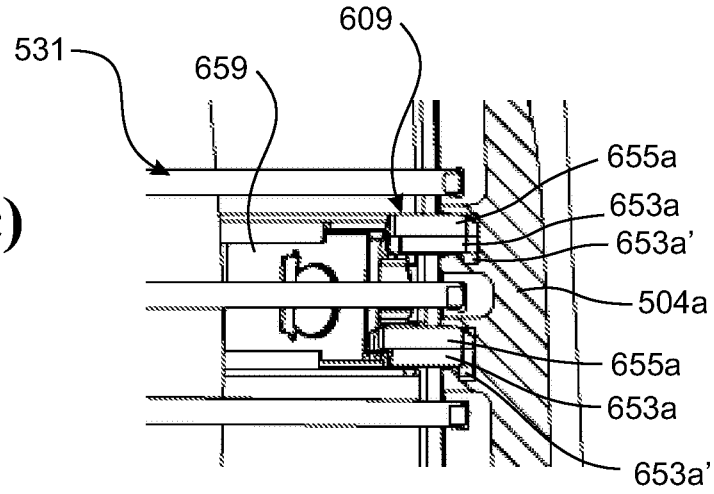

FIGURE 84(c)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2013/059247

A. CLASSIFICATION OF SUBJECT MATTER

A47C 7/36 (2006.01)

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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

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

WPI, EPODOC: IPC, CPC A47C1/14/LOW, A47C9/12/LOW, A47C16/00/LOW, A47C5/12/LOW, A47C7/40/LOW, A47C7/02/LOW, A47C7/16/LOW, A47C1/024/LOW, A47C1/032/LOW, A47C/LOW, B29D28/LOW, B29D29/00, B29D7/00, B29C41/02, B29C43/02, B60N2/66/LOW, E04G21/3266/LOW, E01F13/02/LOW, E01F7/04/LOW, E04G21/32/LOW & Keywords (strap, net, mesh, strain, stretch, integral, fasten, spring, carrier, bias, resilient, adjust, notch, recess, channel, vertical, height, position, plastic, poly, hytrel, stick, stuck, elongate) & like terms.
ESPACENET, AUSPAT: Keywords (FORMWAY FURNITURE, Damon Burwell, Aaron Young, Paul Wilkinson, Christopher Bisman, Stuart Munro, James Prier)
ESPACENET, Google Patents: Keywords (chair, bias, vertical, adjust, mould, strap, weave, lattice) & like terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

[X] Further documents are listed in the continuation of Box C

[X] See patent family annex

* Special categories of cited documents:

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
3 March 2014	03 March 2014
Name and mailing address of the ISA/AU	**Authorised officer**
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustralia.gov.au Facsimile No.: +61 2 6283 7999	Jason Barrido AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. 0262104086

INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. **PCT/IB2013/059247**
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0532476 A1 (CO.FE.MO S.P.A.) 17 March 1993 Abstract and figures 1-6	1-2 and 9-23
X	US 4201814 A (GILBERT et al.) 06 May 1980 Column 1 lines 17-22, figures 1-6	24-28, 30-31, 33-48, 50 and 52-53
X	US 3840269 A (AMBROSE) 08 October 1974 Column 3 lines 7-36 and figure 4	24-26, 33-47 and 52-53
Y	EP 2364616 A1 (KINNARPS SAMAS GMBH) 14 September 2011 Paragraphs [0001] and [0015]	1-2 and 9-23
A	WO 1999/013004 A1 (DSM N.V.) 18 March 1999 Page 1 lines 15-22, page 5 lines 21-25	35-39

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2013/059247

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

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

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
the subject matter listed in Rule 39 on which, under Article 17(2)(a)(i), an international search is not required to be carried out, including

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

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

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

See Supplemental Box for Details

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☒ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
1-53

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.

Supplemental Box

Continuation of: **Box III**

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

This Authority has found that there are different inventions based on the following features that separate the claims into distinct groups:

- Group 1: Claims 1-23 relate to a support assembly for use in a chair. The feature of a mounting member, occupant support with engagement features, carrier with an engagement member to engage the features of the support for selective positioning of the support relative to the carrier, a biasing arrangement connecting the carrier to the mounting member, and wherein the engagement between the member of the carrier and the feature of the support increases upon application of rearward force to the support is specific to this group of claims.

- Group 2: Claims 24-53 relate to a moulded article. The feature of first elongate straps forming a first layer, second elongate straps forming a second layer wherein some of the first straps overlap with at least some of the second straps, and a plurality of joiner members integrally moulded with the first and second straps that connect between the straps in the regions they overlap is specific to this group of claims.

- Group 3: Claims 54-80 relate to a chair. The feature of a supporting frame, occupant support, reclinable back portion, and a recline mechanism which lifts the seat portion when back portion reclines wherein the recline mechanism comprises a back support arm pivotally connecting the back portion to the frame to a forward portion of the seat and a rocker arm pivotally connecting the frame to a rearward portion of the seat and connected to the back support arm is specific to this group of claims.

- Group 4: Claims 81-103 relate to a chair. The feature of a supporting frame, occupant support, reclinable back portion, and a recline resistance mechanism comprising a resistance device connected to one of the back portion, seat or supporting frame, further comprising a first and second retainer both connected to another one of the back portion, seat or supporting frame wherein the second retainer is movable to adjust a reaction point between the resistance device and the back, seat or frame to vary the recline resistance, wherein the first retainer preloads the resistance device when the back is generally upright is specific to this group of claims.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

When there is no special technical feature common to all the claimed inventions there is no unity of invention.

In the above groups of claims, the identified features may have the potential to make a contribution over the prior art but are not common to all the claimed inventions and therefore cannot provide the required technical relationship. Therefore there is no special technical feature common to all the claimed inventions and the requirements for unity of invention are consequently not satisfied *a priori*.

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/IB2013/059247**

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
EP 0532476 A1	17 Mar 1993	EP 0532476 A1	17 Mar 1993
US 4201814 A	06 May 1980	GB 1595331 A	12 Aug 1981
		NL 7807044 A	04 Jan 1979
		US 4201814 A	06 May 1980
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		EP 2364616 B1	28 Nov 2012
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		WO 9913004 A1	18 Mar 1999

End of Annex

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

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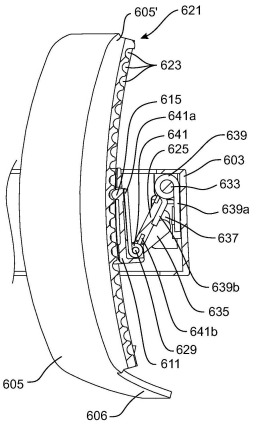
权利要求书7页 说明书34页 附图84页

(54)发明名称

椅子以及承托件

(57)摘要

用于椅子的可调节承托组件具有安装部件603、用于承托椅子就座者的身体的一部分的承托件605以及可滑动地承载承托件的载件611。该承托件具有多个啮合件621而载件具有啮合部件615，啮合部件与啮合件选择性地可啮合以使承托件相对于载件可选择性地被定位于多个位置。偏压装置607操作地将载件611连接至安装部件603并将载件611和承托件605向前偏压。当向承托件施加向后的力时，啮合部件615和被啮合的啮合件621之间的啮合度增加。



CN 104869868 A

1.用于椅子的可调节承托组件,该承托组件包含 :

安装部件 ;

用于承托椅子就座者的身体的一部分的承托件 ;

载件,其可滑动地承载承托件,该承托件包含多个啮合件而该载件包含啮合部件,啮合部件可选择性地与啮合件啮合以使承托件相对载件可选择性地被定位于多个位置 ;和

偏压装置,其操作地将载件连接至安装部件并被配置以将载件和承托件向前偏压 ;

其中当向承托件施加向后的力时,啮合部件和被啮合的啮合件之间的啮合度增加。

2.如权利要求 1 所述的可调节承托件,其中该偏压装置包含偏压部件,其作用于啮合部件上以将啮合部件往承托件偏压。

3.如权利要求 2 所述的可调节承托件,其中当向承托件施加该向后的力时,该偏压部件抗拒啮合部件往安装部件的向后移动多于其抗拒载件往安装部件的向后移动。

4.如权利要求 1 至 3 之任一所述的可调节承托件,其中该偏压装置包含 :

中间部件,其操作地连接至安装部件以及载件 ;

第一偏压部件,其设于安装部件和中间部件之间 ;以及

第二偏压部件,其设于载件和中间部件之间。

5.如权利要求 4 所述的可调节承托件,其中该第一和第二偏压部件是相反定向的扭力弹簧。

6.如权利要求 4 或 5 所述的可调节承托件,其中该中间部件相对于安装部件可绕第一轴线枢转,而载件则相对于中间部件可绕实质上平行的第二轴线枢转。

7.如权利要求 6 所述的可调节承托件,其进一步包含至少一条联接臂,其具有第一端以及第二端,第一端相对于安装部件或中间部件为可枢转的,第二端相对于安装部件或中间部件之另一为可滑动的。

8.如权利要求 7 所述的可调节承托件,其包含两条联接臂,每条臂具有可于安装部件上的槽中滑动的第一端以及可绕中间部件第二轴线枢转的第二端。

9.如权利要求 1 至 8 之任一所述的可调节承托件,其中该啮合部件于前后方向中与啮合件啮合。

10.如权利要求 1 至 9 之任一所述的可调节承托件,其中该承托件可相对于安装部件倾斜。

11.如权利要求 1 至 10 之任一所述的可调节承托件,其中该承托件是高度可调的。

12.如权利要求 1 至 11 之任一所述的可调节承托件,其中该啮合部件是具弹性的。

13.如权利要求 1 至 12 之任一所述的可调节承托件,其中该载件包含导件,其用于滑动地与承托件后侧上匹配的导向件啮合。

14.如权利要求 13 所述的可调节承托件,其中承托件上的导向件包含导向凸部或凸缘 , 而载件包含至少一条导向沟道以滑动地接收导向凸部或凸缘。

15.如权利要求 13 或 14 所述的可调节承托件,其中承托件上的导向件以固定至承托件的导向部件提供。

16.如权利要求 1 至 15 之任一所述的可调节承托件,其中该些啮合件包含面向后的弧形的缺口 ;而啮合部件则包含指向前的弧形的凸部。

17.如权利要求 1 至 16 之任一所述的可调节承托件,其中该承托件是腰部承托件。

18. 如权利要求 17 所述的可调节承托件，其中该承托件于平面视图中向前为凹形的，并包含置中的、实质上垂直的凹位以容纳使用者的脊骨。

19. 如权利要求 17 或 18 所述的可调节承托件，其中该安装部件被配置以安装至椅子的靠背框架。

20. 椅子，其包含具有两侧部部分的靠背框架，以及如权利要求 1 至 19 之任一所述的可调节承托件，其中该安装部件是附接至该两侧部部分。

21. 如权利要求 20 所述的椅子，其中该安装部件相对于该两侧部部分是固定的。

22. 如权利要求 20 或 21 所述的椅子，其中该靠背框架支撑柔软的靠背部分，而承托件被定位于柔软的靠背部分的后方。

23. 如权利要求 22 所述的椅子，其中在没有后向的负载于靠背部分时承托件是从靠背部分向后隔开的，而在施加足够的向后的力至柔软的靠背部分时，靠背部分的至少一部分被向后移动至接触该承托件。

24. 模制的物件，其适于应变定向，该物件包含：

在第一层中形成的多条第一长形带；

在第二层中形成的多条第二长形带，以致至少一些第一长形带与至少一些第二长形带重叠；以及

多个连接部件，其与第一长形带和与第二长形带一体地模制，并在第一长形带和第二长形带重叠的所述区域中于第一长形带和第二长形带之间连接。

25. 如权利要求 24 所述的模制的物件，其中该些第一长形带的至少一部分、该些第二长形带的至少一部分以及该些连接部件的至少一部分皆适于应变定向。

26. 如权利要求 25 所述的模制的物件，其中基本上该些第一长形带的整体、该些第二长形带的整体以及该些连接部件的整体皆适于应变定向。

27. 如权利要求 24 至 26 之任一所述的模制的物件，其中该些第一长形带包含相邻于连接部件的带颈区域，以补偿因连接部件这附加物料引致的应变定向的减少。

28. 如权利要求 27 所述的模制的物件，其中所述带颈区域以延伸进第一长形带侧部的缺口或凹位形成。

29. 如权利要求 28 所述的模制的物件，其中该些缺口或凹位被构形以致在应变定向后，该些第一长形带的侧部实质地沿其整个长度皆实质地平行。

30. 如权利要求 24 至 29 之任一所述的模制的物件，其中该些第二长形带包含相邻于连接部件的带颈区域，以补偿因连接部件这附加物料引致的应变定向的减少。

31. 如权利要求 30 所述的模制的物件，其中该些带颈区域以延伸进第二长形带侧部的缺口或凹位形成。

32. 如权利要求 31 所述的模制的物件，其中该些缺口或凹位被构形以致在应变定向后，该些第二长形带的侧部实质地沿其整个长度皆实质地平行。

33. 如权利要求 24 至 32 之任一所述的模制的物件，其中该些第一长形带包含大体上纵向延伸的带，且其中该些第二长形带包含大体上横向延伸的带。

34. 如权利要求 24 至 33 之任一所述的模制的物件，其中该模制的物件实质上是扁平的。

35. 如权利要求 24 至 34 之任一所述的模制的物件，其中该模制的物件由包含热塑性的

聚酯弹性体的树脂模制。

36. 如权利要求 35 所述的模制的物件，其中该热塑性的聚酯弹性体包含嵌段共聚物。

37. 如权利要求 36 所述的模制的物件，其中该热塑性的聚酯弹性体是聚对苯二甲酸丁二醇酯和聚醚二醇的嵌段共聚物。

38. 如权利要求 35 至 37 之任一所述的模制的物件，其中该树脂被选择以致模制的物件在根据 ASTM 2240 测试下具有约 30D 至约 55D 的范围内的硬度。

39. 如权利要求 24 至 38 之任一所述的模制的物件，其中该物件的至少一部分可被拉伸至初始维度的至少约 400％而不破坏，以致发生应变定向。

40. 组装承托件的方法，其包含 ：

提供框架 ；

提供如权利要求 24 至 39 之任一所述的模制物件，其中模制物件的至少部分具有的如此模制成形的维度小于框架相应的维度 ；

将模制物件的所述至少部分拉伸以使其具有的拉伸后的维度大于框架相应的维度，并且该些第一长形带的至少一部分以及该些第二长形带的至少一部分发生应变定向 ；

将物件的所述至少部分放松，以致其具有处于如此模制成形的维度和拉伸后的维度之间的放松后的维度 ；

并以框架支撑该物件。

41. 如权利要求 40 所述的方法，其中该框架包含至少部分地被框架部分限定的开口，而该方法包含将物件以框架支撑，其中该物件的部分延伸横过开口，以形成柔软的悬挂的承托表面。

42. 如权利要求 40 或 41 所述的方法，其中该些第一长形带包含大体上纵向延伸的带，且其中该些第二长形带包含大体上横向延伸的带。

43. 如权利要求 42 所述的方法，其包含将该些大体上纵向延伸的带拉伸和放松，然后才将该些大体上横向延伸的带拉伸和放松。

44. 如权利要求 42 所述的方法，其包含将该些大体上横向延伸的带拉伸和放松，然后才将该些大体上纵向延伸的带拉伸和放松。

45. 如权利要求 42 所述的方法，其包含在将该些大体上横向延伸的带拉伸和放松的同时将该些大体上纵向延伸的带拉伸和放松。

46. 如权利要求 40 至 45 之任一所述的方法，其中将物件的至少部分拉伸的步骤引致连接部件的拉伸，以致连接部件发生应变定向。

47. 如权利要求 46 所述的方法，其中连接部件在纵向方向和横向方向上皆被应变定向。

48. 如权利要求 40 至 47 之任一所述的方法，其中该些第一长形带于相邻连接部件之处包含带颈的区域，以补偿因连接部件这附加物料引致的应变定向的减少。

49. 如权利要求 48 所述的方法，其中以延伸进第一长形带侧部的缺口或凹位形成该些带颈区域，且其中在放松后的所述物件中，该些第一长形带的侧部沿其实质地整个长度皆实质地平行。

50. 如权利要求 40-49 之任一所述的方法，其中第二长形带于相邻连接部件之处包含带颈的区域，以补偿因连接部件这附加物料引致的应变定向的减少，以补偿因连接部件这

附加物料引致的应变定向的减少。

51. 如权利要求 50 所述的方法，其中以延伸进在放松后的物件中的第二长形带的相邻于连接部件的侧部的缺口或凹位形成该些带颈区域，且其中该些第二长形带的侧部实质地沿其整个长度皆实质地平行。

52. 用于椅子的靠背部分，其以权利要求 40 至 51 之任一所述的方法组装。

53. 用于椅子的座位部分，其以权利要求 40 至 51 之任一所述的方法组装。

54. 椅子，其包含 ：

支撑框架 ；

用于承托就座者的座位部分 ；

用于承托就座者的背部的靠背部分，其相对支撑框架可后倾 ；以及

后倾机制，其被配置以在靠背部分后倾时升起座位部分，后倾机制包含操作地连接至靠背部分的靠背支撑臂，其枢转地连接至支撑框架并枢转地连接至座位部分相对地前向的部分，后倾机制还包含摇动臂，其枢转地连接至支撑框架、枢转地连接至座位部分相对地后向的部分，并操作地连接至靠背支撑臂以相对于靠背支撑臂移动。

55. 如权利要求 54 所述的椅子，其中当靠背部分后倾时，座位部分向上和向后地移动。

56. 如权利要求 54 或 55 所述的椅子，其中在靠背部分不后倾时座位部分具有后向的倾角，而当靠背部分完全后倾时座位部分具有更大的后向的倾角。

57. 如权利要求 54 至 56 之任一所述的椅子，其中在靠背部分不后倾时摇动臂是向下地向前地指向的，在靠背部分完全后倾时摇动臂侧是向上地向前地指向的。

58. 如权利要求 54 至 57 之任一所述的椅子，其中在靠背部分不后倾时靠背支撑臂的一部分大约是水平的，在靠背部分完全后倾时靠背支撑臂的该部分则是向上地向前地指向的。

59. 如权利要求 54 至 56 之任一所述的椅子，其中当靠背部分不后倾时摇动臂是向下地向前地指向的，当靠背部分完全后倾时摇动臂是向上地向前地指向的，且其中当靠背部分不后倾时靠背支撑臂的一部分大约是水平的，在靠背部分完全后倾时靠背支撑臂的该部分则是向上地向前地指向的，其中摇动臂的向上和向前角度比靠背支撑臂的该部分的向上和向前角度大。

60. 如权利要求 59 所述的椅子，其中摇动臂的向下和向前的角度为水平以下约 13 度，摇动臂的向上和向前的角度为水平以上约 24 度，且其中靠背支撑臂的该部分的向上和向前的角度为水平以上约 17 度。

61. 如权利要求 54 至 60 之任一所述的椅子，其中靠背支撑臂和支撑框架的枢轴连接点处于摇动臂至支撑框架的操作连接点的前方。

62. 如权利要求 61 所述的椅子，其中摇动臂和支撑框架的枢轴连接点处于或相邻于支撑框架的后部部分。

63. 如权利要求 62 所述的椅子，其中靠背支撑臂和支撑框架的枢轴连接点的位置相邻于摇动臂和支撑框架的枢轴连接点并在其前方。

64. 如权利要求 63 所述的椅子，其中摇动臂和座位部分的枢轴连接点大体上与靠背支撑臂和支撑框架的枢轴连接点于椅子的前后方向中对齐。

65. 如权利要求 54 至 64 之任一所述的椅子，其中靠背支撑臂至座位部分相对地前向的

部分的枢轴连接包含枢转与滑动的连接。

66.如权利要求54至65之任一所述的椅子，其中该摇动臂通过枢转地连接至靠背支撑臂和枢转地连接至摇动臂的连接联接操作地连接至靠背支撑臂。

67.如权利要求66所述的椅子，其中当靠背部分不后倾时，摇动臂和连接联接的枢轴连接点实质地处于连接联接和靠背支撑臂的枢轴连接点的垂直上方。

68.如权利要求54至65之任一所述的椅子，其中摇动臂以枢转与滑动连接操作地连接至靠背支撑臂。

69.如权利要求68所述的椅子，其中该枢转与滑动连接包含在摇动臂上的销和靠背支撑臂中的槽。

70.如权利要求68所述的椅子，其中该枢转与滑动连接包含可转动地安装在摇动臂上的滚轮，其可沿靠背支撑臂的一表面滑动。

71.如权利要求54至70之任一所述的椅子，其中该后倾机制包含：两条靠背支撑臂，其操作地连接至靠背部分并枢转地连接至支撑框架并枢转地连接至座位部分的该相对地前向的部分；以及两条摇动臂，其枢转地连接至支撑框架、枢转地连接至座位部分相对地后向的部分，并操作地连接至各自的一条靠背支撑臂。

72.如权利要求71所述的椅子，其中该两条摇动臂通过两条连接联接相对于靠背支撑臂可动地连接，该两条连接联接各自枢转地连接至各自的其中一条靠背支撑臂和各自的其中一条摇动臂。

73.如权利要求71或72所述的椅子，其中支撑框架包含横楣件，其具有基座和一对相隔的侧壁，且其中每条靠背支撑臂的部分置于横楣件的侧壁的内侧。

74.如权利要求73所述的椅子，其中每条靠背支撑臂枢转地各自连接至横楣件的各自一个侧壁。

75.如权利要求54至74之任一所述的椅子，其中座位部分包含座位支撑件以及用于承托就坐者的座位表面，其中座位表面相对于座位支撑件于前后方向上选择地可动，且其中摇动臂和靠背支撑臂枢转地连接至座位支撑件。

76.如权利要求54至75之任一所述的椅子，其进一步包含后倾阻力机制以抵抗靠背部分往后倾位置的移动，且其中后倾阻力机制提供的阻力的幅度是选择地可调的。

77.如权利要求54至76之任一所述的椅子，其中座位包含座位表面下的壳体，在壳体的下侧具有中央凹位，且其中在靠背部分不后倾时，后倾机制实质地被容纳于该中央凹位中。

78.如权利要求54至77之任一所述的椅子，其中当靠背部分不后倾时，后倾机制的垂直高度为约40mm。

79.如权利要求54至78之任一所述的椅子，其中摇动臂的前端被配置以和座位部分啮合以提供限定靠背部分最大的后向后倾的后倾止动件。

80.如权利要求54至79之任一所述的椅子，其中靠背支撑臂的前端被配置以和支撑框架啮合以提供限定靠背部分竖直位置的直立止动件。

81.椅子，其包含：

支撑框架；

用于承托就座者的座位部分；

用于承托就座者的背部的靠背部分，其相对于支撑框架可于大体上竖直的位置和大体上后倾的位置之间后倾；以及

后倾阻力机制，以抵抗靠背部分往大体上后倾的位置的移动，该后倾阻力机制包含操作地连接至靠背部分、座位部分或支撑框架之其一的阻力装置，该后倾阻力机制还包含第一保持件和第二保持件，两者皆操作地连接至靠背部分、座位部分或支撑框架之另一，其中该第二保持件是可动的，以调节阻力装置和所述靠背部分、座位部分或支撑框架之另一之间的反动点，以改变后倾阻力机制所提供的后倾阻力的幅度，其中该第一保持件在靠背部分处于大体上竖直的位置时将阻力装置预载，且其中第二保持件可移动至至少一个位置，在所述位置中，在靠背部分在后倾位置时由第二保持件提供反动点。

82. 如权利要求 81 所述的椅子，其中在靠背部分处于大体上竖直的位置时，第二保持件的移动并不改变在阻力装置上的预载。

83. 如权利要求 81 或 82 所述的椅子，其中第一保持件与阻力装置啮合，以致该后倾阻力机制提供第一级的后倾阻力。

84. 如权利要求 83 所述的椅子，其中可将第二保持件移至一位置，在该位置中其提供第二级的后倾阻力，其不同于第一保持件提供的第一级的后倾阻力。

85. 如权利要求 84 所述的椅子，其中第一保持件提供的第一级后倾阻力是相对地低的后倾阻力，第二保持件提供的第二级后倾阻力是相对地高的后倾阻力。

86. 如权利要求 81 至 85 之任一所述的椅子，其中该第二保持件于啮合位置和不啮合的位置之间选择地可动，在啮合位置中，当靠背部分从大体上竖直的位置后倾时，第二保持件与阻力装置啮合。

87. 如权利要求 86 所述的椅子，其中在该啮合位置中，当靠背部分处于大体上竖直的位置时，第二保持件并不与该阻力装置啮合。

88. 如权利要求 81 至 87 之任一所述的椅子，其中当靠背部分并不后倾时，无论第二保持件是否选择地啮合，第一保持件皆接触该阻力装置。

89. 如权利要求 81 至 88 之任一所述的椅子，其中该些保持件的至少其一相对于阻力装置可于多个啮合位置之间移动，以提供不同级的后倾阻力。

90. 如权利要求 81 至 89 之任一所述的椅子，其中该阻力装置操作地连接至靠背部分，而第一和第二保持件是操作地连接至支撑框架。

91. 如权利要求 81 至 90 之任一所述的椅子，其中该阻力装置包含板簧。

92. 如权利要求 91 所述的椅子，其中该板簧具有实效长度、反动长度，以及当靠背部分处于大体上后倾的位置时该板簧的偏离幅度，且其中当第二保持件处于第一位置时，实效长度、反动长度以及偏离幅度皆大于当第二保持件处于第二位置时的，以致当第二保持件处于第一位置时后倾阻力装置提供的阻力相对地高，当第二保持件处于第二位置时该阻力则相对地低。

93. 如权利要求 92 所述的椅子，其中该第一位置是啮合位置，其中当靠背部分从大体上竖直的位置后倾时，该第二保持件与板簧啮合，而第二位置是不啮合的位置。

94. 如权利要求 92 所述的椅子，其中第一和第二位置为不同的啮合位置，其中当靠背从大体上竖直的位置后倾时，该第二保持件与板簧啮合。

95. 如权利要求 91 至 94 之任一所述的椅子，其中板簧操作地连接至靠背部分，以与其

一起移动，而第一和第二保持件操作地连接至支撑框架。

96. 如权利要求 95 所述的椅子，其中第二保持件枢转地连接至支撑框架并选择地可与板簧的前端啮合。

97. 如权利要求 91 至 94 之任一所述的椅子，其中板簧操作地连接至支撑框架，而第一和第二保持件操作地连接至靠背部分以与其一起移动。

98. 如权利要求 81 至 90 之任一所述的椅子，其中该阻力装置包含扭力弹簧。

99. 如权利要求 98 所述的椅子，其中该扭力弹簧包含腿部，而该第一保持件与该腿部啮合。

100. 如权利要求 99 所述的椅子，其中第二保持件是可动的，以与腿部的端部啮合和解除啮合，且其中当第二保持件与该腿部的端部啮合时，该扭力弹簧的实效回弹率较高，因此后倾阻力也较高。

101. 如权利要求 99 或 100 所述的椅子，其中扭力弹簧还包含另一腿部，其操作地连接至靠背部分。

102. 如权利要求 101 所述的椅子，其中该扭力弹簧包含主体和两个腿部，且其中该主体置于靠背部分至支撑框架的枢转轴线上或从其隔开。

103. 如权利要求 81 至 102 之任一所述的椅子，其中该阻力装置包含多个弹簧，且其中第一保持件和 / 或第二保持件可与该些弹簧啮合。

椅子以及承托件

技术领域

[0001] 本发明大体上涉及椅子及与其关联的承托件。本发明特别（但不仅限于）涉及办公椅。

背景技术

[0002] 传统中，椅子被设计以承托就座者在单一“正确”的坐姿中。在较近期，椅子于支撑框架、座位和或椅子靠背之间被提供有后倾机制，它们使座位和靠背可相对支撑框架移动以致就座者可从竖直位置移至后倾位置。这样的椅子偶然亦包括额外的弹性或调节件，以让就座者以较不标准的侧坐或成角度的位置就座而仍然完全被椅子承托。

[0003] 和大部分传统的带有看似舒服的垫件的椅子不同，较近期的可调节椅子是针对市场中“前卫”的那端。那些现代式的椅子的外观在某些例子中可令用家费解，因为这些椅子常常会看似非常机械化，而不会具有带垫件的、织物包覆的椅子的蓬松和舒服的感觉。而且，有些人看见现代的机械化椅子设计会联想到高的价钱，这样他们（尤其是财政拮据时）可能不会那么想买那椅子。

[0004] 我们需要一种椅子，它具有较常规和传统的外观，而仍然提供较现代的“前卫型”椅子的人体工程学上的优点和功能。这样的椅子还需要是廉价的。

[0005] 椅子亦常常被提供有可调节的承托件，例如腰部、头部或颈部承托组件。该些承托件常常是高度可调的。用于这样的承托件的调节机制一般有两种。第一种需要使用者释放致动件以释放位置锁定件并让使用者可以调节承托件的位置。这样的设备一般在机械上是复杂的并可为昂贵的。另一种承托件可使力调节，其中使用者为了调节承托件的位置而手动施加的力克服调节机制中提供的摩擦力。这样的承托件的用途常常为在就座者以一身体部分向承托件施加向后的力时向该就座者施加向前的承托力。在使用摩擦式机制的情况下，如果就座者的力不是直接向后施加而是包含向上或向下的组分，那么使用者在后倾靠着承托件时可意外地令承托件的高度调节。

[0006] 本发明（至少，其优选实施例）的一目的在于提供一种椅子或构件，其解决上列的缺点的至少一点，或至少向公众提供有用的选择。

发明内容

[0007] 根据本发明的第一方面，提供了用于椅子的可调节承托组件，该承托组件包含：

[0008] 安装部件；

[0009] 用于承托椅子就座者的身体的一部分的承托件；

[0010] 载件，其可滑动地承载承托件，该承托件包含多个啮合件而该载件包含啮合部件，啮合部件可选择性地与啮合件啮合以使承托件相对载件可选择性地被定位于多个位置；和

[0011] 偏压装置，其操作地将载件连接至安装部件并被配置以将载件和承托件向前偏压；

[0012] 其中当向承托件施加向后的力时，啮合部件和被啮合的啮合件之间的啮合度增

加。

[0013] 在一实施例中，该偏压装置包含偏压部件，其作用于啮合部件上以将啮合部件往承托件偏压。在一实施例中，当向承托件施加该向后的力时，该偏压部件抗拒啮合部件往安装部件的向后移动多于其抗拒载件往安装部件的向后移动。

[0014] 在一实施例中，该偏压装置包含：中间部件，其操作地连接至安装部件以及载件；第一偏压部件，其设于安装部件和中间部件之间；以及第二偏压部件，其设于载件和中间部件之间。

[0015] 在一实施例中，第一和第二偏压部件是相反定向的扭力弹簧。

[0016] 在一实施例中，中间部件相对于安装部件可绕第一轴线枢转，而载件则相对于中间部件可绕实质上平行的第二轴线枢转。在一实施例中，可调节承托件进一步包含至少一条联接臂，其具有第一端以及第二端，第一端相对于安装部件或中间部件之其一为可枢转的，第二端相对于安装部件或中间部件之另一为可滑动的。在一实施例中，可调节承托件包含两条联接臂，每条臂具有可于安装部件上的槽中滑动的第一端以及可绕中间部件第二轴线枢转的第二端。

[0017] 在一实施例中，啮合部件于前后方向中与啮合件啮合。

[0018] 在一实施例中，承托件可相对于安装部件倾斜。

[0019] 在一实施例中，承托件是高度可调的。

[0020] 在一实施例中，啮合部件是具弹性的。

[0021] 在一实施例中，载件包含导件，其用于滑动地与承托件后侧上的匹配的导向件啮合。在一实施例中，承托件上的导向件包含导向凸部或凸缘，而载件包含至少一条导向沟道以滑动地接收导向凸部或凸缘。

[0022] 在一实施例中，承托件上的导向件以固定至承托件的导向部件提供。

[0023] 在一实施例中，该些啮合件包含面向后的弧形的缺口；而啮合部件则包含指向前的弧形的凸部。

[0024] 在一实施例中，承托件是腰部承托件。替代地，该承托件可为另一类的承托件，例如头部或颈部承托件。

[0025] 在一实施例中，承托件于平面视图中向前为凹形的，并包含置中的、实质上垂直的凹位以容纳使用者的脊骨。

[0026] 在一实施例中，安装部件被配置以安装至椅子的靠背框架。

[0027] 根据本发明的第二方面，提供了椅子，其包含具有两侧部部分的靠背框架，以及如上有关第一方面所述的可调节承托件，其中该安装部件是附接至该两侧部部分。

[0028] 在一实施例中，该安装部件相对该两侧部部分是固定的。替代地，安装部件相对该些侧部部分可以是可动的。

[0029] 在一实施例中，靠背框架支撑柔软的靠背部分，而承托件被定位于柔软的靠背部分的后方。

[0030] 在一实施例中，在没有后向的负载于靠背部分时承托件是从靠背部分向后隔开的，而在施加足够的向后的力至柔软的靠背部分时，靠背部分的至少一部分被向后移动至接触该承托件。

[0031] 根据本发明的第三方面，提供了适于应变定向的模制的物件，该物件包含：

[0032] 在第一层中形成的多条第一长形带；

[0033] 在第二层中形成的多条第二长形带，以致至少一些第一长形带与至少一些第二长形带重叠；以及

[0034] 多个连接部件，其与第一长形带和与第二长形带一体地模制，并在第一长形带和第二长形带重叠的所述区域中于第一长形带和第二长形带之间连接。

[0035] 在一实施例中，该些第一长形带的至少一部分、该些第二长形带的至少一部分以及该些连接部件的至少一部分皆适于应变定向。在一实施例中，基本上该些第一长形带的整体、该些第二长形带的整体以及该些连接部件的整体皆适于应变定向。

[0036] 在一实施例中，第一长形带包含相邻于连接部件的带颈区域，以补偿因连接部件这附加物料引致的应变定向的减少。在一实施例中，以延伸进第一长形带侧部的缺口或凹位形成该些带颈区域。在一实施例中，该些缺口或凹位被构形以致在应变定向后，该些第一长形带的侧部实质地沿其整个长度皆实质地平行。

[0037] 在一实施例中，第二长形带包含相邻于连接部件的带颈区域，以补偿因连接部件这附加物料引致的应变定向的减少。在一实施例中，以延伸进第二长形带侧部的缺口或凹位形成该些带颈区域。在一实施例中，该些缺口或凹位被构形以致在应变定向后，该些第二长形带的侧部实质地沿其整个长度皆实质地平行。

[0038] 在一实施例中，模制的物件从聚合物树脂形成。在此所用的“聚合物树脂”是适于注塑模制的塑料原材料。该树脂可为单一塑料物料，或可包含多个塑料物料。在一实施例中，模制的物件由包含热塑性的聚酯弹性体的树脂模制。

[0039] 在一实施例中，该热塑性的聚酯弹性体包含嵌段共聚物。在一实施例中，该嵌段共聚物包含坚硬的段和软的段。在一实施例中，该热塑性的聚酯弹性体是聚对苯二甲酸丁二醇酯和聚醚二醇的嵌段共聚物。

[0040] 在一实施例中，树脂被选择以致模制的物件在应变定向前在根据 ASTM 2240 测试下具有约 30D 至约 55D 的范围内的硬度。在一实施例中，该树脂被选择以致在应变定向前，该模制物件具有约 30D 至约 46D 的范围内的硬度，优选地在约 35D 至约 45D 的范围内，优选地在约 36D 至约 44D 的范围内，更优选地在约 37D 至约 43D 的范围内，更优选地在约 38D 至约 42D 的范围内，更优选地在约 39D 至约 41D 的范围内，最优选地为约 40D。

[0041] 该热塑性的聚酯树脂优选为 HYTREL 4069、HYTREL 4556、HYTREL 5526、HYTREL 5556 和 HYTREL 3078 之其一。该树脂可额外包括稳定剂和 / 或添加剂以达致所期望的属性，例如以增强其抵抗紫外光、火、热力老化、潮湿，和 / 或将树脂弄成适合的颜色。

[0042] 可以了解该物件可由其它具有合适属性的树脂模制。

[0043] 该些第一长形带可为多条以大体上纵向的第一方向延伸的长形带。该些第二长形带例如可为多条以大体上横向于该大体上纵向的第一方向的第二方向延伸的长形带。替代地，该些带可以任何合适的方式相对彼此地定向。优选的是于第一层的该些第一长形带纵向地延伸，而于第二层的该些第二长形带横向地延伸。

[0044] 该些大体上纵向延伸的长形带可为与该些大体上横向延伸的长形带不同的。例如，该些大体上纵向延伸的长形带可具有比该些大体上横向延伸的长形带小的截面维度。但是，优选的是该些大体上纵向延伸的长形带与该些大体上横向延伸的长形带的截面维度至少在不带颈的区域中实质上是一样的。

[0045] 优选地，模制的物件的该些长形带的至少一些具有约 12mm 或更小的截面维度，更优选地具有约 2.5mm 或更小的截面维度。优选地，模制的物件的该些长形带的至少大部分具有约 12mm 或更小的截面维度，更优选地具有约 5mm 或更小的截面维度，更优选地具有约 2.5mm 或更小的截面维度。优选地，模制的物件的该些长形带的至少一些具有约 1.5mm 或约 2mm 的深度。

[0046] 在一实施例中，每条带在应变定向前的深度为约 1.5mm 或约 2mm，该些大体上横向延伸的带于不带颈的区域具有约 12mm 的截面阔度（于纵向方向）并于带颈区域具有约 10mm 的截面阔度，而该些大体上纵向延伸的带则于不带颈的区域具有约 12mm 的截面阔度（于横向方向）并于带颈区域具有约 9.4mm 的截面阔度。优选地，维度被配置以致在应变定向后，每条带的深度为约 1.0mm，大体上横向延伸的带于带颈和不带颈的区域具有约 8mm 的截面阔度（于纵向方向），而大体上纵向延伸的带于带颈和不带颈的区域具有约 8mm 的截面阔度（于横向方向）。

[0047] 可了解，整个模制物件可由该些第一长形带和该些第二长形带构成。优选地，模制物件的至少大部分是由该些第一长形带和该些第二长形带构成。

[0048] 替代地，模制物件可以只是部分由该些第一和第二长形带构成，而模制物件可额外地被提供有一体地模制进物件的附接件。

[0049] 模制物件的至少一部分可具有作为模制过程的一部分而形成的弯曲的轮廓。只作为例子说，模制物件的至少部分可具有作为模制过程的一部分而形成的弯曲的侧视轮廓和/或弯曲的俯视轮廓。替代地，模制物件可为实质上扁平的但可例如在其在使用中被框架支撑期间被固定于具轮廓的、不扁平的形状中。

[0050] 优选地，物件的至少一部分可被拉伸至初始维度的至少约 400％，优选地至少约 450％，优选地至少约 500％，优选地至少约 600％，优选地至少约 700％，优选地至少约 800％，优选地至少约 900％，而不破坏，以致发生应变定向。优选地，该些带被拉伸至其初始长度的约 450％以引致应变定向，并在放松后具有的长度为初始长度的约 210％。

[0051] 该物件可为用于椅子的承托表面。例如，该物件可为用于椅子的背部承托件或座位承托件，并其后被安装至用于支撑薄膜的框架以形成柔软的悬挂的承托表面。但是该方法可用于形成任何其它合适类别的物件。

[0052] 根据本发明的第四方面，提供了组装承托件的方法，其包含：

[0053] 提供框架；

[0054] 提供如上有关第三方面所述的模制物件，其中模制物件的至少部分具有的模制后的维度小于框架相应的维度；

[0055] 将物件的所述至少部分拉伸以使其具有的拉伸后的维度大于框架相应的维度，并且该些第一长形带的至少一部分以及该些第二长形带的至少一部分发生应变定向；

[0056] 将物件的所述至少部分放松，以致其具有处于模制后的维度和拉伸后的维度之间的放松后的维度；

[0057] 并以框架支撑该物件。

[0058] 在一实施例中，该框架包含至少部分地被框架部分限定的开口，而该方法包含将物件以框架支撑，其中该物件的部分延伸横过开口，以形成柔软的悬挂的承托表面。例如，该框架可包含侧部部分以及上部和下部部分（或在座位框架的情况下为前部和后部部

分），而该些框架部分可限定一个或更多个开口，在物件被框架支撑时，该些开口被物件盖过。

[0059] 在一实施例中，该些第一长形带包含大体上纵向延伸的带，而该些第二长形带包含大体上横向延伸的带。在一实施例中，该方法包含将该些大体上纵向延伸的带拉伸和放松，然后才将该些大体上横向延伸的带拉伸和放松。在替代的实施例中，该方法包含将该些大体上横向延伸的带拉伸和放松，然后才将该些大体上纵向延伸的带拉伸和放松。在又一实施例中，该方法包含在将该些大体上横向延伸的带拉伸和放松的同时将该些大体上纵向延伸的带拉伸和放松。

[0060] 在一实施例中，将物件的至少部分拉伸的步骤引致连接部件的拉伸，以致连接部件发生应变定向。在一实施例中，连接部件在纵向方向和横向方向上皆被应变定向。

[0061] 在一实施例中，连接部件是长形的部件，其具有的如此模制成形的维度为长度18.5mm、阔度1.0mm、深度2.0mm（以于连接的带之间形成2.0mm的空隙）。在一实施例中，该些连接部件在拉伸后放松后的具有的维度为长度约28.5mm、阔度约0.8mm、深度约1.8mm。连接部件可替代地具有不同的维度或者可为任何其它合适的形状。

[0062] 在一实施例中，第一长形带于相邻连接部件之处包含带颈的区域，以补偿因连接部件这附加物料引致的应变定向的减少。在一实施例中，以延伸进第一长形带侧部的缺口或凹位形成该些带颈区域，且其中在放松后的所述物件中，该些第一长形带的侧部沿其实质地整个长度皆实质地平行。

[0063] 在一实施例中，第二长形带于相邻连接部件之处包含带颈的区域，以补偿因连接部件这附加物料引致的应变定向的减少。在一实施例中，以延伸进第二长形带侧部的缺口或凹位形成该些带颈区域，且其中在放松后的物件中，该些第二长形带的侧部实质地沿其整个长度皆实质地平行。

[0064] 该物件可于其横向和纵向的维度中（或于任何其它合适的方向中）被拉伸和放松。拉伸的步骤可包含绕360°皆将物件拉伸。如果该物件包含不规则的部件格局和/或斜向的部件，绕360°皆将物件拉伸是尤其有用的。

[0065] 该方法可包含将整个物件拉伸和放松，或可包含将物件的部分拉伸和放松。即是说，在完成的承托件中，物件的某些部分可以已被应变定向，而其它部分可以未被应变定向。在一实施例中，物件的实质上所有第一和第二长形带和连接部件可以已于两个方向中被应变定向，而物件的剩余部分可以是未被应变定向的。

[0066] 视乎所用的物料，在一实施例中该些带被拉伸至其模制后的长度的约4倍和约5倍之间，优选地是约4.5倍。在一实施例中，该些带在应变定向后放松后的长度为如此模制成形的长度的约1.5倍和约2.7倍之间，优选地是模制后的长度的约2.1倍。

[0067] 放松和支撑的部骤可同时进行。例如，物件可包含袋或类似物以捕捉框架的相应部分，而在物件被放松期间，该些部分可被该些袋捕捉。替代地，该物件可在放松物件后被连接至框架。例如，在放松物件后，可将该物件小量地拉伸然后以框架将其支撑。用于以框架支撑物件的拉伸的维度优选地是其应变定向后放松后的维度的约1.1倍，但那会视乎框架的构形以及所期望的带的张力。

[0068] 物件可被直接连接至框架，例如通过物件和框架的其一的部分被接收于物件和框架的另一的相应的匹配的凹位中。例如，物件可绕其外周的至少部分设有一体模制的连接

部件，其接收框架上的钩或凸部以将物件连接至框架。替代地，可用分开的紧固件将物件和框架连接。又替代地，可用一条或多条止动条将物件连接至框架。优选地，物件是以附接件直接连接至框架，该些附接件是从和物件其它部分一样的物料作为模制过程的一部分与物件一体地模制成形。物件带有该些一体的附接件的部分一般不会被应变定向。

[0069] 在一实施例中，作为模制方法的一部分，将表面纹理模制至物件上。

[0070] 方法可包含将物件的不同部分以不同程度拉伸，以于物件中得出不同的属性。但在优选的实施例中，该些第一长形带的拉伸百分比和该些第二长形带的拉伸百分比实质上相同，于是它们经过实质上相同程度的应变定向。

[0071] 该些第一长形带的一条或更多条可与其它第一长形带的长度不同。但是，优选地，将每条第一长形带以实质地相同的长度增加百分比拉伸，以于每条第一长形带中提供实质上相同程度的应变定向。

[0072] 该些第二长形带的一条或更多条可与其它第二长形带的长度不同。但是，优选地，将每条第二长形带以实质地相同的长度增加百分比拉伸，以于每条第二长形带中提供实质上相同程度的应变定向。

[0073] 根据本发明的第五方面，当使用如上有关第四方面所述的方法组装，提供了用于椅子的靠背部分。

[0074] 根据本发明的第六方面，当使用如上有关第四方面所述的方法组装，提供了用于椅子的座位部分。

[0075] 根据本发明的第七方面，提供了椅子，其包含：

[0076] 支撑框架；

[0077] 用于承托就座者的座位部分；

[0078] 用于承托就座者的背部的靠背部分，其相对支撑框架可后倾；以及

[0079] 后倾机制，其被配置以在靠背部分后倾时升起座位部分，后倾机制包含操作地连接至靠背部分的靠背支撑臂，其枢转地连接至支撑框架并枢转地连接至座位部分相对地前向的部分，后倾机制还包含摇动臂，其枢转地连接至支撑框架、枢转地连接至座位部分相对地后向的部分，并操作地连接至靠背支撑臂以相对于靠背支撑臂移动。

[0080] 在一实施例中，当靠背部分后倾时，座位部分向上和向后地移动。座位部分可在靠背部分开始后倾期间初始时从其初始位置向上和向前地移动，然后向上和向后地移动以总体地从其初始位置向上和向后地移动。

[0081] 在一实施例中，在靠背部分不后倾时座位部分具有后向的倾角，而当靠背部分完全后倾时座位部分具有更大的后向的倾角。

[0082] 在一实施例中，在靠背部分不后倾时摇动臂是向下地向前地指向的，在靠背部分完全后倾时摇动臂侧是向上地向前地指向的。

[0083] 在一实施例中，在靠背部分不后倾时靠背支撑臂的一部分大约是水平的，在靠背部分完全后倾时靠背支撑臂的该部分则是向上地向前地指向的。

[0084] 在一实施例中，当靠背部分不后倾时摇动臂是向下地向前地指向的，当靠背部分完全后倾时摇动臂是向上地向前地指向的，且其中当靠背部分不后倾时靠背支撑臂的一部分大约是水平的，在靠背部分完全后倾时靠背支撑臂的该部分则是向上地向前地指向的，其中摇动臂的向上和向前角度比靠背支撑臂的该部分的向上和向前角度大。在一实施例

中，摇动臂的向下和向前的角度为水平以下约 13 度，摇动臂的向上和向前的角度为水平以上约 24 度，且其中靠背支撑臂的该部分的向上和向前的角度为水平以上约 17 度。

[0085] 在一实施例中，靠背支撑臂和支撑框架的枢轴连接点处于摇动臂至支撑框架的操作连接点的前方。在一实施例中，摇动臂和支撑框架的枢轴连接点处于或相邻于支撑框架的后部部分。在一实施例中，靠背支撑臂和支撑框架的枢轴连接点的位置相邻于摇动臂和支撑框架的枢轴连接点并在其前方。在一实施例中，摇动臂和座位部分的枢轴连接点大体上与靠背支撑臂和支撑框架的枢轴连接点于椅子的前后方向中对齐。

[0086] 在一实施例中，靠背支撑臂至座位部分相对地前向的部分的枢轴连接包含枢转与滑动的连接。

[0087] 在一实施例中，摇动臂通过枢转地连接至靠背支撑臂和枢转地连接至摇动臂的连接联接操作地连接至靠背支撑臂。在一实施例中，当靠背部分不后倾时，摇动臂和连接联接的枢轴连接点实质地处于连接联接和靠背支撑臂的枢轴连接点的垂直上方。

[0088] 在一实施例中，摇动臂以枢转与滑动连接操作地连接至靠背支撑臂。在一实施例中，该枢转与滑动连接包含在摇动臂上的销和靠背支撑臂中的槽。在一实施例中，该枢转与滑动连接包含可转动地安装在摇动臂上的滚轮，其可沿靠背支撑臂的一表面滑动。

[0089] 在一实施例中，后倾机制包含 :两条靠背支撑臂，其操作地连接至靠背部分并枢转地连接至支撑框架并枢转地连接至座位部分的该相对地前向的部分 ;以及两条摇动臂，其枢转地连接至支撑框架、枢转地连接至座位部分相对地后向的部分，并操作地连接至各自的一条靠背支撑臂。在一实施例中，该两条摇动臂通过两条连接联接相对于靠背支撑臂可动地连接，该两条连接联接各自枢转地连接至各自的其中一条靠背支撑臂和各自的其中一条摇动臂。

[0090] 在一实施例中，支撑框架包含横楣件，其具有基座和一对相隔的侧壁，且其中每条靠背支撑臂的部分置于横楣件的侧壁的内侧。在一实施例中，每条靠背支撑臂枢转地各自连接至横楣件的各自一个侧壁。

[0091] 在一实施例中，座位部分包含座位支撑件以及用于承托就坐者的座位表面，其中座位表面相对于座位支撑件于前后方向上选择地可动，且其中摇动臂和靠背支撑臂枢转地连接至座位支撑件。

[0092] 在一实施例中，椅子还包含后倾阻力机制以抵抗靠背部分往后倾位置的移动，其中后倾阻力机制提供的阻力的幅度是选择地可调的。

[0093] 在一实施例中，座位包含座位表面下的壳体，在壳体的下侧具有中央凹位，且其中在靠背部分不后倾时，后倾机制实质地被容纳于该中央凹位中。

[0094] 在一实施例中，当靠背部分不后倾时，后倾机制的垂直高度为约 40mm。

[0095] 在一实施例中，摇动臂的前端被配置以和座位部分啮合以提供后倾止动件 , 其限定靠背部分最大的后向后倾。

[0096] 在一实施例中，靠背支撑臂的前端被配置以和支撑框架啮合以提供竖直位置止动件，其限定靠背部分的竖直位置。

[0097] 根据本发明的第八方面，提供了椅子，其包含 :

[0098] 支撑框架 ;

[0099] 用于承托就座者的座位部分 ;

[0100] 用于承托就座者的背部的靠背部分，其相对于支撑框架可于大体上竖直的位置和大体上后倾的位置之间后倾；以及

[0101] 后倾阻力机制，以抵抗靠背部分往大体上后倾的位置的移动，该后倾阻力机制包含操作地连接至靠背部分、座位部分或支撑框架之其一的阻力装置，该后倾阻力机制还包含第一保持件和第二保持件，两者皆操作地连接至靠背部分、座位部分或支撑框架之另一，其中该第二保持件是可动的，以调节阻力装置和所述靠背部分、座位部分或支撑框架之另一之间的反动点，以改变后倾阻力机制所提供的后倾阻力的幅度，其中该第一保持件在靠背部分处于大体上竖直的位置时将阻力装置预载，且其中第二保持件可移动至至少一个位置，在所述位置中，在靠背部分在后倾位置时由第二保持件提供反动点。

[0102] 在一实施例中，在靠背部分处于大体上竖直的位置时，第二保持件的移动并不改变在阻力装置上的预载。

[0103] 在一实施例中，第一保持件与阻力装置啮合，以致该后倾阻力机制提供第一级的后倾阻力。在一实施例中，可将第二保持件移至一位置，在该位置中其提供第二级的后倾阻力，其不同于第一保持件提供的第一级的后倾阻力。在一实施例中，第一保持件提供的第一级后倾阻力是相对地低的后倾阻力，第二保持件提供的第二级后倾阻力是相对地高的后倾阻力。

[0104] 在一实施例中，第二保持件于啮合位置和不啮合的位置之间选择地可动，在啮合位置中，当靠背部分从大体上竖直的位置后倾时，第二保持件与阻力装置啮合。在一实施例中，在该啮合位置中，当靠背部分处于大体上竖直的位置时，第二保持件并不与该阻力装置啮合。

[0105] 在一实施例中，当靠背部分并不后倾时，无论第二保持件是否选择地啮合，第一保持件皆接触该阻力装置。

[0106] 在一实施例中，该些保持件的至少其一相对于阻力装置可于多个啮合位置之间移动，以提供不同级的后倾阻力。

[0107] 在一实施例中，该阻力装置操作地连接至靠背部分，而第一和第二保持件是操作地连接至支撑框架。

[0108] 在一实施例中，该阻力装置包含板簧。在一实施例中，该板簧具有实效长度、反动长度，以及当靠背部分处于大体上后倾的位置时该板簧的偏离幅度，且其中当第二保持件处于第一位置时，实效长度、反动长度以及偏离幅度皆大于当第二保持件处于第二位置时的，以致当第二保持件处于第一位置时后倾阻力装置提供的阻力相对地高，当第二保持件处于第二位置时该阻力则相对地低。

[0109] 在一实施例中，该第一位置是啮合位置，其中当靠背部分从大体上竖直的位置后倾时，该第二保持件与板簧啮合，而第二位置是不啮合的位置。替代地，第一和第二位置可为不同的啮合位置，其中当靠背从大体上竖直的位置后倾时，该第二保持件与板簧啮合。

[0110] 在一实施例中，板簧操作地连接至靠背部分，以与其一起移动，而第一和第二保持件操作地连接至支撑框架。在一实施例中，第二保持件枢转地连接至支撑框架并选择地可与板簧的前端啮合。

[0111] 在一实施例中，板簧操作地连接至支撑框架，而第一和第二保持件操作地连接至靠背部分以与其一起移动。

[0112] 在一实施例中，该阻力装置包含扭力弹簧。在一实施例中，该扭力弹簧包含腿部，而该第一保持件与该腿部啮合。

[0113] 在一实施例中，第二保持件是可动的，以与腿部的端部啮合和解除啮合，且其中当第二保持件与该腿部的端部啮合时，该扭力弹簧的实效回弹率较高，因此后倾阻力也较高。

[0114] 在一实施例中，扭力弹簧还包含另一腿部，其操作地连接至靠背部分。在一实施例中，该扭力弹簧包含主体和两个腿部，且其中该主体置于靠背部分至支撑框架的枢转轴线上或从其隔开。

[0115] 在一实施例中，该阻力装置包含多个弹簧，且其中第一保持件和 / 或第二保持件可与该些弹簧啮合。作为例子，该些弹簧可为板簧、可为扭力弹簧，或可为彼此不同的。

[0116] 在本说明书中的术语“包含”意指“至少部分包括”。当解读本说明书中每句包括“包含”这术语的语句时，所述“包含”的特点 / 部件以外的其它特点 / 部件亦可存在。相关的术语，如“包含”和“包含”，应同样地解读。

[0117] 在此所用的“和 / 或”意指“和”及“或”，或者两者皆是。

[0118] 在此所用的名词随后的“(s)”意指该名词的众数或单数形式。

[0119] 所意图的是，本文中公开的提及的数字范围 (例如从 1 到 10) 亦包括提及该范围中的所有有理数 (例如，1, 1.1, 2, 3, 3.9, 4, 5, 6, 6.5, 7, 8, 9 和 10) 以及该范围中的所有有理数的范围 (例如，2 至 8、1.5 至 5.5 和 3.1 至 4.7)，因此，本文中所有明确公开的范围的所有子范围在此亦明确公开。这些只是所特意意图的效果的例子，文中所述的最低值和最高值之间所有可能的数值的组合皆应以类似的方式被视为在这申请中明确表述。

[0120] 椅子可为任何合适形态的椅子。例如该椅子可为办公椅。该椅子亦可为不同种类的椅子，包括但不限于交通工具座位，例如汽车座位、航空器座位或船上座位，或休息室 / 酒廊椅子或剧院椅子。

[0121] 本发明的不同实施例的可选特点 / 部件于附上的从属权利要求中描述。

[0122] 本发明所关联的领域的技术人员会自然想到很多构造上的改动和发明的很不同的实施例和应用，这些皆离不开如所附权利要求所限定的本发明的范围。本文中的公开和描述仅为说明性的，并没有于任何方面作限定的意图。如本文中提及的特定特征于本发明所涉及的领域中具有已知的等效物，该些已知的等效物则被视作如同独自公开那般包含在此内。

[0123] 本发明主要由以上所组成，并亦设想作各种建设，下文仅提供其中的例子。

附图说明

[0124] 为了使发明可更全面地被理解，现在对其某些实施例，参照附图以例子作说明，其中：

[0125] 图 1 是一优选型态椅子的透视图；

[0126] 图 2 是图 1 的椅子的前视图；

[0127] 图 3 是图 1 和 2 的椅子的侧视图；

[0128] 图 4 是图 1 至 3 的椅子的后视图；

[0129] 图 5 是图 1 至 4 的椅子的平面图；

[0130] 图 6 是图 1 至 5 的椅子的仰视图；

[0131] 图 7 是示意性侧视图，其以虚线示出处于竖直位置的靠背部分 501 和座位部分 151，并以实线示出处于完全后倾位置的靠背部分和座位部分；

[0132] 图 8 是一替代的优选型态椅子的透视图，该椅子具有高背；

[0133] 图 9 是图 8 的椅子的前视图；

[0134] 图 10 是图 8 和 9 的椅子的侧视图；

[0135] 图 11 是图 8 至 10 的椅子的后视图；

[0136] 图 12 是示意图，其示出第一或第二优选型态椅子的第一个优选型态的靠背后倾机制在靠背部分处于竖直位置期间联接之间的连接；

[0137] 图 13 是对应图 12 的示意图，但其中靠背部分处于后倾位置；

[0138] 图 14 是对应图 13 的示意图，并示出于靠背部分后倾期间座位的实效枢转点；

[0139] 图 15 是图 12 至 14 的后倾机制的侧视图，其中靠背部分处于竖直位置；

[0140] 图 16 是对应图 15 的视图，其中靠背部分处于部分后倾位置；

[0141] 图 17 是对应图 15 和 16 的视图，其中靠背部分处于完全后倾位置；

[0142] 图 18 是示意图，其示出第一或第二优选型态椅子的第二个优选型态的靠背后倾机制在靠背部分处于竖直位置期间联接之间的连接；

[0143] 图 19 是对应图 18 的示意图，但其中靠背部分处于后倾位置；

[0144] 图 20 是图 18 和 19 的后倾机制的侧视图，其中靠背部分处于竖直正位置；

[0145] 图 21 是对应图 20 的视图，其中靠背部分处于部分后倾位置；

[0146] 图 22 是对应图 20 和 21 的视图，其中靠背部分处于完全后倾位置；

[0147] 图 23 是其中一张优选型态椅子的底部平面图，其示出座位部分处于最前方的深度调节的位置；

[0148] 图 24 是和图 23 相似的底部平面图，但其示出座位部分处于最后方的深度调节的位置；

[0149] 图 25 是透视图，其示出图 12 至 17 中的后倾机制的后倾阻力机制 (RRM) 的第一优选型态（但该 RRM 亦可应用于例如 18 至 22 中的后倾机制），其中靠背部分竖直，RRM 处于高阻力配置；

[0150] 图 26 是对应图 25 的视图，但其中靠背部分后倾；

[0151] 图 27 是图 12 至 17 的后倾机制以及图 25 和 26 的 RRM 的分解透视图；

[0152] 图 28 是图 25 的 RRM 的平面图；

[0153] 图 29 是对应图 25 的视图，但其中 RRM 处于低阻力配置；

[0154] 图 30 是对应图 29 的视图，其中靠背部分后倾；

[0155] 图 31 是图 25 的设备设置的剖视图；

[0156] 图 32(a) 是图 30 的设备设置的剖视图；

[0157] 图 32(b) 是图片 6 的设备设置的剖视图；

[0158] 图 33 是透视图，其示出图 12 至 17 的后倾机制的 RRM 的第二优选型态（但该 RRM 亦可应用于例如 18 至 22 中的后倾机制），其中靠背部分竖直，RRM 处于高阻力配置；

[0159] 图 34 是对应图 33 的视图，但其中 RRM 处于低阻力配置；

[0160] 图 35 是图 34 的设备设置的剖视图；

[0161] 图 36 是图 34 的视图，但其中靠背部分后倾；

[0162] 图 37 是图 1 至 7 或 8 至 11 的椅子的左边臂支撑组件的一优选型态的前视图；

[0163] 图 38 是图 37 的臂支撑组件的侧视图；

[0164] 图 39 是部分分解图，其示出图 37 和 38 的臂支撑组件的高度调节机制，其中臂垫被移除；

[0165] 图 40 是图 37 至 39 的臂支撑组件的剖视图，其示出臂垫并示出臂的主体在套件中；

[0166] 图 41 是图 37 至 40 的臂支撑组件的剖视图，其示出臂垫并示出高度调节机制锁定于最低位置；

[0167] 图 42 是类似图 41 的部分剖视图，其中高度调节机制解锁，处于最低位置；

[0168] 图 43 是图 41 和 42 那种视图，其中高度调节机制解锁，处于中间高度的位置；

[0169] 图 44 是图 42 的视图，其中高度调节机制锁定于中间高度的位置；

[0170] 图 45 是优选型态椅子的靠背组件的前视透视图；

[0171] 图 46 是图 45 的靠背组件的后视透视图；

[0172] 图 47 是图 45 的靠背组件的分解前视透视图；

[0173] 图 48 是图 45 的靠背组件的分解后视透视图；

[0174] 图 49(a) 是图 45 的靠背组件的靠背框架的后视透视图，而图 49(b) 和 (c) 是用于连接钉针接收部件的靠背框架部件的放大细节图；

[0175] 图 50(a) 是用于连接至图 49(a) 至 (c) 的靠背框架的钉针接收部件的前视透视图，而图 50(b) 和 (c) 是用于将钉针接收部件连接至靠背框架的部件的放大细节图；

[0176] 图 51(a) 和 (b) 是部分截面图，其示出图 49(a) 至 (c) 的靠背框架以及图 50(a) 至 (c) 的钉针接收部件的组装件的细节，其中图 51(a) 示出于框架顶部部分的连接，而图 51(b) 示出于框架下部部分的连接；

[0177] 图 52(a) 至 (c) 示出图 45 的靠背组件的装饰性的盖，其中图 52(a) 是该装饰性的盖的前视透视图，图 52(b) 是在装饰性的盖的上部部分，用于将装饰性的盖连接至靠背框架的凸片的放大细节图，而图 52(c) 是在装饰性的盖的下部部分，用于将装饰性的盖连接至靠背框架的压榫的放大细节图；

[0178] 图 53(a) 至 (d) 是部分截面图，其示出靠背框架和装饰性的盖的组装件，其中图 53(a) 示出于框架顶部部分的连接、图 53(b) 示出于框架下部部分的连接，而图 53(c) 及 53(d) 示出于框架侧部部分的连接；

[0179] 图 54 是图 45 的靠背组件的上部部分的截面视图，该截面穿过靠背组件中线的一垂直平面；

[0180] 图 55 是构成图 45 的靠背部分的部分的承托件在其模制后的型态的前视透视图；

[0181] 图 56 是图 55 的承托件从前视的平面图；

[0182] 图 57 是图 55 的承托件的两条纵向延伸的带和两条横向延伸的带之间的重叠相交点的从前视的细节视图；

[0183] 图 58 是图 55 的承托件的后视透视图；

[0184] 图 59 是图 55 的承托件从后视的平面图；

[0185] 图 60 是图 55 的承托件的一条纵向延伸的带和两条横向延伸的带之间的重叠相交点的从后视的细节视图；

[0186] 图 61 是图 55 的承托件处于一应变定向后放松后的构形的前视透视图；

[0187] 图 62 是处于图 61 的构形的承托件从前视的平面视图；

[0188] 图 63 是处于图 61 的构形的一条纵向延伸的带和一条横向延伸的带的重叠相交点的从前视的细节视图，其示出其中一个带子附接件；

[0189] 图 64(a) 至 (f) 是示出其中一个将纵向延伸的带连接至横向延伸的带的连接部件于模制后的型态的视图，其中 64(a) 是后视透视图、64(b) 是前视透视图、64(c) 是后视平面图、64(d) 是于横向方向的侧视图、64(e) 是前视平面图，而 64(f) 是截面视图，该截面穿过图 64(e) 中的 64f-64f 线；

[0190] 图 65(a) 和 (b) 分别示出横向带和纵向带的带颈区域的示例性的模制后的维度；

[0191] 图 66(a) 至 (f) 是示出其中一个将纵向延伸的带连接至横向延伸的带的连接部件于图 61 的构形下的视图，其中 66(a) 是后视透视图、66(b) 是前视透视图、66(c) 是后视平面图、66(d) 是于横向方向的侧视图、66(e) 是前视平面图，而 66(f) 是截面视图，该截面穿过图 66(e) 中的 66f-66f 线；

[0192] 图 67(a) 和 (b) 是分别示出横向带和纵向带的带颈部分替代的示例性的模制后的维度的视图；

[0193] 图 68(a) 至 (d) 示出靠背框架上用于将模制的承托件连接至靠背框架的部件，其中 68(a) 是靠背框架的前视透视图、68(b) 是在框架顶部部分上的其中一个附接件的视图、68(c) 示出在框架底部部分上的两个附接件，而 68(d) 则示出在框架侧部部分上的其中一些附接件；

[0194] 图 69(a) 至 (d) 与图 68(a) 至 (d) 类似，但示出附接至框架的其中一些长形带部件，其中 69(a) 示出其中一条纵向带至顶部框架部分的附接，69(b) 示出其中一条纵向带至框架底部部分的附接，69(c) 示出其中一条横向带于上部部分附接至框架侧部部分的附接，而图 69(d) 示出其中一条横向带于下部部部分附接至框架侧部部分的附接；

[0195] 图 70 是后视图，其示出图 55 至 67 的承托件附接至椅子靠背框架并承托软垫部件；

[0196] 图 71 是用于图 1 至 7 或 8 至 11 的椅子的优选形态的腰部承托组件的透视图，其中将腰部承托板块调节至中间高度并偏压至前向位置；

[0197] 图 72 是图 71 的腰部承托组件的分解透视图；

[0198] 图 73 是图 71 的腰部承托组件的前视图；

[0199] 图 74 是图 71 的腰部承托组件的平面视图；

[0200] 图 75 是图 71 的腰部承托组件的后视图；

[0201] 图 76 是图 71 至 75 的腰部承托组件的截面视图，截面穿过图 73 中的 76-76 线；

[0202] 图 77(a) 是图 71 至 76 的腰部承托组件的截面视图，截面穿过图 73 中的 77-77 线；

[0203] 图 77(b) 是图 77(a) 的部分的细节视图；

[0204] 图 78(a) 是对应图 77(a) 的截面视图，但其中在椅子座者施加向后的力时，腰部承托板块被后移，将偏压机制压缩；

[0205] 图 78(b) 是图 78(a) 的部分的细节视图；

[0206] 图 79 是对应图 77(a) 的截面视图，但其中将腰部承托板块调节至较高位置；

[0207] 图 80 是对应图 79 的截面视图，但其中将腰部承托板块向上倾斜；

[0208] 图 81 是对应图 77(a) 的截面视图，但其中将腰部承托板块调节至较低位置；

[0209] 图 82 是对应图 81 的截面视图，但其中将腰部承托板块向下倾斜；

[0210] 图 83 是图 71 至 82 的腰部承托组件的一优选型态的附接机制的构件的分解视图；

[0211] 图 84(a) 是部分剖面的前视图，其示出将图 71 至 83 的腰部承托组件附接至椅子的靠背框架的第一阶段；

[0212] 图 84(b) 是与图 84(a) 相似的部分剖面的前视图，但其示出将腰部承托组件附接至椅子的靠背框架的第二阶段；而

[0213] 图 84(c) 是与图 84(a) 相似的部分剖面的前视图，但其示出将腰部承托组件附接至椅子的靠背框架的最后阶段。

具体实施方式

[0214] 由于附图为了便于解释某些部件，对优选型态的椅子从多个不同角度描示，所以在合适的地方在某些附图中加入了以“F”标示的箭头以显示椅子向前的方向。相应地，前向、后向、左侧和右侧（等）术语应被了解为相对于椅子的向前方向F，而未必是相对于某附图中所示的定向。

[0215] 优选型态的椅子的特点在此描述和显示，以提供对优选型态的椅子的构件和操作的全面理解。应了解的是不是每张椅子都要提供此内描述的所有特点。

[0216] 图 1 至 7 显示根据本发明的第一个优选型态的椅子 101。图 8 至 11 显示根据本发明的第二个优选型态的椅子 101’。这两张椅子都可具有以下描述的特点的任一个或多个。第一个优选型态的椅子 101 和第二个优选型态的椅子 101’ 的主要分别在于该第一个优选型态的椅子是“中背”椅，其具有靠背部分 501，其大小和构形被设定以承托就座者的背部上至大约其肩胛骨的区域。第二个优选型态的椅子 101’ 是“高背”椅，其具有靠背部分 501’，其大小和构形被设定以承托就座者的背部上至并包括其肩部区域。由于该些椅子除此之外实质上是一样的，所以相同的参照号标示附图中相同的部件，撇号（’）显示有分别的部分。

[0217] 每张椅子都具有支撑框架 102，其包含基座 103 以支撑椅子在地板表面上。在所示的型态中，基座是带脚轮的基座 103，其具有多个径向延伸的脚 107，它们从单一的中央毂向外延伸。在所示的型态中，有五只脚。但可理解，可有更多或更少脚。脚轮或滚轮 109 可旋转地安装于径向延伸的脚 107 的末端，与中央毂相对的那端。脚轮使椅子就座者可沿地面移动基座 103，连带移动椅子。在替代的配置中，椅子可包含固定的基座，其不让椅子在地面滚动。

[0218] 高度可调的柱 111 耦合至基座的中央毂并从其向上延伸。高度可调的柱可为任何合适的、容许椅子座位部分 171 和靠背部分 501、501’ 相对地面的高度调节的一种气动弹簧。支撑框架的主要横楣件 121 耦合至高度可调的柱 111 的上端，以致该柱的高度调节引致横楣件 121 以及其支撑的构件的高度调节。

[0219] 用于承托就座者的座位部分 151 以及承托就座者的背部的靠背部分 501、501’ 通过如下所述的后倾机制耦合至横楣件 121，以致座位部分 151 和靠背部分可相对支撑框架移动。座位部分 151 和靠背部分 501 将在下文详述。

[0220] 椅子 101、101’ 可供有或不供有用于承托就座者臂部的臂部承托组件 401。

[0221] 后倾机制

[0222] 在优选型态的椅子中，椅子的靠背部分 501、501’可相对支撑框架 102 于竖直位置（图 3 和 10）和后倾位置（图 7）之间倾斜。椅子包含后倾机制 201、202，它们将靠背部分 501、501’耦合至座位部分和横楣件 121。后倾机制被配置以在靠背部分 501、501’后倾期间升起座位部分 151。

[0223] 图 12 至 17 显示后倾机制 201 的第一个优选型态。在这实施例中，后倾机制包含靠背支撑臂 203、摇动臂 211，以及连接器联接 215。靠背支撑臂 203 被固定至靠背部分 501、501’并从靠背部分 501、501’向前延伸。靠背框架 503 和靠背支撑臂 203 之间的角度优选为固定的并为约 90°。靠背支撑臂 203 是刚性的部件并具有扭结的设置，其中有：后向部分 203a，它从其后端向前延伸至枢轴 219；向上地和向前地指向的中间部分 203b，其位于枢轴 219 和 205 之间；以及前向部分 203c，其位于枢轴 205 和 207 之间。优选地，靠背支撑臂 203 的部分 203c 在靠背部分 501、501’是竖直的时候是大致上水平的，在靠背部分是后倾的时候则为向上地、向前地指向的。

[0224] 靠背支撑臂 203 以枢轴 205 枢转地连接至横楣件 121，而靠背支撑臂 203 的前端 203c 以枢转与滑动件 207 通过支撑件 161 枢转地连接至座位部分 151 相对前向的部分。优选地，靠背支撑臂 203 的前端连接至座位部分 151 的前方。摇动臂 211 以枢轴 213 枢转地连接至横楣件 121 并具有：相对地前向的第一端，其枢转地连接至座位部分 151 相对地后向的部分；以及相对地后向的第二端，其枢转地连接至连接器联接 215；这样是为了将摇动联接 211 可操作地连接至靠背支撑臂 203 以相对靠背支撑臂 203 移动。

[0225] 摇动臂 211 和横楣件 121 之间的枢轴连接 213 被置于横楣件 121 的后部部分或其相邻处。靠背支撑臂 203 和横楣件 121 之间的枢轴连接 205 是相邻于摇动臂 211 和横楣件 121 之间的枢轴 213 并在其前方。在靠背部分完全后倾和完全竖直的配置中，摇动臂和座位部分 151 之间的枢轴连接 209 大致上也与靠背支撑臂 203 和横楣件 121 的枢轴连接对齐于椅子的前 - 后方向中。

[0226] 在第一实施例 201 中，在靠背部分是完全竖直和是完全后倾时，摇动臂 211 和连接联接 215 的枢轴连接 217 实质上皆被垂直地置于连接联接 215 和靠背支撑臂 203 的枢轴连接 219 之上。如图 12 和 13 所示，在靠背部分 501 从竖直向后倾经过约 18° 的角度 á 期间，连接联接 215 和靠背支撑臂 203 之间的角度 ã 改变小于约 2°，从约 93.6° 改至约 95.4°。在该后倾过程中，摇动臂 211 从靠背部分完全竖直时摇动臂 211 向下向前地指向的定向 -- 比水平定向低 è 的角度，约 13°，优选约 12.7° -- 枢转至靠背部分完全后倾时摇动臂 211 向上向前地指向的定向 -- 比水平定向高约 24°，优选约 23.8°。在后倾的配置中，摇动联接 211 向上和向前的角度 è 大于角度 â，即靠背支撑臂 203 从横楣件枢轴 205 延伸至座位部分枢轴 207 的部分 203c 的向上和向前的角度。在这实施例中，在后倾的配置中向上和向前的角度 â 是约 17.1°，在靠背部分为竖直的时候该向下和向前的角度 â 则是约 0.8°。

[0227] 图 15 至 17 示出图 12 至 14 的后倾机制的侧视图，其中靠背部分 501、501’处于完全竖直（图 15）、中间（图 16）和完全后倾（图 17）的位置。

[0228] 如图 27 所示，靠背支撑臂 203 和座位部分 151 之间的枢转与滑动件 207 包含固定于座位部分 151 的前部部分的下侧的销 210，以及在靠背支撑臂 203 的前端 203c 中的至少

一个槽 208。槽 208 是稍为长形的孔，于后倾过程中其容许销 210 沿槽 208 移动约 1.5mm 至约 2mm 之间。替代地，枢转与滑动件 207 可包含任何其它滑动的连接，例如在靠背支撑臂 203 的前端的销或凸部，其在座位部分 103 中的槽中滑动。

[0229] 图 18 至 22 示出第二个优选型态的后倾机制 202。该实施例具有与图 12 至 17 的实施例相似的特点和运作，而相同的标号标示相同的部件，撇号 (') 显示有分别的部分。这实施例的分别在于作为连接器联接 215 的替代，摇动联接 211' 是通过枢转与滑动连接 220 可操作地连接至靠背支撑臂 203' 以相对于靠背支撑臂移动。摇动联接 211' 于其两端之间的枢轴 213' 枢转地连接至横椗件 121。

[0230] 枢转与滑动连接 220 的前后位置被选择以使摇动联接 211' 在横椗件枢轴 213' 和座位枢轴 209 之间的前向部分在靠背部分 501、501' 后倾期间移动经过和第一实施例中一样的角度，以致第一和第二实施例 201、202 在靠背部分 501、501' 后倾时对座位部分 151 的致动实质上都是一样的。第一和第二实施例 201、202 在座位部分 151 和靠背支撑臂 203' 之间的枢转与滑动连接 207 实质上都是一样的。可以看见，在这实施例中靠背支撑臂的枢轴 220、205、207 比在图 12 至 17 中的实施例的更接近成一直线。

[0231] 优选地，枢转与滑动连接 220 包含在摇动臂 211' 上的销 223 和在靠背支撑臂 203' 中的槽 225，如图 20 至 22 所示。优选地，枢转与滑动连接 220 提供约 2 和约 3mm 之间的滑动，最优选地为约 2.5mm。枢转与滑动连接 220 提供的滑动量取决于连接 220 相对于靠背支撑臂 203' 和枢轴 213' 的垂直位置。对于枢转与滑动连接 220 一给定的前后位置，枢转与滑动连接若处于较低位置，则会比处于较高位置需要较多的滑动。替代地，滑动连接可包含任何其它合适的滑动连接，例如可转动地安装在摇动臂 211' 上的滚轴，其可沿靠背支撑臂 203' 的一表面滑动。

[0232] 后倾机制可包含单一个靠背支撑臂 203、203'、摇动臂 211、211'、和 / 或摇动联接 215 或枢转与滑动件 220，它们可以大体上置中地安装在椅子中。优选地，椅子包含一对靠背支撑臂 203、203'、一对摇动臂 211、211'，和相应的一对摇动联接 215 或枢轴 / 滑动件 220，它们跨过椅子的一横向阔度相隔以为后倾机制的移动提供稳定性。两个靠背支撑臂 203、203' 可为带有两条向前延伸的臂的、通过横跨部件连接的一体的单一部件，或可为两分开的支撑臂，两者皆可操作地连接至靠背部分 501、501'。

[0233] 如图 25 至 30 所示，横椗件 121 优选地包含一对相隔的侧壁 227，以及基座 229。靠背支撑臂 203、203' 优选是置于横椗件侧壁 227 的内侧，并于枢轴 213、213' 枢转地连接至其各自的侧壁 227。摇动联接 211、211' 优选是置于横椗件侧壁的外侧。

[0234] 图 15 至 17 和 20 至 22 示出后倾机制的侧视图，其中靠背部分 501、501' 为竖直、部分后倾和完全后倾。在后倾期间，座位部分 151 先向上和向前地移动，直至摇动联接 211、211' 为水平的，其后则向上和向后地移动。当靠背部分 501、501' 为竖直时，座位部分 151 向后倾斜 4° 。在靠背支撑臂 203 一前端的下侧第一表面 212a 抵接横椗件 121 的部分以提供竖直位置止动件以限定靠背部分的竖直位置。

[0235] 在靠背部分 501、501' 后倾以及座位部分 151 升起期间，座位的后倾度增加，但其增加速率低于靠背部分 501、501' 的角度变化。在后倾期间，靠背支撑臂 203 的第一表面 212a 移动，离开与横椗件 121 的接触。图 17 示出靠背部分 501、501' 完全后倾时的座位部分 151。在完全后倾的位置，在摇动联接 211、211' 一前端的上方第二表面 212b 抵接座位部

分 151 的表面以提供后倾止动件并限定靠背部分 501、501’的最大后倾度。在一优选实施例中，于靠背部分在竖直位置时座位部分后倾约 4°，于靠背部分在完全后倾的位置时座位部分后倾约 7.8°。

[0236] 可以看见，在靠背部分 501、501’后倾期间，座位部分 151 优选是向上和向后地升起，并增加后向的倾角。座位部分的升起提供“补偿重量”的后倾机制，即是较重的就座者则需要比较轻的就座者所需的更大的力才能将靠背部分后倾。如图 14 所示，座位部分相对横楣件 121 的实效上的枢转点 221 在靠背部分至横楣件的枢轴连接 205 后方和下方，从该枢轴连接 205 其向后的距离 RPD 为约 374mm，垂直的距离 VPD 则为向下约 44.2mm。这些维度仅为例子并可变更。

[0237] 由于主要的靠背支撑臂 203、203’向前延伸，在下方经过座位部分 151 的大部分，并连接至座位部分的相对地前向的部分，所以在靠背部分 501、501’后倾期间座位部分的升起主要为其前向部分的升起。摇动臂 211、211’通过它们连接至靠背支撑臂 203、203’的操作连接作用为该运动的从动件，并升起座位部分的后部部分。

[0238] 座位部分 151 包含座位支撑件 161 以及用于承托就座者的座位表面 171。在一优选实施例中，座位表面 171 在相对座位支撑件 161 的前后方向上选择性地可动，以选择性地调节相对靠背部分 501、501’的座位深度。摇动臂 211、211’以及靠背支撑臂 203、203’于枢轴 207、209 枢转地连接至座位支撑件 161。替代地，座位表面 171 可被固定至座位支撑件 161 并不设深度调节。在所示的型态中，座位表面 171 是带软垫和外饰的表面。替代地，它例如可为柔软的带槽的座位板，或带槽的座位板和带软垫和外饰的表面的组合。

[0239] 后倾机制 201、201’是低矮的机制。如图 20 所示，后倾机制的顶部和底部表面之间的垂直高度 VHRM 优选为约 40mm。如图 1 至 11 所示，座位部分的下侧可包含具中央凹位的壳体 181。在椅子的靠背部分是竖直时，后倾机制的一大部分（包括横楣件 121）安置于中央凹位中。

[0240] 如图 6、9 和 10 中所示，三个致动件 191a、191b、191c 齐平嵌入地安装于下侧壳体 181 中，并被提供以让就座者可通过移动该些致动器调节椅子的特点。在一实施例中，在椅子左侧的前部致动器 191a 调节（下文详述的）后倾阻力、在椅子右侧的致动器 191b 调节座位表面 171 的高度和深度，而在椅子左侧的后部致动器 191c 致动直立锁定件 251 以防止靠背部分后倾。

[0241] 图 23 和 24 示出在支撑件 161 上的座位深度调节安装架的细节。座位板 151a 中横向相隔的部分捕捉支撑件 161 的相应部分以将板 151a 可滑动地安装至支撑件上。支撑件设有齿条，其包含多个相隔的槽 161a。卡扣主体 192 安装至板 151a，并带有可横向地移进和移离与槽 161a 的啮合的齿 192d。当啮合时（图 24），座位表面 171 的深度位置相对支撑件 161 是锁定的。当不啮合时（图 23），座位表面 171 的深度位置可由就座者调节。要调节深度时，就座者将致动器 191b 从空档位置以某方向移动，其通过耦合联接 192a 以及其与卡扣主体 192 的球窝连接（球 :192b ;窝 :192c）将卡扣主体移离与齿条的轨道连接的啮合。在释放致动器时，偏压力会导致卡扣主体 192 重新与齿条啮合，以将座位表面锁定于多个深度调节位置之其一。将致动器从空档往另一方向移动则会释放气动弹簧 111 以容许座位部分 151 的高度被调节。

[0242] 如图 27 所示，椅子优选地具有大体上 L 形的锁定部件 251，其可操作地连接至座位

部分 151，并相对座位部分 151 和横楣件 121 选择性地可横向滑动。锁定部件 251 的长形部分 251a 延伸穿过座位部分中的孔 253，并且选择性地可啮合于横楣件 121 的孔 255 中。锁定部件 251 的较短部分 251b 延伸穿过在座位部分中的孔，并在长形部分啮合时啮合相对孔 255 在横楣件 121 的另一侧的孔 255a。当锁定部件 251 啮合于孔 255a、255 时，座位部分 151 和靠背部分 501、501’被锁定于竖直位置。当其脱离与孔 255a、255 的啮合时，座位部分 151 和靠背部分 501、501’可被后倾。

[0243] 后倾阻力机制

[0244] 椅子 101、101’还包含后倾阻力机制 301 或 302 以抵抗靠背部分 501、501’往后倾位置的移动。后倾阻力机制 301 或 302 所提供的阻力是选择地可被调节。

[0245] 图 25 至 32(b) 示出第一个优选型态的后倾阻力机制 301。

[0246] 该后倾阻力机制 301 包含第一保持件 307、阻力装置 305，以及可动的第二保持件 309。该阻力装置包含板簧 305，其一端通过连接至靠背支撑臂 203 可操作地固定至靠背部分 501、501’。第一保持件 307 附接至横楣件 121 并至少在靠背部分 501、501’处于竖直位置时啮合板簧 305 的上表面。在竖直位置时，靠背支撑臂 203 的表面 212a 啮合横楣件 121 的表面，第一保持件 307 则向板簧施加向下的力，这样就把板簧 305 预载并将靠背部分 501、501’偏向竖直。

[0247] 第二保持件 309 包含鞍部件，其枢转地安装至横楣件 121 并选择性地可于停用位置（图 29、30、32(a)）和启用位置（图 25、26、28、31、32(b)）之间枢转。当第二保持件 309 在停用位置时，在靠背部分 501、501’后倾期间无论板簧 305 怎样动，第二保持件也不会触及板簧。在该停用配置时，当靠背部分相对横楣件后倾时，板簧偏离以抵抗后倾。板簧于第一保持件 307 抵着横楣件反动以提供偏离，如图 32(a) 所示。当第二保持件 309 处于启用位置时，其位于板簧 305 的顶部表面上、第一保持件 307 的前方。第二保持件 309 在靠背部分 501、501’处于竖直位置时并不向板簧 305 施加向下的力或预载。优选地，在靠背部分 501、501’处于竖直位置时，第二保持件 309 并不接触板簧 305 的顶部表面。

[0248] 优选地，在启用时，第二保持件 309 在靠背部分后倾约 3° 至 5° 之间后触及板簧 305。当第二保持件 309 启用而靠背部分 501、501’相对横楣件后倾时，板簧 305 偏离以抵抗该后倾，并于超过约 3° 至 5° 的后倾后于第二保持件 309 抵着横楣件 121 反动。如图 32(b) 所示，于靠背部分 501、501’后倾期间，板簧 305 与第一保持件 307 脱离接触并从其移离。

[0249] 如图 27 所示，壳体支架 319 将靠背部分 501、501’操作地连接至后倾机制 201 以及后倾阻力机制 301。靠背部分 501、501’的底部部分以例如螺栓等紧固件固定至这壳体支架 319。壳体支架 319 亦以螺栓等紧固件固定至靠背支撑臂 203。后倾机制的连接联接 215 于枢轴 219 枢转地连接至靠背支撑臂 203。板簧 305 的一端置于壳体支架 319 内并以销 320 相对于壳体支架定位于前后的方向中。壳体支架 319 包含两个相隔的横向杆，其置于壳体内。第一杆 323 置于壳体支架 319 的下部、前部部分，而第二杆 321 置于第一杆 323 的上方和后方。板簧延伸进壳体支架，跨过第一杆 323 上方和第二杆 321 下方，以致第一和第二杆实制上将板簧保持在相对壳体支架 319 的悬臂关系中并从而对靠背部分 501、501’也成悬臂关系。于靠背部分 501、501’后倾期间，杆 321、323 对板簧的后倾力反动。相比板簧 305 直接连接至壳体 319 的悬臂连接，杆 321、323 增加板簧 305 的实效长度，并且亦减小

在相邻壳体的位置施加在板簧上的集中的应力。

[0250] 在一个优选的实施例中，板簧 305 包含复合材料，例如单向玻璃纤维强化的环氧树脂复合物。替代地，该板簧可包含例如弹簧钢。

[0251] 从图 31 可见，当只启用第一保持件 307 时，板簧 305 的实效长度为 BR，当启用第二保持件 309（并且靠背部分 501、501’在后倾）时，实效长度则为较长的 BS。此外，当只启用第一保持件 307 时，板簧 305 还具有靠背部分 501、501’的主要枢轴 205 至主要横楣件 121 之间的第一反动长度 PR，而当启用第二保持件 309（并且靠背部分 501、501’正在后倾）时，板簧则具有较长的第二反动长度 PS。

[0252] 参照图 32(a) 和 32(b)，当只启用第一保持件 307 时，在靠背部分后倾时板簧的偏离幅度为第一幅度 D1，而当启用第二保持件时，板簧 305 的同一点偏离的幅度为较大的第二幅度 D2。结果是，当第二保持件启用时，在靠背部分后倾期间，板簧的实效长度、反动长度以及偏离幅度皆大于只启用第一保持件时的。由于在第二保持件 309 启用时板簧 305 的实效长度较长，这产生了相比只启用第一保持件 307 时较低的回弹率。但较长的反动长度 PS 以及较大的板簧偏离幅度 D2 克服了实效上较长的板簧的较低的回弹率。

[0253] 第一保持件 307 将板簧预载，而且在靠背部分 501、501’是竖直时将第二保持件 309 带进启用位置并不会令它触及板簧，所以调节第二保持件 309 的位置时并不需要克服任何作用于板簧 305 上的力。

[0254] 如例如图 28 示意地示出，第二保持件 309 以鲍登缆绳 315 调节。缆绳具有缆绳壳体以及可相对壳体活动的内缆绳部分。内部部分 317 耦合至在座位部分下侧的致动器 191a 以供就座者使用。当就座者用手移动该致动器时，这引致缆绳 317 的内部部分活动。这会引致缆绳内部部分的另一端活动，并相应地引致第二保持件 309 枢转进入或离开与板簧 305 的啮合。板簧 305 的自由端包含保持件卡扣件 313，当第二保持件处于启用位置而靠背部分 501、501’后倾时，该卡扣件锁上第二保持件 309。当第二保持件 309 与板簧 305 啮合时，第二保持件可相对于横楣件枢转以在靠背部分 501、501’后倾期间与板簧的末端一起转动。在靠背部分 501、501’后倾期间，保持件卡扣件 313 防止第二保持件意外地枢转离开与板簧 305 的啮合。

[0255] 如图 32(a) 和 32(b) 所示，如果在第二保持件 309 在停用位置时将椅子的靠背部分 501、501’后倾，然后使用者尝试把第二保持件 309 移进图 32(b) 中的启用位置，那么第二保持件 309 则会碰上升起了的板簧 305 的末端。同样地，如果在椅子的靠背部分 501、501’后倾的时候使用者尝试将第二保持件 309 移离与板簧 305 的啮合，那么板簧向着第二保持件 309 施加的力会高于可容许第二保持件 309 从板簧脱离啮合的程度。相应地，如图 28 示意地示出，缆绳包括例如螺旋弹簧的第一偏压器 318，它使就座者可以在靠背部分 501、501’后倾时将第二保持件 309 预设至与板簧 305 啮合或不啮合，而该偏压器只在靠背部分回到竖直位置后而第二保持件 309 可改变与板簧 305 的啮合或不啮合时才会导致该调节生效。这是通过在缆绳 315 的某部分提供例如螺旋弹簧 318a 的第二偏压器达成。

[0256] 第二偏压器 318a 比第一偏压器 318 较硬，而在正常使用中无论保持件是启用还是停用，该第二偏压器 318a 都是没有被压缩的。当第二保持件 309 处于停用位置而靠背部分处于后倾位置时，如果就座者将第二保持件 309 预设为与板簧 305 啮合，那么第二保持件会尝试与板簧啮合，但由于会抵上板簧的末端，所以不会可以枢转到位。然而，第二偏压

器 318a 会压缩，而当椅子回到竖直时，第二偏压器 318a 就会将第二保持件 309 拉进与板簧 305 啮合的位置。同样地，当第二保持件 309 正与板簧 305 啮合而靠背部分处于后倾位置时，如果就座者将第二保持件 309 预设至与板簧 305 脱离啮合，那么第二保持件会尝试脱离啮合但不会成功枢转至脱离啮合。然而，缆绳 315 会变得松弛。当椅子回到竖直时，第一偏压器 318 会将第二保持件 309 推离与板簧 305 的啮合。

[0257] 上文的描述只说明后倾阻力机制 301 的一个优选型态。在一个替代的实施例中，第二保持件 309 可以不是枢转地连接至横楣件 121 而是可以相对板簧 305 滑动以改变板簧抵着横楣件 121 的反动点。在这样的实施例中，当靠背部分 501、501’处于大体上竖直的位置时，第二保持件 309 会是可相对板簧自由滑动而不改变施于板簧 305 上的预载。而且，除了第一 (307) 和第二 (309) 保持件之外，还可以有一个或更多个可啮合板簧 305 的额外保持件，以提供更多级的后倾阻力。

[0258] 如图 25 至 32(b) 所示的那优选实施例包含单一的板簧 305。替代地，后倾阻力机制 301 可包含两个或更多个板簧。第一 (307)、第二 (309) 和任何额外的保持件可只啮合那些板簧的单一，或可同时啮合多于一块板簧。例如，在带有置于横楣件 121 的相对两侧的两板簧的实施例中，每块板簧可包含各自的附接至横楣件 121 的第一保持件 307。枢转地附接至横楣件的第二保持件 309 可包含两个鞍部件，它们被设置以在第二保持件被调节至高阻力位置时同时与两条板簧啮合。

[0259] 图 33 至 36 示出后倾阻力机制 302 的第二个优选型态。此实施例的特点和运作类似于上述的实施例，而相同的标号标示相同的部件。在这实施例中，不使用板簧 305，阻力装置改为扭力弹簧 325。扭力弹簧 325 包含操作地连接至横楣件的第一条腿 326a 以及操作地连接至靠背部分的第二条腿 326b。第二条腿 326b 包含弯曲的端部，其横向地延伸并被接收于靠背支撑臂 203 中的孔中。在所示的型态中，扭力弹簧 325 是双螺旋的扭力弹簧，其带有两条操作地连接至靠背部分的腿 326b，以及两条操作地连接至横楣件 121 的腿 326a。在一个优选的实施例中，扭力弹簧的枢轴置于靠背部分的枢轴 205 后方。替代地，扭力弹簧的枢轴可与枢轴 205 同轴 (如图示)，或置于枢轴 205 前方。如上述的板簧实施例那般，固定至横楣件 121 的第一保持件 307’与扭力弹簧的腿 326a 的顶部表面啮合以将弹簧的腿 326a 操作地连接至横楣件 121，并于靠背部分 501、501’ 处于竖直位置时施加预载至扭力弹簧 325 以及在靠背部分 501、501’后倾期间提供第一后倾阻力。型态为钩形的第二保持件 309’于枢轴 311’枢转地附接至横楣件 121，并于靠背部分 501、501’是在大体上竖直的配置时可枢转以与腿 326a 之间的横跨部件啮合以增加在靠背部分后倾期间的后倾阻力。

[0260] 在扭力弹簧的枢轴设于靠背部分枢轴 205 后方的那些实施例中，扭力弹簧的腿 326a 以类似于板簧实施例那样的方式与保持件互动。具体地，在靠背部分后倾期间，在启用第二保持件 309’时弹簧的反动长度和偏离幅度比只启用第一保持件 307’时为大。由于在启用第二保持件 309’ 时弹簧的腿 326a 的实效长度较长，那样提供的回弹率比只启用第一保持件 307’ 时的较低。但较长的反动长度以及较大的板簧偏离幅度克服了实效上较长的弹簧的较低的回弹率。

[0261] 在替代的实施例中，阻力机制 301、302 可以不是于靠背部分 501、501’ 和横楣件 121 之间操作地连接，而是于座位部分 151 和横楣件 121 之间操作地连接，或者于靠背部分 501、501’ 和座位部分 151 之间操作地连接。附加地或替代地，该些后倾阻力机制可用于设

有如上所述的第二个优选型态的后倾机制 201’的椅子中，或用于设有其它种类的后倾机制的椅子中。

[0262] 臂组件

[0263] 椅子 101、101’具有一对臂组件 401，它们设于椅子组件 151 的两侧。图 37 和 38 中示出一个优选型态的臂组件。每个臂组件 401 包含支撑组件 402 以及扶手 403。扶手 403 相对于支撑组件 402 可以是固定位置的，以致扶手只是高度可调。替代地，扶手 403 除了高度可调，也可以是相对于支撑组件 402 大体上可于水平方向上移动。作为例子，扶手 403 可以是选择性地相对支撑组件可于前后方向、一侧至另一侧的方向，和 / 或绕实质上垂直的轴线枢转地移动。

[0264] 在所示的型态中，支撑件 402 是连接至靠背部分 501、501’的，以致在靠背部分后倾时扶手与其一起移动。替代地，支撑件 402 可连接至椅子的另一部分，例如座位部分 151 或支撑框架（例如横楣件 121）。

[0265] 支撑可动的扶手 403 的支撑组件 402 优选是高度可调的，并安装至椅子 101、101’。参照图 39 至 44，高度可调的支撑组件 402 优选地包含支撑主体 406、接收主体的套件 405，以及杠杆 411。通过致动该杠杆可于套件 413 中选择性地调节主体 406 的高度，以调节扶手 403 相对椅子 101、101’的高度。

[0266] 套件 405 包含两个内套件部分 415、417，它们设于外套部件 413 中并以安装板 419 定位。优选地，其中一个内套件部分 417 包含套圈 417a，其套过另一内套件部分 415 以及安装板 419，以确保三个部件准确对齐，以及保持美观。替代地，套圈 417a 可为独立的盖部件。每个内套件部分 415、417 的内部表面包含带棘位的槽轨 416、418，其具有长形的、垂直的槽轨部分 416b、418b 以及多个棘位 416a、416b。在所示的实施例中，棘位 416a、418a 包含从长形的垂直槽 416b、418b 后向地延伸的水平的的缺口。

[0267] 支撑主体 406 包含长形的中空的弯曲的实质上垂直的管状部分 406a 以及从中空部分 406a 顶部延伸的向前延伸的实质上水平的悬臂部分 406b。支撑主体 403 的中空部分 406a 被套件 405、413、415、417 接收。悬臂部分 406b 操作地支撑扶手 402。臂盖部件 407 以紧固件（未示出）同时附接至支撑主体 406 的悬臂部分 406b 以及长形的中空部分 406a 的顶部并盖着它们。

[0268] 支撑主体 406 优选地是模制的塑料部件。钢制的加固部件 421 设于主体 406 中。

[0269] 杠杆 411 是反转的 L 型部件，其设于支撑主体 406 中并相对主体 406 可绕枢轴 407a 枢转，枢轴 407a 由销 423 延伸穿过杠杆 411 与臂盖 407 中的孔构成。杠杆的一条腿设于支撑主体的长形中空部分 406a 中，而杠杆的另一条腿则设于支撑主体的悬臂部分 406b 中。杠杆 411 附接至加固部件 421 和盖部件 407，或以其它方式操作地枢转地附接至支撑主体 406。

[0270] 杠杆 411 的下端包含导向凸部 427 以及锁定销 429。锁定销 429 通过凸部的中心以及设于主体 406 上两侧的槽（未示出）。锁定销 429 延伸进内套件部分 415、417 上的带棘位的槽轨 416、418 中。在杠杆 411 绕其枢轴销 423 被枢转期间，凸部于主体 406 中的槽中前后移动。在主体中的槽的两端以及槽轨 416、418 充当抵着凸部 427 的指动件以限制杠杆 411 的枢转。加固部件 421 限定另一个槽 425，它给杠杆上的凸部 427 提供虚位，以致在杠杆 411 枢转期间导向凸部 427 可相对加固部件 421 移动。

[0271] 杠杆 411 于其上前端包含致动器部分 410。支撑主体 406 的悬臂部分 406b 的下侧的一开口让致动器部分 410 露出。优选地，该致动器部分从该开口凸出，以让使用者容易找到该致动器部分 410。按着、向上拉着或释放致动器部分 410 使杠杆 411 绕枢轴 423 枢转。在杠杆 411 枢转期间，凸部 427 于加固部件槽 425 中滑动，而锁定销 429 于主体中的槽 406c 中滑动以于带棘位的槽轨 416、418 中移动以与棘位 416a、418a 啮合和解除啮合。

[0272] 图 41 示出锁定于最低位置的支撑组件，其中锁定销 429 与最低的棘位 416a、418a 啮合。偏压器 424（其于所示型态中为螺旋弹簧）设于致动器部分 410 和臂主体盖 407 之间以将致动器部分 410 向下偏压并从而将杠杆 411 偏压进锁定位置，其中锁定销与棘位 416a、418a 啮合。向致动器部分 410 施加向上压力则将杠杆 411 枢转至释放的位置，其中锁定销 429 从棘位 416a、418a 解除啮合并可自由地于长形槽 416b、418b 中滑动。替代地，偏压部件可设于杠杆 411 的另一部分以及壳体 406、407 之间以将杠杆偏压进锁定或释放位置。可使用任何合适种类的偏压器。

[0273] 图 42 和 43 示出处于释放的位置的杠杆 411 和锁定销 429。当杠杆和销处于释放的位置时，臂组件主体 406 可在上限和下限之间于套件 405 中自由滑动以调节扶手的高度。例如，通过将扶手 403 或臂主体 406 向上拉或向上推，可将臂组件从图 42 所示的最低位置调节至图 43 所示的位置。当致动器部分 410 从图 43 所示的位置被释放，弹簧 424 则将杠杆 411 偏压回锁定位置，将锁定销 429 移进一棘位 416a、418a 以锁定扶手的高度，如图 44 所示。

[0274] 扶手可相对套件 405 被调节至相应于棘位 416a、418b 数量的多个高度。例如，在所示的实施例中，带棘位的槽轨 416、418 各包含十个垂直相隔的缺口，扶手就可于十个不同高度之间移动。可以了解，套件可包含多于或少于十个棘位以容许于更多或更少位置之间调节扶手 403。

[0275] 要组装支撑组件 402，将杠杆 411 和加固板 421 布置以致杠杆凸部 427 置于加固板槽 425 中，两者进而以销 423 于枢轴 407a 被钉上盖部件 407 上。杠杆和板 421 然后被置于支撑主体 406 中。在附接杠杆 411 和加固板 421 的之前或之后将上述的转动机制连接至盖 407。然后将盖部件 407 扭上支撑主体 406b 上。然后将锁定销插入穿过在臂主体 406 的长形中空部分中的槽，以及穿过在杠杆凸部 427 中的匹配的孔。然后将内套件部分 415、417 以及安装板 419 绕着臂主体 406 的长形部分组装，以致锁定销 429 的两端置于各自的带棘位的槽 416、418 中。然后将内套件部分 415、417 和安装板 419 滑进外套件 415 中。

[0276] 安装板 419 具有对准的、具螺纹的孔 420 以供安装套组件 405，以及从而安装臂支撑组件至椅子 101、101’上。外套件 413 的背部亦设有孔（未示出），它们与安装板 419 中的孔 420 对准以接收例如螺旋盖等紧固件 420a。通过将螺旋盖从椅子背面穿过靠背部分 501、501’中的孔，并穿进安装板 419 上的具螺纹的孔 420 中，以有效地将套 405 夹于安装板 419 和椅子靠背之间，以将套组件 405 安装至椅子的靠背部分 501、501’。

[0277] 外套件 413 的背部那侧优选是被构形以各自抵着椅子靠背 501 的相应的框架部分 504a 而坐并实质上与其齐平。例如，在所示的实施例中，套件的背部 419 是凹形的，以齐平地与凸形的靠背框架部分 504a 而坐。

[0278] 从图 37 至 44 可见，高度调节机制（除了致动件部分 410）是实质上从臂支撑组件外部的视线被屏蔽的，从而令臂支撑组件美观。即使该 405 相比支撑主体 406 矮小亦然。

[0279] 在替代的实施例中，支撑件 402 可为高度不可调的支撑件，其可包含可安装至椅子 101 的单一部件。替代地，支撑件可为高度可调的，但不包含角度可调和 / 或前后或侧向可调的扶手。

[0280] 靠背部分

[0281] 靠背的构造

[0282] 图 45 至 70 示出一个优选型态的靠背组件 501。靠背组件 501 包含靠背框架 503，其具有框架侧部部分 504a 以及框架上 (504b) 和下 (504c) 部分，它们限定开口 503a。下文将进一步描述的承托件 531，其附接至框架 503 并被悬挂跨过框架开口 503a。软垫组件 507 置于框架 503 前方并抵着承托件 531 的前表面。一个或多个钉针接收部件 511、512 固定至框架 503 的后方以将软垫部件 507 连接至框架 503。装饰性的盖 517 置于靠背组件的后侧以盖着框架 503、软垫组件 507 以及钉针接收部件 511、512 之间的连接。

[0283] 向前凸出的连接部分 505 连接至框架下部部分 504c 以将靠背组件 501 连接至后倾机制 201。连接部分 505 连接至如上所述的后倾机制的靠背支撑臂 203，以使靠背部分可相对横椆件后倾。替代地，靠背支撑臂 203 和靠背框架的连接部分 505 可以是一体的。在替代的实施例中，靠背组件 501 可被固定地连接至横椆件或座位部分，或可以替代的机制连接至横椆件以致靠背组件 501 的后倾或移动相同于或不同于上文于后倾机制 201、201’相关处所描述的。

[0284] 靠背框架 503 限定实质上矩形的开口 503a。承托件 531 包含多个相隔的长形的纵向延伸的带 533 以及多个相隔的横向延伸的带 535。每条纵向带 533 和横向带 535 各包含两端的连接器 545，其各带有孔 547。纵向带和横向带以钩 561 连接至靠背框架 503，以致承托件 531 被悬挂跨过开口 503a，以给软垫组件 507 提供承托表面。

[0285] 靠背框架 503 和靠背组件 501 绕垂直轴线向前优选是为凹形的，而靠背框架和靠背组件的至少一下部部分绕水平的横向轴线向前则优选是为凸形的，以紧贴使用者背部的自然曲线。

[0286] 软垫组件 507 包含前外饰套件 509a、软垫 508 和后外饰套件 509b。软垫 508 优选是泡沫塑料部件，并可包含模制或剪裁的部分以容纳靠背框架 503 的部分以及供承托件 531 的附接钩 561。外饰套件可为任何合适种类的，例如织物、皮革或人造革。前外饰套件 509a 被粘至软垫的前表面，后外饰套件 509b 被粘至软垫的后表面。软垫 508 至少如靠背框架 503 所限定的开口 503a 那般大，并优选地其尺寸被设定以实质上盖过靠背框架 503 的前表面和开口 503a。软垫 508 可以比靠背框架 503 的前表面稍大，以致软垫 508 的外周部分包过靠背框架 503 的周边。前外饰套件优选是比软垫的前表面大，以致前外饰套件的周边可被包过软垫 508 的外边以及软垫 508 的部分后部。

[0287] 如图 49(a) 至 (c) 最清楚地显示，靠背框架 503 的后表面包含多个中空的圆柱形凸部 515、516。上方的凸部 515 比下方的凸部 516 矮，以让框架上部部分 504b 可以比框架下部部分 504c 扁平。钉针接收部件 511、512 各包含前表面，其带有多个向前凸出的匹配的压榫 513、514，如图 50(a) 至 (c) 所示。压榫 513、514 的外直径比靠背框架后侧上的中空凸部 515、516 的内直径稍大。要将钉针接收部件连接至靠背框架 503，就将榫 513、514 按进框架上相应的中空凸部 515、516 中，令每个榫的至少一部分变形。图 51(a) 和 51(b) 示出将钉针接收部件 511、512 组装至框架 503 的步骤。在所示的实施例中，榫 513、514 绕其外周

带有肋条。当榫 513、514 被逼进靠背框架 503 上的圆柱形凸部 515、516 时至少部分的这些肋条被压扁，以产生钉针接收部件 511、512 和框架 503 之间紧密的摩擦力接合。

[0288] 钉针接收部件 511、512 和榫 513、514 优选地包含硬度比靠背框架 503 较低的热塑性聚合物料。例如，钉针接收部件可以聚丙烯形成，框架可以 30％玻璃纤维强化的 PET 塑料形成。榫 513、514 的变形通常为塑性变形，以致如果将钉针接收部件 511、512 拆除，则不能将它们稳固地重新附接。在替代的实施例中，可以其它手段将钉针接收部件 511、512 附接至框架 503，例如用紧固件、粘剂、或其它卡扣式连接。替代地，可直接以框架接收钉针。又替代地，前外饰套件可以任何合式手段紧固至框架，例如上述的手段。

[0289] 钉针接收部件 511、512 提供表面，其用于将软垫组件 507 钉至靠背框架 503。图 54 示出软垫组件 507 和靠背框架 503 上部部分的附接。在所示的实施例中，前外饰套件 509a 包过软垫 508 的周边，以及靠背框架 503 和钉针接收部件 511、512 的后方。然后将前剪外饰套件 509a 和钉针接收部件 511、512 钉在一起。钉针接收部件提供比靠背框架 503 较软的表面以接收钉针。在替代的实施例中，后外饰部件 509b 亦可包过靠背框架 503 的周边并与前外饰套件 509a 一起被钉至钉针接收部件 511、512。替代地或额外地，软垫 508 和 / 或后外饰套件 509b 可被粘上靠背框架 503 的前表面。

[0290] 图 52 所示的装饰性的盖 517 被附接至靠背框架 503 的后侧以盖过前外饰套件 509a 被钉着的部分、钉针接收部件 511、512，以及靠背框架的后侧。装饰性的盖 517 包含开口 517a，它与靠背框架的开口 503a 大致同样大小或比它略小，以致承托件 531 和靠背外饰套件 509b 可从靠背部分后方看见。装饰性的盖 517 的开口亦容许软垫组件 507 和承托件 531 的部分在承托使用者期间向后偏离至框架 503 和装饰性的盖 517 以外。

[0291] 如图 52(a) 和 53(a) 所示，装饰性的盖 517 的上部部分包含多个向上凸出的凸片 518。凸片 518 用于与靠背框架 503 的前表面上的相应的凹位 521 啮合，如图 53(a) 所示。装饰性的盖 517 的下部部分包含多个向前凸出的压榫 519，如图 52(c) 和 53(b) 所示。装饰性的盖 517 的侧部部分包含多个向外指向的凸片 520a 和外凸部 520b。在靠背框架的侧部部分上的相应的卡扣件 522 可于向外指向的凸片 520a 和外凸部 520b 之间的空间中被接收。靠背框架 503 的下部部分包含多个中空的圆柱形凸部 506。压榫 519 和上文于钉针接收部件 511、512 相关处所描述的那些压榫相似。

[0292] 装饰性的盖 517 通过以下方式附接至靠背框架 503 ：首先，将装饰性的盖 517 的上部部分相对上靠背框架部分定位，以致凹位 521 置于凸片 518 后 (图 53(a))，将侧部卡扣件 522 卡于侧部凸片 520a 和凸部 520b 之间 (图 53(c) 和 53(d))，然后将压榫 519 按进靠背框架上相应的中空凸部 506 中 (图 53(b))，将压榫 519 变形。

[0293] “高背”的靠背部分 501’以相同于靠背部分 501 的方式形成。然而，其靠背框架 503 的上部部分会于开口上方设有“刀片”，它会支撑软垫组件的上端。软垫组件可设有袋或类似物以接收刀片以协助将软垫组件安装至框架的刀片。

[0294] 模制的承托件

[0295] 图 70 是一优选型态的椅子的后视图，其示出承托件 531 于靠背部分 501 中承托软垫组件 507。承托件具有像多条独立的纵向的带 533 叠在多条独立的横向的带 535 上的外观。包含多条独立的带的承托件更为美观，但这样的设置相比一件式的模制承托件具有多个组装和性能上的缺点。将多条分开的带各自附接至框架是较花劳动力的，而且在该些带

是不同长度的情况下要确保带的次序和定向正确是有难度的。在使用中，平行的带易于相对彼此扭曲或移动而失去美观的网格设置。

[0296] 图 55 至 70 示出一优选型态的模制承托件 531，其用于附接至框架 503 以形成图 70 所示的、具有独立的带的外观的承托件。

[0297] 图 55 至 60、64(a) 至 (f) 以及图 65(a) 和 (b) 示出如此模制成形的的承托件 531。模制的承托件 531 实质上是扁平的并包含多条长形的纵向带 533 和多条长形的横向带 535。横向带 535 形成第一层，而纵向带 533 与横向带 535 重叠以形成叠在第一层上的第二层。一体模制的连接部件 536 将横向和纵向带 535、533 连接，并置于带 533、535 重叠的部分。优选地，每条纵向带皆以连接部件 536 附接至每条横向带。

[0298] 在如此模制成形的形态中，纵向和横向带 533、535 优选地（至少在不带颈的区域中）具有实质上相同的截面阔度和厚度。作为例子，如图 65(a) 和 (b) 所示，该些带可于不带颈的区域中具有 12mm 的阔度 WUT、WUL，带颈和不带颈的区域中的深度则皆可为约 1mm。替代地，如果期望在纵向方向和横向方面达到不同的特性，或为了美观方面的原因期望有不同大小的带的配搭，则纵向带可具有与横向带不同的截面维度。

[0299] 各条纵向带 533 的长度可为不同的，以配合具有非平行的框架上部和下部部分的框架 503，或让各条纵向带 533 于组装后的型态中可具有不同程度的弯曲。类似地，各条横向带 535 的长度可以相对框架的侧部部分同样的理由而为不同的。

[0300] 横向带 535 和纵向带 533 可以等距相隔，或者相邻的带之间的间隔可为不同的。在所示的型态中，横向带往承托件 531 的上部部分较疏地相隔，在相应于椅子靠背部分的靠腰部分的承托件部分间隔则较紧密。在带子较紧密的地方，承托件不会那么柔软，可提供较高程度的承托。

[0301] 连接部件 536 在图 64(a) 至 64(f) 和 66(a) 至 66(f) 中最清楚地示出，它们优选是在横向方向上为长形的。在其中一个实施例中，如此模制成形的连接部件于横向带方向中为 18.5mm，在纵向带方向中为 1.0mm，深度则为 2.0mm（以于带之间形成 2mm 的空隙）。连接部件 536 从横向带 535 的前表面凸出并连接至纵向带的后表面 533。

[0302] 横向和纵向带于连接部件 536 的两侧皆通过带侧的缺口或凹位形成颈部。在所示的型态中，横向带到 35 包含带颈的部分 539，其包含实质地沿连接部件 536 的长度延伸的凹位。作为例子，带颈部分的长度 LNT 可为 17.9mm，在凹位之间的横向带的阔度 WNT 可为 10.0mm，如图 65(a) 所示。

[0303] 纵向带 533 包含带颈部分 537，在所示的型态中其包含缺口。如此模制成形的带颈部分比连接件 536 的厚度长但小于相应的横向带 535 的阔度。横向带 535 上的颈 539 比纵向带 533 上的颈 537 浅。作为例子，缺口之间的带颈部分的阔度 WNL 可为 9.4mm，缺口则可各具有约 4.1mm 的长度 LNL。

[0304] 带颈的区域的维度被选择以使该带在应变定向后放松后可具有实质上平行的侧部，如下文详述。图 65(a) 和 65(b) 中所示的构形是一构形例子，在这例子中的带会被张开至其模制成形后的长度的 450％以达成应变定向。因应所期望的张开百分比，两个阔度维度的比率会增加或减小。

[0305] 图 67 为与图 65 相似的视图，但其示出一颈部区域的替代的示例维度。在这实施例中，维度 LNT’、WUT’、WNT’、WUL’ 和 WNL’ 和参照图 65 所描述的相应的维度 LNT、WUT、WNT、

WUL、和 WNL 相同。在这实施例中，相比图 65 的 LNL 的 4.1mm，LNL’的维度为较短的 3.5mm。此例在带颈部的区域 537 接上纵向带 533 的直侧的区域中具有约 1.25mm 的半径 LR。较大的半径更有助于在带子在应变定向后被放松后在带 533 中达成实质上平行的侧。在这实施例中，每条带沿其带颈和不带颈的部分皆具有约 1.5mm 的主体深度，而沿带子延伸的长形肋条可各带有约 0.5mm 的额外深度。在应变定向后，每条带不计长形肋条的主体深度会是约 1.0mm。

[0306] 在这些实施例中给横向带选定的比率为 0.833(10/12 ＝ 0.833)。如果拉伸百分比增加，则带颈部的阔度 WNT 相比带宽 WUT 的比率会减小。例如，如果拉伸百分比增加至 600％，带颈部阔度 WNT 则可被减至 8.7，得出 0.725(8.7/12) 的比率。替代地，如果拉伸百分比减小，带颈部的阔度 WNT 相比带宽 WUT 的比率会增加。例如，如果拉伸百分比减至 400％，带颈部的阔度 WNT 则可被增至 10.2，得出 0.85(10.2/12) 的比率。

[0307] 同样原则用于纵向带上的带颈区域，其中所示的维度适用于在张开至 450％之后放松后令带子具有实质上平行的侧部。对于伸长至 450％选定给纵向带的比率为 0.783(9.4/12)。

[0308] 其它的维度（带颈区域长度 LNT（在这实施例中＝ 17.9mm) 以及 LNL（在这实施例中＝ 4.1mm) 和连接件本身的维度有关。

[0309] 图 63 中的带的前表面上所示的长形肋条有助于拉伸和应变定向，并于连接件接上带之处辅助模制物料的流动。

[0310] 应了解，可改变连接部件、带以及带颈区域的构形和维度而不偏离本发明的这方面的范围。

[0311] 可采用本领域的技术人员所知的任何合适方法模制承托件 531。作为例子，可以我们的 PCT 号 WO 2009/1260851 的公开文件中所述的方法将承托件注塑模制，而该说明书的内容通过参照全部纳入于此。优选型态的承托件并没有如该公开文件中所述那般幼细的部件，所以该承托件替代地也可以较一般的模制方式模制。

[0312] 承托件 531 由一个或多个适于应变定向的物料模制。适合的物料的例子包括从 DuPont 可得的某些 HYTREL 物料。在一成形后的 HYTREL 物件中，物料中的聚合物链是相对地随机的。通过将物件拉伸，另聚合物链变得相对地对齐。这现象就是应变定向。应变定向改变物料的属性。物料一般是变得更强韧和弹性；即是说其弹性极限相比成形后的物料的增加。另外，物件一般在拉伸方向上增长而截面面积减小。

[0313] 在优选型态中，该物料是热塑性的聚酯弹性体。优选地，该热塑性的聚酯弹性体是嵌段共聚物，其包含坚硬（结晶）的聚对苯二甲酸丁二醇酯的段和软（非晶态）的基于长链聚醚二醇的段。优选地，该热塑性的聚酯弹性体树脂被选择，以致模制方法形成的物件在完全固化后和应变定向前在根据 ASTM 2240 测试下具有约 35D 至约 55D 的范围内的硬度。更优选地，该热塑性的聚酯弹性体树脂被选择，以致该物件具有约 30D 至约 46D 的范围内的硬度，更优选地在约 35D 至约 45D 的范围内，优选地在约 36D 至约 44D 的范围内，更优选地在约 37D 至约 43D 的范围内，更优选地在约 38D 至约 42D 的范围内，更优选地在约 39D 至约 41D 的范围内，最优选地为约 40D。

[0314] 该热塑性的聚酯树脂优选为 HYTREL 4069、HYTREL 4556、HYTREL 5526、HYTREL 5556 和 HYTREL 3078 之其一。最优选地，该树脂为 HYTREL 4069。该树脂可额外包括稳定

剂和 / 或添加剂以达致所期望的属性，例如以增强其抵抗紫外光、火、热力老化、潮湿，和 / 或将树脂弄成适合的颜色。

[0315] 本发明的模制物件可由任何其它具有合适属性的树脂形成。

[0316] 图 55 至 60 的模制承托件然后以 SL、ST 箭头所示的两方向被拉伸以形成图 61 至 63 和图 70 所示的伸长了的承托件 531。在这伸长步骤中，带 533、535 各被于其纵向方向被拉伸 SL、ST 以将带延长。这伸长引致带中以及连接部件 536 中的物料的应变定向。在带的相邻于连接部件 536 的带颈区域 537、359 中发生较少的应变定向，因为该处物料较厚以致有较少伸长。当该些带被完全拉伸时，区域 537、539 是带的最阔部分。当承托件被放松时，带的侧部放松以致沿其长度，包括于区域 537、539 中，皆为实质上平行的。于这步骤期间，被拉伸的承托件的维度大于其要被附接上的框架的维度。即是说，纵向带 533 被拉伸 SL 至比框架上和下部分 504b、504c 之间的距离更长的长度，而横向带 535 则被拉伸 ST 至比框架侧部分 504a 之间的维度更长的长度。

[0317] 优选地，带的拉伸后的长度为带的模制后的维度的约 4 和约 5 倍之间，并优选地为模制后的维度的约 4.5 倍。每条带优选地被以比例上相同量拉伸。即是说，例如，带子可各被拉伸至其初始模制后的长度的 450％。这确保任何被模制至具有相同的截面维度但不同长度的带于其被拉伸的型态中亦会具有实质上相同的截面维度，而带之间的长度的比例上的不同会被维持。因此，即使伸长后的带的长度不同，但它们亦会具有相同的应变定向和属性。替代地，如果期望不同的带具有不同的属性，例如要求承托件中不同位置具有更多柔软度，则可将带伸长至不同的程度。

[0318] 带子可一条一条地被伸长。替代地，可将所有的纵向带 533 同时伸长，然后伸长所有横向带，或者相反地可将所有的横向带同时伸长，然后伸长所有纵向带 535。作为另一选择，可同时将所有纵向和横向带伸长。

[0319] 该些带被伸长后，施加于带上的张力被释放，带子就放松回到一没有张力的状态。图 61 至 63 以及 66 示出处于放松状态的承托件 531。由于带中的物料的对齐，放松的带的长度比于其模制后的型态的带的初始长度较长。于放松的状态中，在这步骤期间拉伸后的承托件的维度小于其要附接至的框架的维度。即是说，纵向带 533 比框架上部和下部部分之间的长度短，横向带 535 则比框架侧部部分之间的维度短。

[0320] 如于图 61、62 和 66 中可见，在伸长后的放松状态中，横向带 535 的侧部是平行的，而纵向带 533 至少从承托件的横向带那边可见的那些部分的侧部也是平行的。这样地，从椅子靠背部分后方看，给出了独立的带的外观。优选地，纵向带的侧部沿其整个长度也是平行的。在伸长带子期间，带的带颈部分和不带颈部分的阔度皆减小。但由于更大的应变定向，于不带颈部分阔度的减小是更大的。这保偿了带颈部分较小的阔度减小，以致在应变定向后，带颈部分的阔度和不带颈部分的阔度实质上是一样的。

[0321] 于横向带 535 上的颈 539 带有比纵向带 533 上的颈 537 较温和的弧度。较好的是，连接部件 536 被定向以致处于连接件 536 的纵向方向的颈是在形成承托件 531 最后层的横向带 535 上。这是因为在应变定向后，带的侧于相邻连接件 536 的带颈区域 537、539 中未必完全平行。于带颈部分中的应变定向后的带的阔度的任何不均倾向于在弧度较温和的带颈区域中较不明显。因此，较好的是，带有弯的较紧的带颈区域的带是形成承托件前层的那些带，以致该些带的任何于带颈部分的阔度的不均皆被最后方的带 535 从后方遮蔽，以及

被软垫组件从前方遮蔽。

[0322] 在替代的配置中，承托件 531 没有被盖着，以在使用中提供露出的就座者承托表面，并且从椅子前方可见；在这替代的配置中，盖可被有效地反转以致带有弧度较温和的颈的横向带 535 设于纵向带 533 前方。替代地，纵向带可置于横向带前方，但连接部件 536 可被重新定向以致它们是于纵向方向为长形的，而纵向带可被给予弧度较温和的那颈。

[0323] 优选地，带在拉伸后放松的长度 RL、RT 为模制后的维度的约 1.5 和约 2.7 倍之间，优选为相应的模制后的带长 IL、IT 的约 2.1 倍。在应变定向后，横向和纵向带都会比在应变定向前的较长，并无论在阔度还是深度方向上皆会具有较小的截面。例如，带的深度可由 1.5mm 减至 1.0mm。这从横向和纵向带之间增长的距离从图中可明显看见。即是说，SL、ST 带的长度会比初始的长度 IL、IT 长，带的切面维度则会比带的初始的切面维度小。拉伸后放松的长度 RL、RT 会比拉伸的 SL、ST 带的长度短，但比初始的长度 IL、IT 长。拉伸后放松的带的截面维度会是处于带的初始截面维度和拉伸的带的截面维度之间。

[0324] 在所示的优选型态中，最长的纵向带 533 模制后的长度为约 255mm。这被拉伸至 1147.5mm，但亦可被拉伸至相比其初始长度的任何合适的长度，例如其初始长度的约 4 至 9 倍之间。类似地，在所示的型态中，最长的横向带 535 的模制后的长度为约 210mm。这被拉伸至 945mm，但亦可被拉伸至相比其初始长度的任何合适的长度，例如其初始长度的约 4 至 9 倍之间。最长的纵向带然后被放松至 519mm，最长的横向带则被放松至 426mm。放松的长度会因应不同的框架构形或最终产品所期望的不同张力而有异，因此初始的模制后的长度和拉伸的幅度亦然。

[0325] 连接部件 536 的尺寸亦因拉伸纵向带 533 和长形带 535 时发生的应变定向而改变。例如，连接件 536 初始时可被量度为 18.5mm 长、1.0mm 阔以及 2.0mm 深（带间的维度），经伸长后则可被量度为 28.5mm 长、0.8mm 阔以及 1.8mm 深。这些阔度和深度量度值是通过连接部件中心而测得的。这些是于连接部件中心的值，因为连接部件会为了模制和强化的用途而在其与横向和纵向带互动之处具有多个半径。由于对纵向带 533 和横向带 535 的拉伸，连接部件 536 于承托件的纵向和横向方向皆被应变定向。连接部件的阔度由 1.0mm 减至 0.8mm，但如果该些连接部件不是因对纵向带 533 的拉伸而于横过连接部件阔度的方向被应变定向，该阔度会减小更多。

[0326] 连接部件被示出为比纵向带的阔度更长，但这主要是为了模制的用途的设定。连接部件可为任何其它适合的形状或大小。

[0327] 每条横向和纵向带于其两端皆包含附接部分 545。该些附接部分 545 作为模制过程的一部分被一体成形，并用于将承托件附接至框架 503。在所示的型态中，附接部分 545 包含带有孔 547 的加厚的部分。在拉伸承托件 531 期间，附接部分一般不被伸长多少，所以在侧附接件的区域并不发生应变定向，或者并不发生很多应变定向，而该些部分中的物料维持实质上不对齐的。

[0328] 图 68(a) 至 69(d) 示出承托件 531 至靠背框架 503 的一优选附接。靠背框架被供有多个钩 561，它们作为框架的部分地被一体模制。在优选的型态中，该些钩绕框架的周边相隔并各自限定钩和框架之间的一凹位。

[0329] 该些钩设于框架顶部部分 504b 的前表面、框架侧部部分 504a 的前表面，以及框架底部部分 504c 的后表面。该些钩从靠背部分的中央面向外，于是在使用中，承托件 531 中

的张力保持承托件与钩啮合。至少某些钩是于框架的凹位 563 中提供，其中该些凹位的尺寸适于接收带上的一体连接器 545。如图 69a 所示，顶部和侧部的钩可设于凹位中，也可设于表面。

[0330] 可通过将钩 561 穿过附接部分 545 上提供的孔 547 将承托件安装至靠背框架。

[0331] 框架的侧部部分 504a 上的钩 561 的间隔对应横向带 535 的间隔。框架上部和下部部分 504b、504c 上的钩的间隔对应纵向带 533 的间隔。对于平均地相隔的带，钩的间隔可为平均的，或者，如果带的间隔为不同的，钩的间隔亦可为不同的，以于承托件的一部分提供较大的承托。例如，在所示的型态中，于框架的侧部部分的钩于靠背部分的靠腰区域附近间隔较为紧密，以向使用者的腰部区域提供更大承托。

[0332] 要将承托件安装至框架，将每条横向带 535 的一端 545 钩上框架。然后将该些带拉伸，然后将每条带的另一端钩上框架。然后为了置于横向带前方的纵向带 533 重复这过程。替代地，可再将承托件拉伸至或超过其最终维度然后将其连接至框架。替代地，可在将盖扩张以将带子应变定向后将承托件放松至框架上。

[0333] 附接件可全设于框架的前表面、全设于框架的后表面，或者一些在前一些在后。附接件可以不是钩而是凸部。但钩是优选的，以提供更牢固的耦合。

[0334] 在替代的实施例中，框架上的附接件可主要提供定位功能。可以任何额外的合适方法将承托件固定至框架，例如用粘剂、紧固件，或者将承托件焊接至框架。

[0335] 在完成的物件中，纵向延伸的带 533 于靠背框架上和下的横向部分之间（或在用于座位的情况下，前和后的座位框架部分之间）延伸，而横向部件 535 实质地于框架侧部部分之间延伸。至少在优选实施例中，结果是得出柔软的悬挂的承托表面，它是易弯的且具有良好的抗蠕变性和抗拉强度。

[0336] 在所示的型态中，带 533、535 是实质上扁平的部件。替代地，带子或模制的承托件 531 可具有模制过程中形成的弯曲的轮廓。只作为例子说，物件的至少一部分可具有模制过程中形成的弯曲的侧部轮廓和 / 或弯曲的顶部轮廓。通过将物件模制，可简单地将其形成为具有三维的轮廓。承托件的轮廓可通过将承托件附接至具轮廓的框架而改变。例如，在所示的型态中，扁平的模制承托件 531 在它被附接至向前凸的靠背框架后具有向前凸的型态。

[0337] 上文中参照了用于椅子靠背部分的承托件而被描述模制承托件 535。替代地，该模制承托件可有其它用途。例如，该模制承托件可为椅子的承托表面。优选地，座位或靠背框架包含至少部分地以框架部分限定的开口，而该方法包含从框架支撑模制的物件，其中模制的物件部分延伸横过开口，以形成柔软的悬挂的承托表面。

[0338] 如果该物件是要用作座位表面而不是靠背表面，那么带 533、535 的厚度可比上述的厚；例如为上述的厚度的约两倍。替代地或附加地，长形的带 533、535 的阔度可比上述的阔；例如为上述的阔度的约两倍。

[0339] 但是，模制的物件可为任何其它合适类别的物件。只作为例子说，该些物件可作为或包括于以下物件中应用：健身器材中的阻力部件；供接触性运动的头盔；头盔和帽子的衬垫；用于背囊、攀爬、安全、滑翔飞行、笨猪跳的索带；用于包括汽车座位、弹床、婴儿车、婴儿床等育婴产品的承托表面；弹床，例如弹簧弹床、软垫弹床、迷你弹床、救生弹床；其它家具，例如牙科座椅、飞机座位、体育场座位、户外家具；床品，例如床垫替换品、床垫承托

表面，或枕头；汽车座位、软尾门、檐篷；吊床；滑板、滑雪单板和 / 或滑雪板固定件；自行车的座位；运输工具中的行李装载件；如网球，壁球，羽毛球等运动中的球拍的击打表面；潜水衣中，例如弹性插入垫；游艇中，例如双体船的弹床表面。在这些替代的用途中，长形带 533、535 可具有和上述的很不同的截面维度和长度。带子被拉伸的程度亦可变。例如，为了更高的负载能力，部件可具有较大的截面维度。

[0340] 以上描述了模制承托件优选的形态，而可对它作改动而不偏离本发明这方面的范围。例如，模制的物件被描述为用于可后倾的办公椅的靠背的承托件。但可了解，这样的物件可被纳入不同种类的椅子，例如牙科椅、会议座位、车辆座位、体育场座位、剧院座位、飞机或其它交通工具座位。支撑的框架可相应地被改动，例如在剧院座位的情况下可被固定至地面或墙壁板块。

[0341] 也可了解，本发明的这方面可用于提供某种带子，其中于它们应变定向后的型态中所期望的形状是带子两侧并不是平行的。例如，可能期望形成沿其长度有指定的起伏的带子。在这种构形中，将会对带颈区域相对不带颈区域的维度相对于用于引致应变定向的设想的带子的拉伸额度作出改变。

[0342] 例如，靠背部分的带子 533、535 可以不被形成为模制的承托件 531，而是独立的挤压成型的带子，它们被应变定向并连接至靠背框架以为软垫组件 507 提供承托。但是，模制的一体的承托件 531 是优选的，因为连接部件 535 将带 533、535 互相联接，并防止带子相对彼此显著地移动。如果使用独立的带子，则需要通过粘剂、焊接之类方法将它们各自互相系上以防止带子过分地独立移动。因此，上述的优选型态的模制承托件相比这替代的型态替供可观的生产效率。

[0343] 作为另一例子，模制承托件 531 被描述用于在框架上承托软垫组件。但模制承托件 531 也可形成承托就座者的接触身体的表面。

[0344] 对于该模制物件的其它改动例子和用途列于“发明内容”部分。

[0345] 腰部承托件

[0346] 椅子 101、101’具有腰部承托组件 601，它与靠背组件 501 排列以向使用者的背部的腰部区域提供承托。一优选型态的腰部承托组件示于图 71 至 84(c) 中。腰部承托组件 601 包含腰部承托部件或垫 605，其通过载件 611 和偏压机制 607 操作地连接至安装部件 603。安装部件 603 进而附接至靠背组件 501、501’以使用附接机制 609 将腰部承托部件 605 安装于靠背组件的使用者承托表面 551 后方，如下所述。偏压机制 607 将载件 611 和腰部承托部件 605 向前偏压。图 73 至 75 为承托组件的前方、俯视和后视的正视图。

[0347] 在一优选的实施例中，腰部承托部件或垫 605 包含聚碳酸酯，安装部件 603 则包含聚丙烯。承托组件的其它构件可包含其它适合的物料，例如模制的尼龙或钢。

[0348] 腰部承托部件 605 可滑动地安装至载件 611 上，以相对安装部件 603 选择性地垂直地调节腰部承托件的位置。腰部承托部件 605 于其后边包含长形导向部分 617。该导向部分可固定地或不固定地被附接至腰部承托部件 605，或可与腰部承托部件 605 一体。优选地，导向部分 617 于承托部件 605 上设于中央位置。导向部分 617 包含两个侧向延伸的导向凸缘 619，而载件 611 则包含两条匹配的沟道 613，其具有开放的顶和底端，并且滑动地接收导向凸缘 619，以致腰部承托部件 605 可相对载件 611 滑动。

[0349] 导向部分 617 包含中央部分，其具有一系列垂直相隔的啮合件，于所示型态中为

面向后的缺口 623。图 75 是承托组件 601 的后视图，并示出该系列的缺口 623。载件 611 包含啮合部件，于所示实施例中为向前凸出的棘位 615，它可与缺口 623 啮合以固定腰部承托部件 605 相对载件 611 的高度。棘位 615 优选地是弹性的，并相对载件 611 的其它部分弹性地移动以于调节腰部承托部件 605 的高度时与相应的缺口啮合和解除啮合，以致腰部承托部件 605 相对载件 613 选择性地可于多个高度之间被调节。当向腰部承托部件 605 施加足够的向上或向下的力时，会克服棘位 615 的向前偏压力并容许垂直调节发生。腰部承托部件 605 于其下缘包含两个向后指向的把手 606 以让使用者容易调节腰部承托部件 605 的高度。

[0350] 优选地，棘位 615 和缺口 623 是弧形的，以提供顺滑的调节和在对腰部承托部件 605 的高度调节期间减小棘位 615 和缺口 623 之间的噪音。替代地，缺口 623 和棘位 615 可为其它形状，例如可包含成角度的表面。

[0351] 在替代的实施例中，载件 611 包含的啮合件可包含在可动部件上的缺口，而承托部件 605 上的啮合件可包含用于啮合该缺口的多个凸部。可了解，载件 611 可具有多于一个啮合件以啮合于承托部件 605 上的多个啮合件中。同样地，可了解，腰部承托部件 605 和载件 611 可以不包含凸缘和沟道而包含替代的相互匹配的导向件。例如，载件 611 可包含侧向的导向凸部而腰部承托部件 605 则可包含匹配的沟道或槽以接收该些凸部。

[0352] 图 76、77(a) 和 77(b) 的截面视图示出根据一优选型态实施例的组装好的偏压机制 607。在那实施例中，偏压机制 607 包含操作地连接至安装部件 603 和载件 611 的中间部件 625。中间部件 625 优选地于第一枢轴 631、633 枢转地连接至安装部件 603 并以销 629 于实质上平行的第二枢轴 626、627 枢转地连接至载件 611。在所示的实施例中，安装部件 603 上的枢轴 633 被提供于三个凸出的凸片内。替代地，可提供两个或多于三个凸片。

[0353] 第一偏压部件 639 设于安装部件 603 和中间部件 625 之间，以将中间部件转动地偏压离开安装部件 603。第二偏压部件 641 设于棘位 615 和中间部件 625 之间，以转动地将棘位 615 偏压离开中间部件 625 并进入与缺口 623 的啮合。图 77(a) 和 77(b) 的截面视图是穿过棘位 615 中央的截面视图，它们示出第二偏压部件 641 正在将棘位偏压进与其中一个缺口 623 啮合。

[0354] 优选地，第一和第二偏压部件 639、641 是相反定向的扭力弹簧，其各具有成角度的两条腿。第一个扭力弹簧 639 优选地是绕中间部件的第一枢轴 631 安装，其中第一条腿 639a 接触安装部件 603 而第二条腿 639b 接触中间部件 625。第二扭力弹簧 641 优选地绕枢轴销 629 安装，其中第二扭力弹簧 641 的第一条腿 641a 接触载件 611 上的棘位 615，第二条腿 641b 则接触中间部件 625。

[0355] 偏压机制 607 还包含两条联接臂 635，其各具有第一端 635a，它们可于枢轴销 629 绕枢轴 626、627 于载件 611 和中间部件 625 之间枢转。联接臂的第一端 635a 包含用于接收销 629 的孔。两条联接臂 635 各具有第二端 635b，其枢转地和可滑动地安装于安装部件 603 上的槽 637 中。槽 637 优选地于中间部件 625 和安装部件 603 之间正交于枢轴 631，以致在中间部件 625 相对安装部件 603 枢转时联接臂 635 的第二端 635b 可移向或移离枢轴轴心 631。联接臂 635 限制中间部件因预载力离开安装部件的移动。在替代实施例中，联接臂的第二端 635b 可以枢转地被附接至安装部件 603 并可相对中间部件 625 滑动。

[0356] 当使用者靠进椅子的靠背部分 501、501’时，偏压机制 607 抗拒腰部承托部件 605

的向后移动。当施加向后的力至腰部承托部件 605 时，偏压机制 607 抗拒棘位 615 往安装部件 603 的向后移动多于其抗拒载件 611 往安装部件 603 的向后移动。作用于棘位 615 上的第二偏压部件 641 将棘位偏压进与缺口 623 啮合，并在腰部承托件 605 向后移动时引致棘位与被啮合的缺口之间的啮合度增加。

[0357] 图 78(a) 和 78(b) 的截面视图示出承托部件处于后向位置，其中棘位 615 被进一步偏压进与缺口 623 的啮合。这增加的啮合度意味着当向后的力施加至承托部件 605 时，需要更大的力才能将腰部承托部件 605 相对载件 611 滑动。这确保在后向的力被施加至腰部承托部件 605 期间，例如在椅子中承托使用者的腰部区域期间，腰部承托部件 605 较不易意外地相对载件 611 移动。这对于很柔软的靠背部分 501、501’特别有用，就座者可容易地“陷入”这样的靠背部分并在向腰部承托部件 605 施加向后的力以外也可意外地施加向下的力。

[0358] 除了抗拒向向后的移动以外，上述的并于附图所示的偏压机制 607 还使腰部承托部件 605 可相对安装部件 603 倾斜。在腰部承托组件的一替代实施例中，偏压机制可将棘位偏压离开安装部件 603 而不使腰部承托部件 605 可倾斜。例如，载件 611 可以是可往安装部件 603 水平地移动或滑动但不可在角度上倾斜。在这样的实施例中，偏压机制可包含偏压器，例如直接设于安装部件 603 和载件 611 上的缺口 615 或其它啮合件的弹簧。安装部件 603 上的一部件 636(图 72) 通过将中间部件 625 止动以限制偏压机制 607 的向后活动。

[0359] 在所示的实施例中，承托件中间部件 625 的第一和第二枢轴 631、629 是实质上水平的，以使承托件可上下倾斜以于使用者在椅子中活动期间顺应他 / 她的背部的角度。在替代的实施例中，枢轴的轴可例如为实质上为直的，以使腰部承托部件 605 可侧向地倾斜以顺应在椅子中扭动的使用者的背部。

[0360] 图 79 示出腰部承托部件 605 被调节至高的垂直并被偏压的前向位置，其中没有向后的负载施加至腰部承托部件 605。图 80 示出在该设置中的腰部承托部件 605 在施加向后的力至腰部承托部件的中央或上部部分时向上倾斜。可见在腰部承托部件 605 的上端后倾时，棘位被进一步偏压进与缺口 623 的啮合。图 81 示出腰部承托部件 605 被调节至低的垂直并被偏压的前向位置，其中没有向后的负载施加至腰部承托部件 605。图 82 示出在该设置中的腰部承托部件 605 在施加向后的力至腰部承托部件的中央或下部部分时向下倾斜。

[0361] 优选型态的腰部承托部件 605 的形状于图 74 中以平面视图示出并于图 76 至 82 中以截面视图示出。腰部承托部件 605 的水平截面向前为凹入的，以围绕使用者的背部弯曲，而其垂直截面向前则为凸出的，以配合使用者背部的向后弧度。于腰部承托部件 605 的中间区域提供了长形的、实质上垂直的凹位 605’，以为使用者的脊骨提供虚位。

[0362] 安装部件 603 将腰部承托部件 605 置于靠背部分 501、501’的使用者承托表面的后部 551 后方。当没有向椅子的靠背部分 501、501’向后的负载时，腰部承托部件 605 与靠背部分 501、501’ 的使用者承托表面的后部 551 相隔，于其后方并不与其接触。间隔足够小，以致当使用者靠进靠背部分 501、501’时施加向后的力至使用者承托表面时，靠背部分的至少一部分 551 相对靠背框架 503 向后弯以接触靠腰承托部件 605。腰部承托部件 605 通过对靠腰区域的向后活动提供额外阻抗以向使用者的背部的腰部区域提供承托。

[0363] 在所示的形态中，安装部件 603 是刚性的柱并优选地是弯曲的，但替代地可例如

为U形。安装部件603的端部附接至靠背框架503的侧部部分504a以致安装部件603从框架向后延伸。于所示的实施例中，安装部件603于每端包含两个附接机制609以将安装部件附接至框架侧部部分504a。

[0364] 附接机制609的优选型态的构件于图72的分解视图中示出，并于图83中更详细地示出。使用一个这样的附接机制609的方法示于图84(a)至84(c)。每个附接机制609包含：锁定梭651；第一锁定部件653，其带有锁定钩653a，其具有锁定凸部653a'；第二锁定部件655，其带有锁定销655a；导向销657；锁定滑动件659；以及锁定保持器盖件661。第一锁定部件653可具有一个、两个、三个或更多个锁定钩，其中第二锁定部件655具有相应数量的锁定销655a。于安装部件603的前表面接近安装部件的每端设有锁定机制沟道663，其具有下方和上方的水平导向肋条663a、663b。

[0365] 锁定机制609于缩回的解锁位置和凸出的锁定位置之间选择性地可动，于解锁位置中它们不怎么凸出超过安装部件603的端部，或者完全不凸出，于锁定位置中它们凸出超过安装部件603的端部以将安装部件603附接至框架侧部部分504a。锁定滑动件659设有适于手握的区域，例如向前指向的凸部660，以容许使用者致动锁定机制。

[0366] 在组装好的安装部件/锁定机制中，锁定梭651位于锁定机制沟道663中。锁定梭651于垂直方向中可于下方和上方的水平导向肋条663a、663b之间滑动，但于水平方向中不可滑动。锁定梭具有后向沟道651b，它们于沟道中与垂直肋条663c啮合以使梭可垂直滑动。

[0367] 第一锁定部件653设于梭前方，并且它的锁定钩653a指向安装部件603的端部。第二锁定部件655置于第一锁定部件前方，并且它的锁定销655a指向安装部件的端部。第二锁定部件655上的凸部655b是从梭上的凸部651a沿该柱内向地设置的，以抑制第二锁定部件655向外移动。锁定销657延伸穿过第二锁定部件、第一锁定部件以及锁定梭中的对齐的槽。锁定滑动件659设于第二锁定部件前方，并具有围绕第一锁定部件和第二锁定部件的向后凸出的墙壁。导向销657的头部置于锁定滑动件659中的空腔659a中，该空腔优选地是垂直地长形的，以使导向销657可相对锁定滑动件垂直移动。

[0368] 锁定保持器盖件661设于锁定滑动件659前方，并具有大体上围绕锁定机制其它构件的墙壁。锁定保持器盖件661通过任何适当手段固定至安装部件603，例如夹、粘剂，和/或超声波焊接。锁定保持器盖件将锁定机制保持与安装部件603组装在一起。

[0369] 于安装部件603的每端的组件会是实质上相同的，其中各构件会是彼此的镜象相反形状。

[0370] 可见锁定梭651具有实质上线性的并实质上水平的沟道652。第一锁定部件653具有沟道654，其具有内部的成角度的部分，以从其最内端在初始处向外和向上延伸，并之后具有实质上线性和实质上水平的部分。第二锁定部件655具有沟道656，它从其最内端在初始处实质上线性和实质上水平地向外延伸，并之后具有外部的成角度的部分，其向外和向上地延伸。导向销657如上所述地穿过沟道652、654和656。

[0371] 要将安装部件603附接至框架侧部部分504a，将安装部件603置于背部承托件531背后并大体与框架侧部部分504a中的锁定孔或凹位665对齐。安装部件603的端部设有定位件604以将安装部件的端部定位于相对其中一条横向带553所期望的位置。凹位665设有啮合肩部667。锁定滑动件659开始时在其最内部位置，以致锁定机制609如图

84(a) 所示地处于其缩回的解锁位置。锁定梭 651 将会处于其最低的垂直位置，于锁定部件 603 中的锁定机制沟道 663 中。

[0372] 于锁定滑动件 659 最初的向外运动中，导向销 657 处于第一锁定部件 653 中的槽 654 的内部的成角度的部分中，并沿第二锁定部件的槽 656 的水平部分滑动。第一锁定部件 653 向外移动以致它们锁定钩 653a 定位于凹位 665 中。凸位 651a 啮合至第二锁定部件上的具有凸部 655b 的梭上，这会于第一锁定部件 653 开始的向外活动期间抑制或阻止第二锁定部件 655 的向外活动。于锁定钩 653a 和进入凹位 665 的入口之间有足够的虚位，以致锁定钩 653a 可绕过啮合肩部 667，但之后可被手动地下移至肩部后方到位至如图 84(b) 所示的位置中。

[0373] 锁定滑动件 659 进一步的向外活动引致导向销 657 被定位于在第二锁定部件 655 中的槽 656 的成角度的外部部分，并沿第一锁定部件 653 中的槽 654 的线性的水平部分滑动。在导向销 657 于槽 654、656 中被提起期间，导向销亦于锁定机制沟道 663 中提起梭 651，以致凸部 651a、651b 被解除啮合而第二锁定部件可向外移动。垂直地可滑动的梭 651 亦帮助避免导向销 657 卡进槽中。锁定销 655a 于锁定钩 653a 的旁边该抵着延伸，至到如图 83(c) 中所示的位置。锁定凸部 653a’ 位于啮合肩部 667 外方。于锁定销 655a 和锁定钩 653a 和凹位 665 的入口之间并没有足够的虚位让锁定凸部 653a’ 足够地移动以绕过啮合肩部 667。如此将安装部件 603 附接至靠背框架。

[0374] 要从框架移除安装部件 603，将过程倒行。具体地，使用者会将锁定滑动件 659 向内移动，这在开始时会将第二锁定部件 655 缩回以致锁定销 655a 从锁定钩 653a 移离。之后就可将安装部件 603 垂直移动以致锁定凸部 653a 可绕过啮合肩部 667。锁定滑动件 659 进一步的向内移动会引致锁定钩 653a 从凹部 665 缩回，以致安装部件 603 可从框架被移除。

[0375] 可了解，机制可简单地被相反地设计，以致锁定钩 653a 是带有向上指向的锁定凸部 653a’ 的上部部件，而锁定销 655a 则啮合锁定钩 653a 的下侧。

[0376] 腰部承托组件可在后期由最终使用者安装至靠背部分 501、501’，并优选地可由最终使用者从靠背部分移除。

[0377] 除了使用上述的附接机制，可替代地，安装部件 603 可使用夹子安装至框架侧部部分 504a。该些夹可为包绕过框架 503 前表面的 U 形夹。要将安装部件 603 附接至靠背框架，将安装部件设于靠背部分的使用者承托表面的后部 551 后方，其中附接夹在框架前方并与框架侧部部分对齐。然后将安装部件 603 相对框架向后拉，直至附接夹卡进与框架的啮合。会于框架侧部部分 504a 提供适合的孔以接收该些夹。

[0378] 在替代的实施例中，安装部件 603 可以其它附接方法附接至靠背框架 503。例如，安装部件 603 可用例如螺钉、粘剂等紧固件将附接至框架，或焊接至框架。替代地，安装部件 603 和靠背框架 503 可为一体的。优选地，安装部件 603 相对侧部部分 504a 是固定的，但替代地安装部件 603 可以是可相对框架调节的。

[0379] 承托组件的实施例可以不是用为作如上所述的腰部承托组件，而用于从椅子的靠背部分承托背部或身体的其它部分，例如设于靠背部分 501’ 较高区域，作为头或颈部承托组件。

[0380] 上文描述的是本发明的优选型态，而它们是可被改动而不离开本发明的范围的。例如，优选型态的特点是参照可后倾的办公椅描述和显示的。但可理解，其中很多的特点可

容易地被纳入不同种类的椅子，例如会议椅子，汽车座位或剧院椅子。支撑的框架可相应地被改动，例如在剧院椅子的情况下可被固定至地面或墙壁板块。

[0381] 另外，本文描述的特点，其中某数量的特点可被纳入具有不同特点的椅子中。它们不需要全部被纳入同一张椅子中。

[0382] “发明内容”部分中列有其它改动的例子。

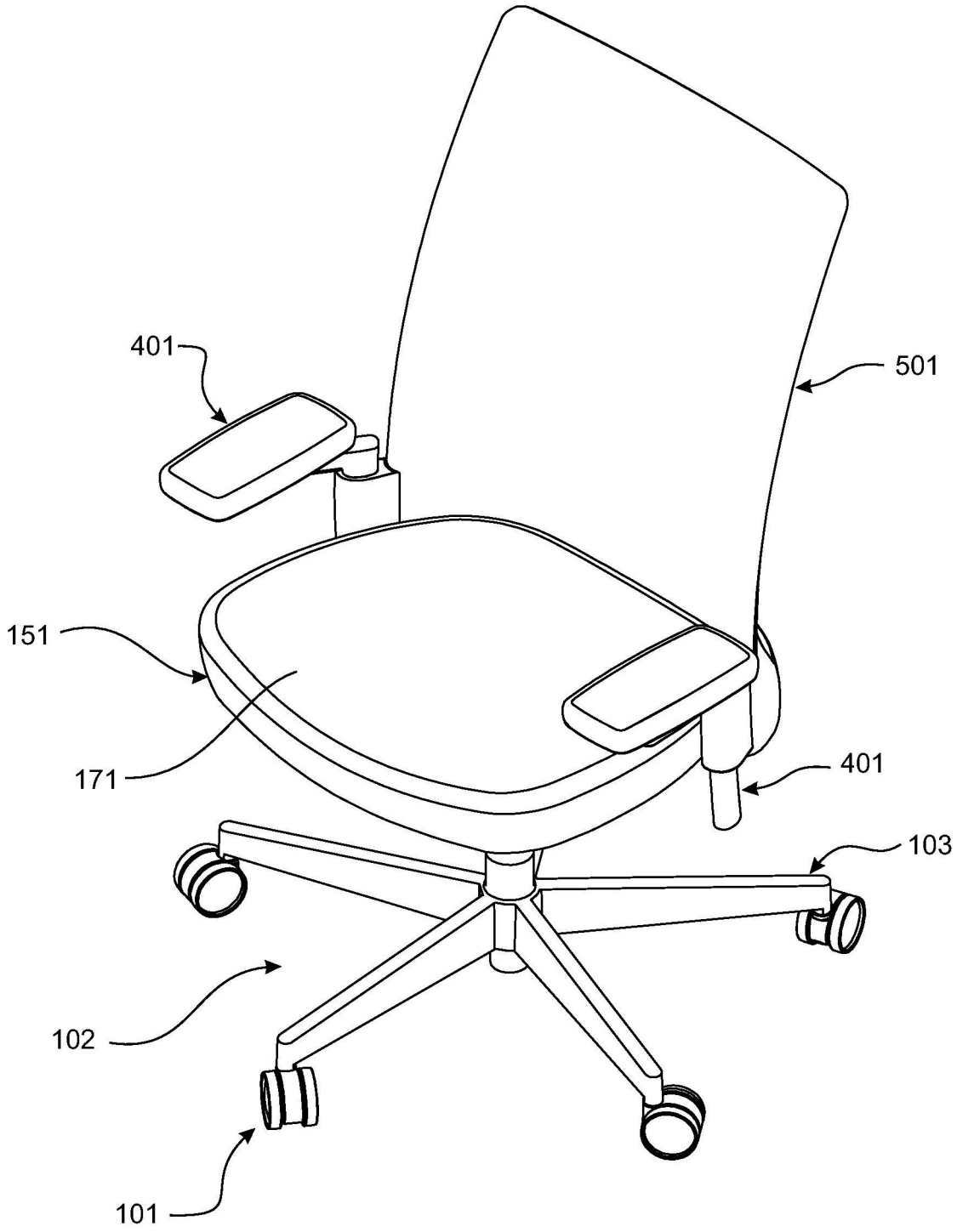


图 1

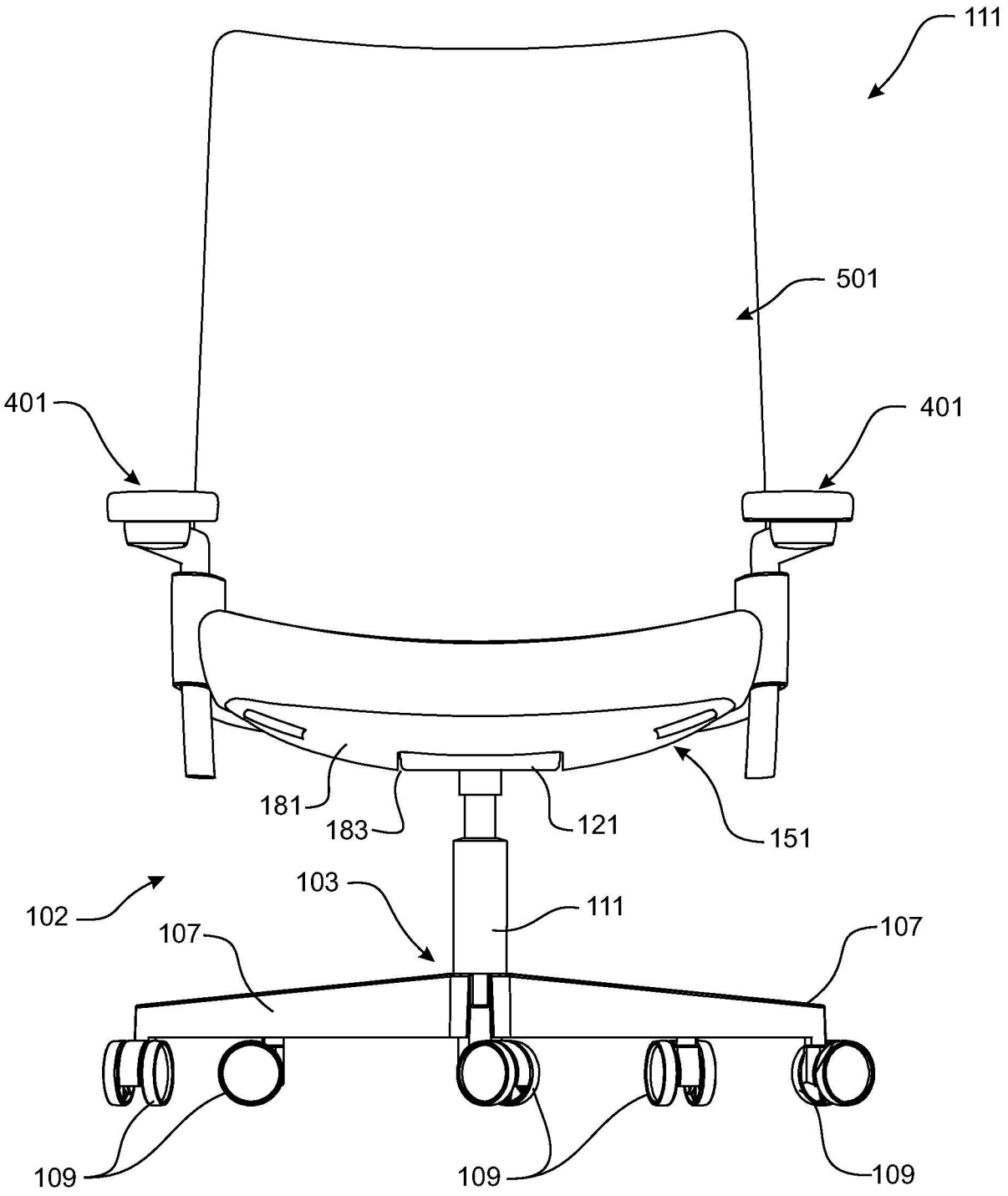


图 2

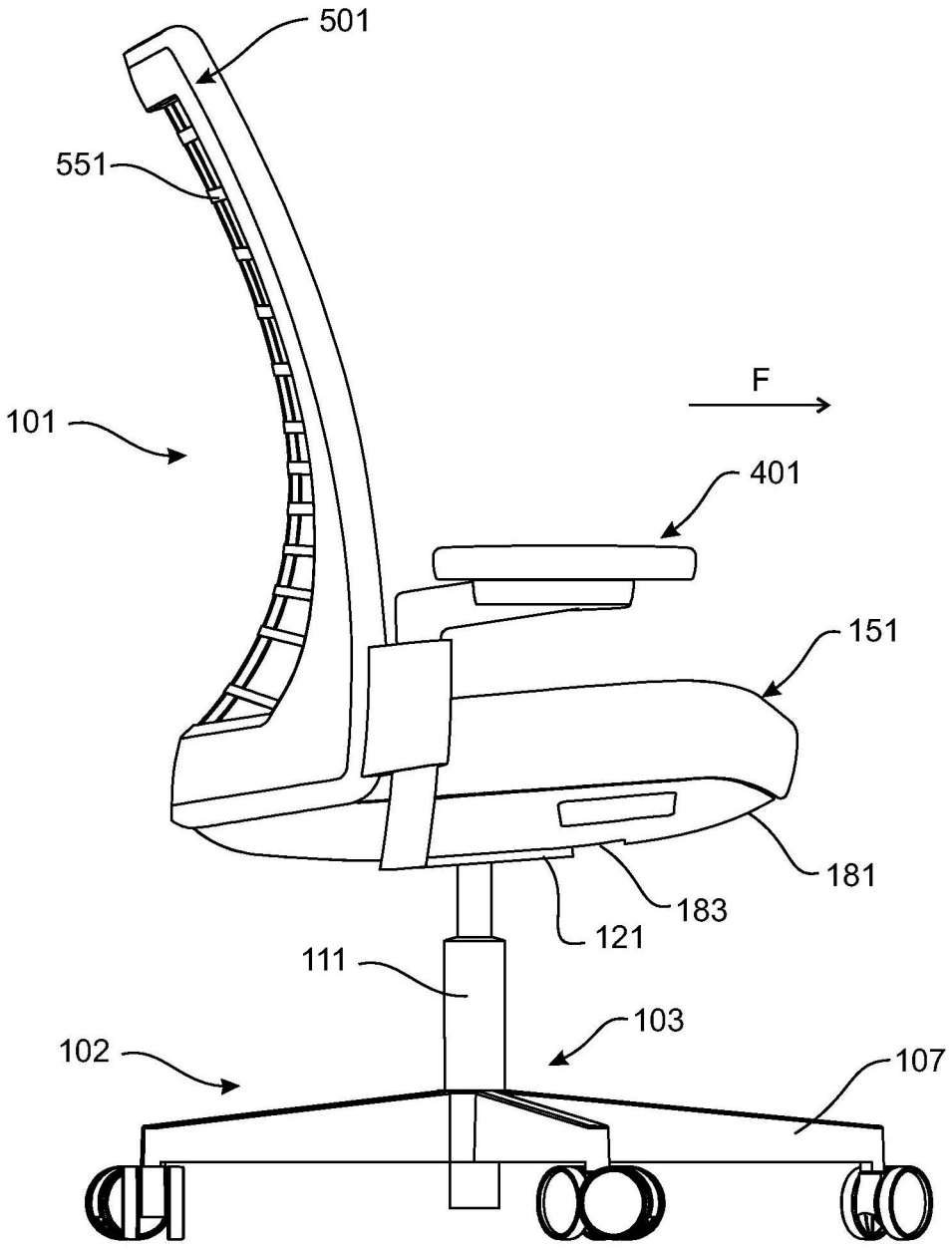


图 3

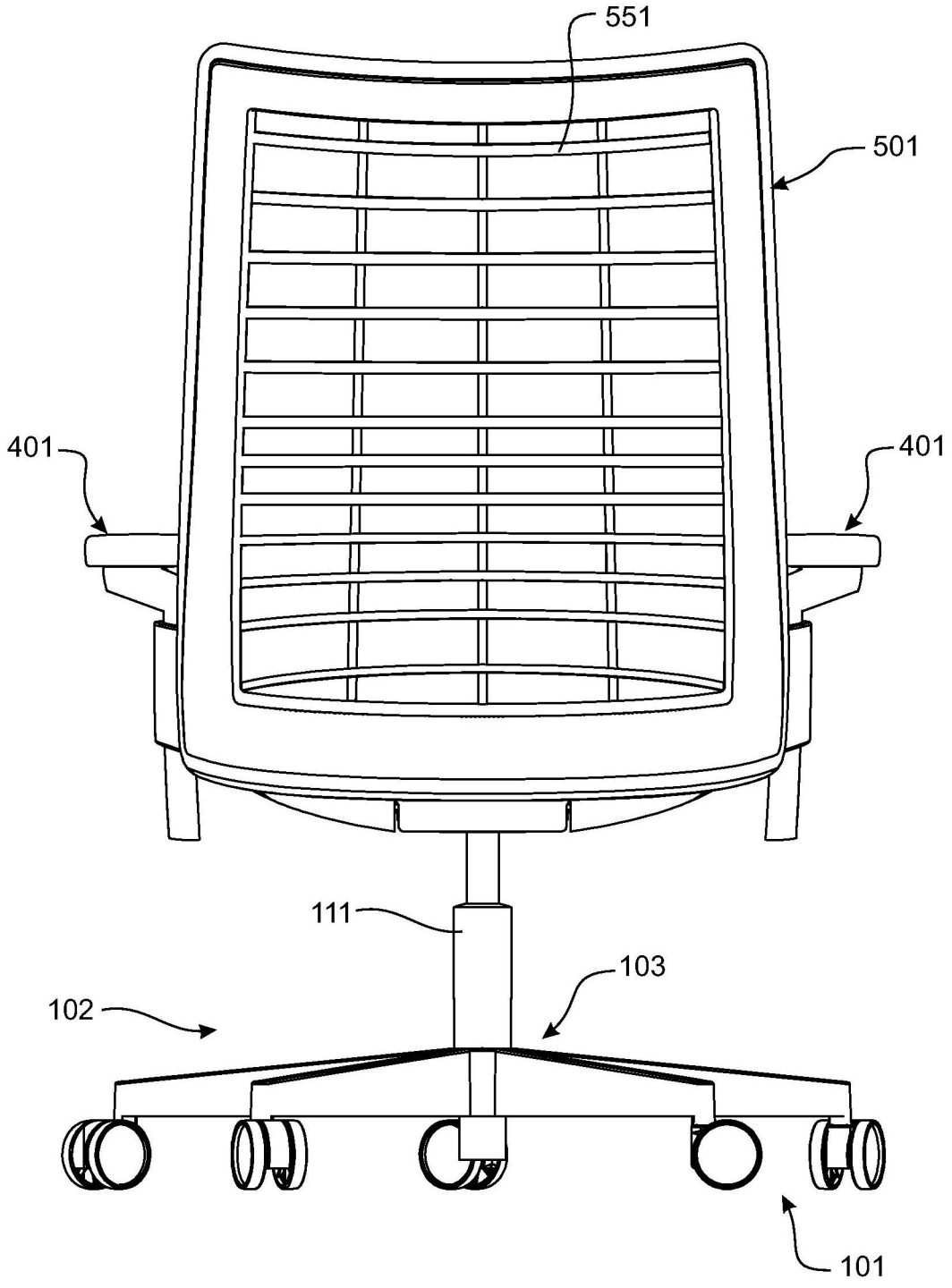


图 4

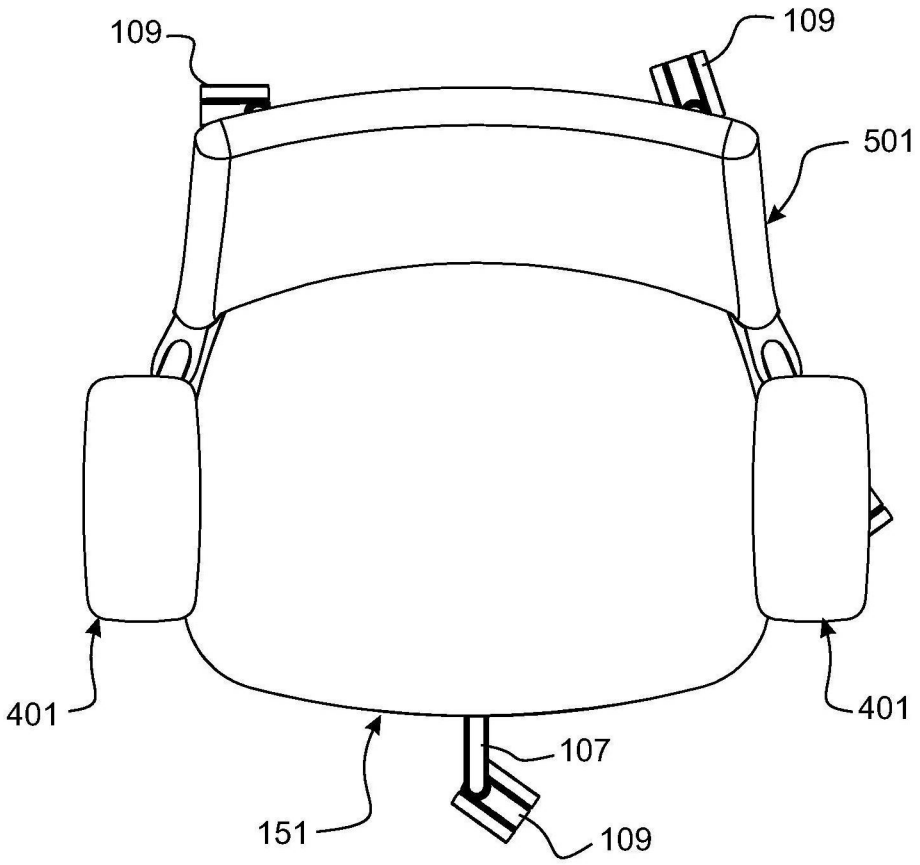


图 5

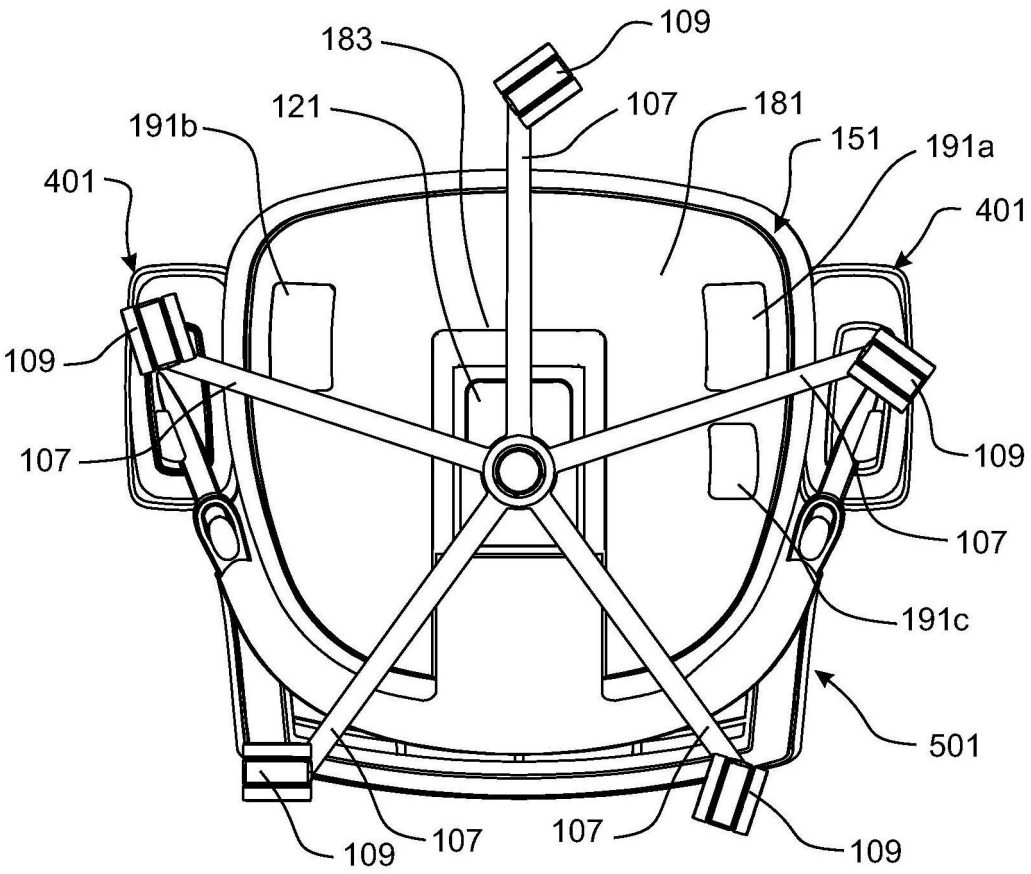

109
183
121
107
181
191b
151
191a
401
401
109
107
109
107
191c
501
109
107
107
109

图 6

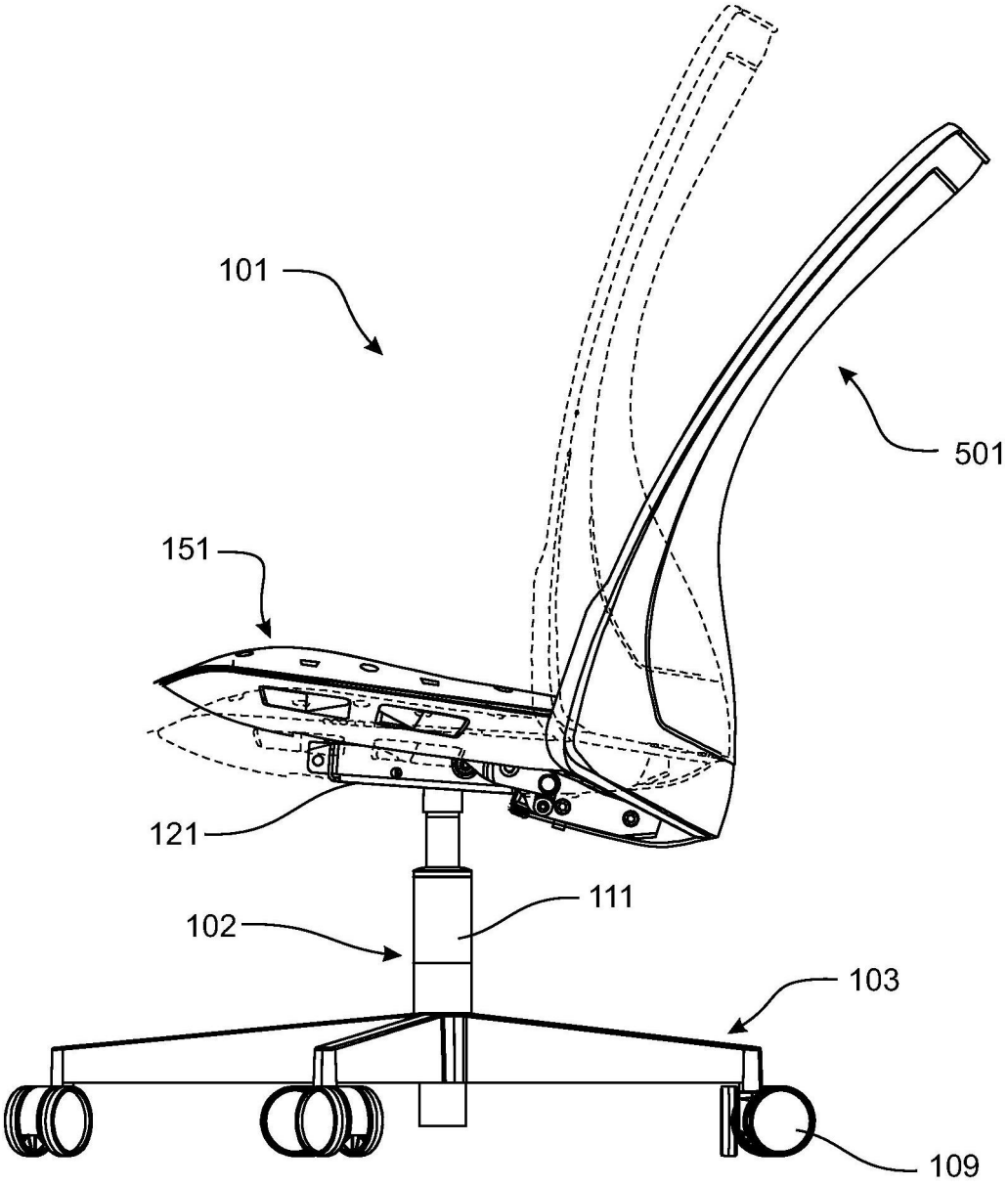


图 7

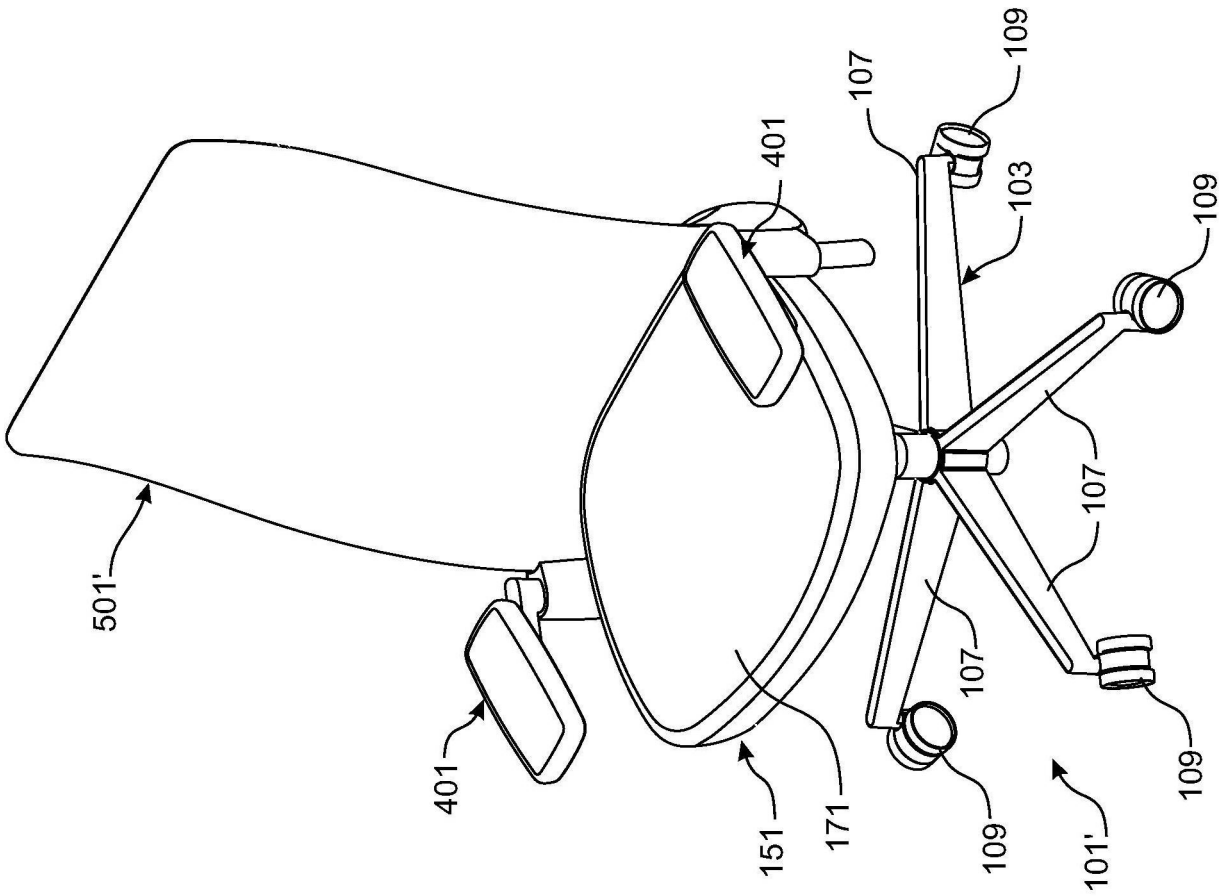


图 8

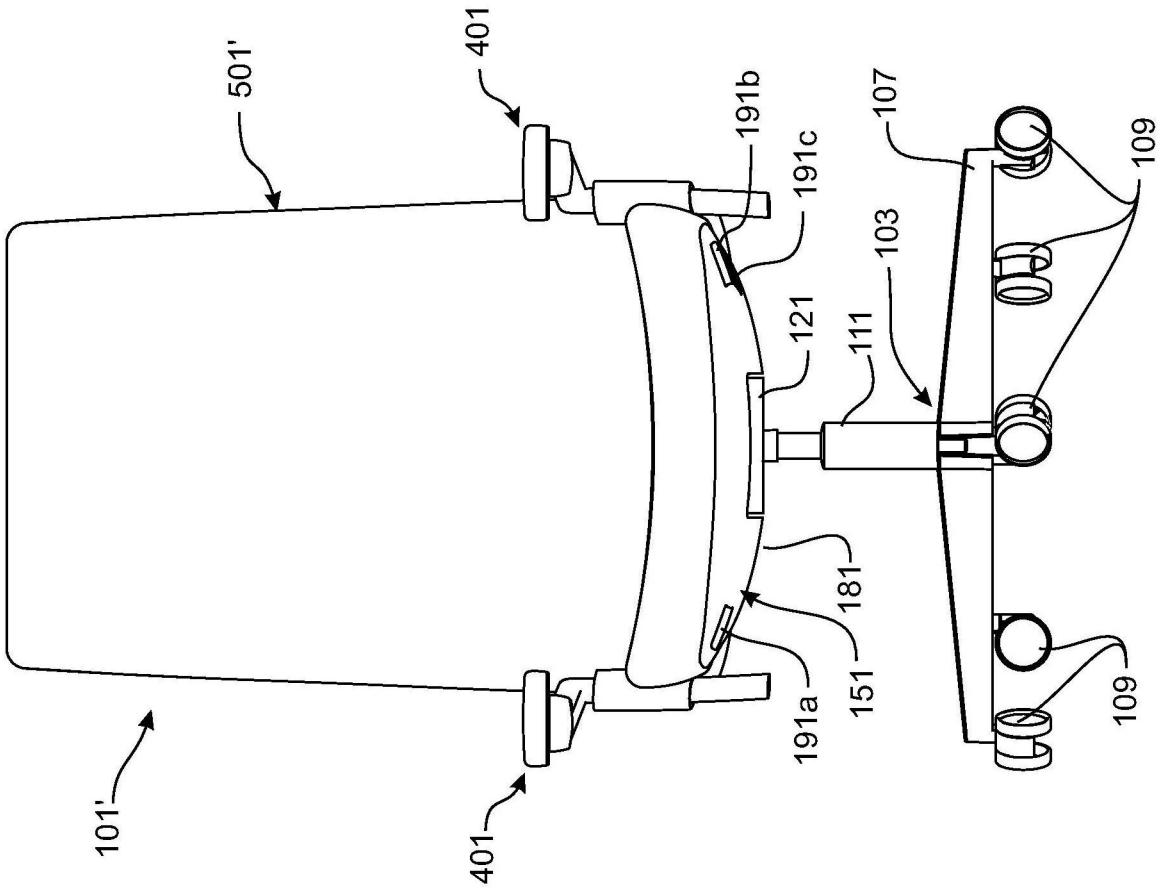


图 9

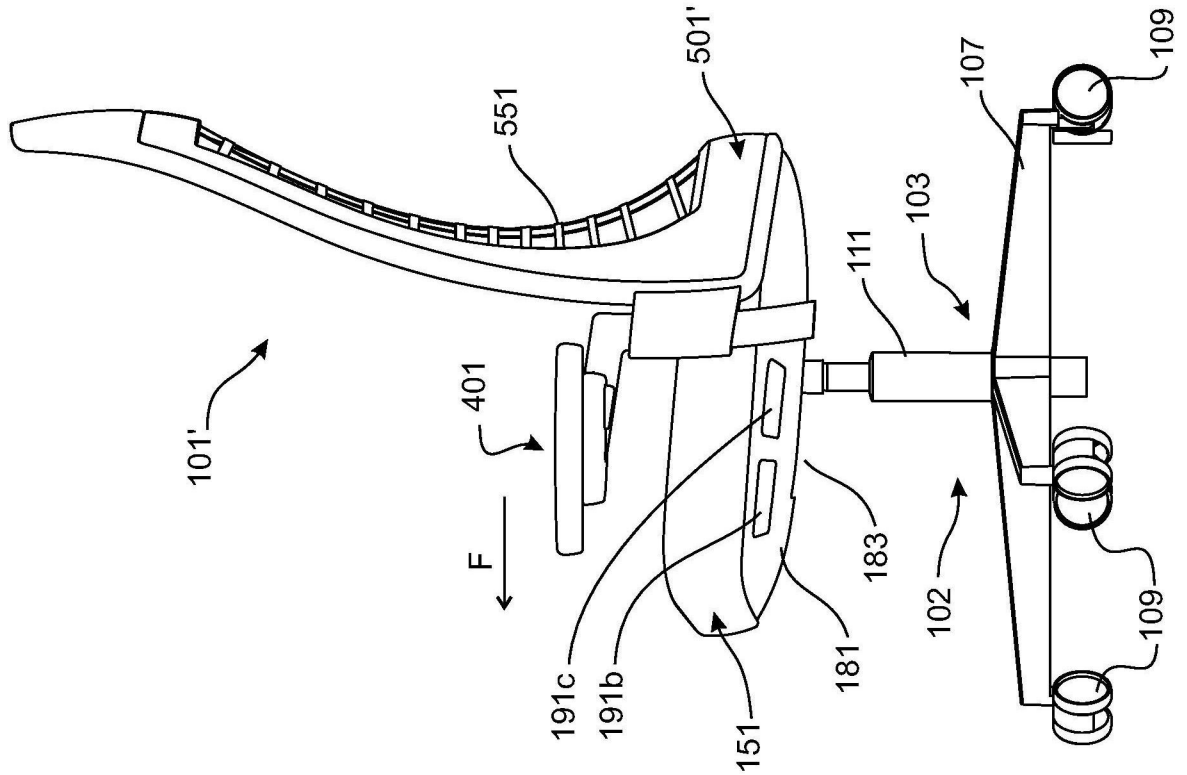


图 10

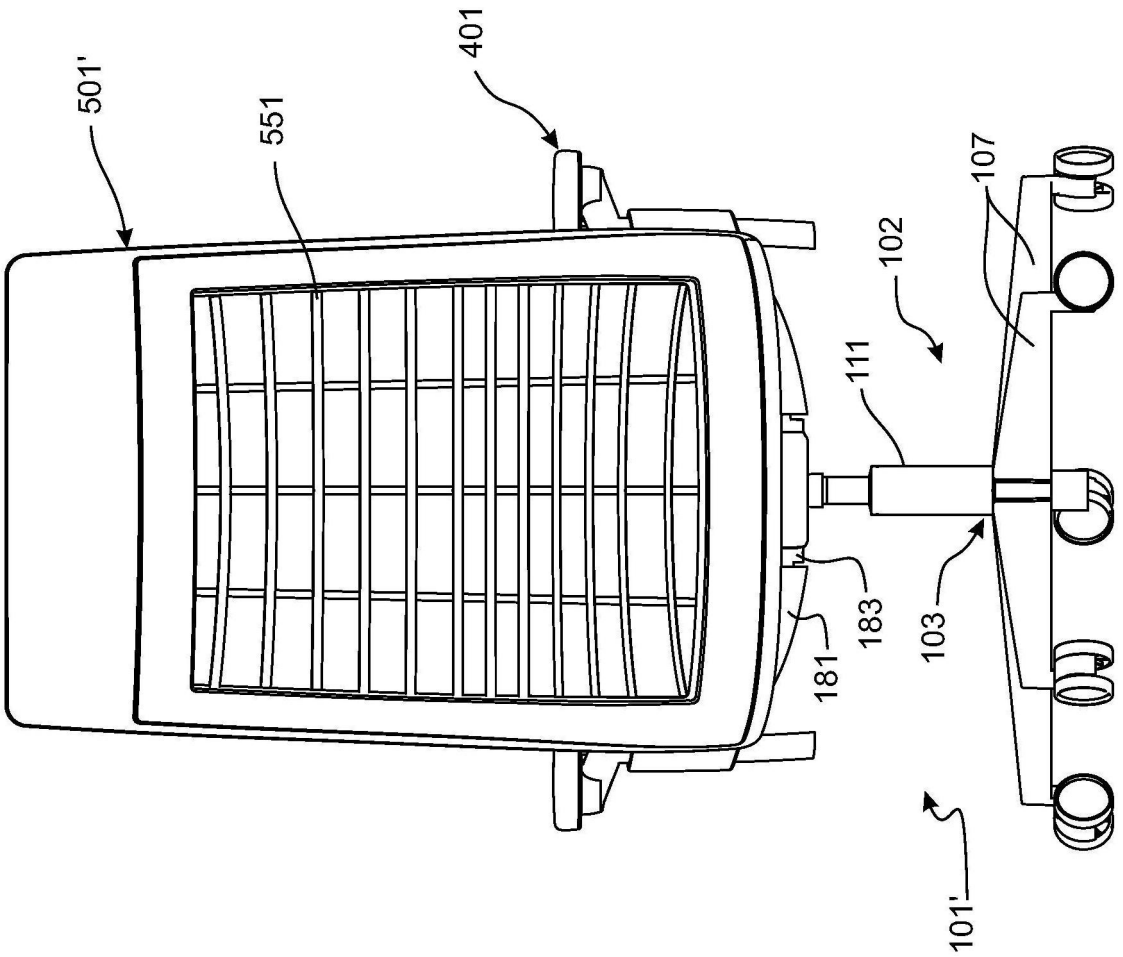


图 11

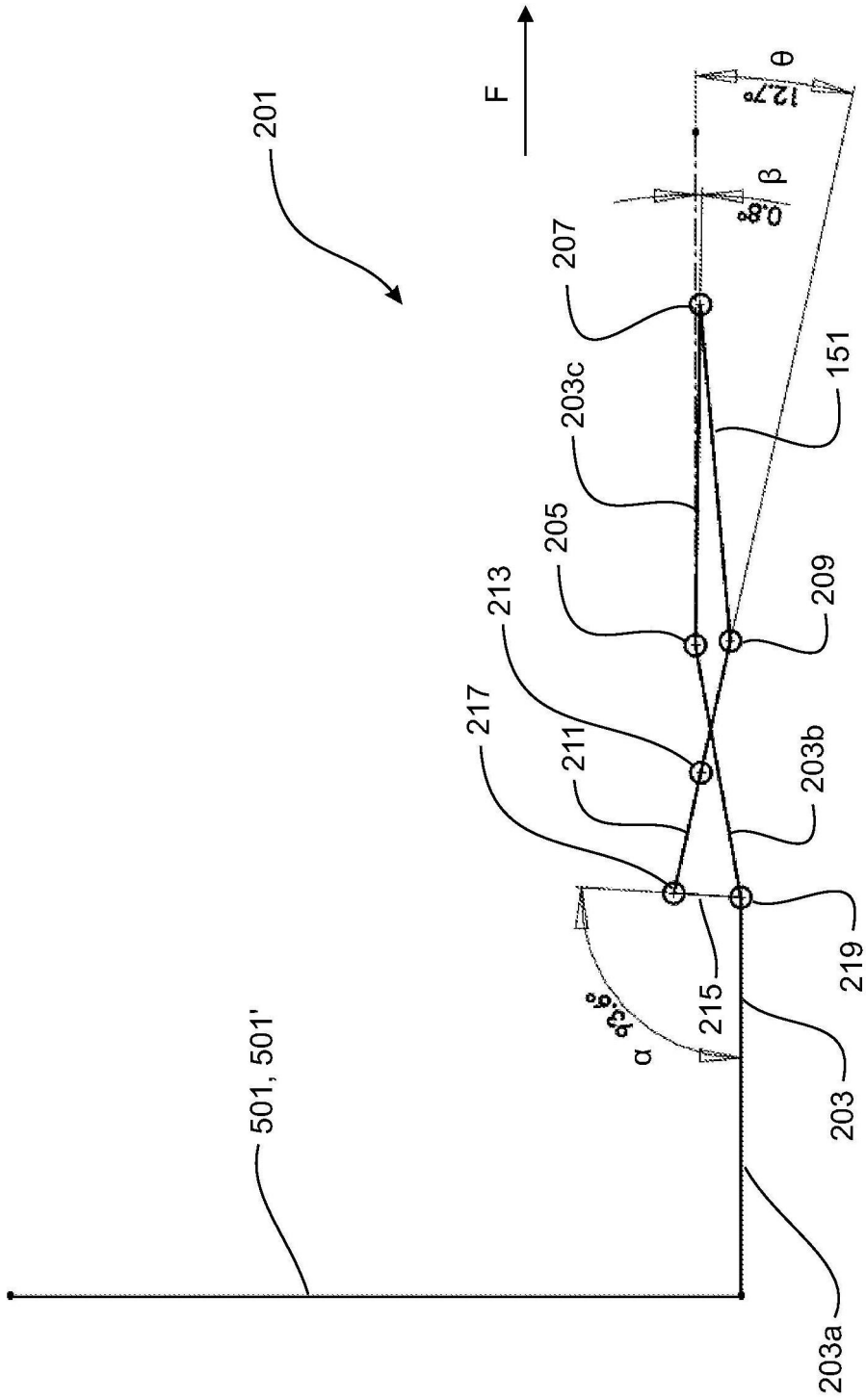

201
F
θ
12.7°
β
0.8°
207
151
203c
205
209
213
217
211
203b
219
215
α
203
501, 501'
203a

图 12

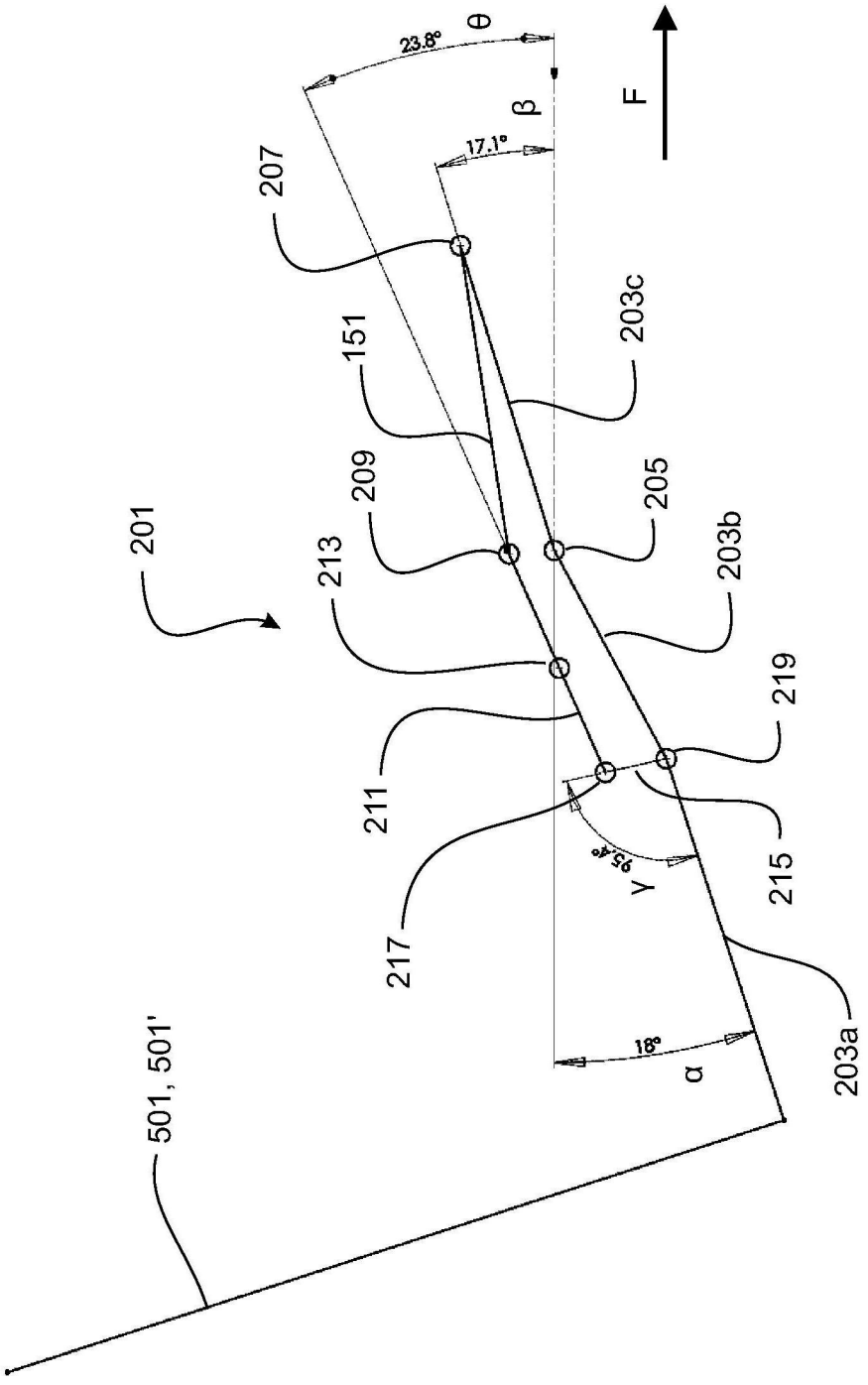

23.8°
θ
β
17.1°
F
207
151
203c
209
205
201
213
203b
219
211
215
217
95.4°
γ
203a
18°
α
501, 501'

图 13

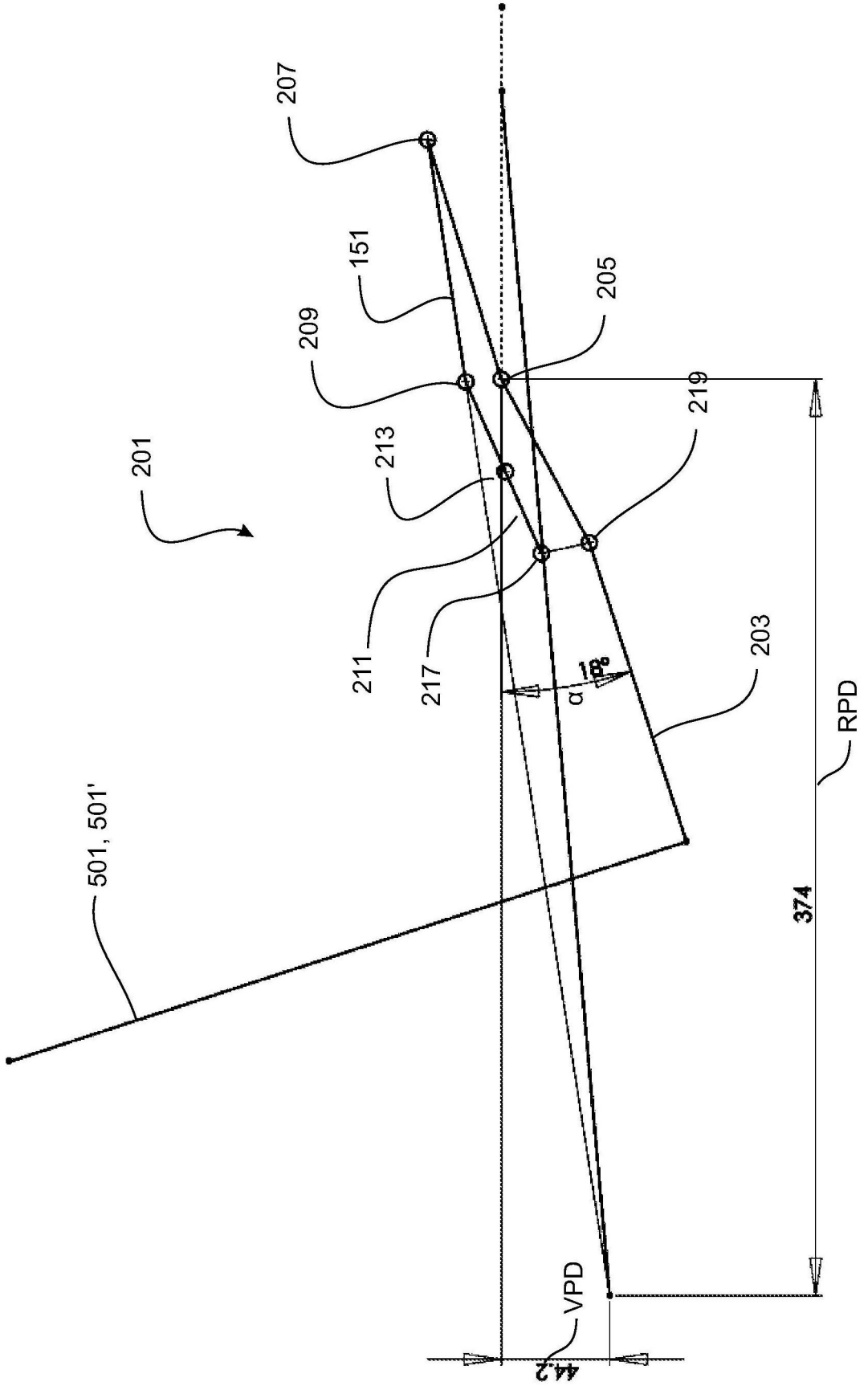

207
151
205
209
219
213
201
211
217
203
18°
α
RPD
501, 501'
374
VPD
44.2

图 14

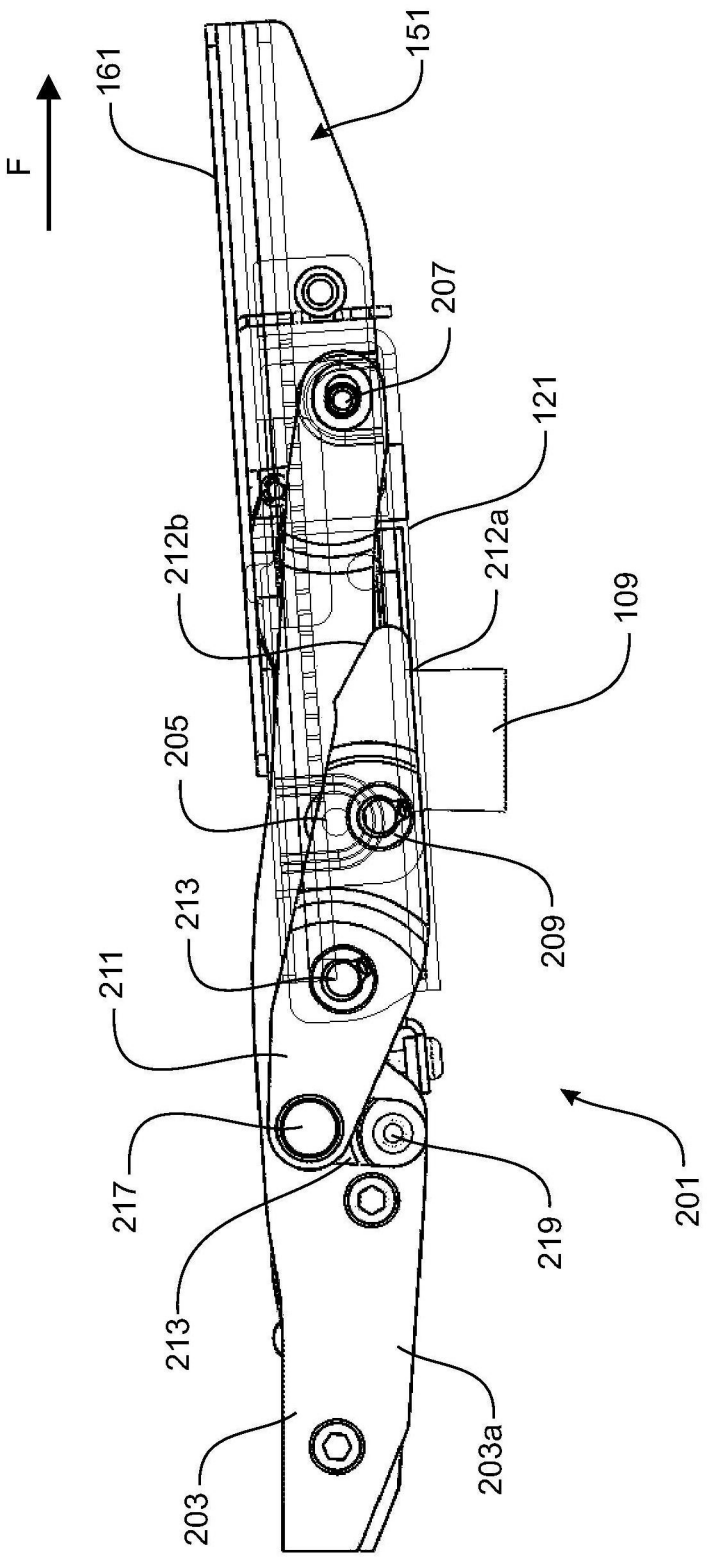

F
161
151
207
121
212b
212a
109
205
209
213
211
217
213
219
201
203
203a

图 15

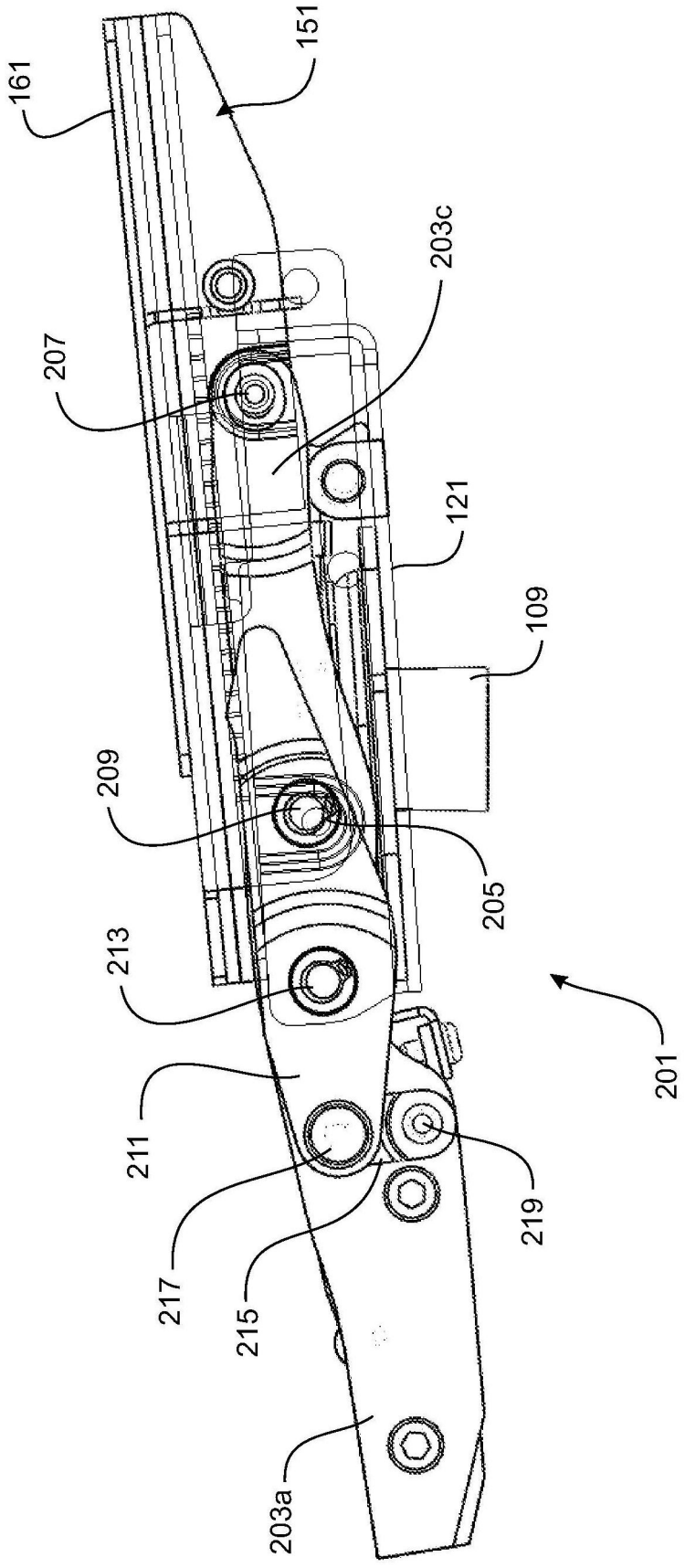


图 16

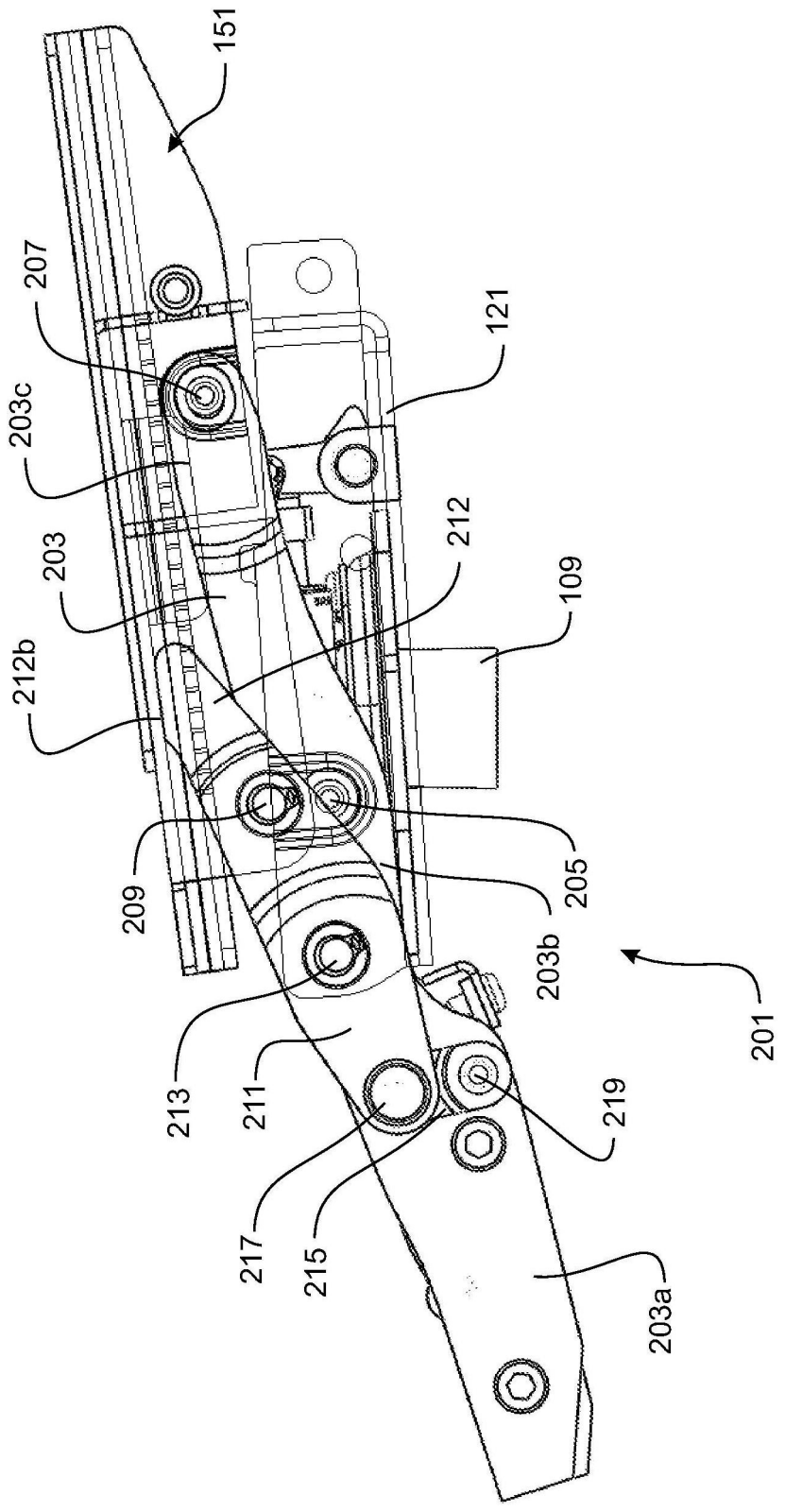

151
207
121
203c
212
203
109
212b
209
205
203b
201
213
211
219
217
215
203a

图 17

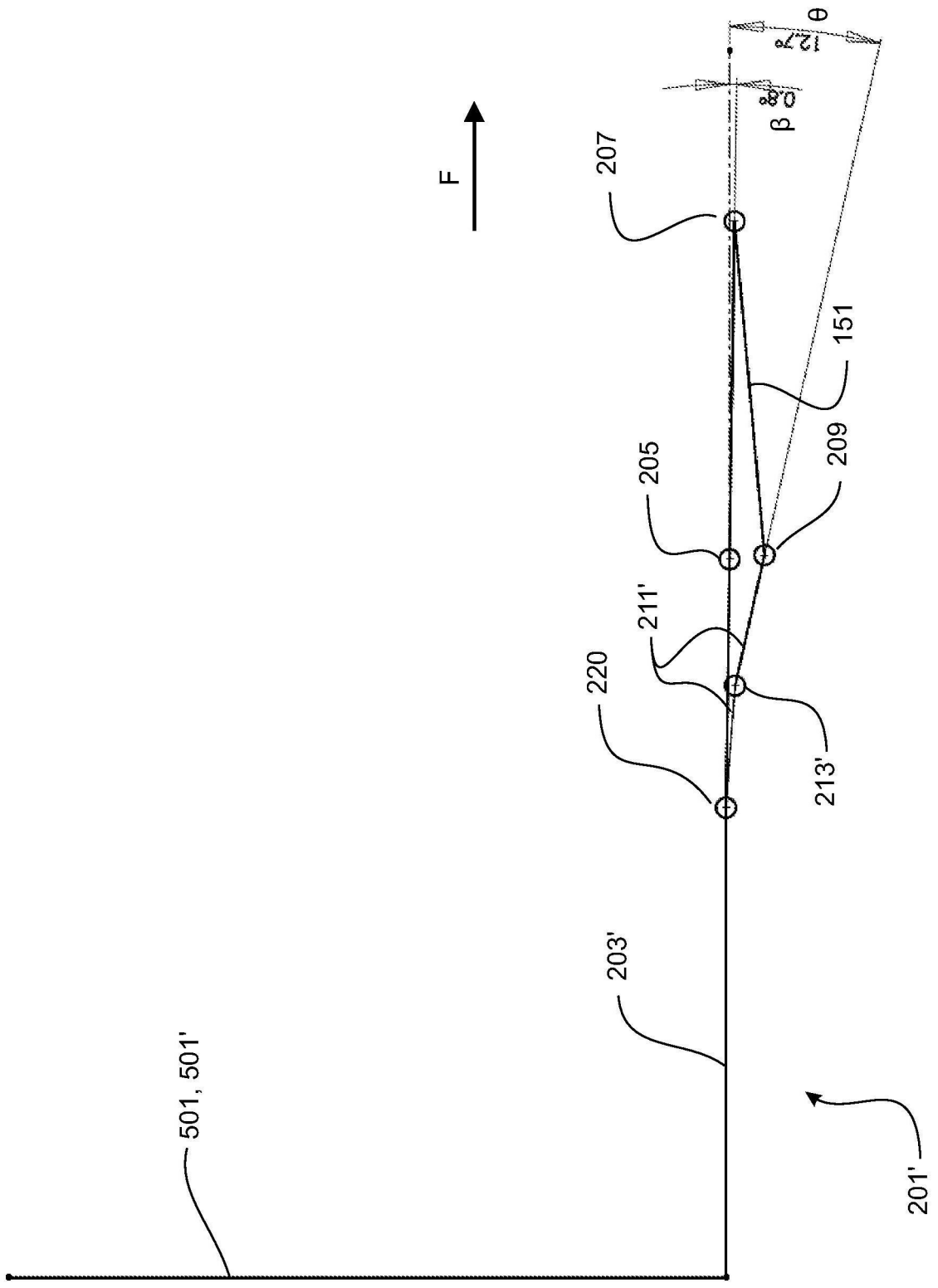


图 18

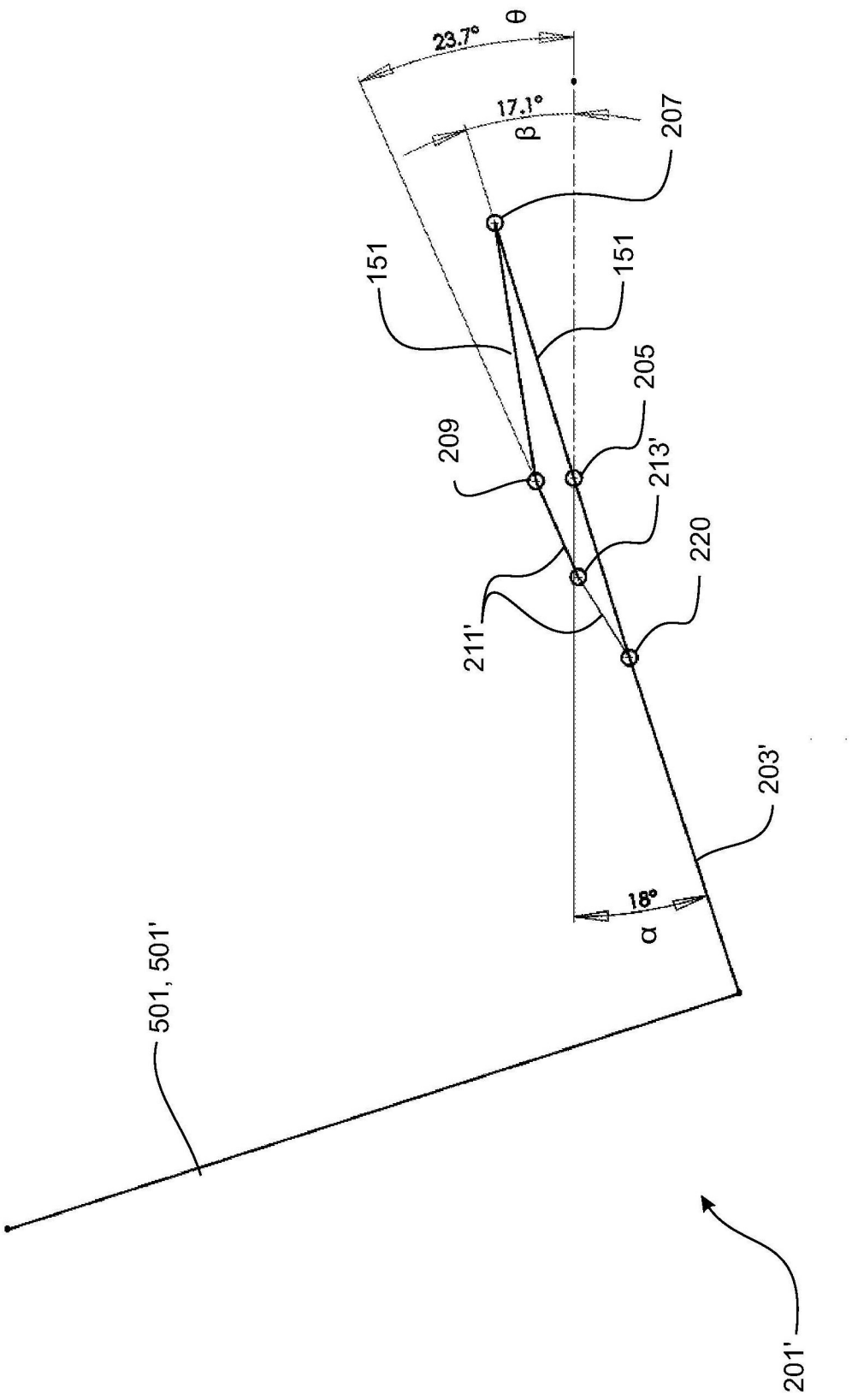


图 19

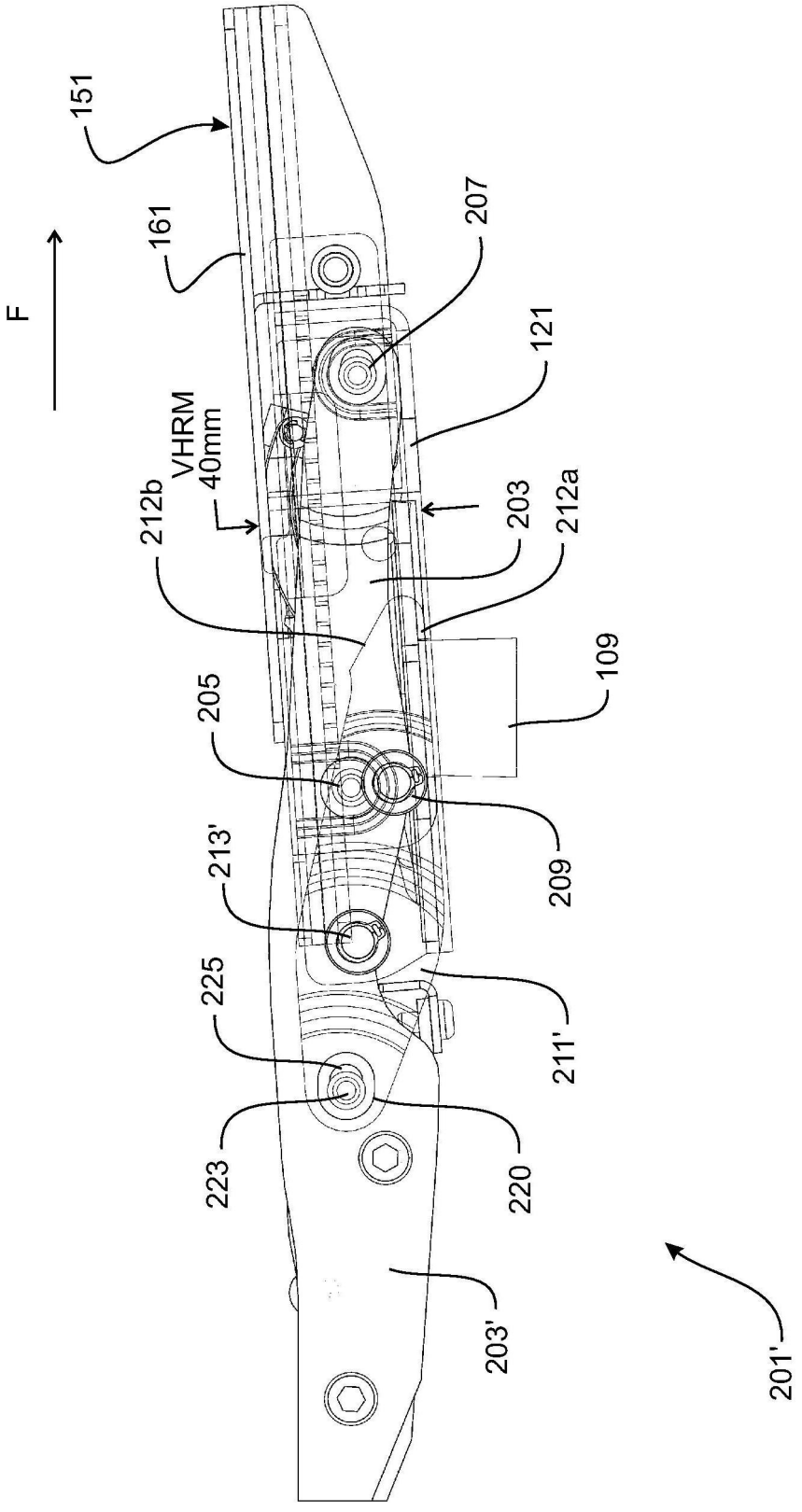

151
161
207
121
F
VHRM
40mm
212b
203
212a
109
205
209
213'
225
211'
223
220
203'
201'

图 20

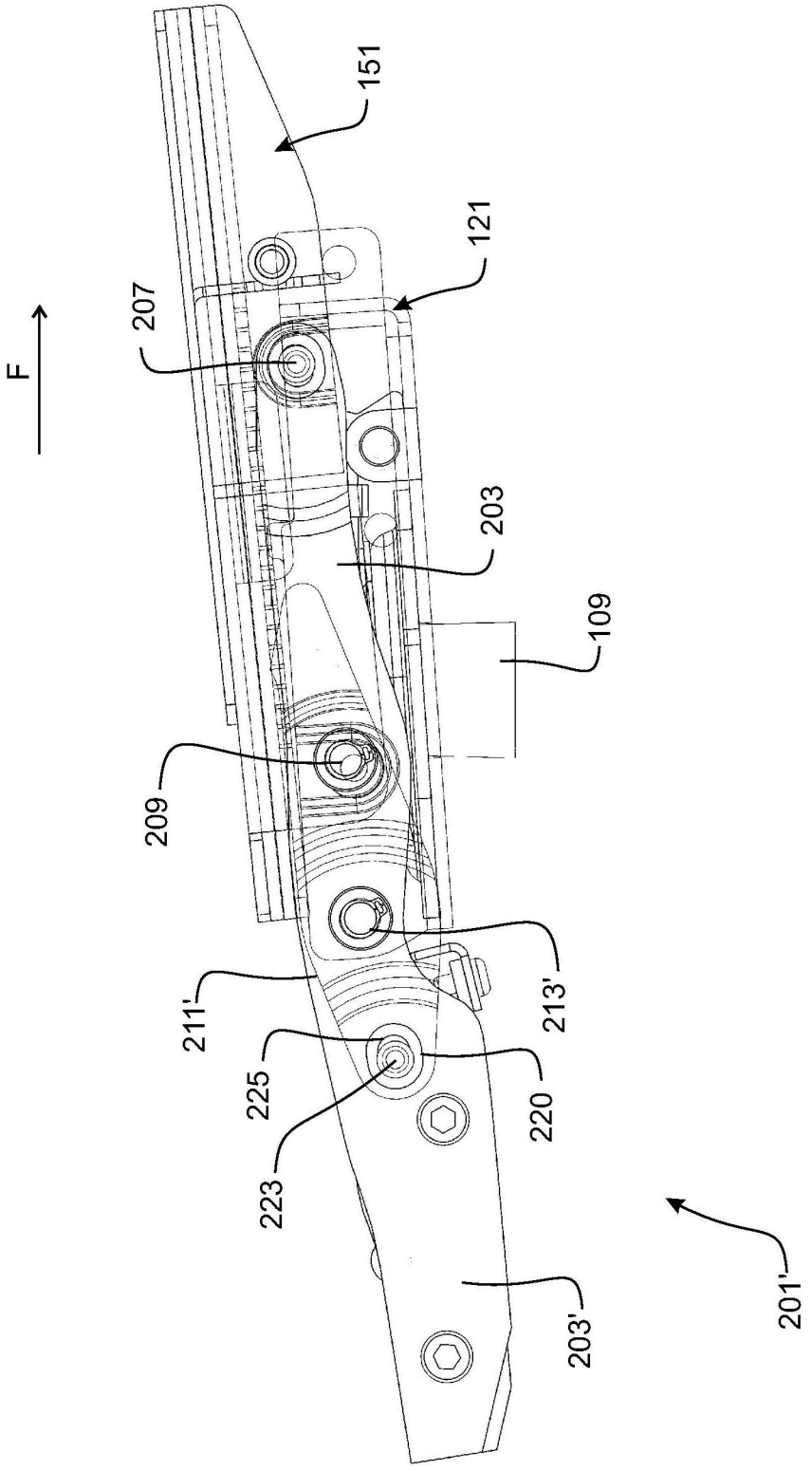


图 21

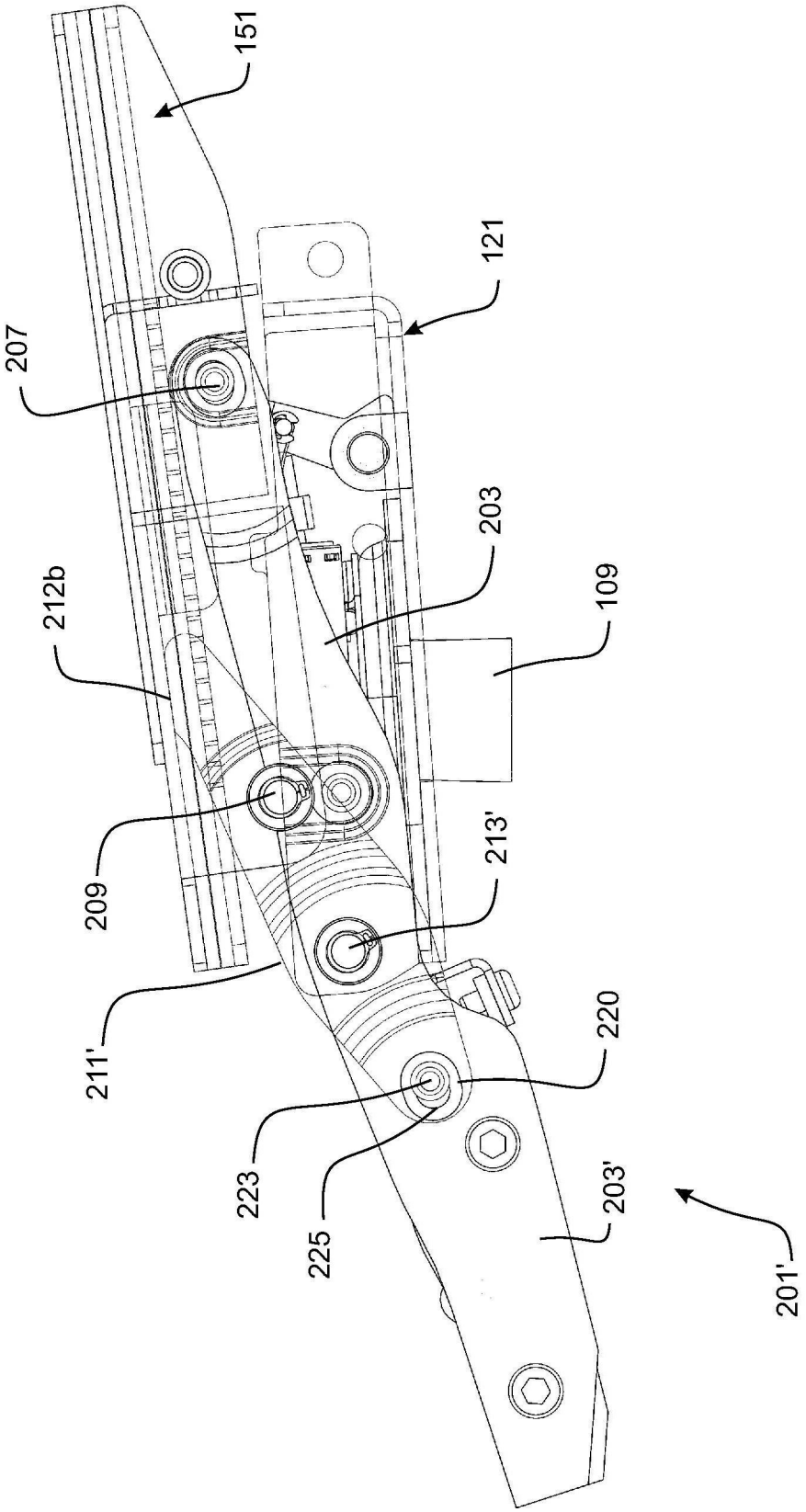


图 22

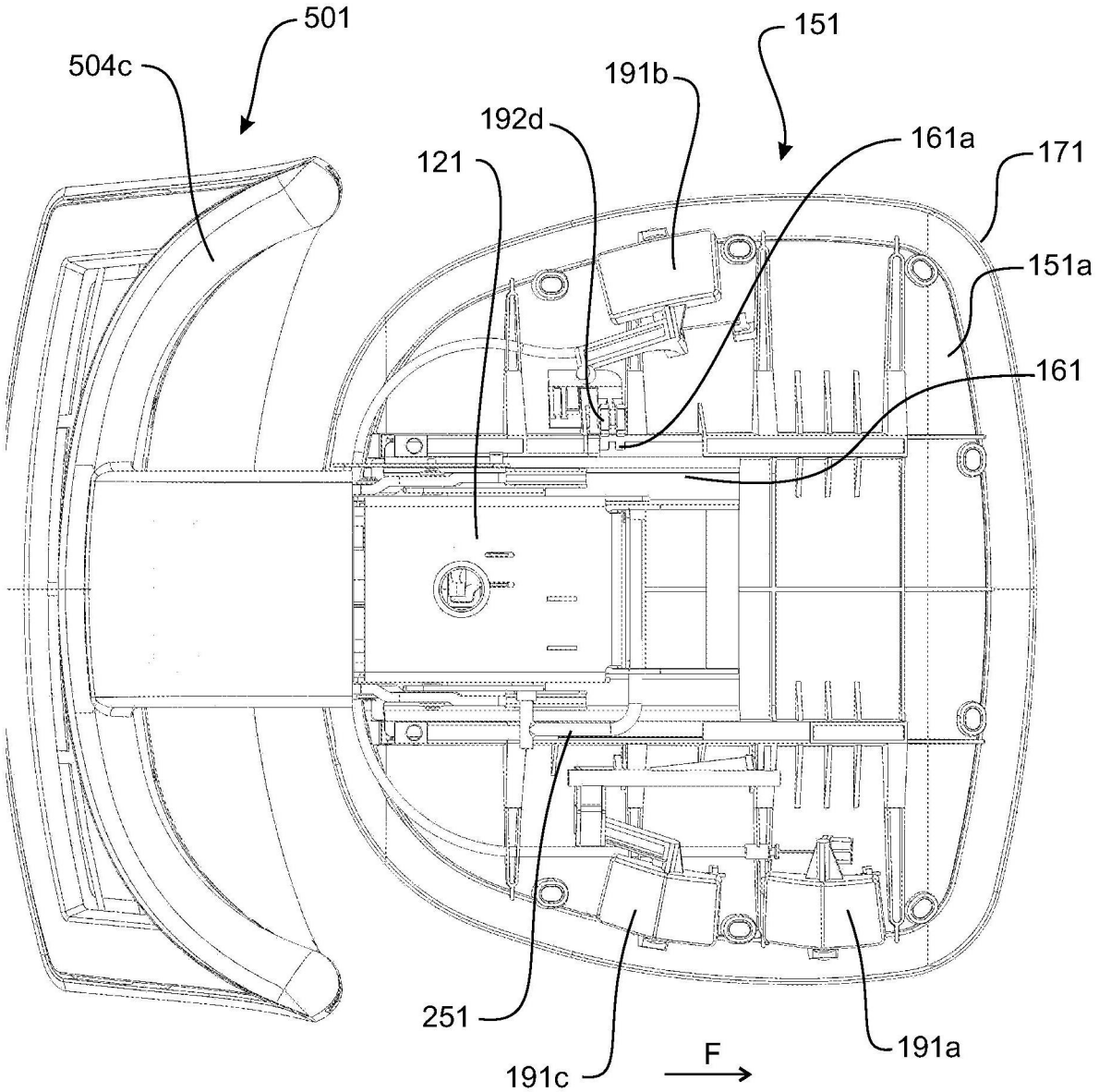


图 23

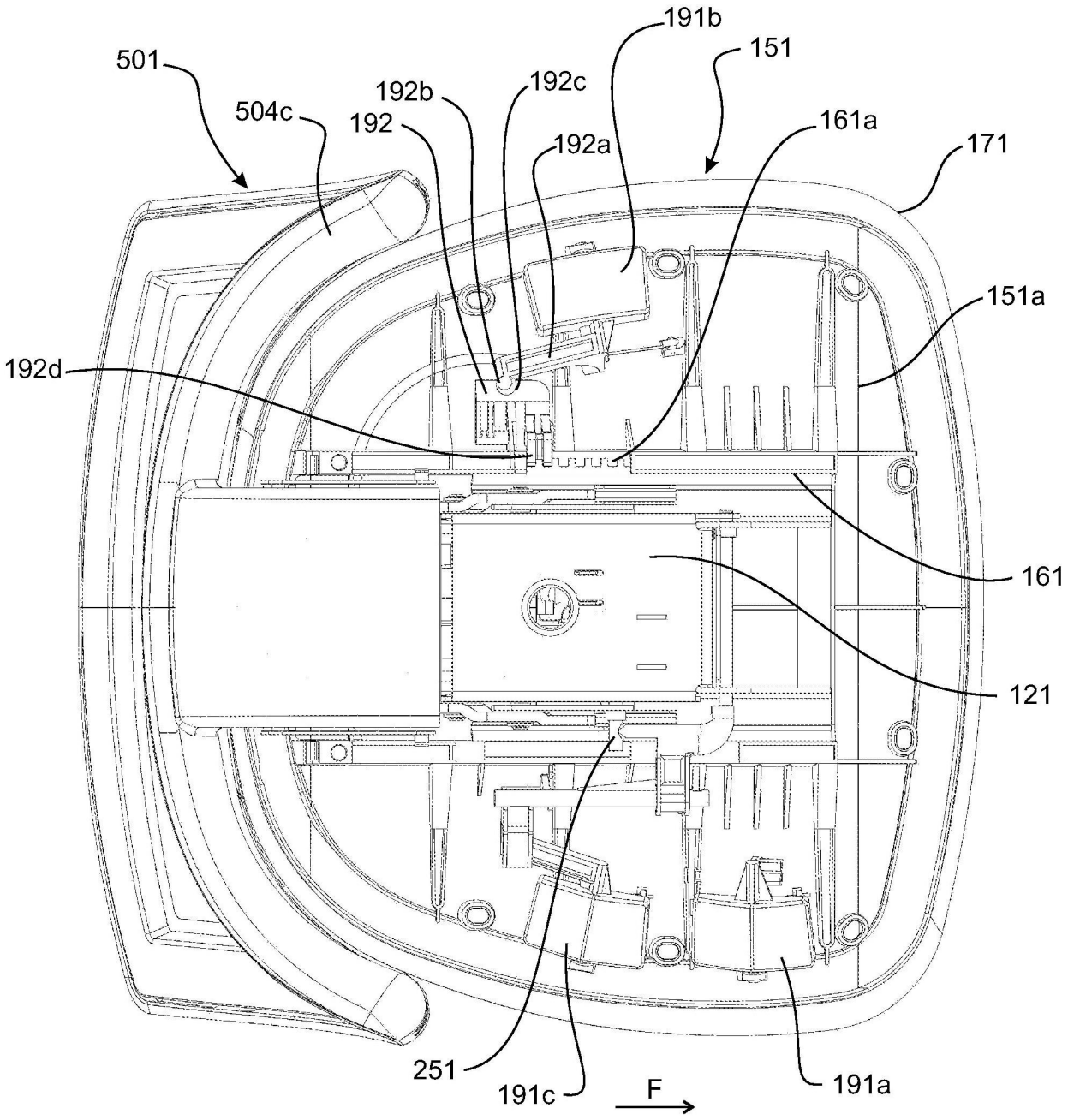

501
504c
192b
192
192c
192a
191b
151
161a
171
151a
192d
161
121
251
191c
F
191a

图 24

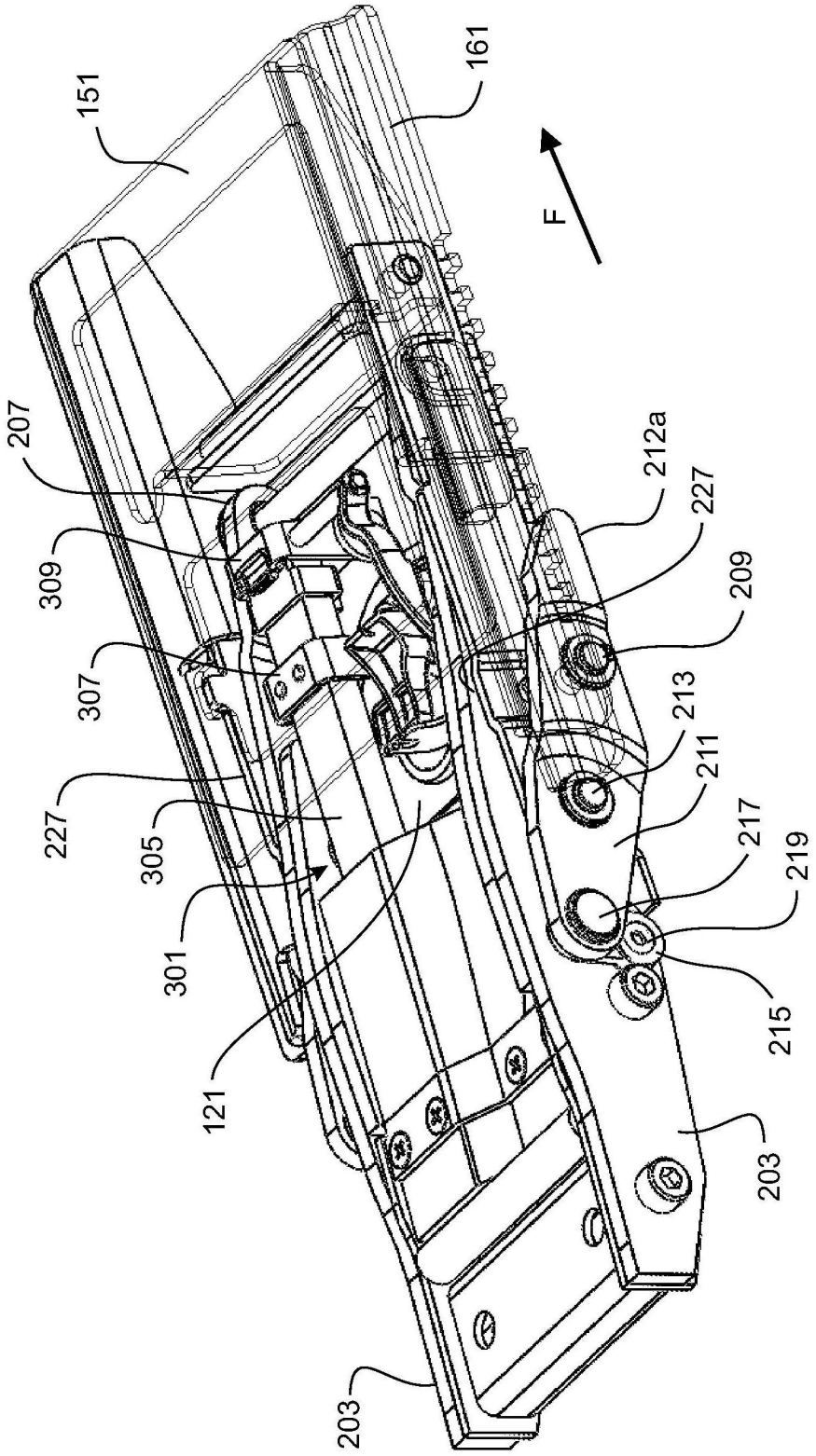

151
161
F
207
212a
227
309
209
307
213
211
227
305
217
219
301
215
121
203
203

图 25

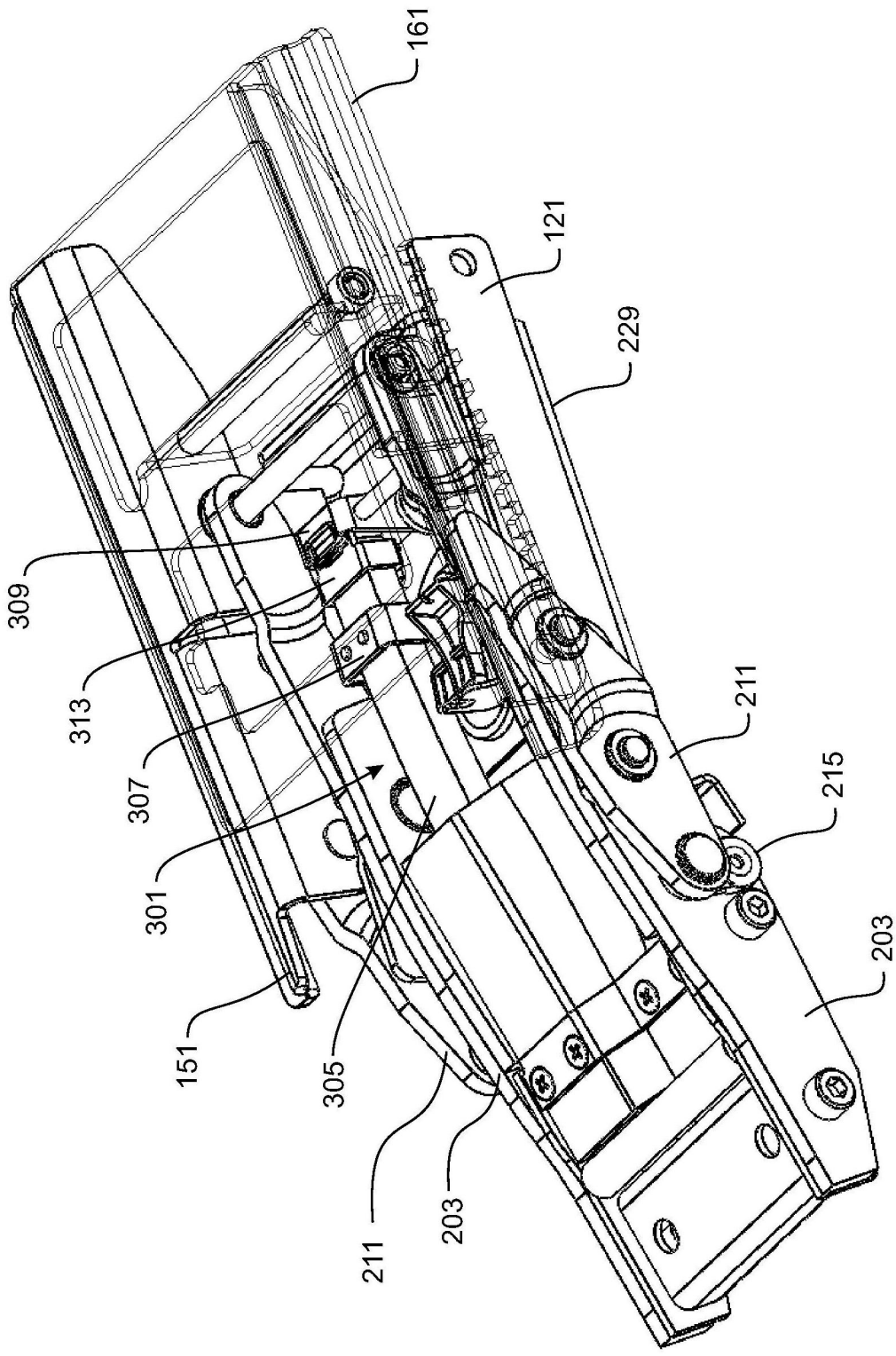


图 26

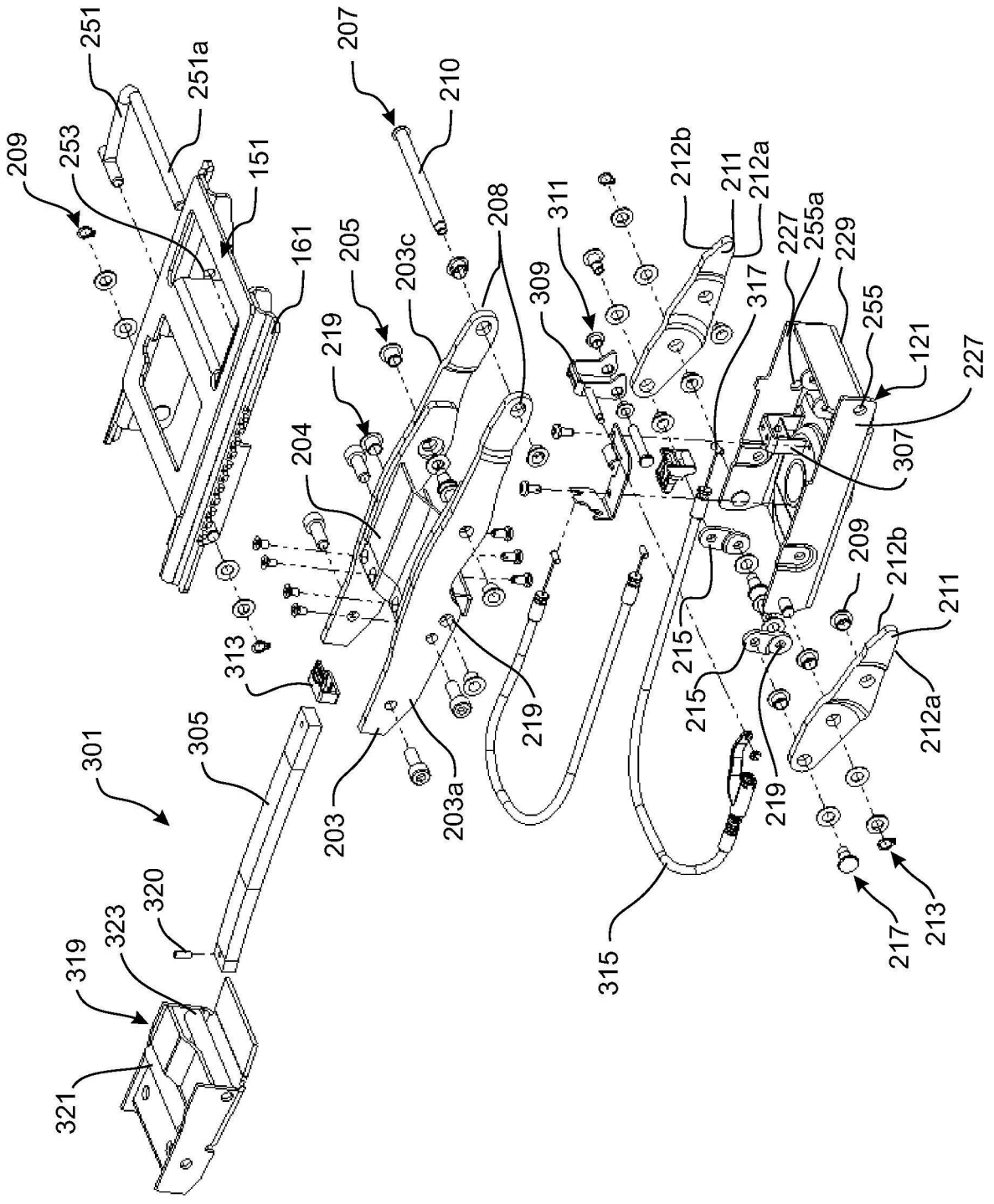

251
251a
209
253
151
161
207
210
205
203c
208
311
212b
211
212a
227
255a
229
317
309
219
204
255
121
227
307
313
305
301
203
203a
219
215
209
212b
211
212a
320
323
319
321
315
217
213

图 27

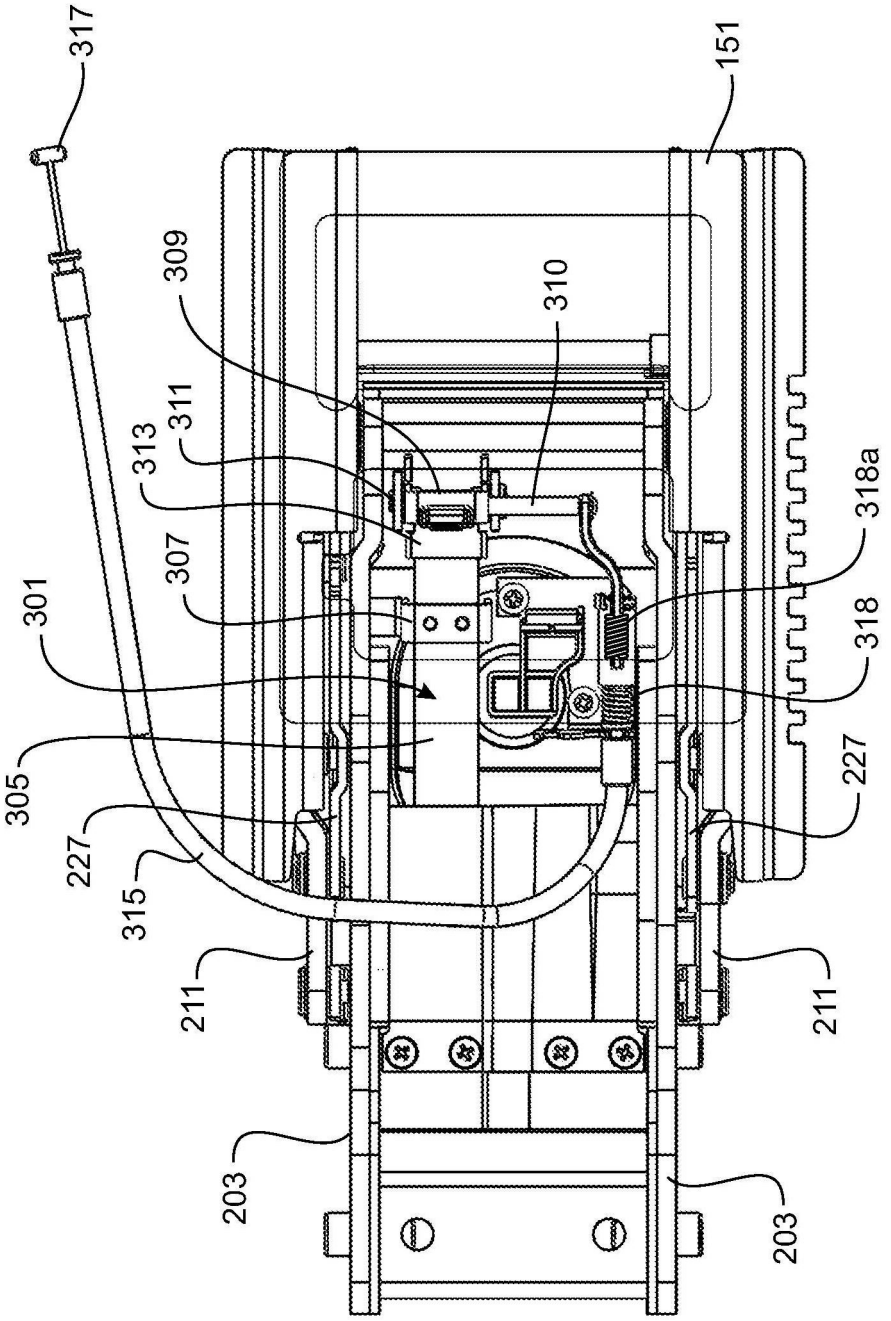

317
151
309
310
311
313
307
318a
301
318
305
227
227
315
211
211
203
203

图 28

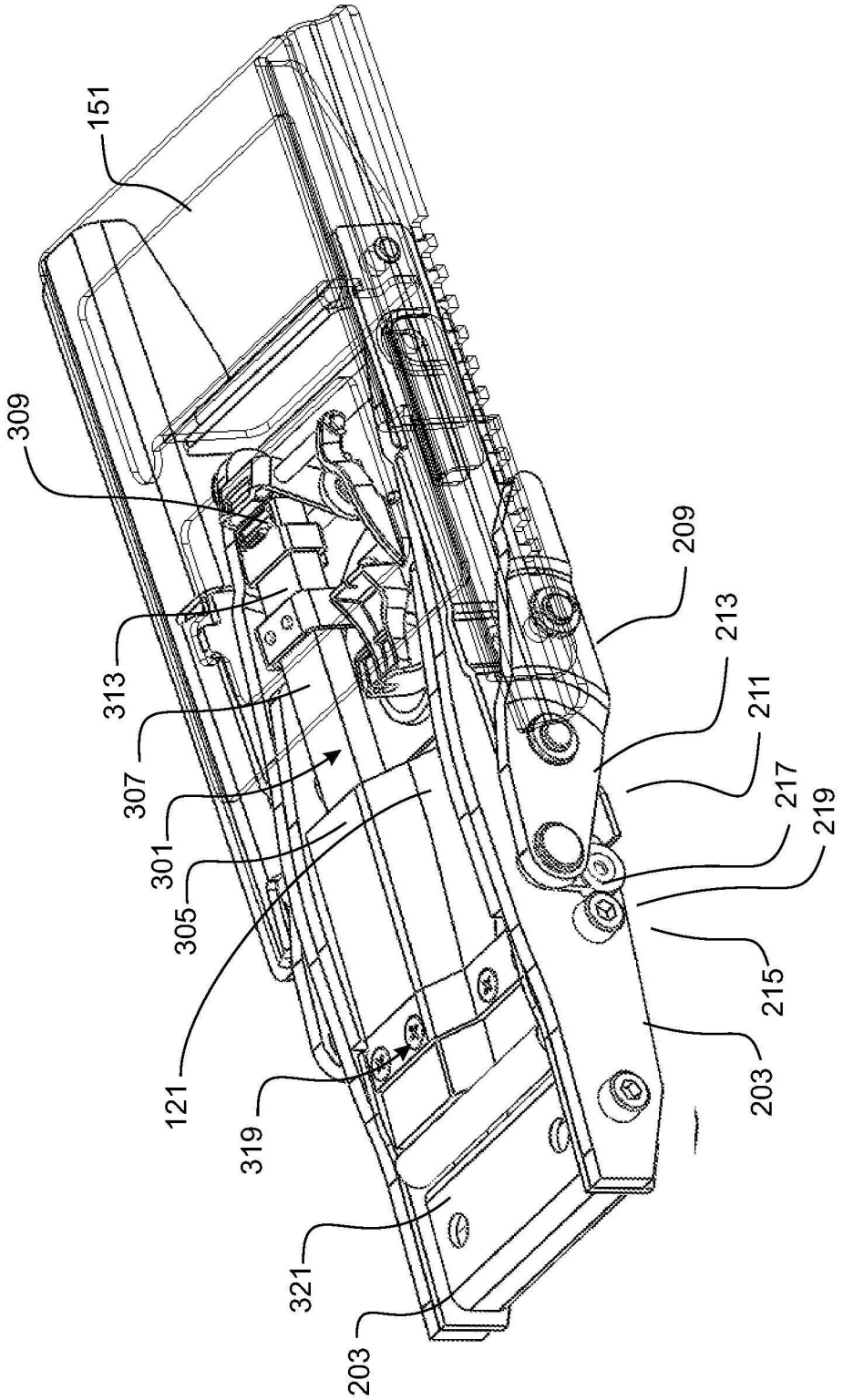

151
309
313
307
301
305
121
319
321
203
209
213
211
217
219
215
203

图 29

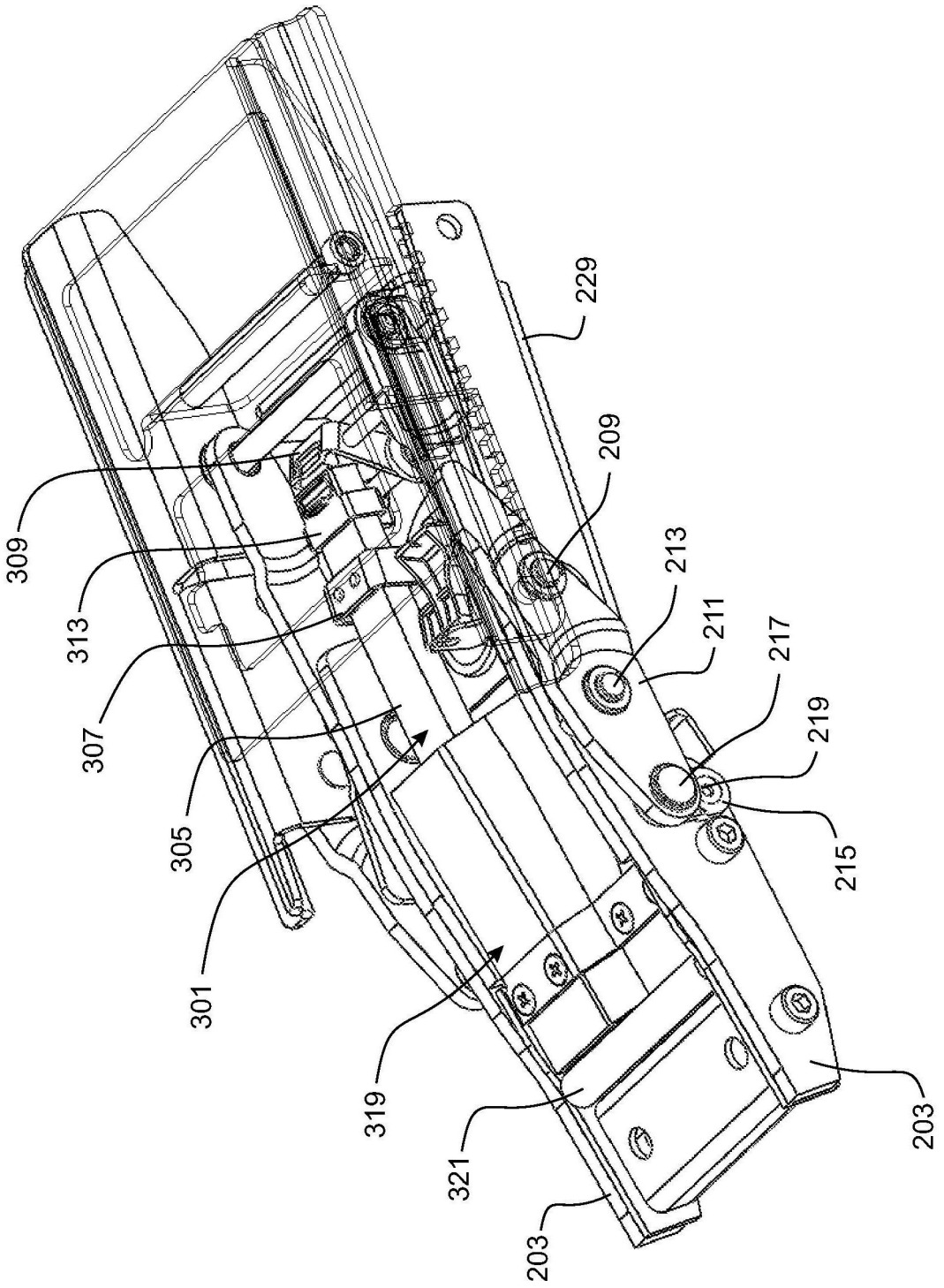


图 30

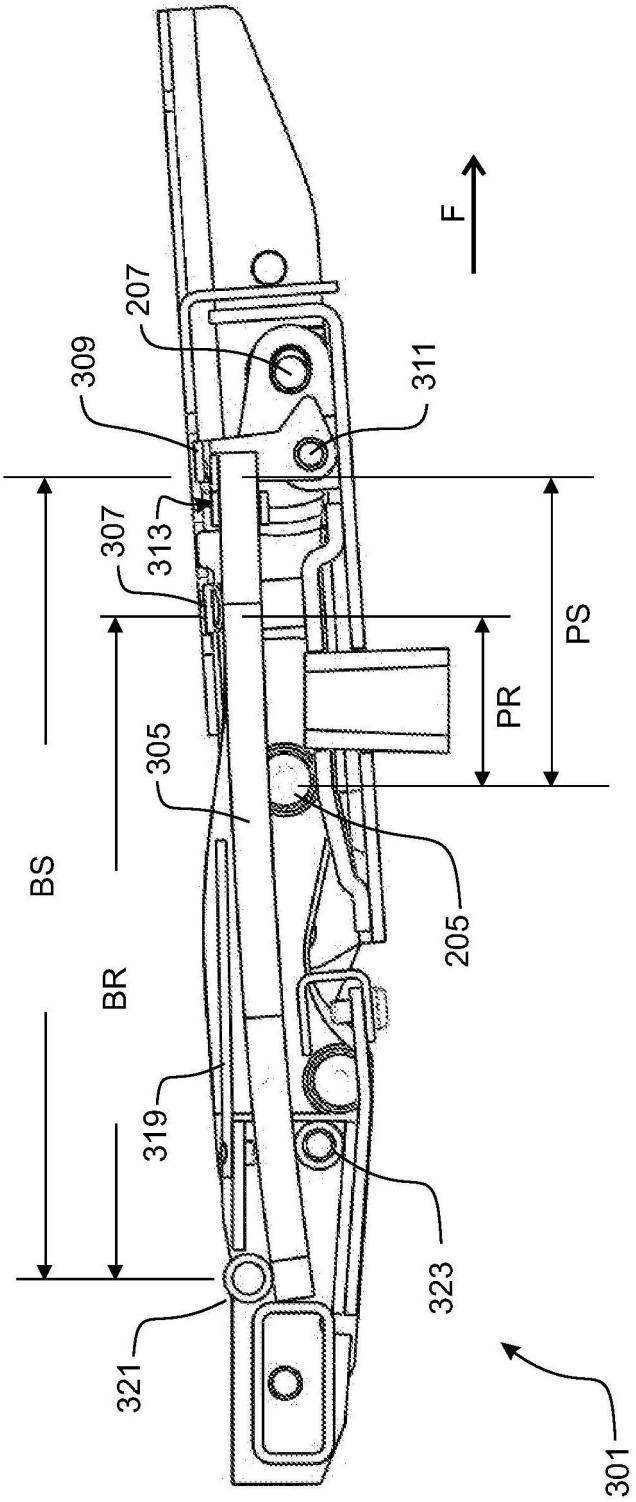


图 31

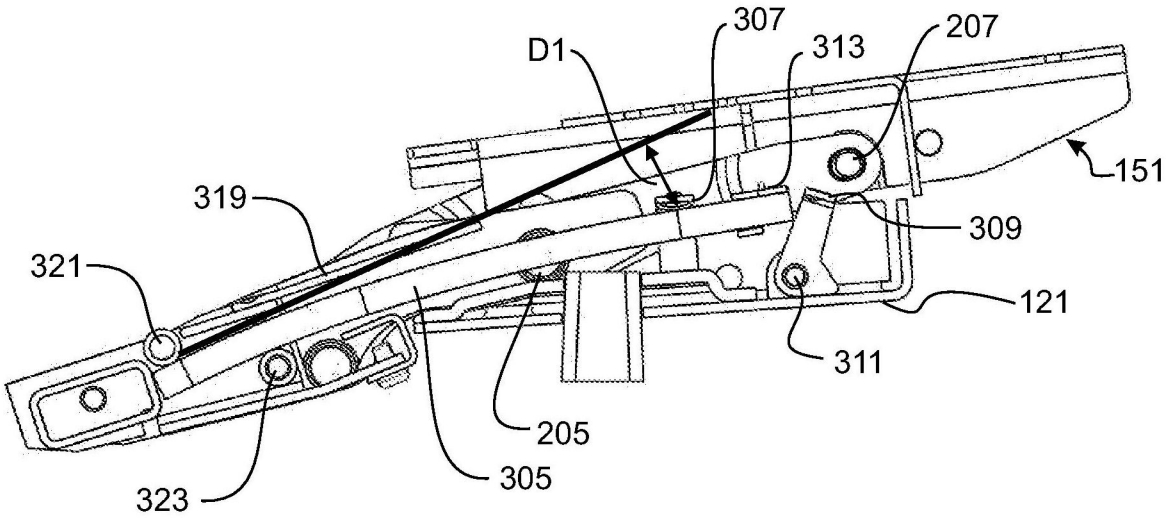

307
D1
313
207
151
319
309
321
121
311
205
305
323

图 32(a)

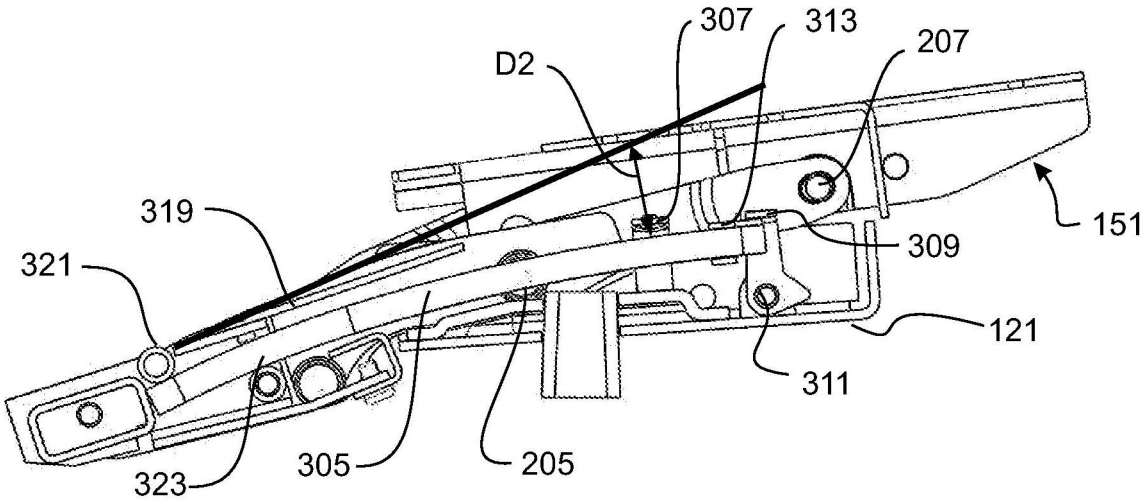

307
313
207
D2
319
151
309
321
121
311
305
205
323

图 32(b)

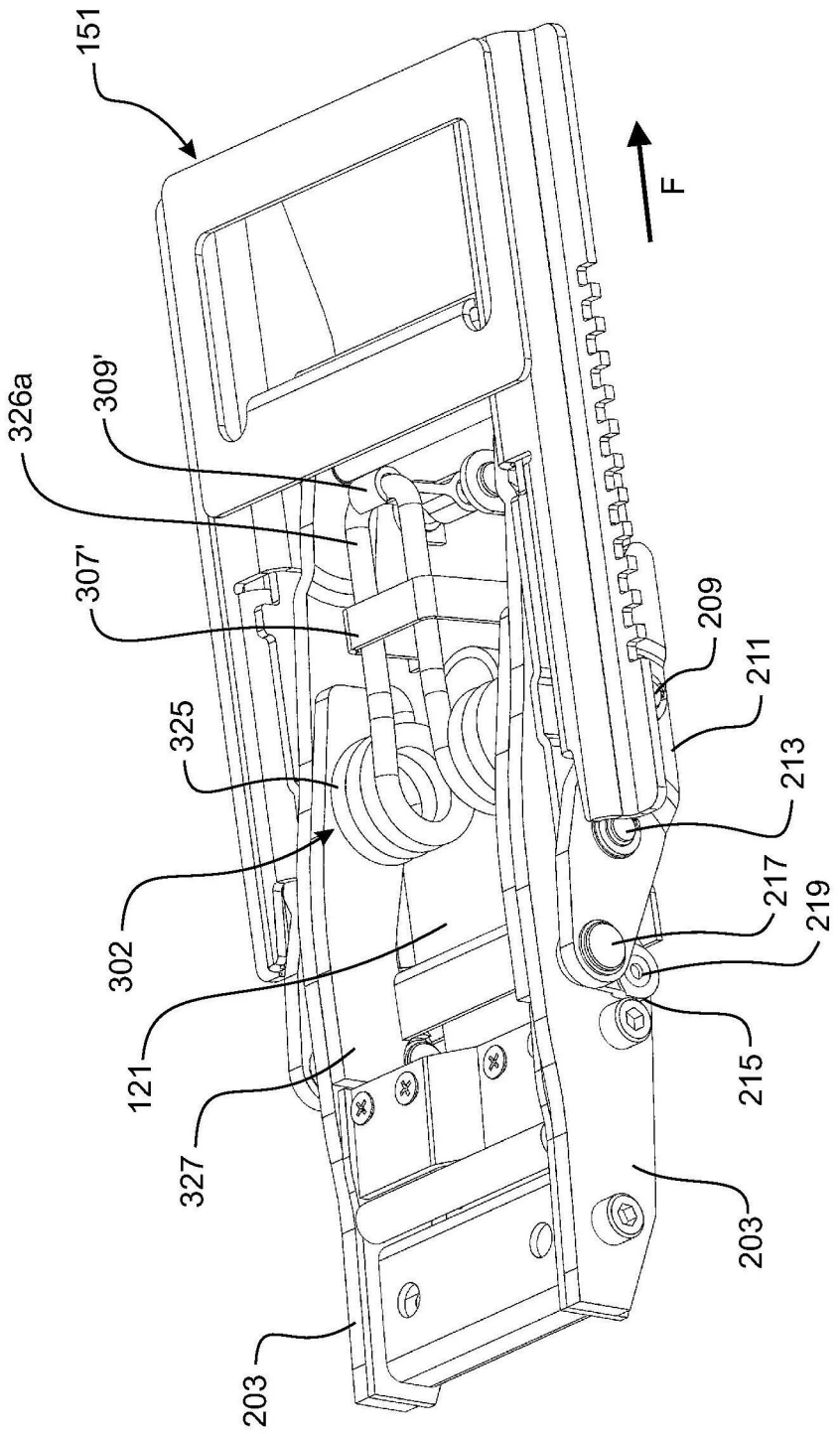

151
F
326a
309'
307'
325
302
121
327
203
203
209
211
213
217
219
215

图 33

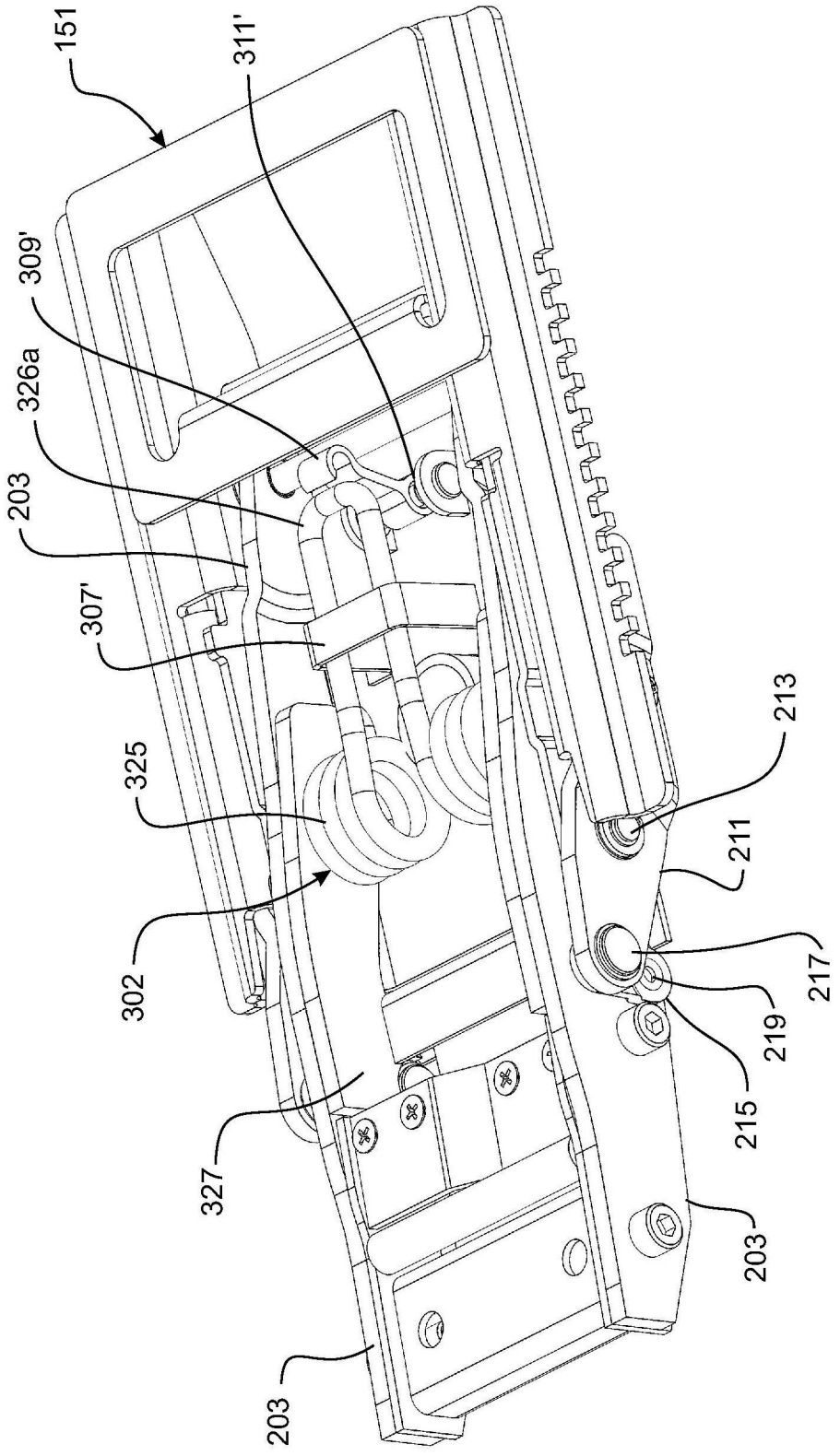


图 34

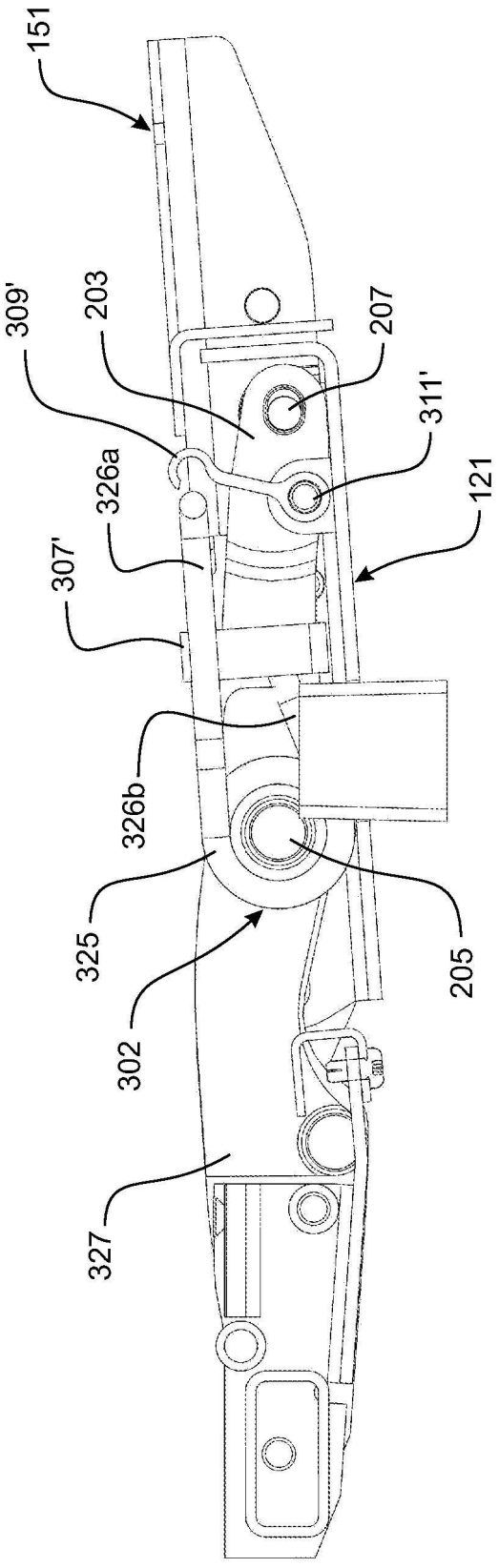


图 35

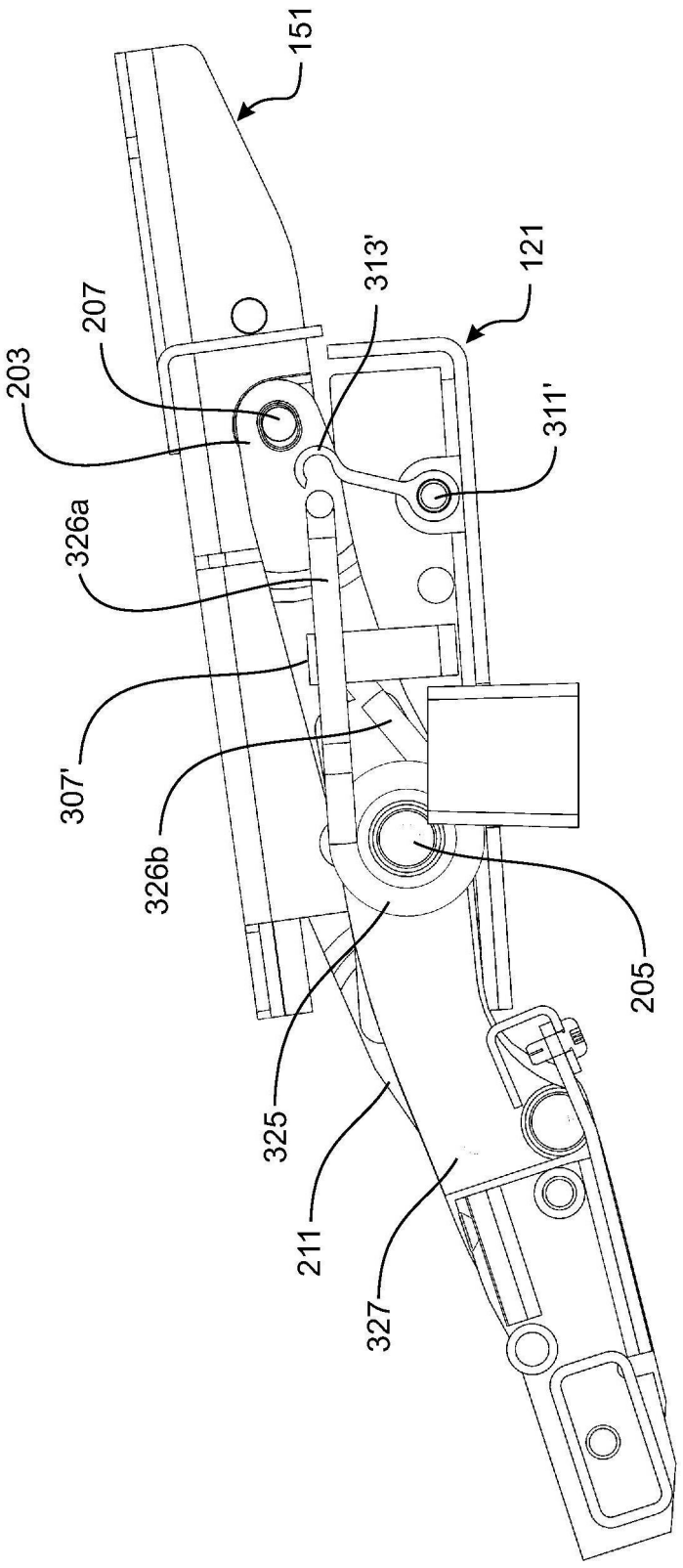


图 36

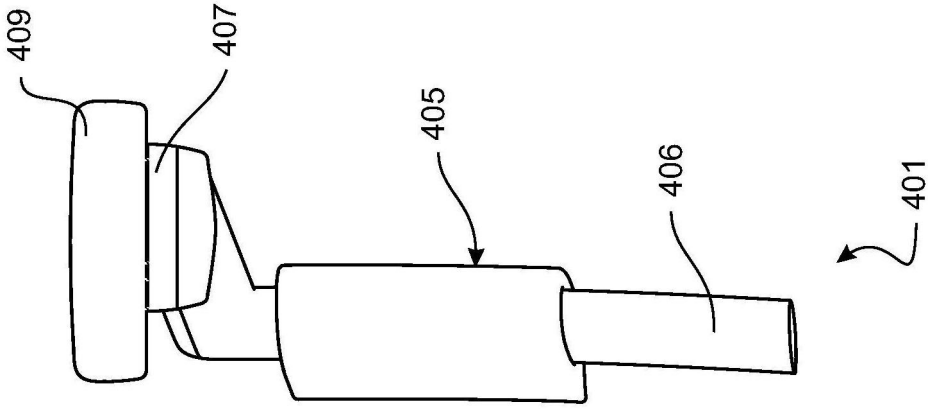


图 37

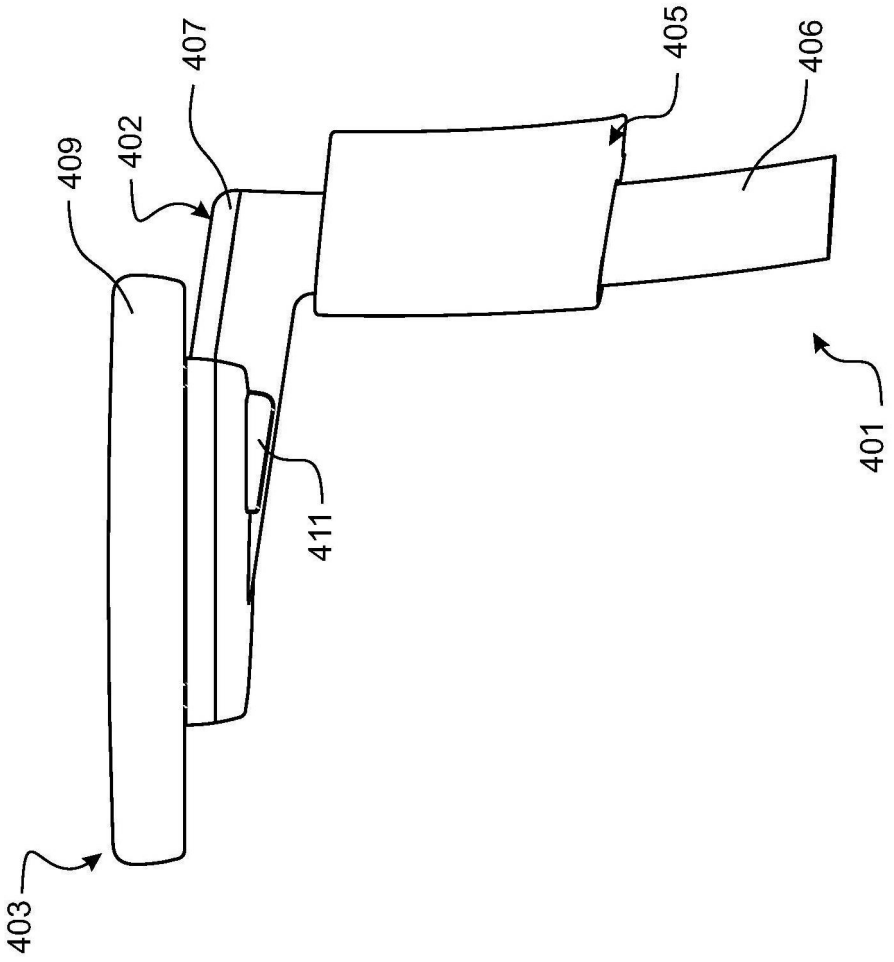


图 38

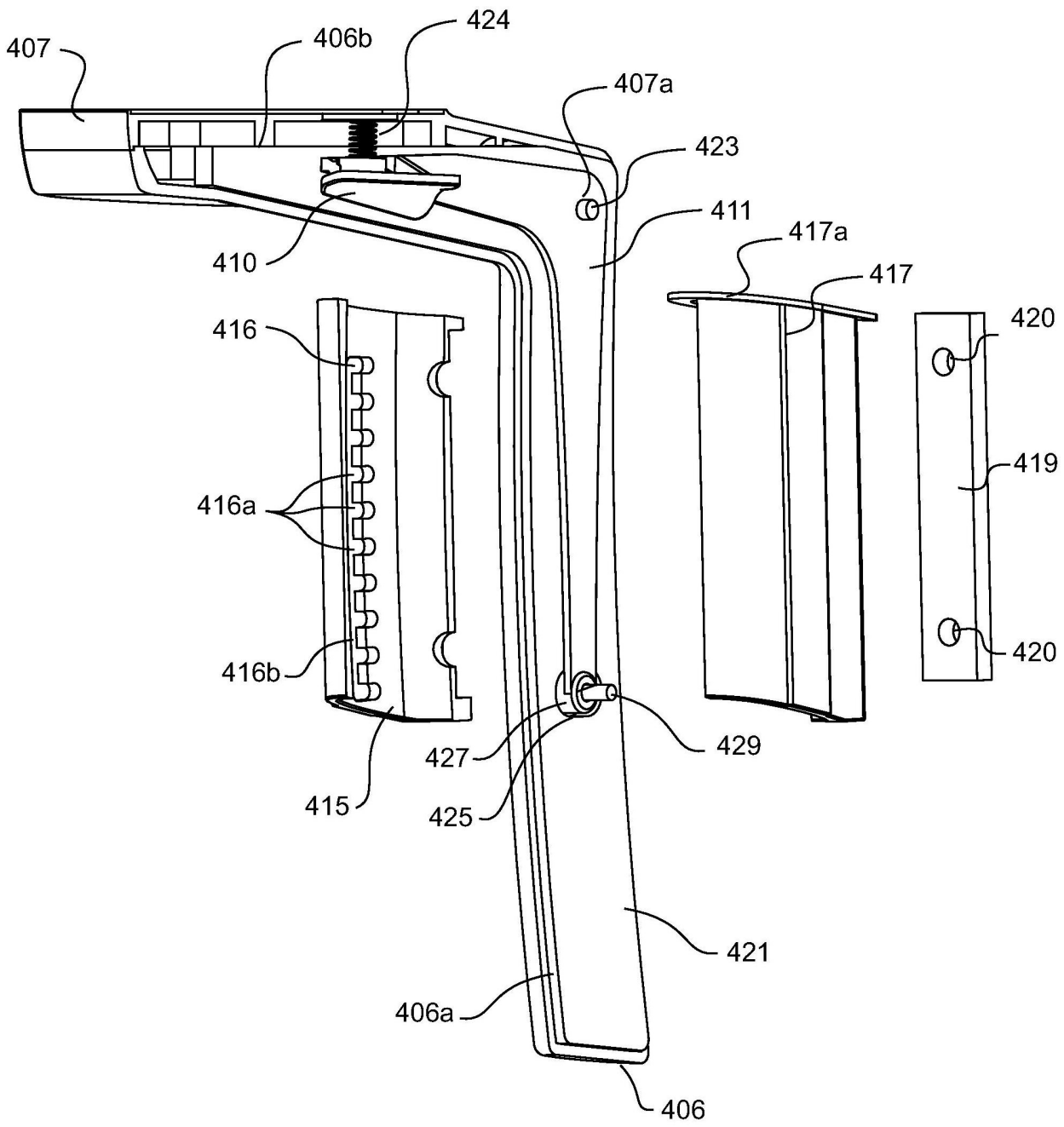

407
406b
424
407a
423
411
410
417a
417
420
419
416
416a
416b
415
427
425
429
421
406a
406

图 39

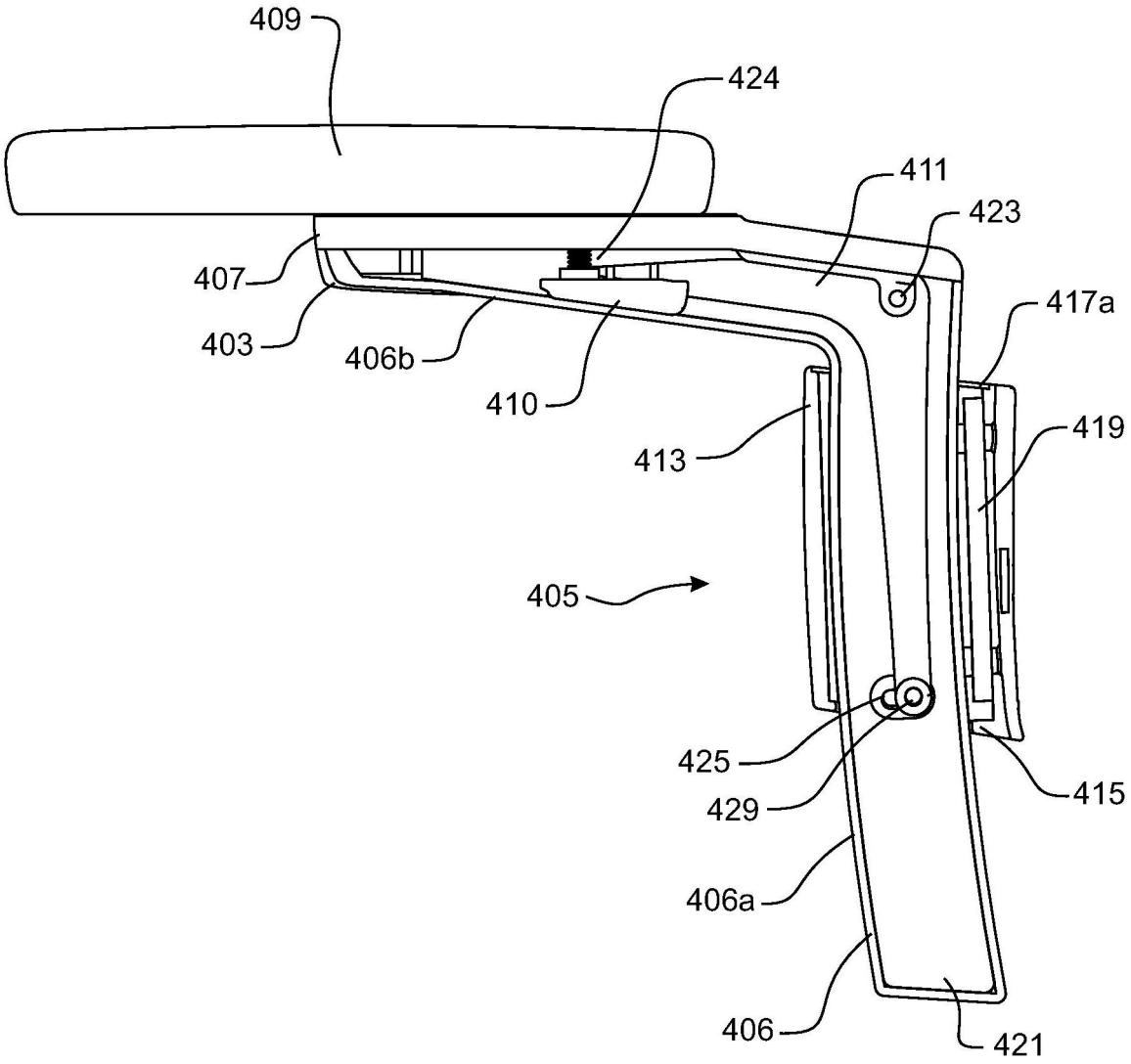

409
424
411
423
407
417a
403
406b
410
413
419
405
425
415
429
406a
406
421

图 40

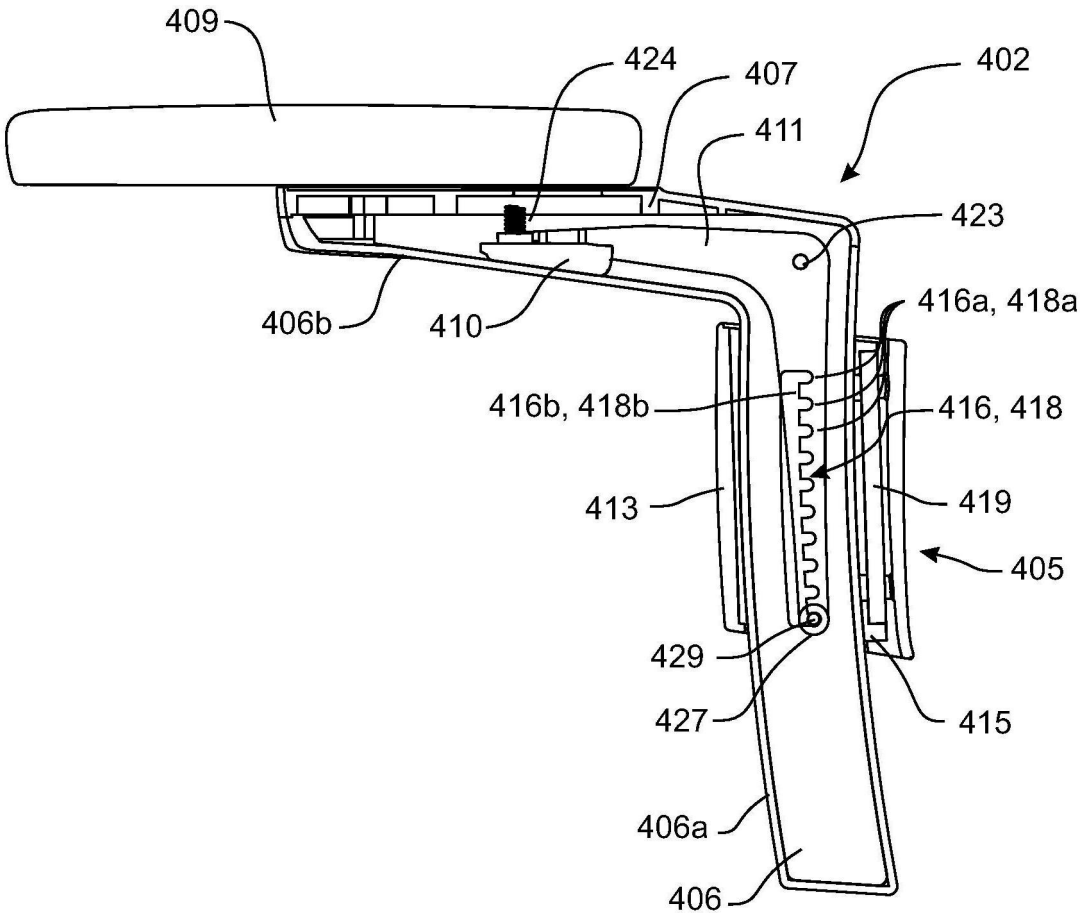

409
424
407
402
411
423
406b
410
416a, 418a
416b, 418b
416, 418
413
419
405
429
427
415
406a
406

图 41

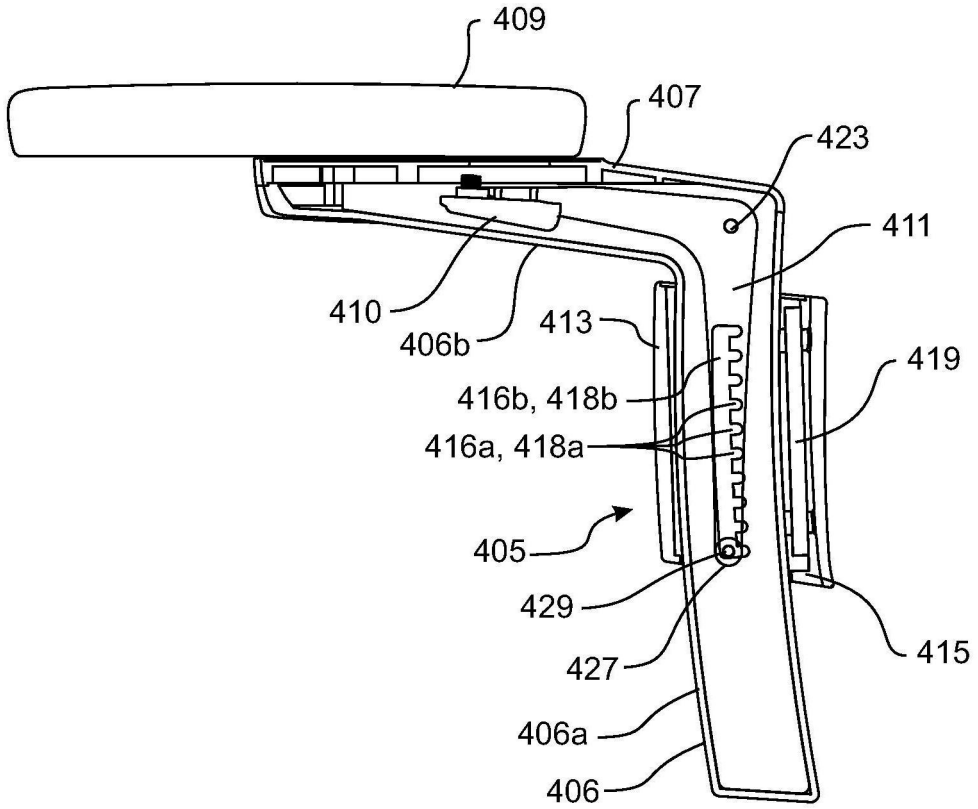

409
407
423
411
410
406b
413
419
416b, 418b
416a, 418a
405
429
427
415
406a
406

图 42

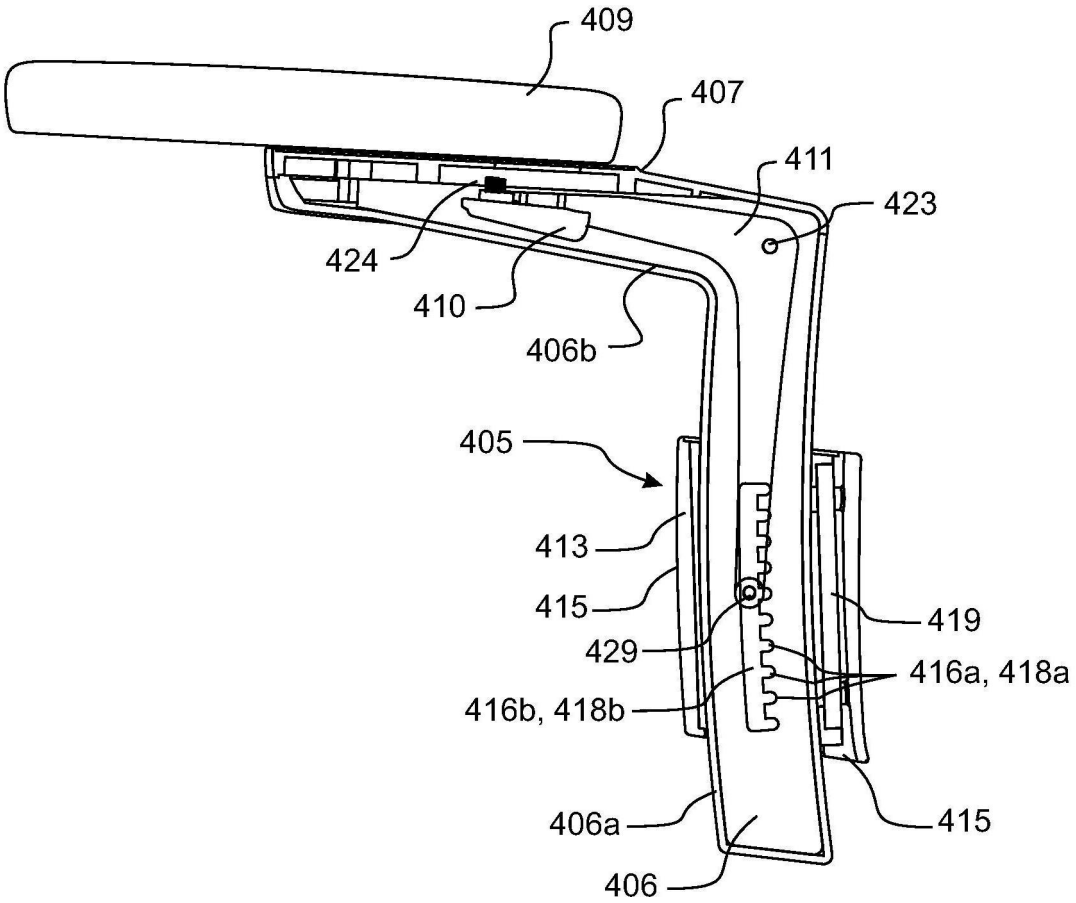

409
407
411
423
424
410
406b
405
413
415
429
419
416a, 418a
416b, 418b
406a
415
406

图 43

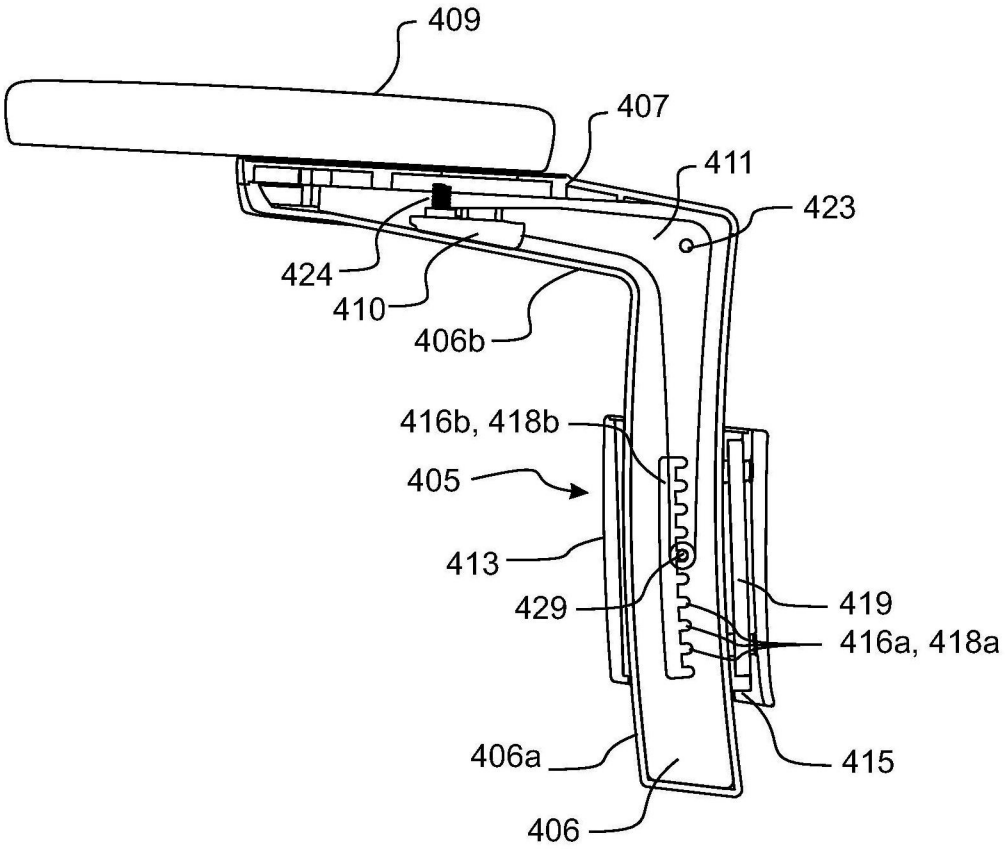

409
407
411
423
424
410
406b
416b, 418b
405
413
429
419
416a, 418a
406a
415
406

图 44

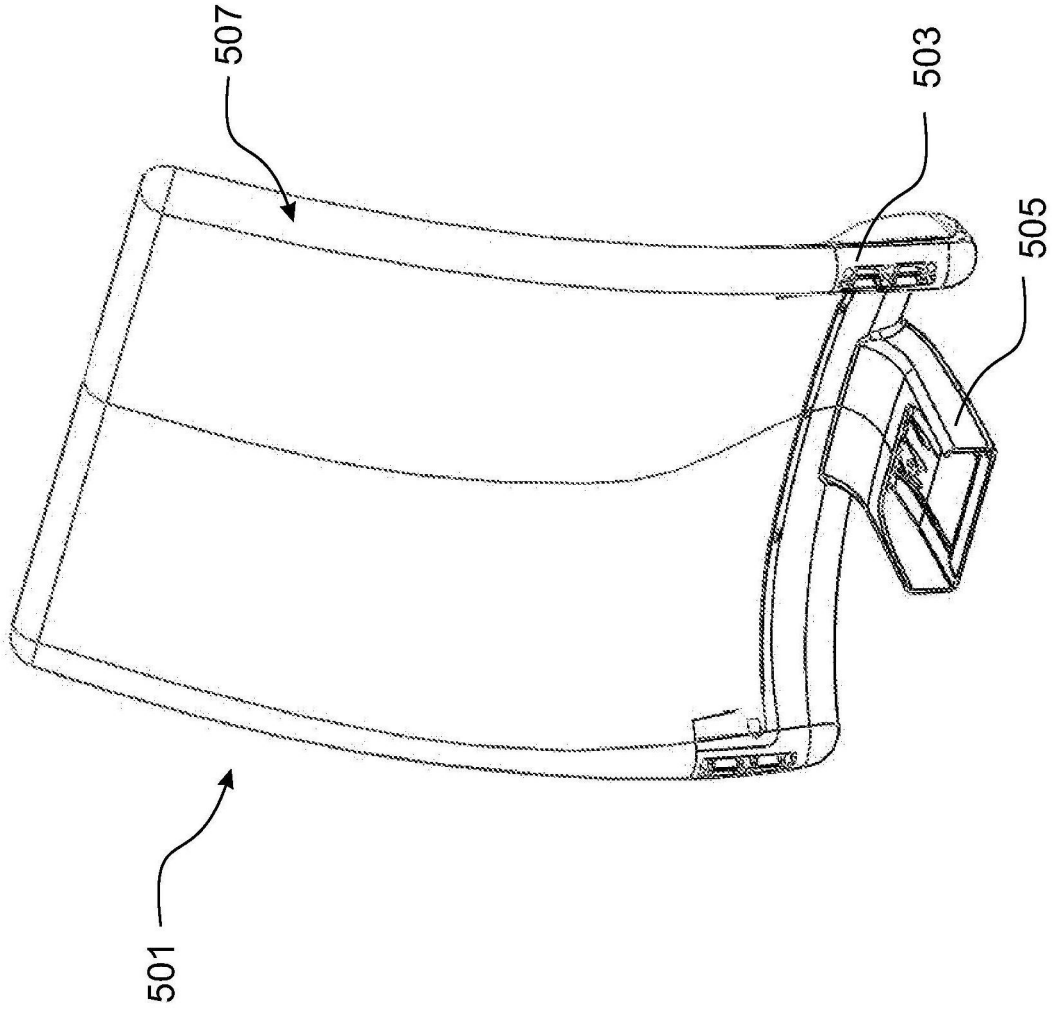


图 45

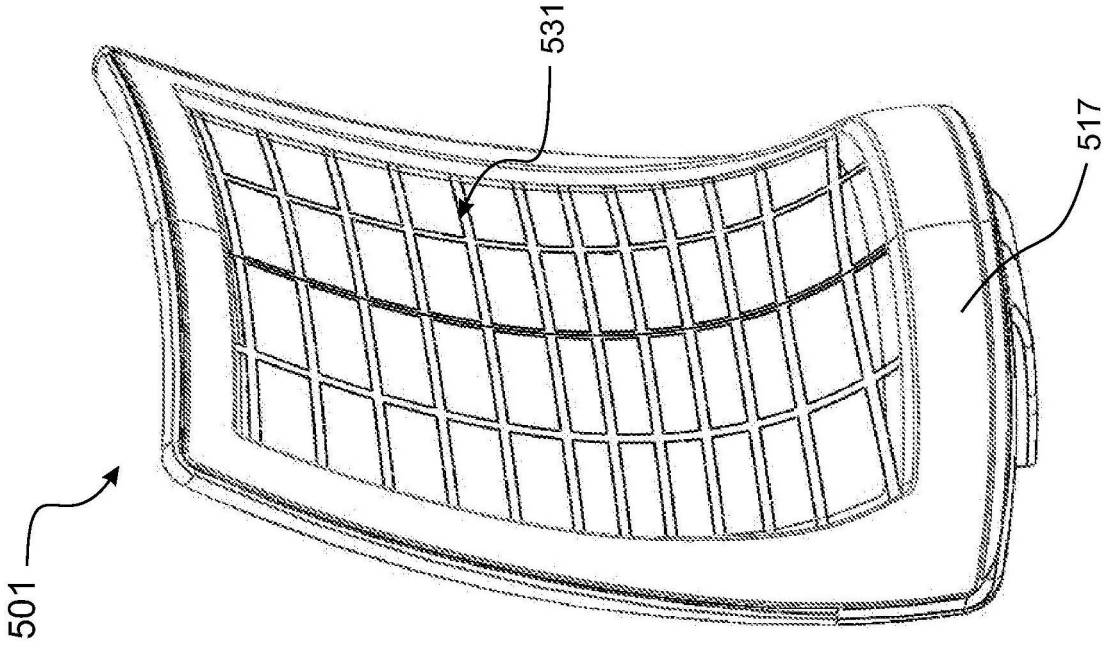


图 46

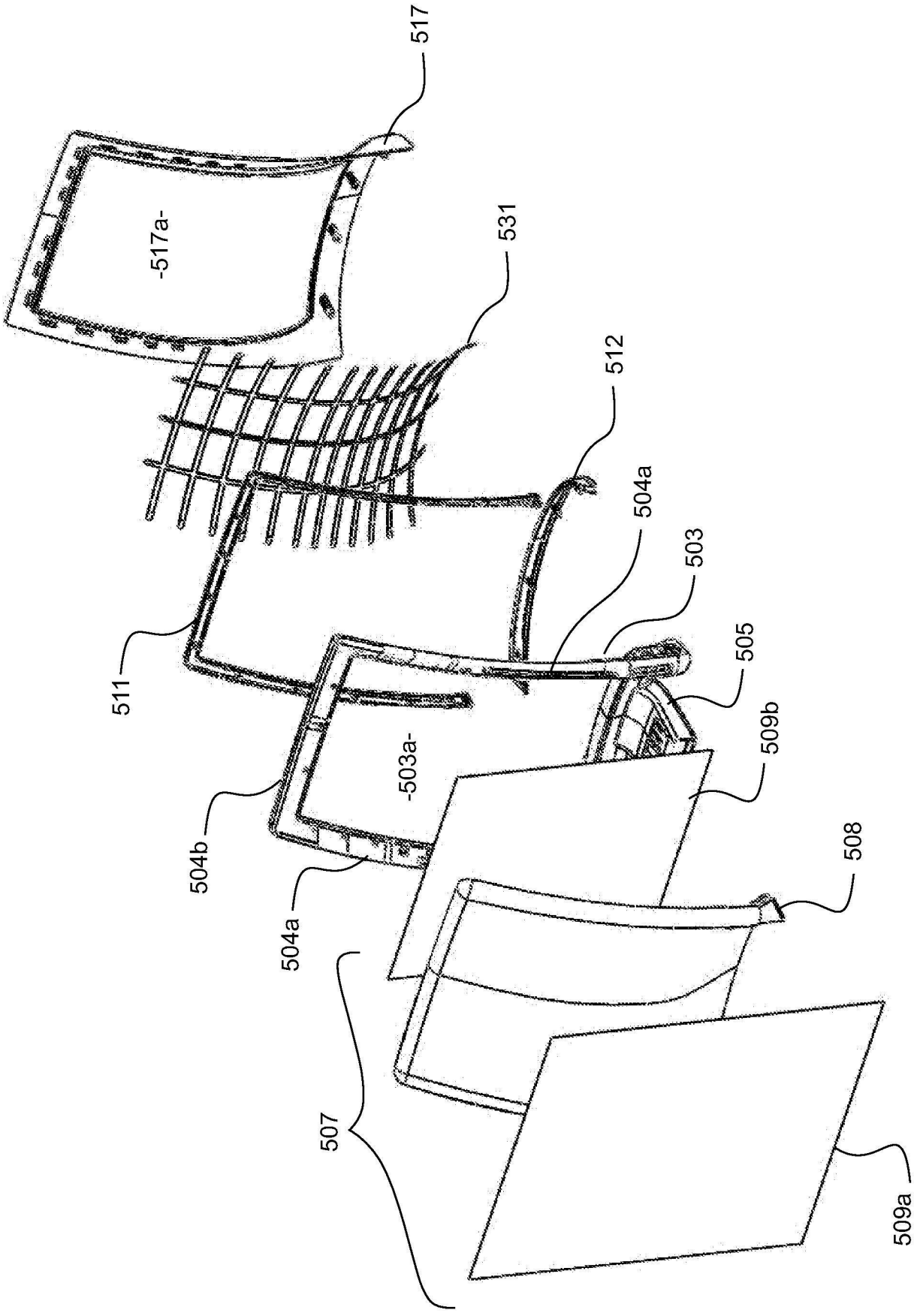

517
-517a-
531
512
504a
503
505
509b
511
-503a-
504b
504a
508
507
509a

图 47

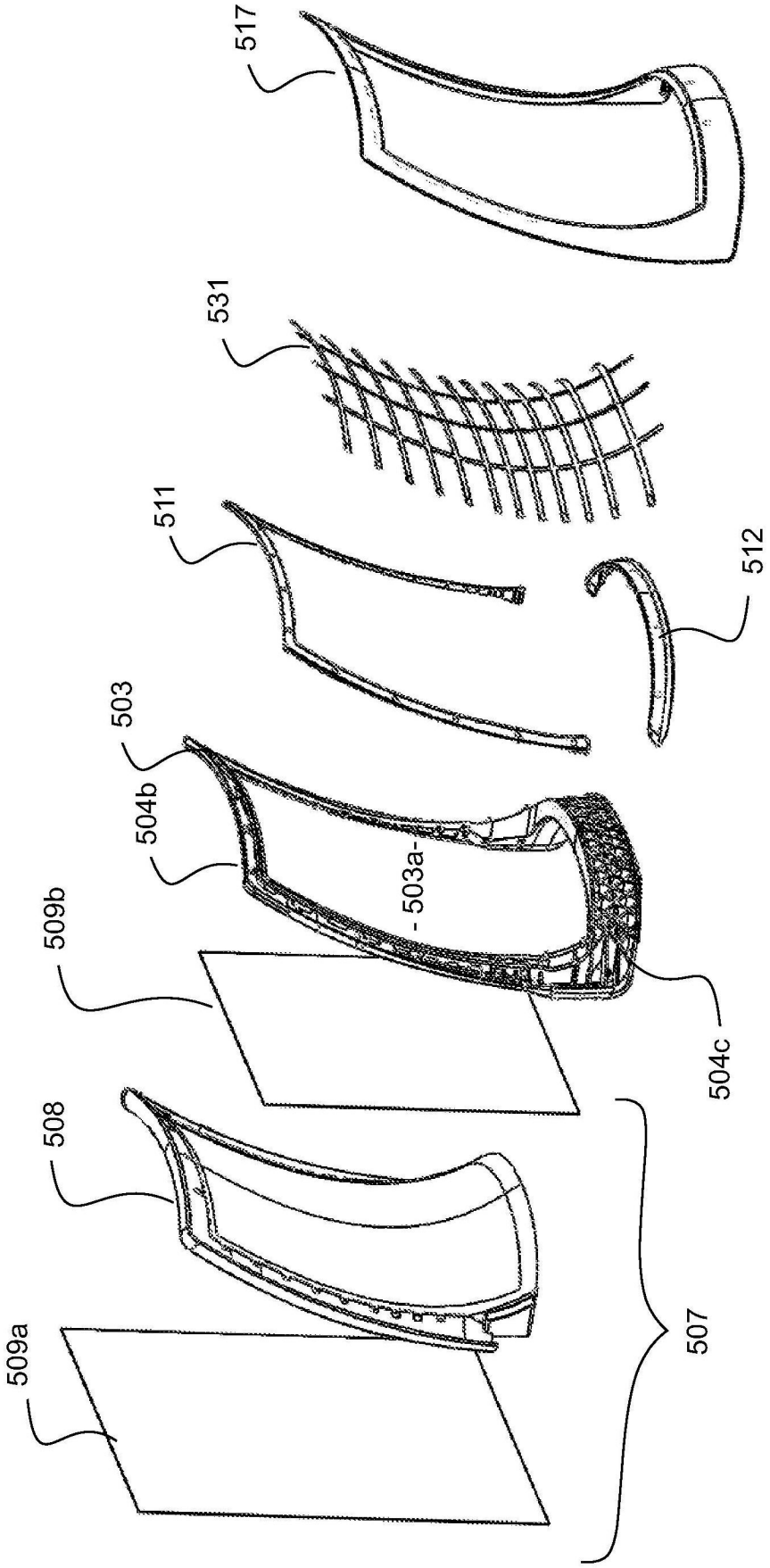


图 48

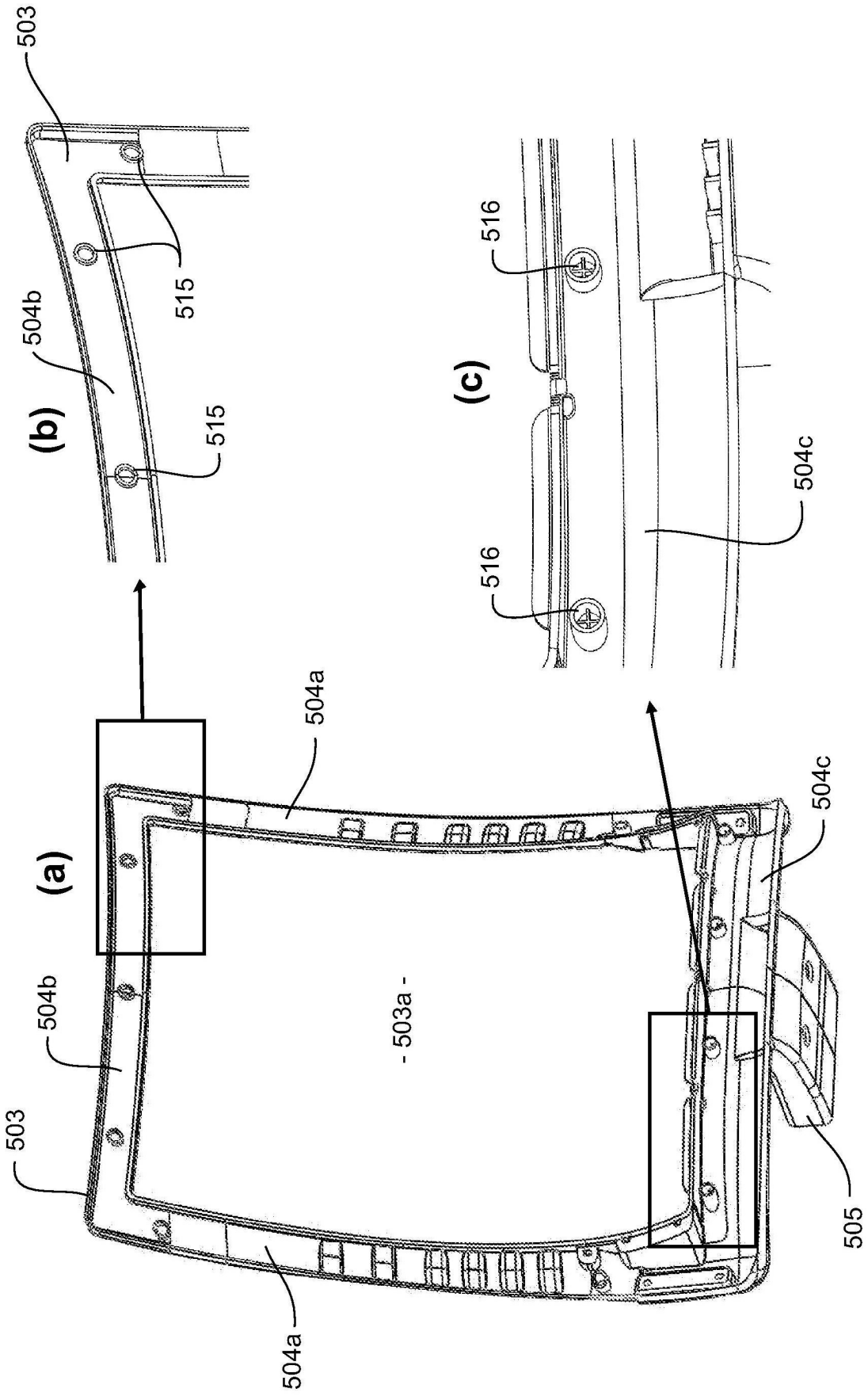

503
515
504b
515
(b)
516
(c)
504c
516
504a
(a)
504b
- 503a -
503
504a
504c
505

图 49

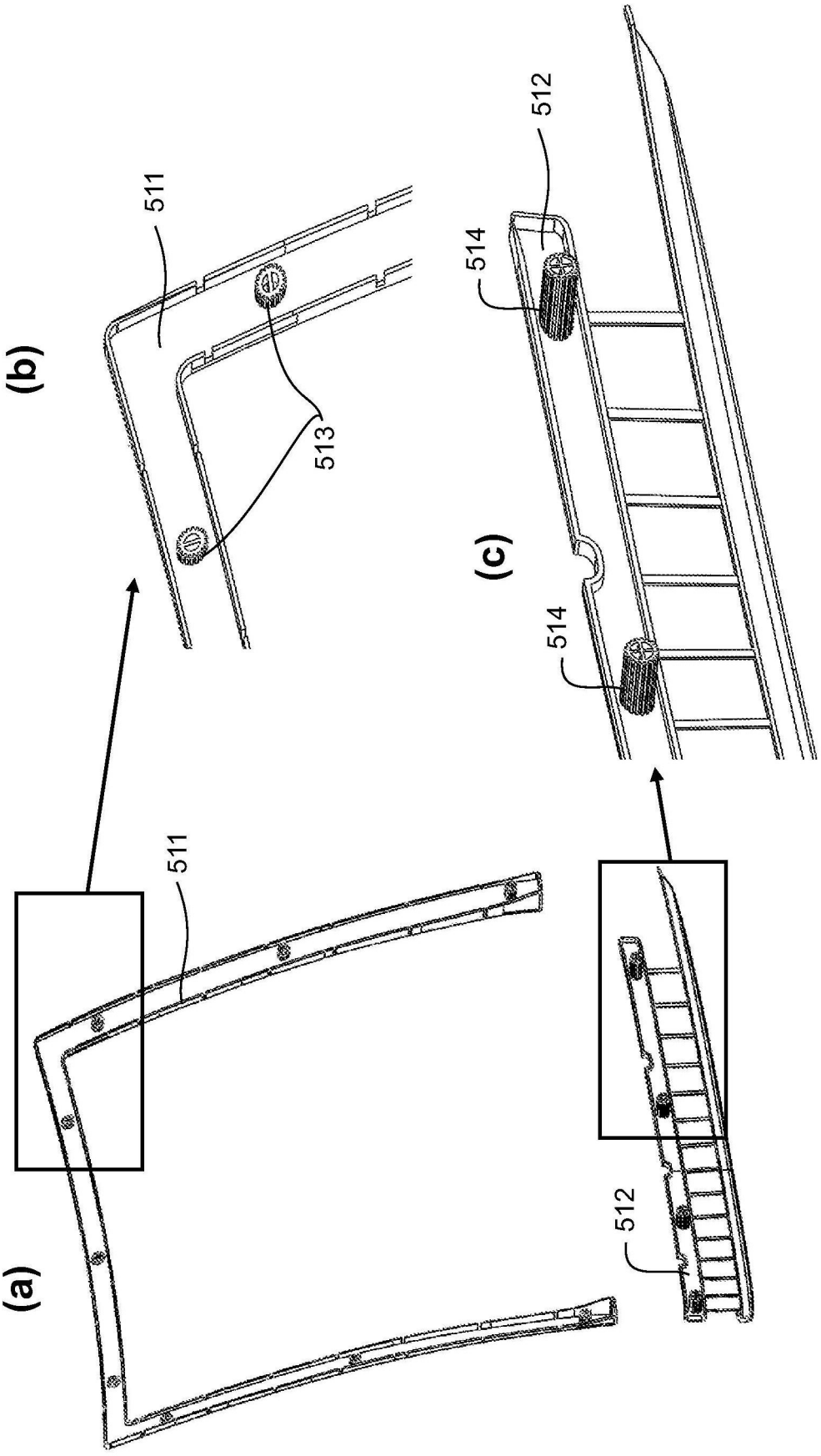


图 50

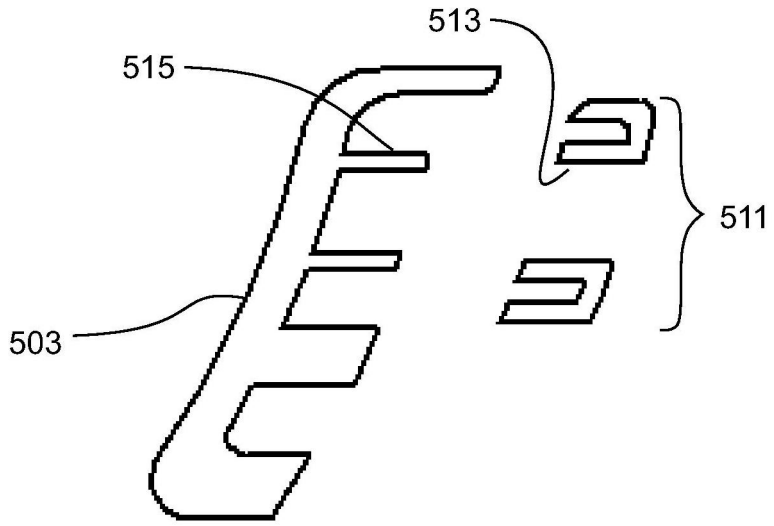


图 51(a)

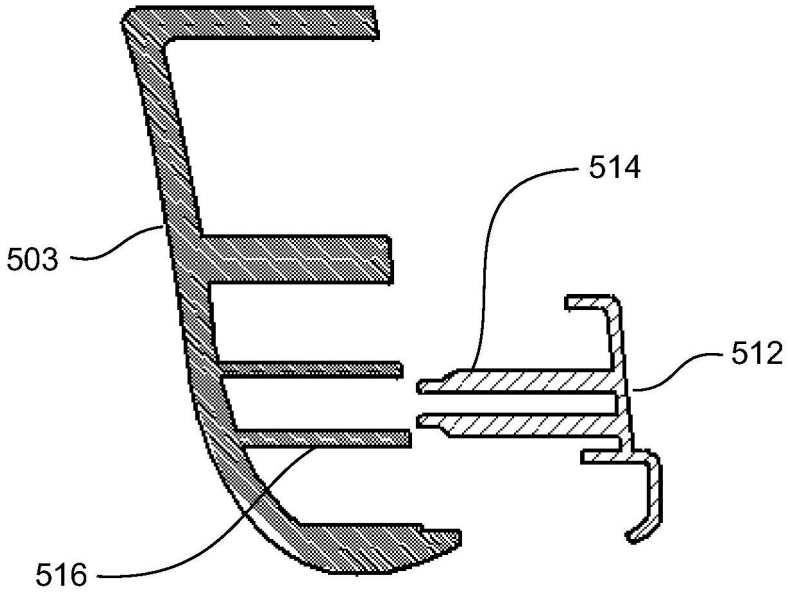


图 51(b)

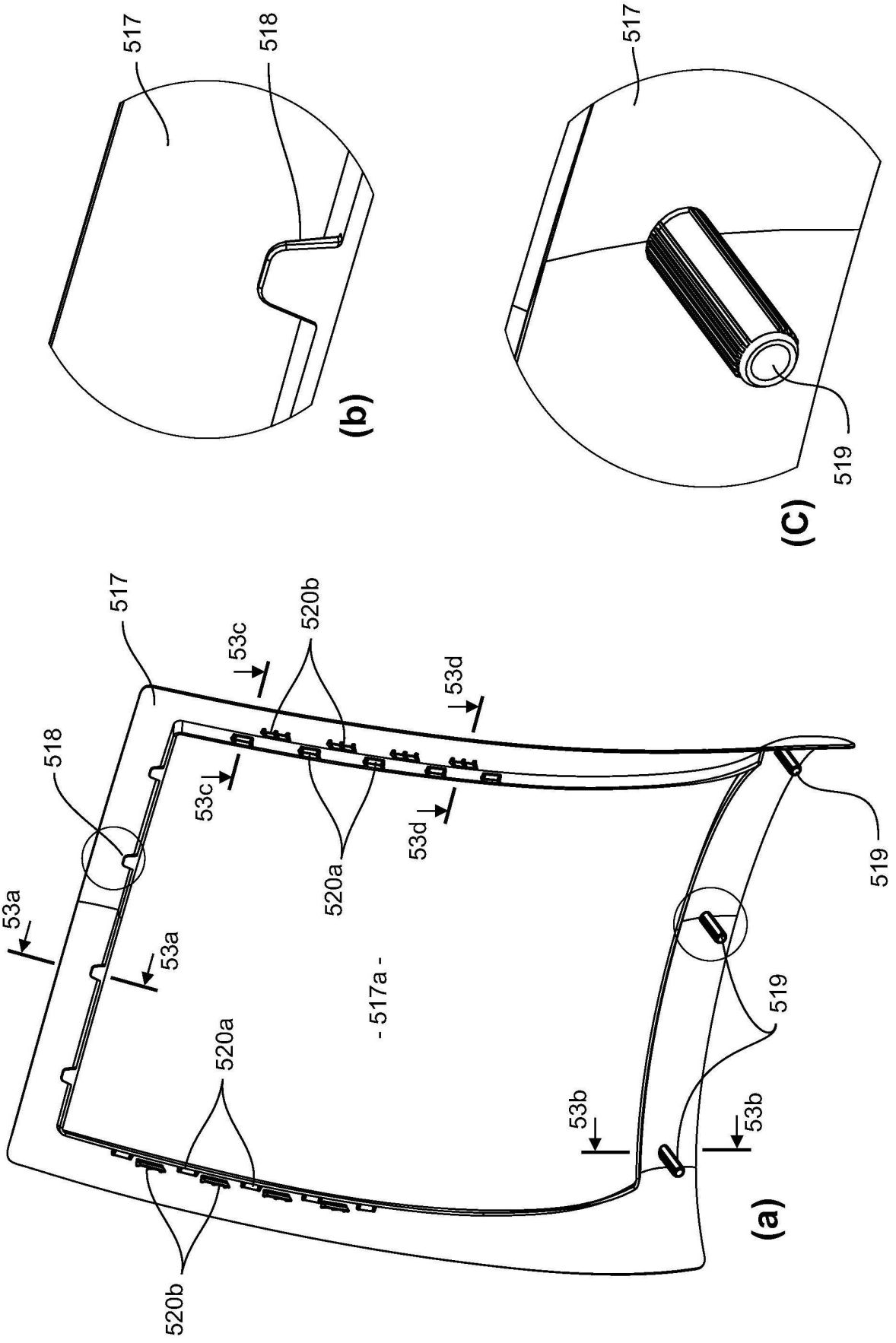

517
518
(b)
517
519
(C)
517
520b
53c
53d
518
53c
53d
520a
519
53a
53a
- 517a -
519
520a
53b
53b
520b
(a)

图 52

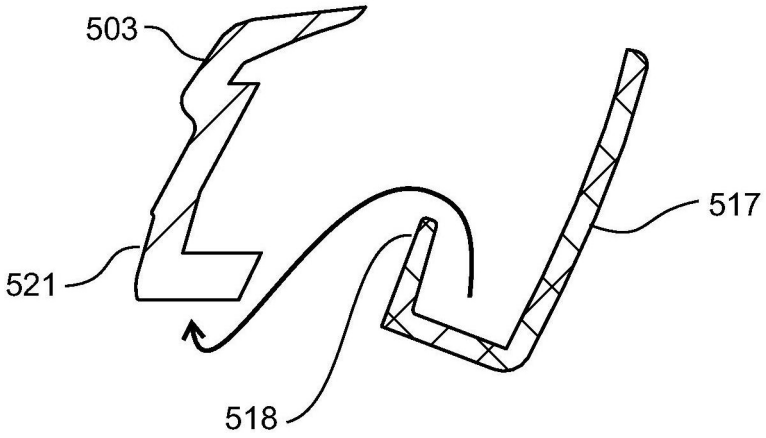


图 53(a)

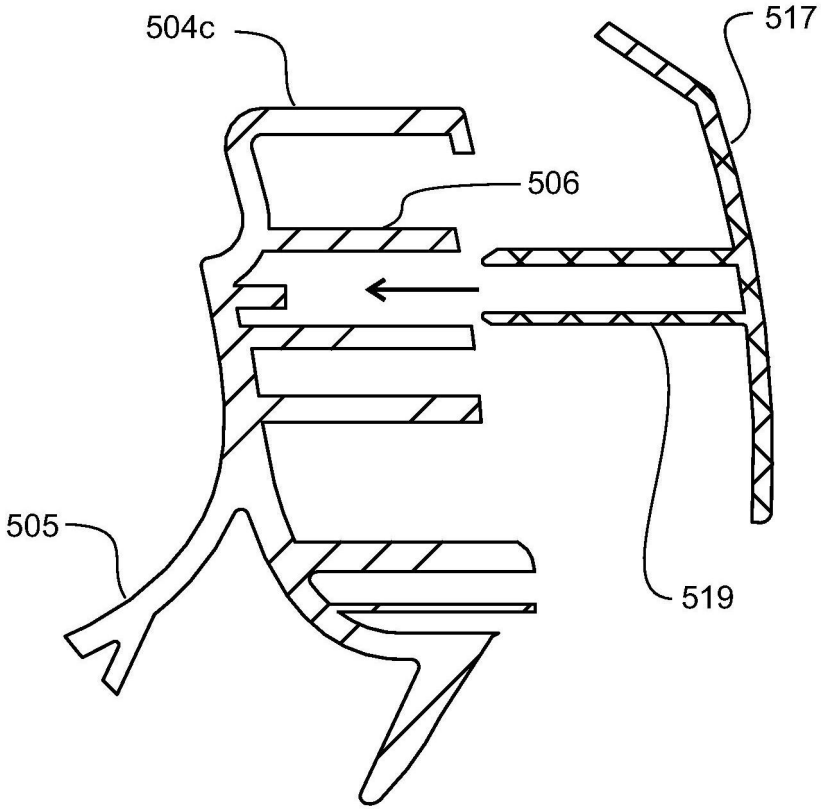


图 53(b)

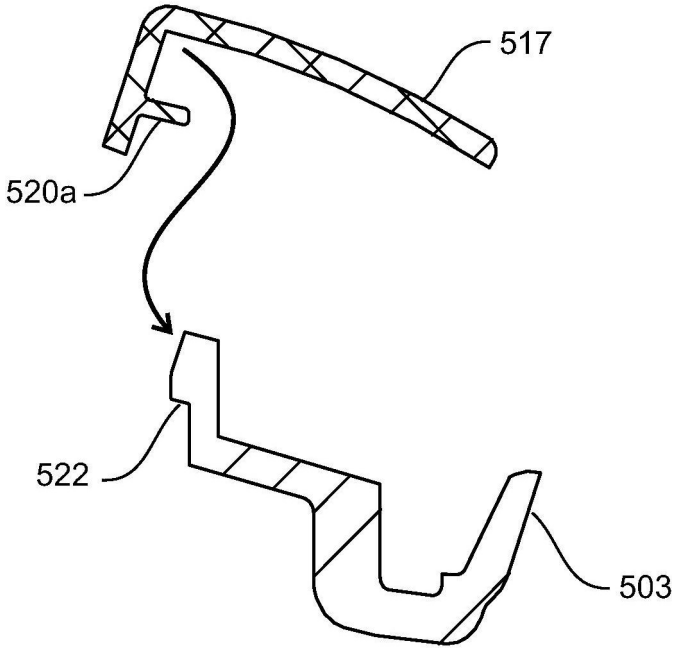


图 53(c)

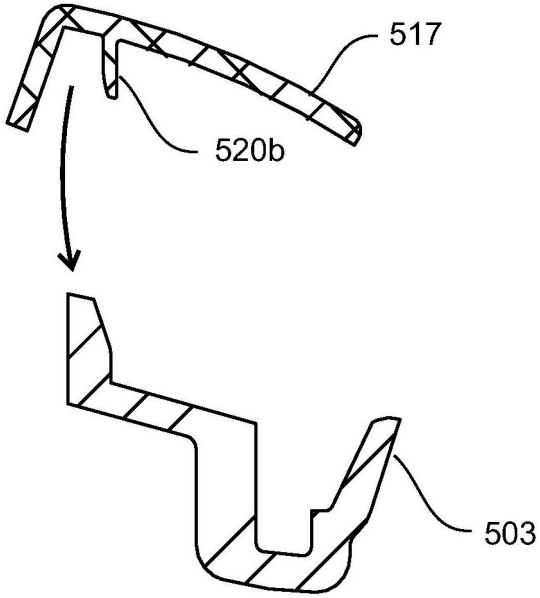


图 53(d)

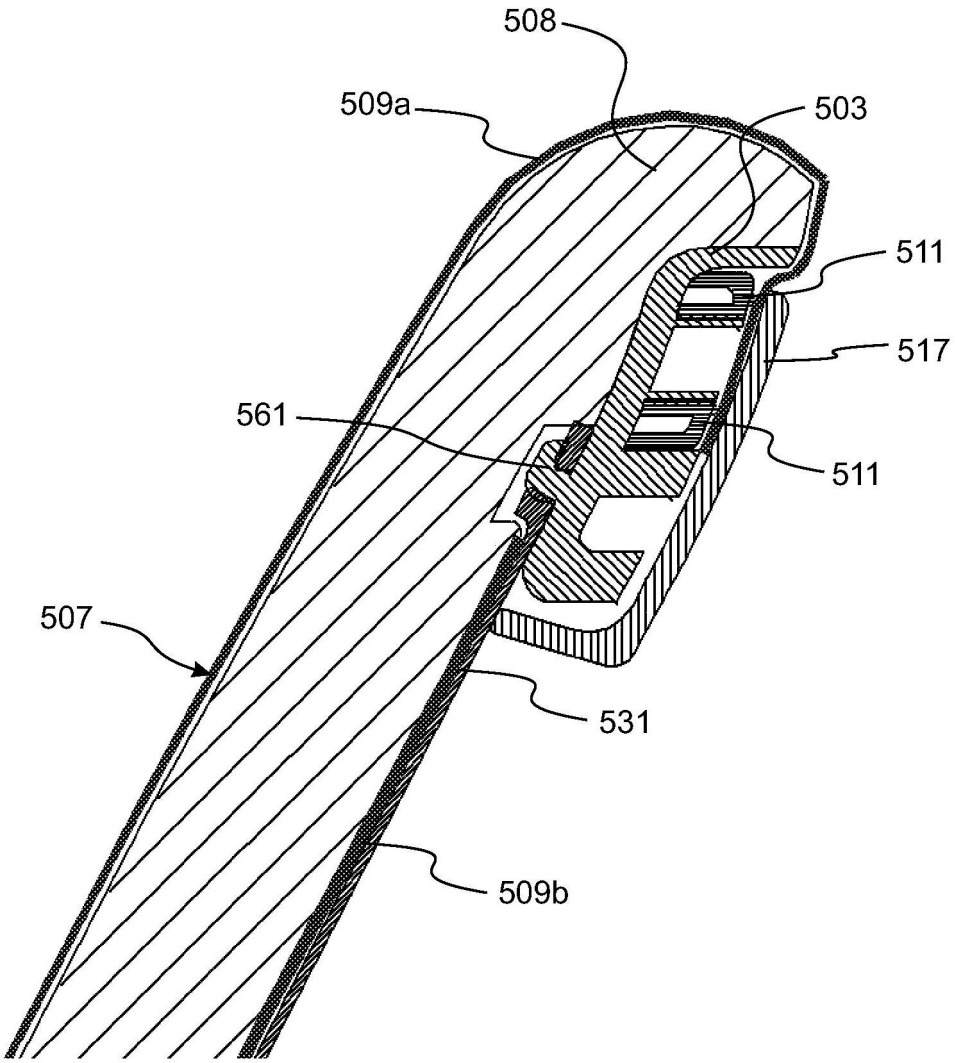


图 54

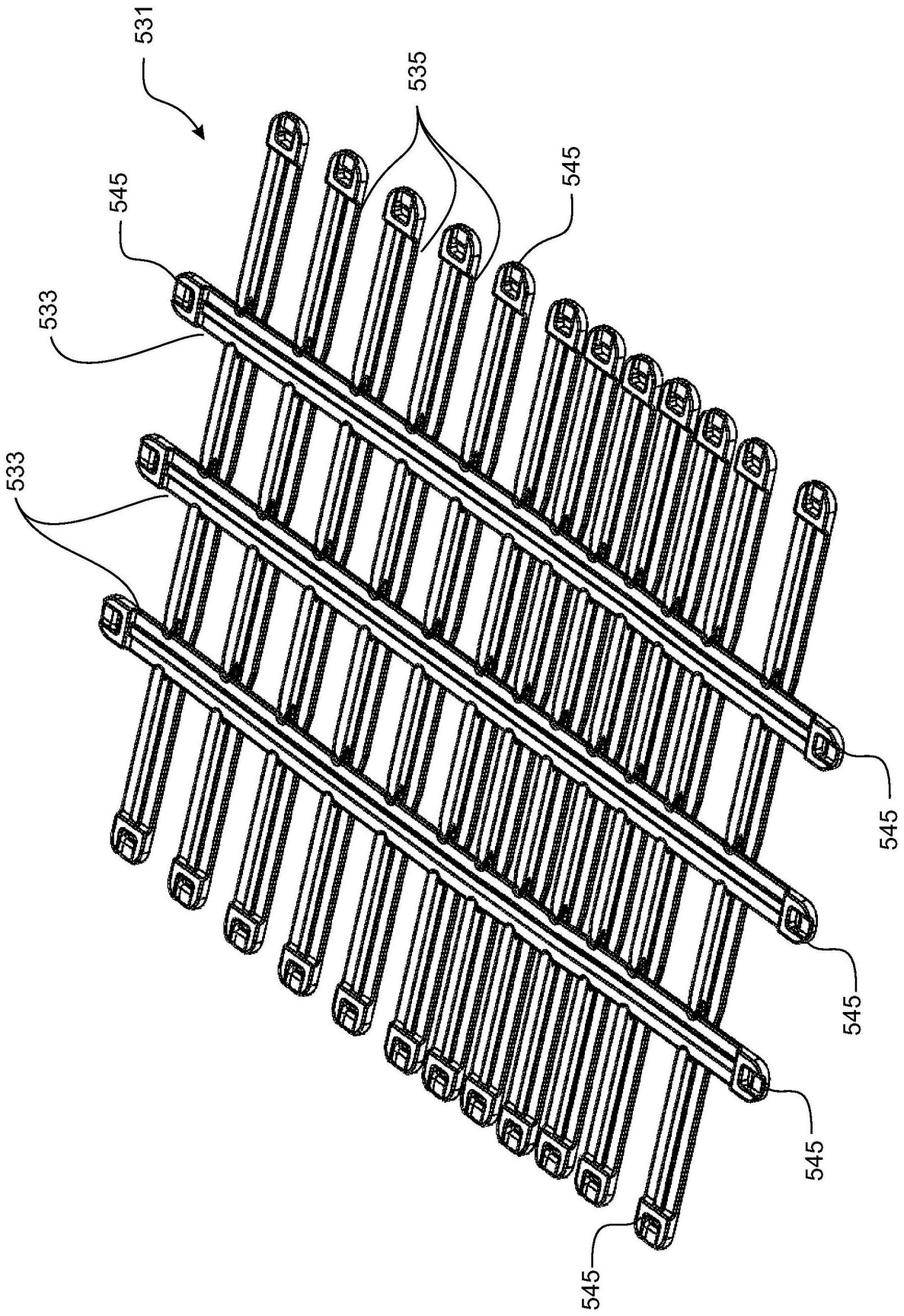


图 55

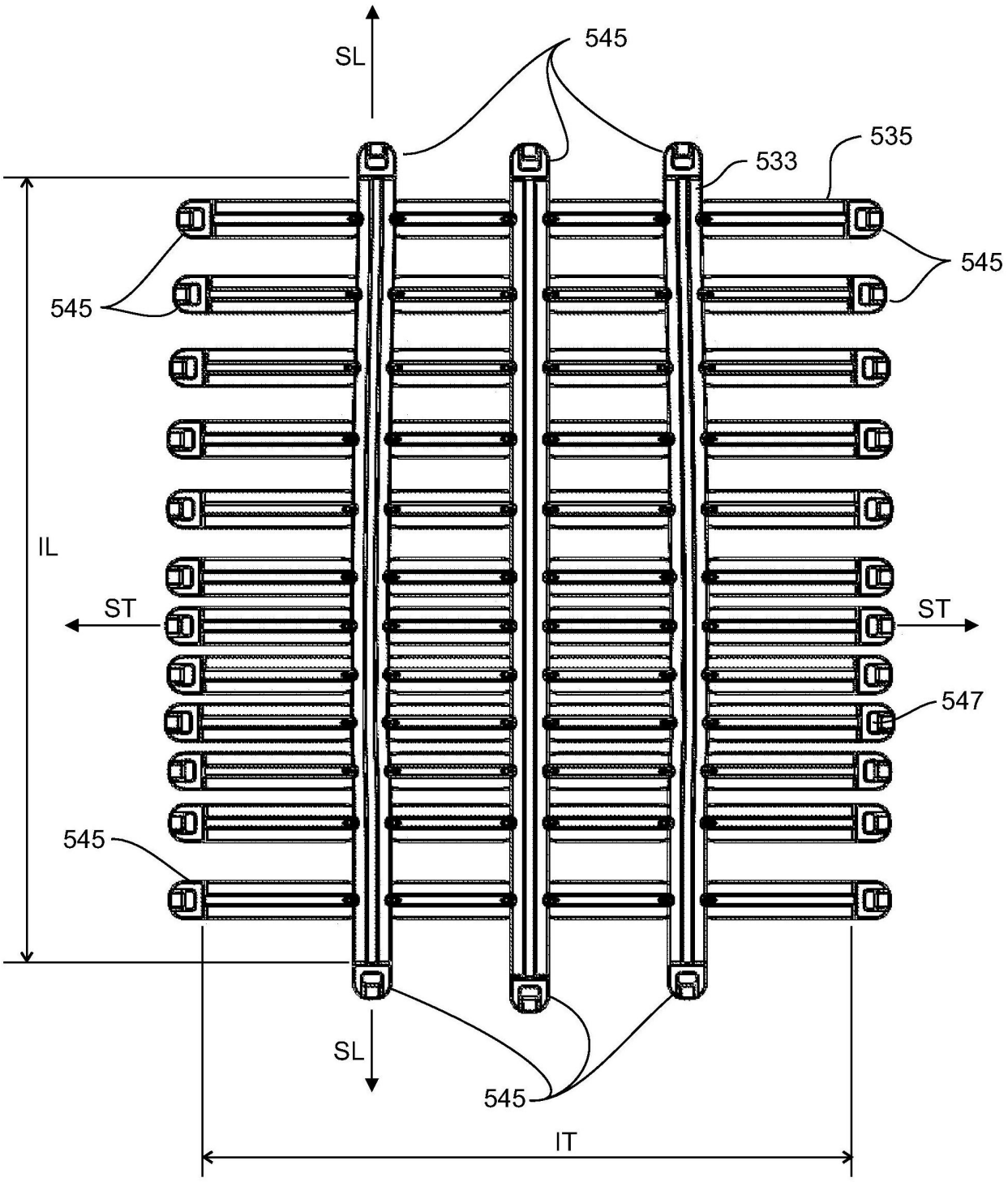


图 56

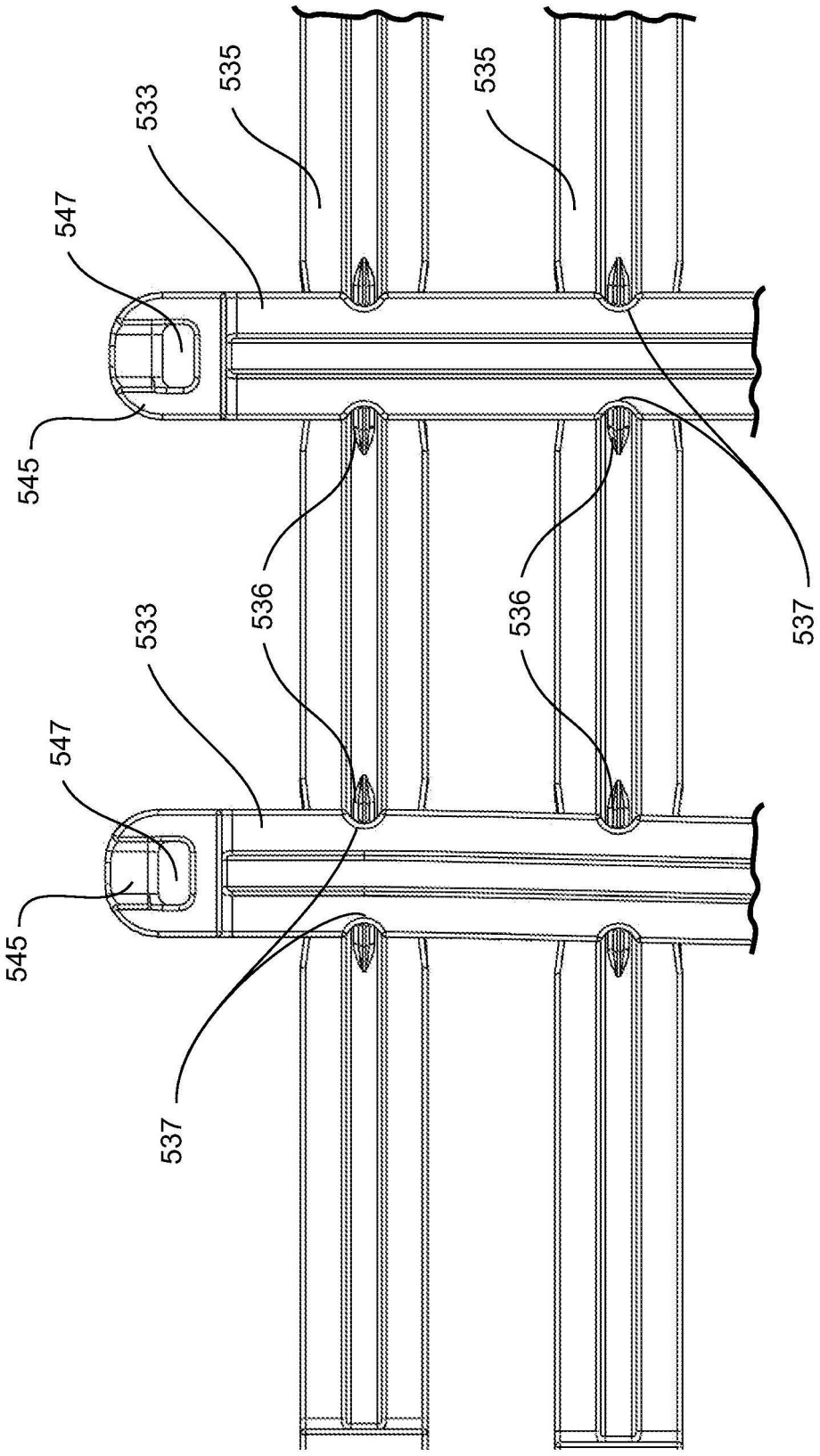


图 57

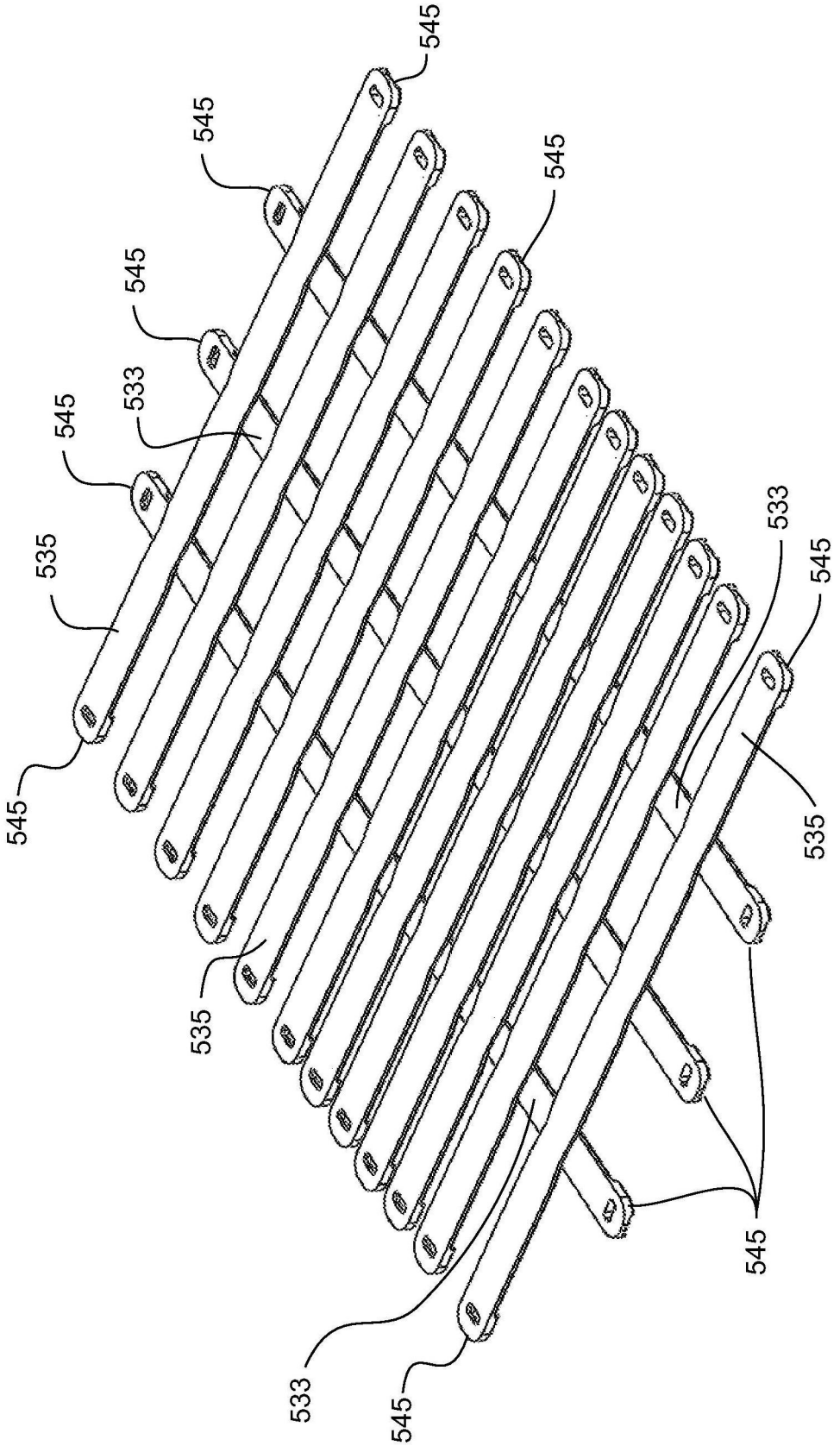


图 58

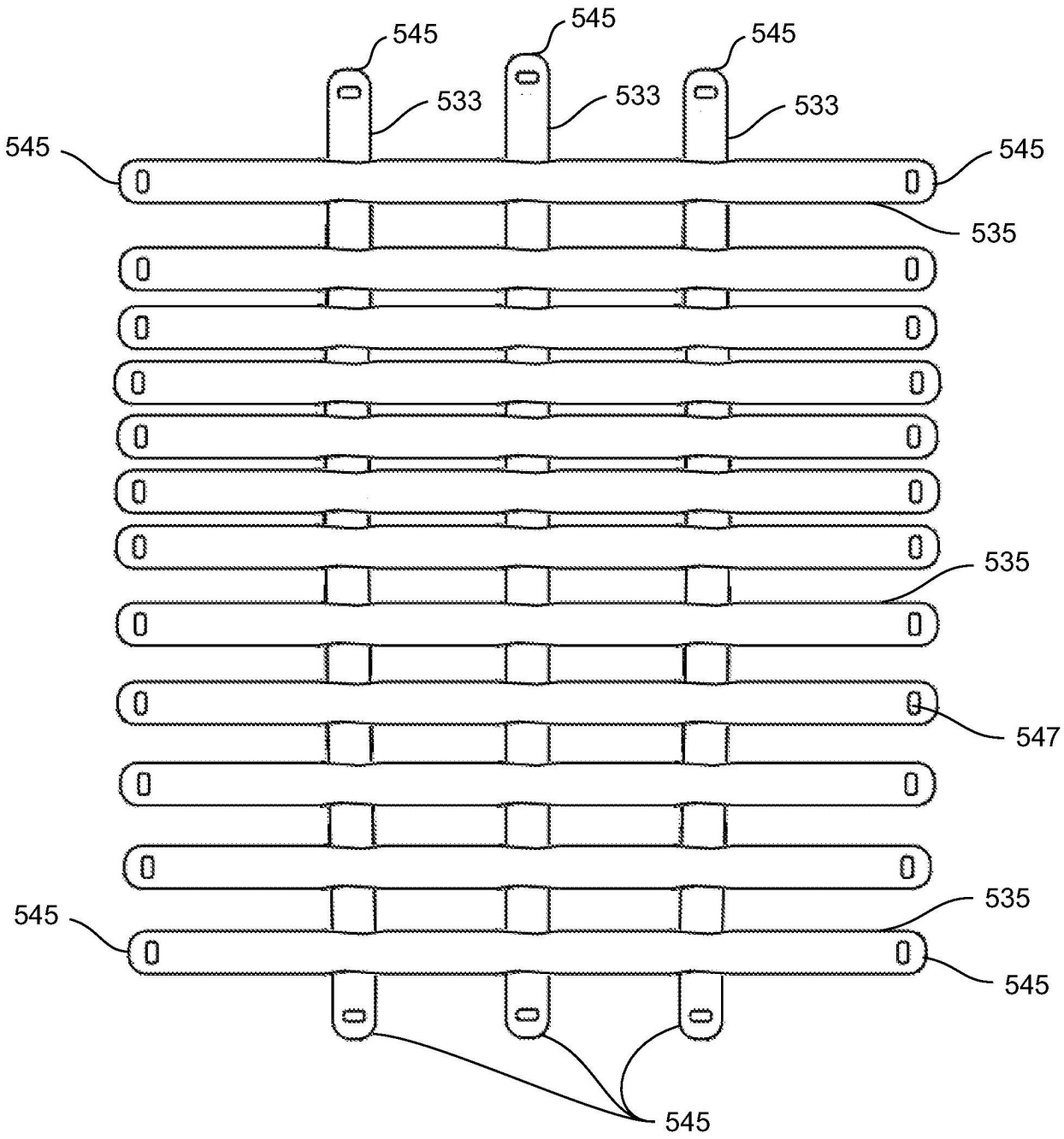


图 59

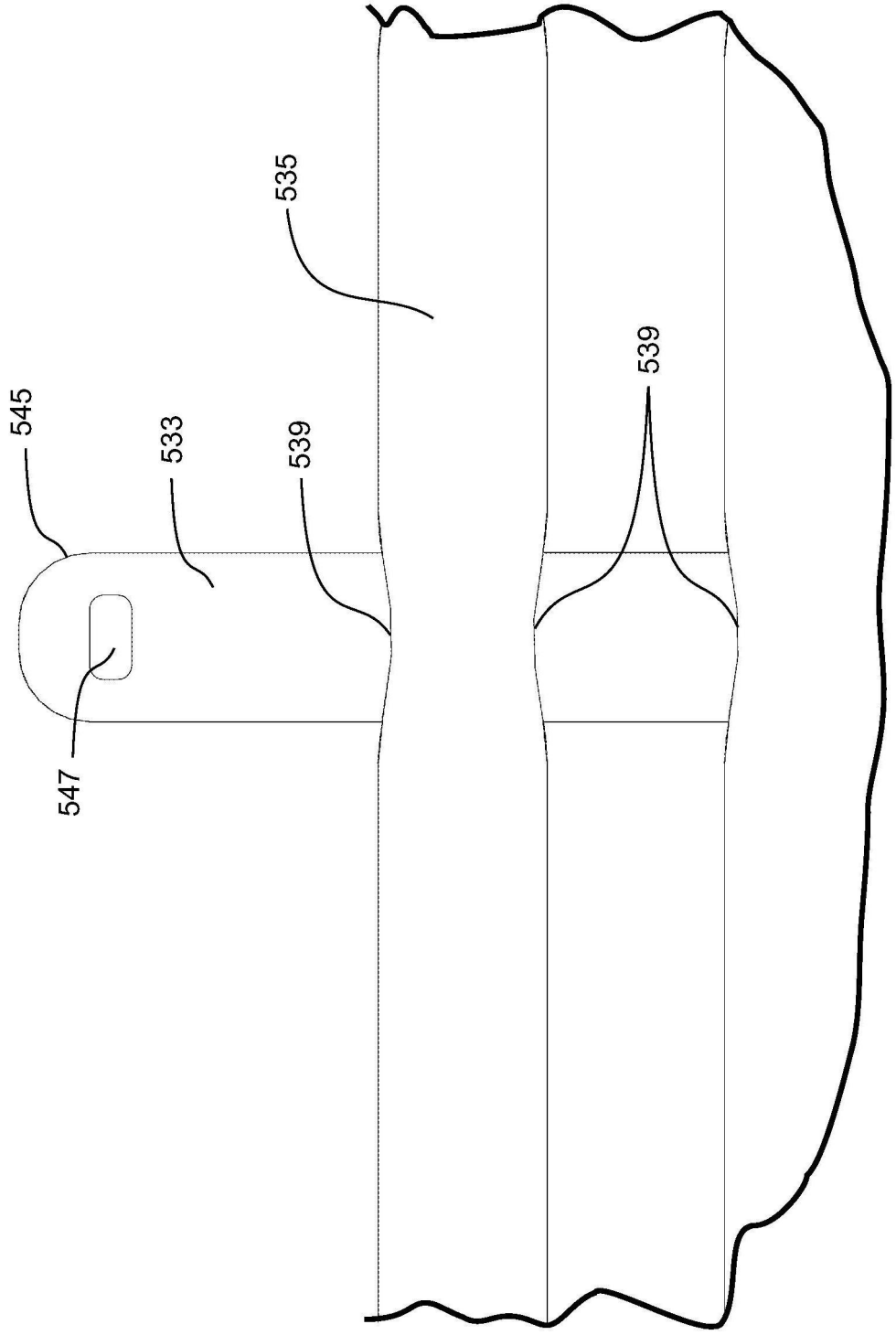


图 60

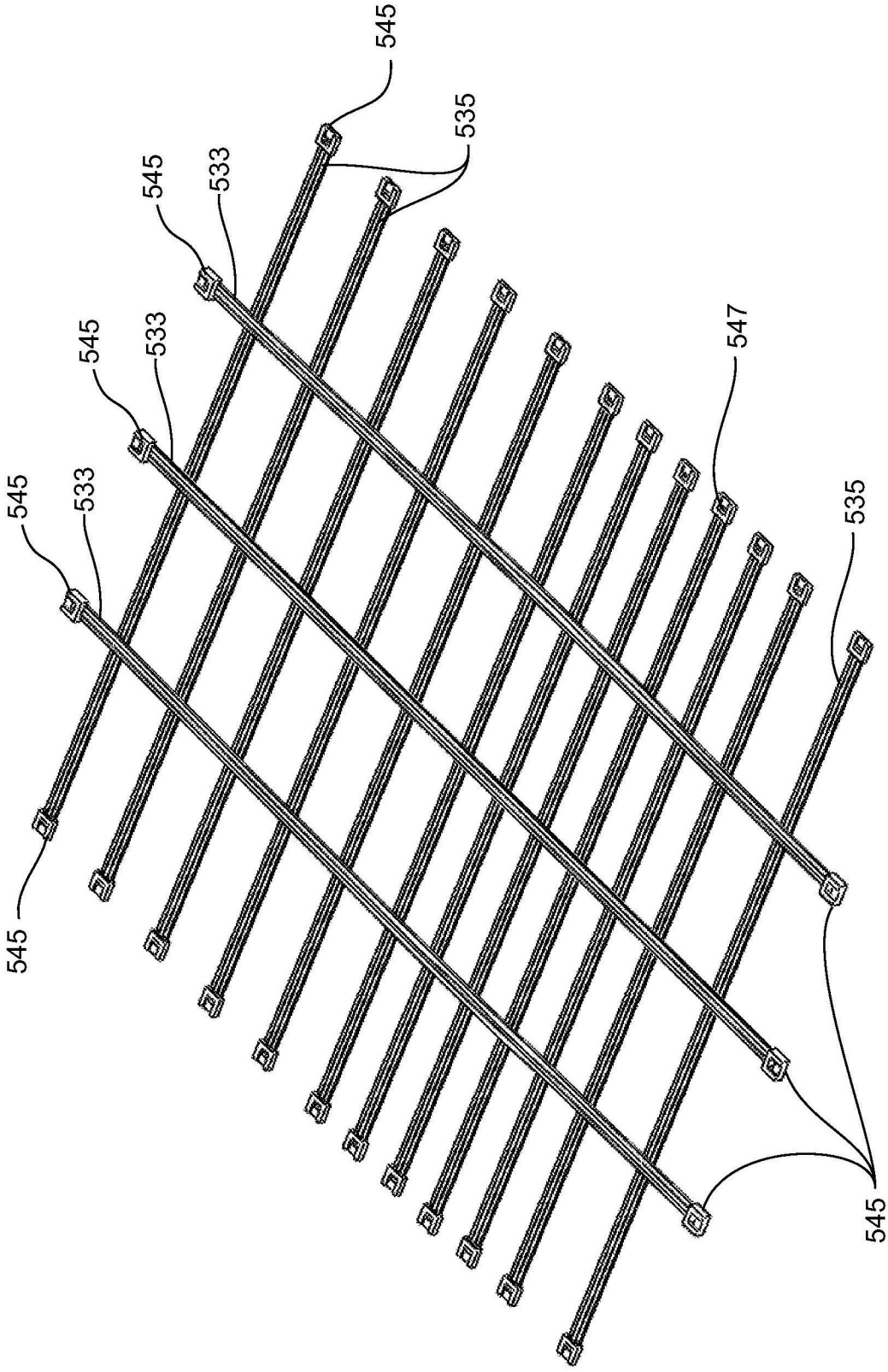


图 61

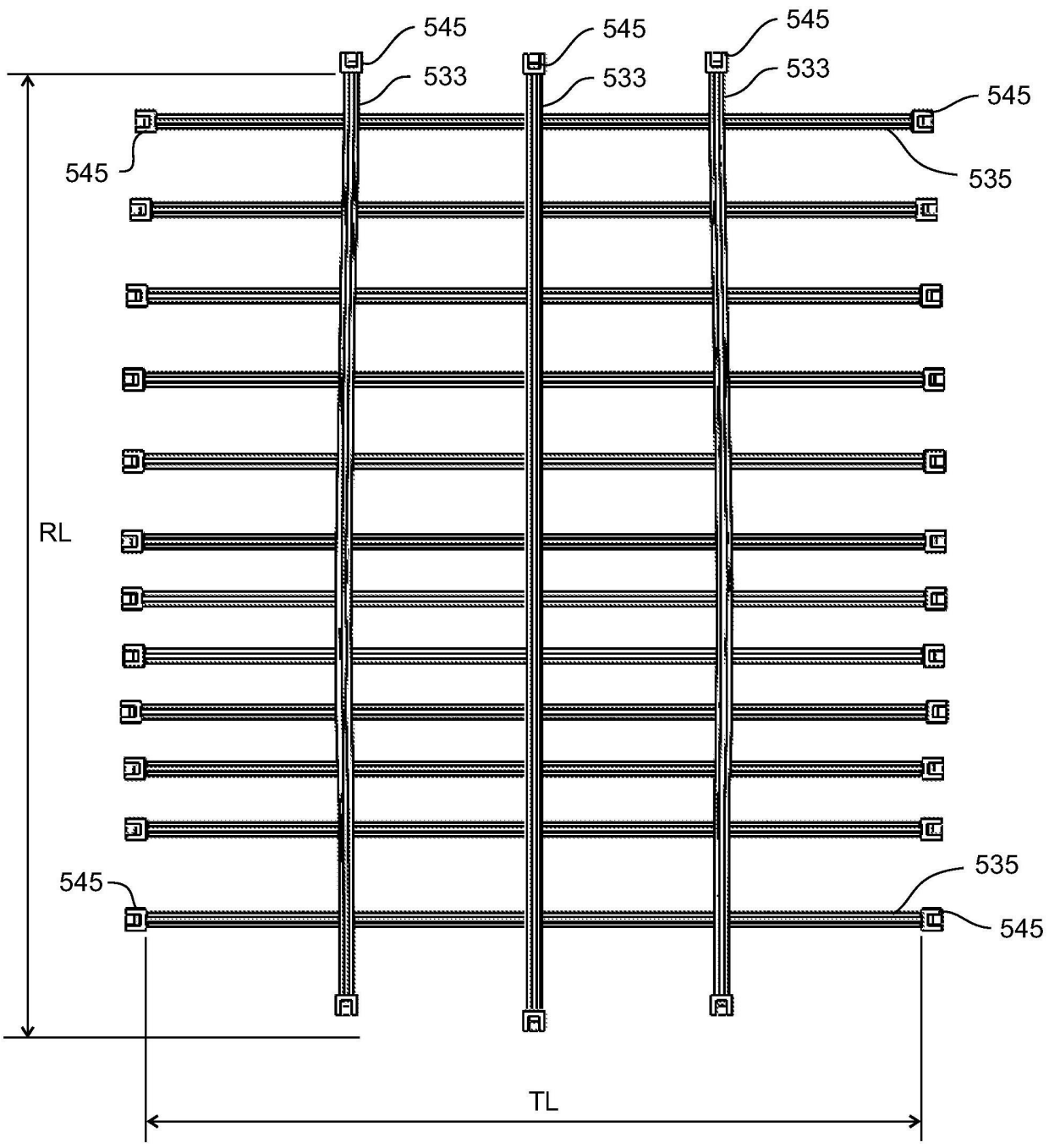


图 62

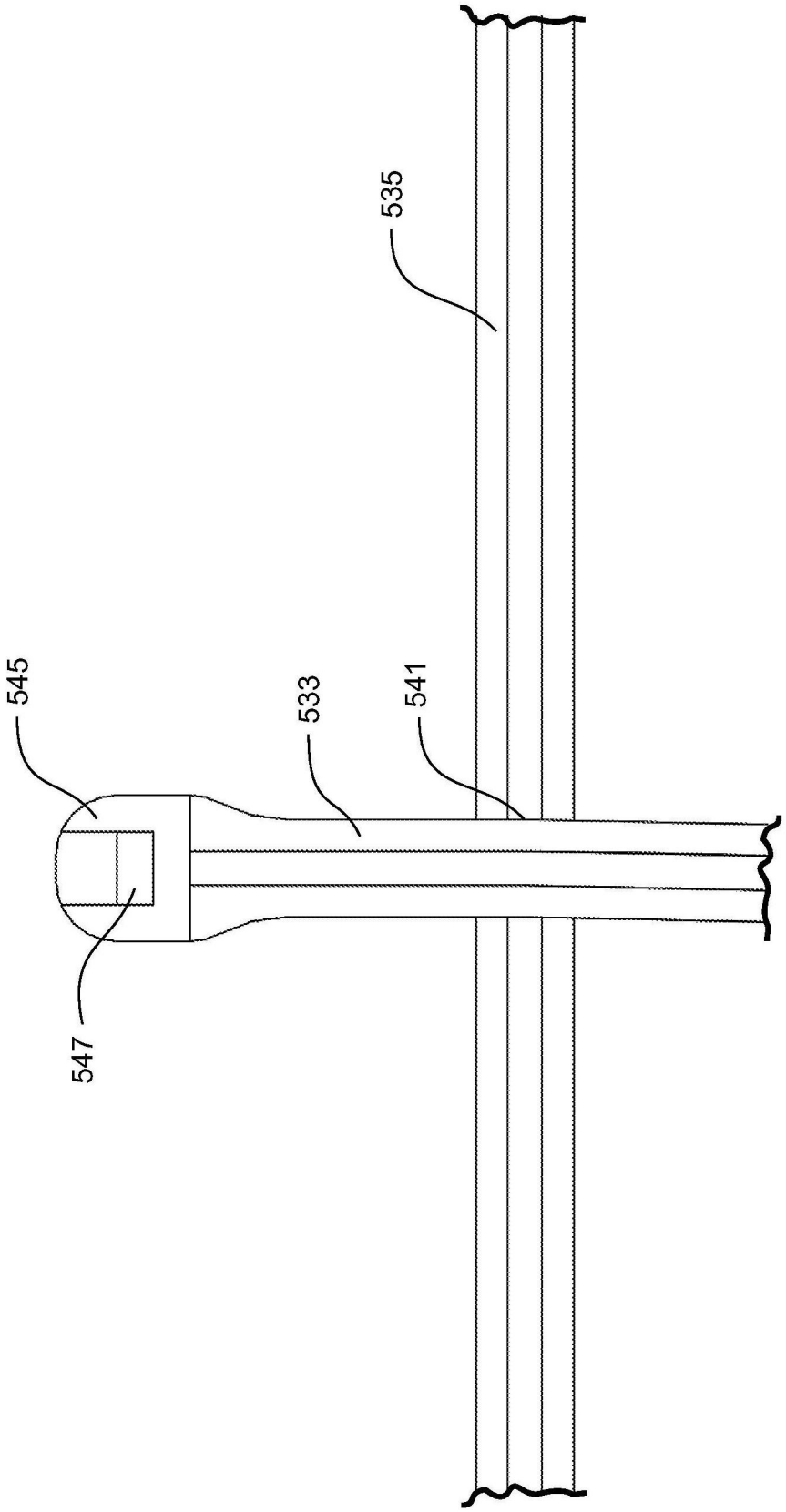


图 63

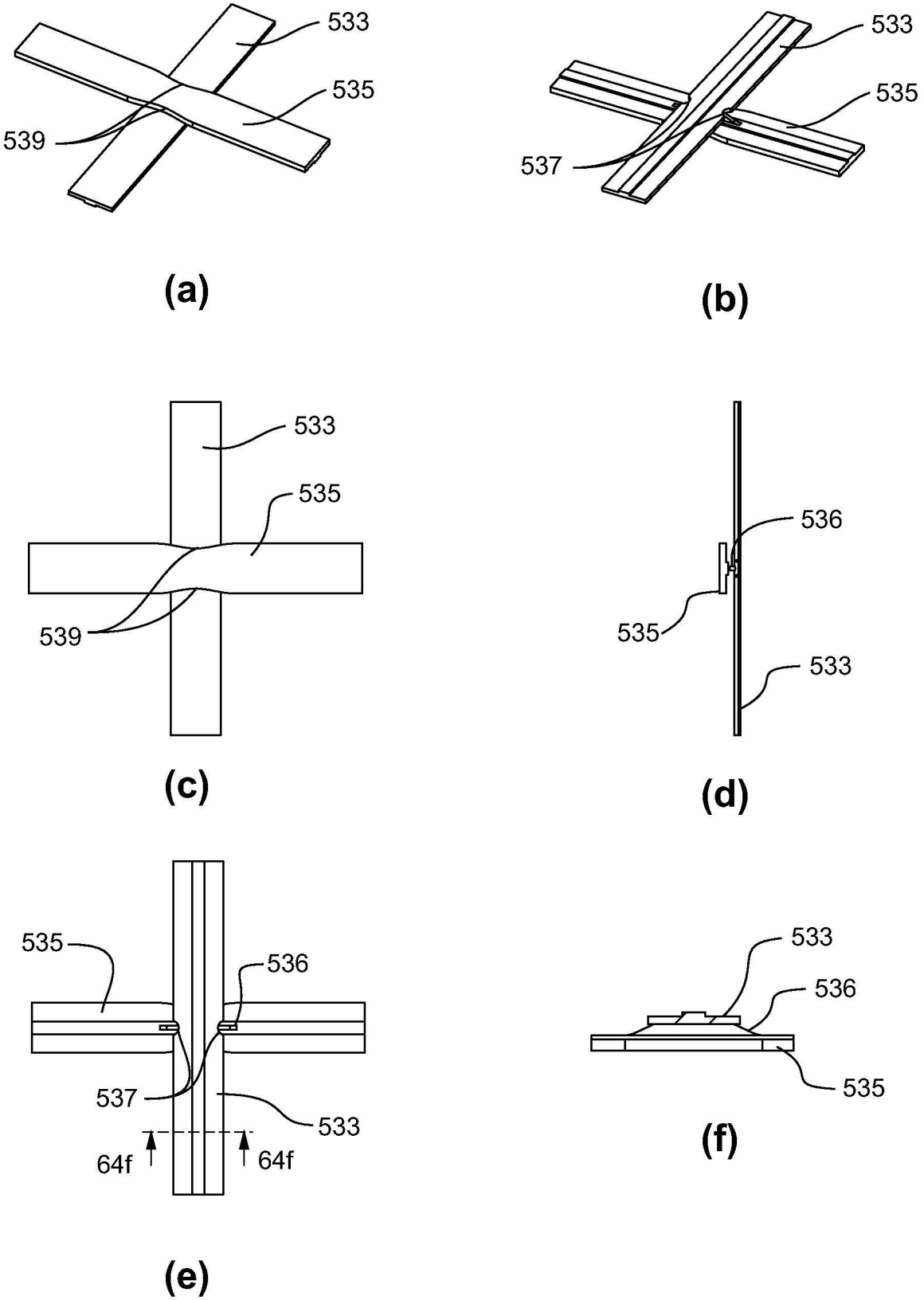

533
535
539
(a)
533
535
537
(b)
533
535
539
(c)
536
535
533
(d)
535
536
537
533
64f
64f
(e)
533
536
535
(f)

图 64

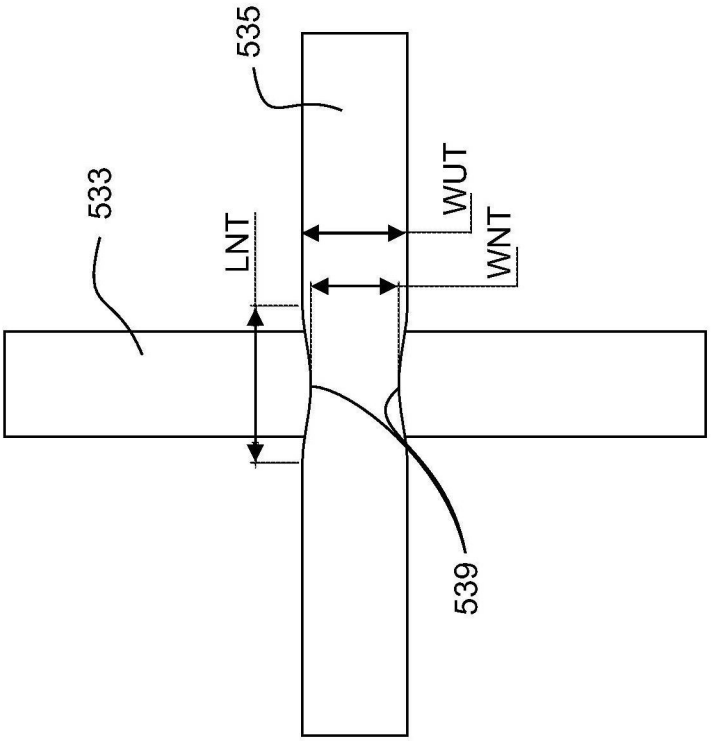


图 65(a)

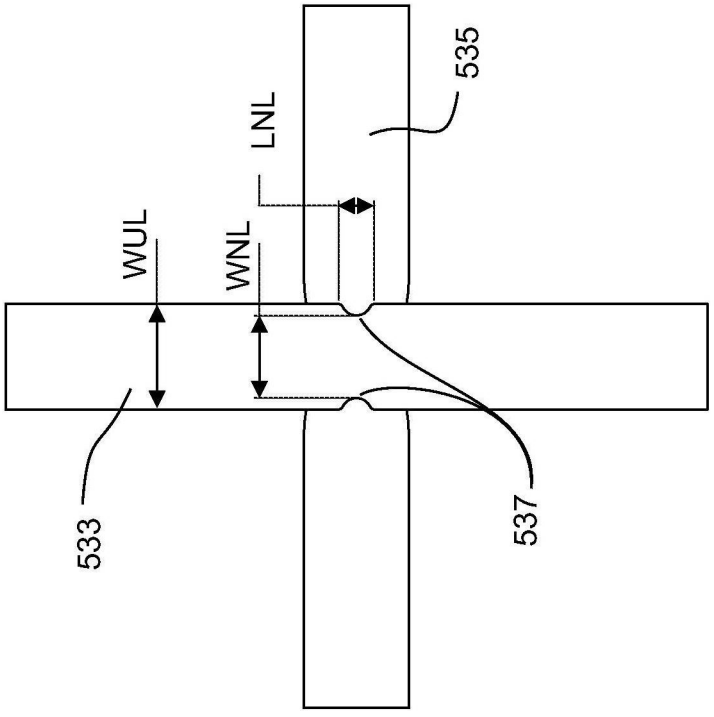
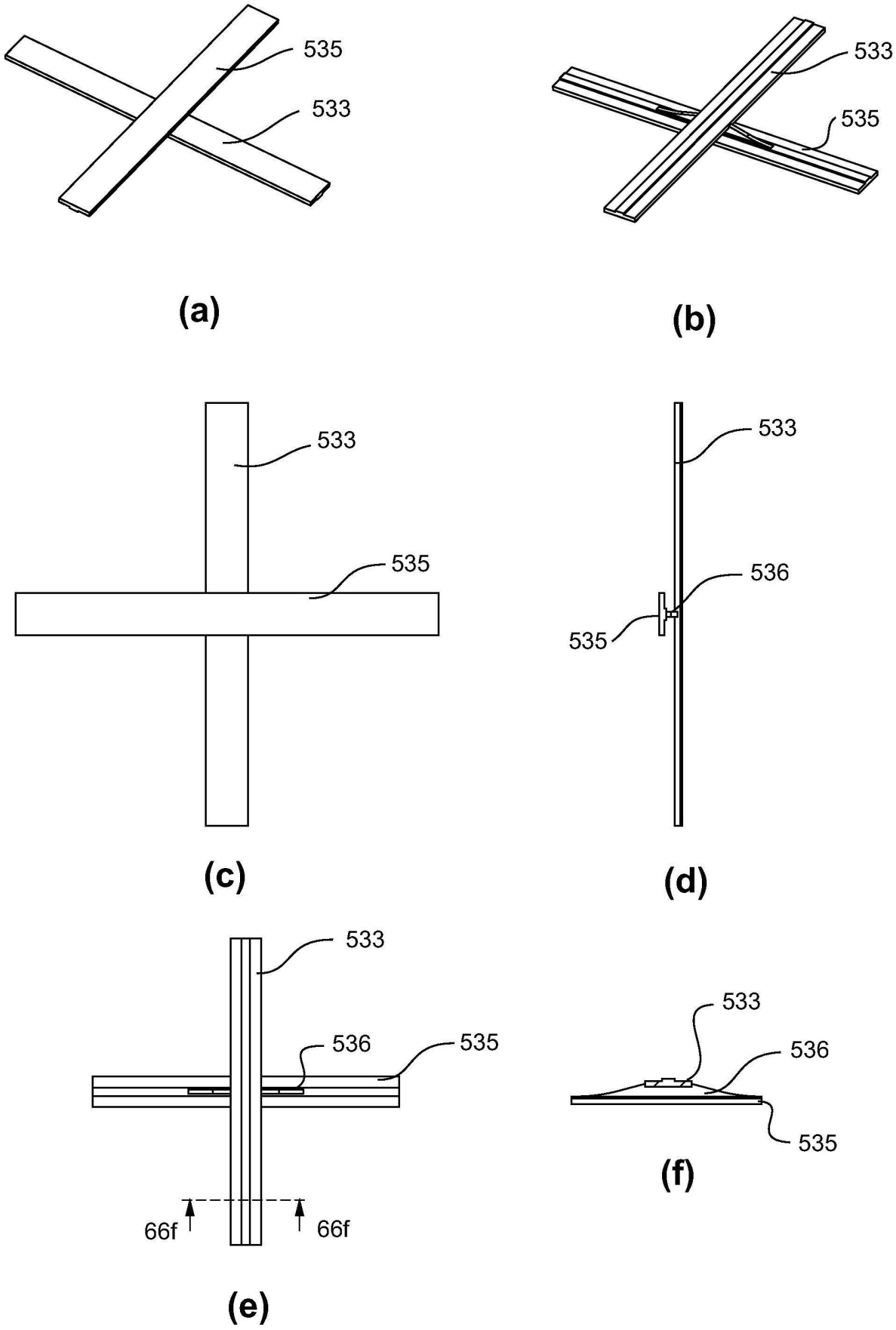


图 65(b)


535
533
(a)
533
535
(b)
533
535
(c)
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536
535
(d)
533
536
535
66f
66f
(e)
533
536
535
(f)

图 66

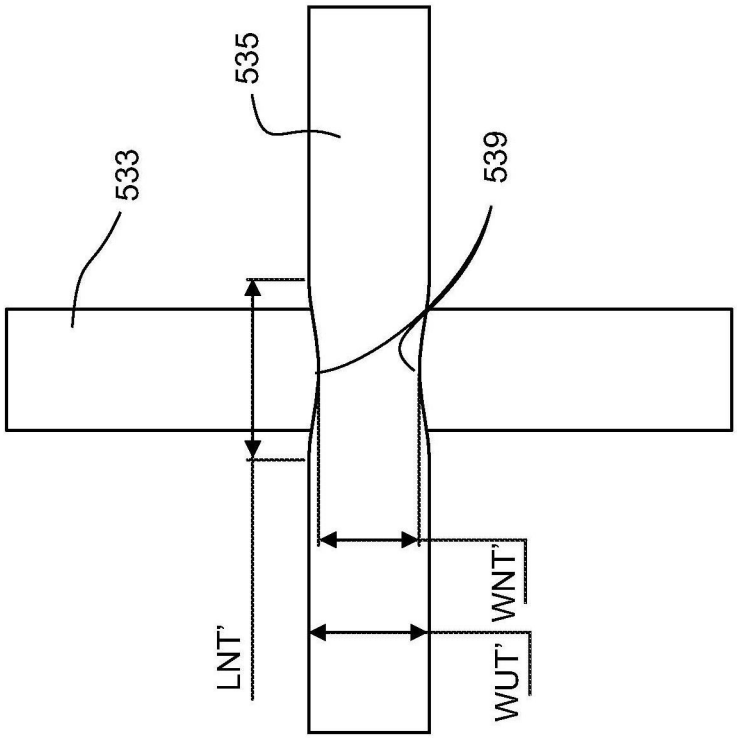

图 67(a)

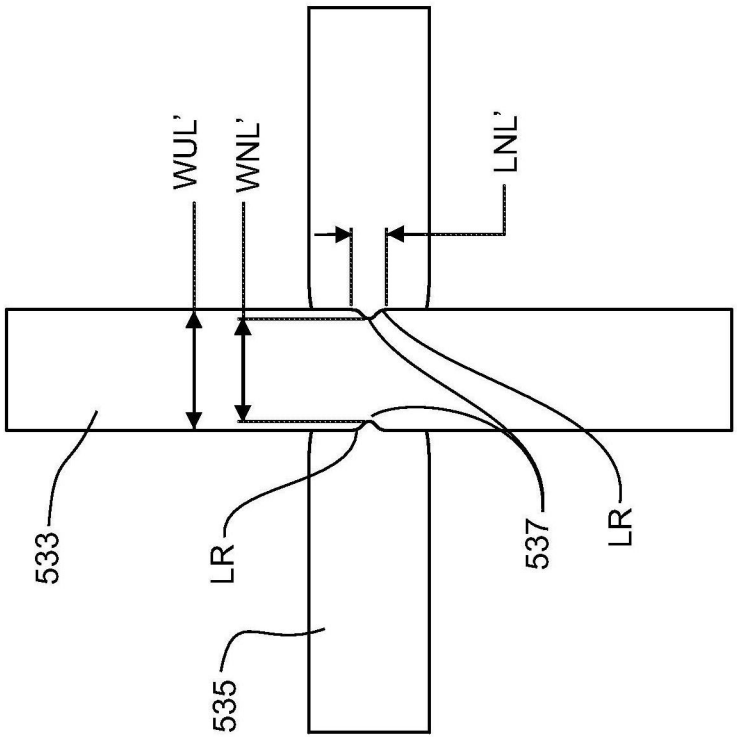

图 67(b)

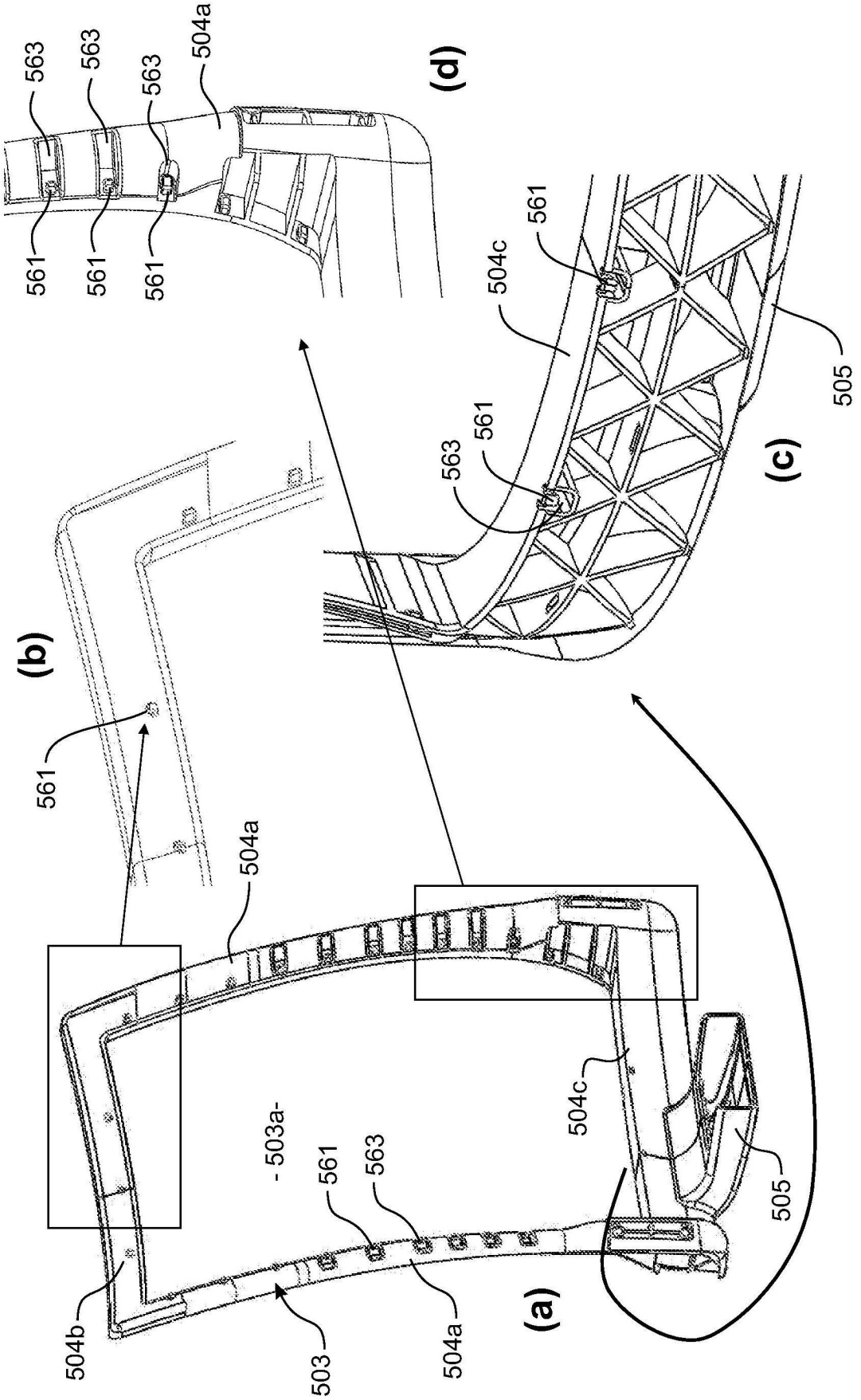

图 68

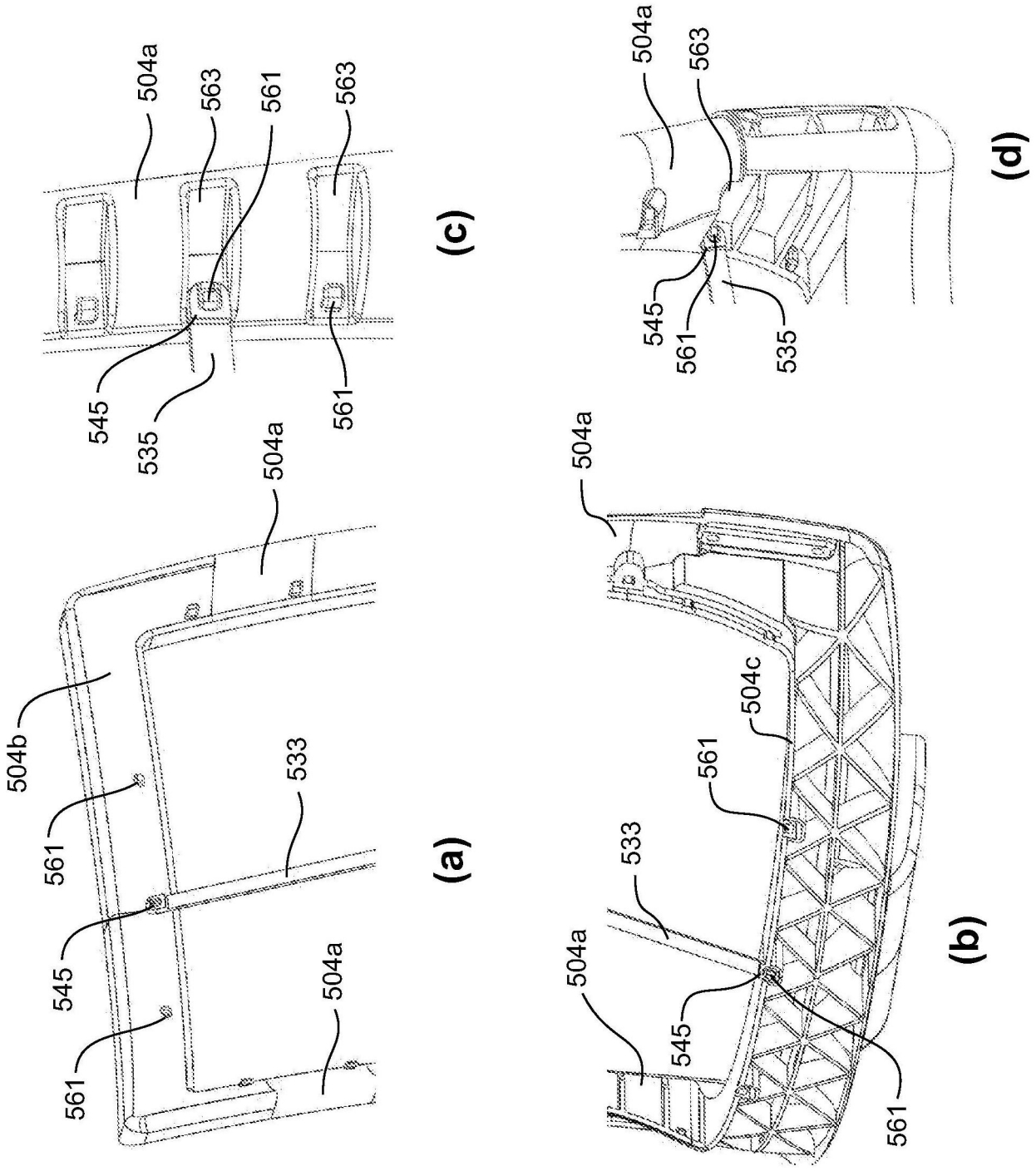
504a
563
561
563
545
535
561
(c)
504a
563
545
561
535
(d)
504a
504b
561
533
545
504a
561
(a)
504a
504c
561
533
504a
545
561
(b)

图 69

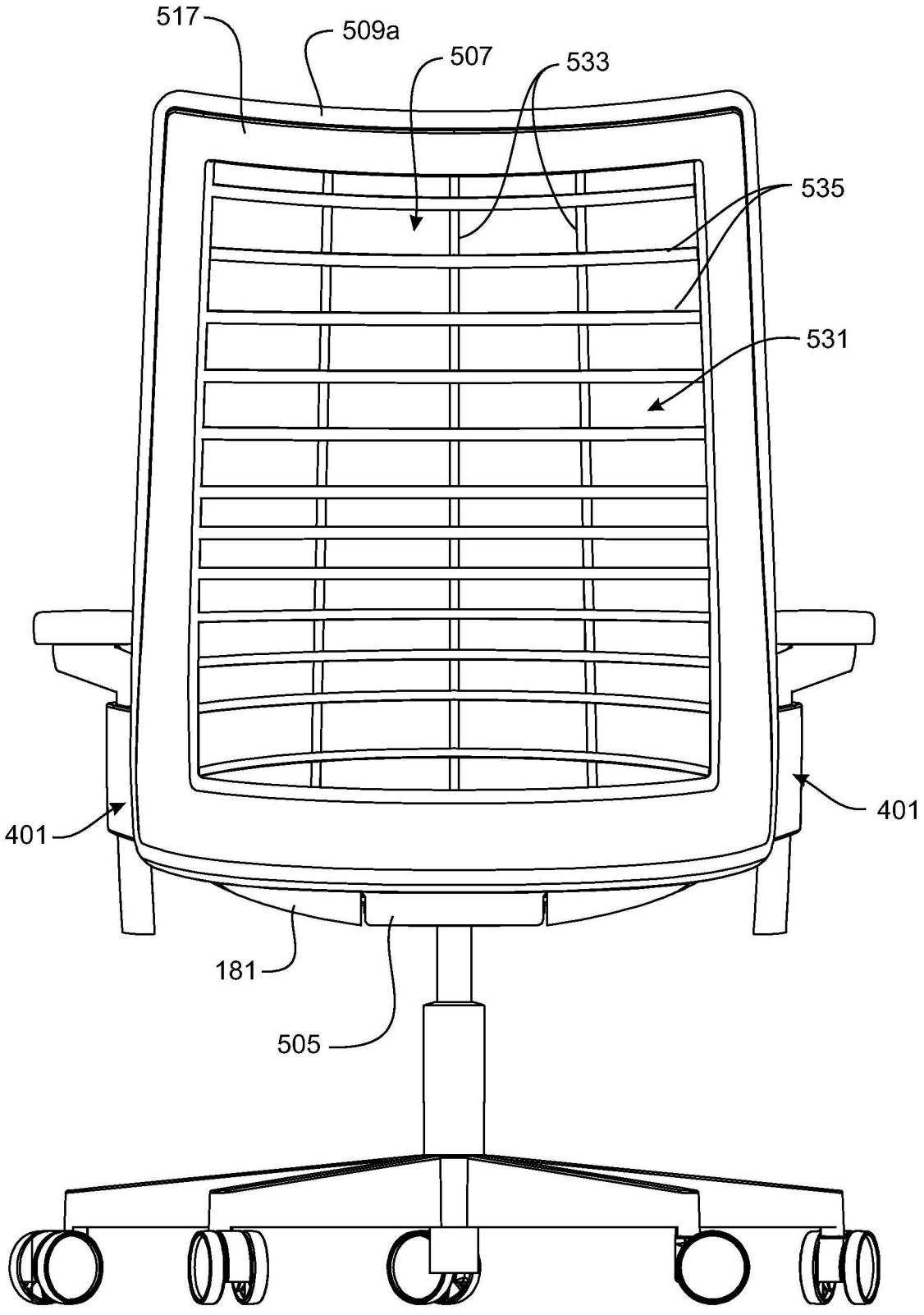

图 70

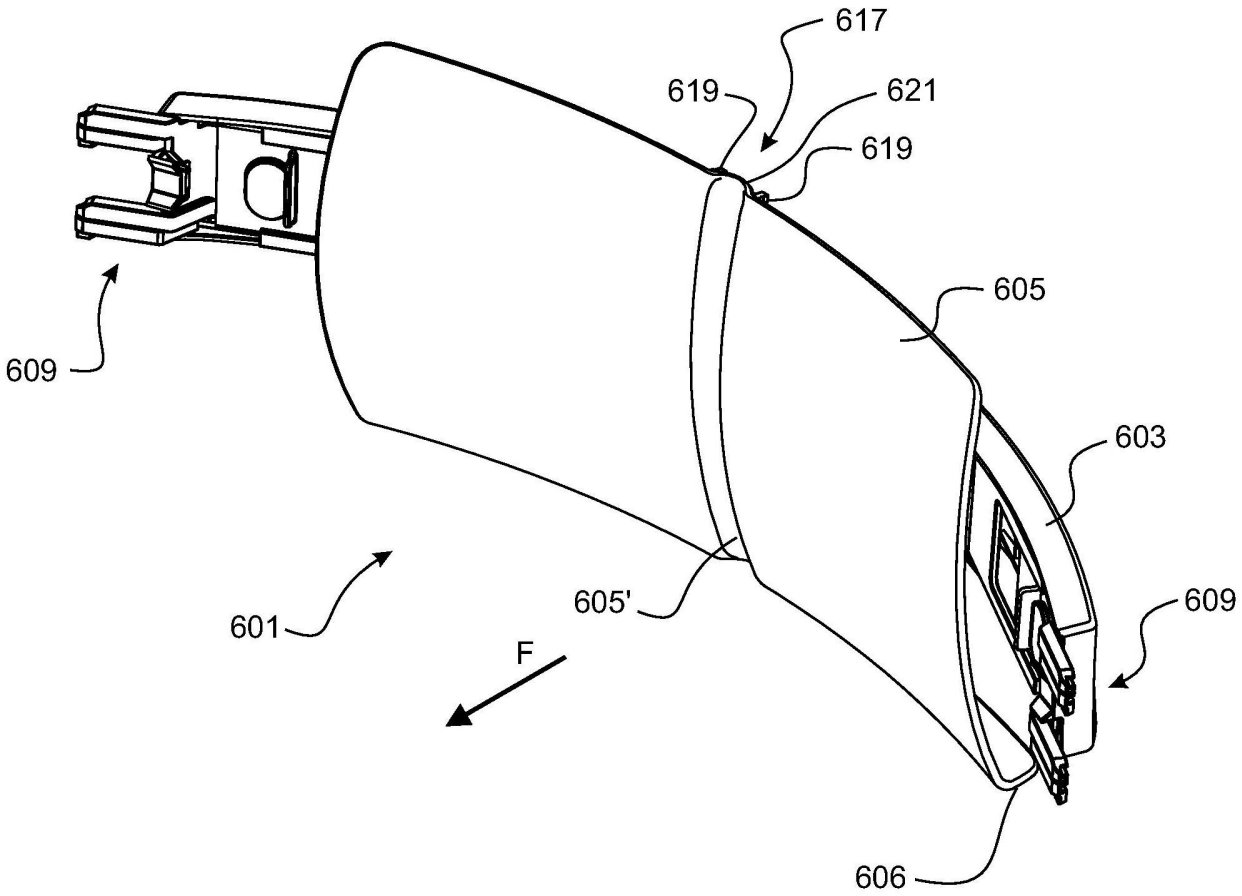

图 71

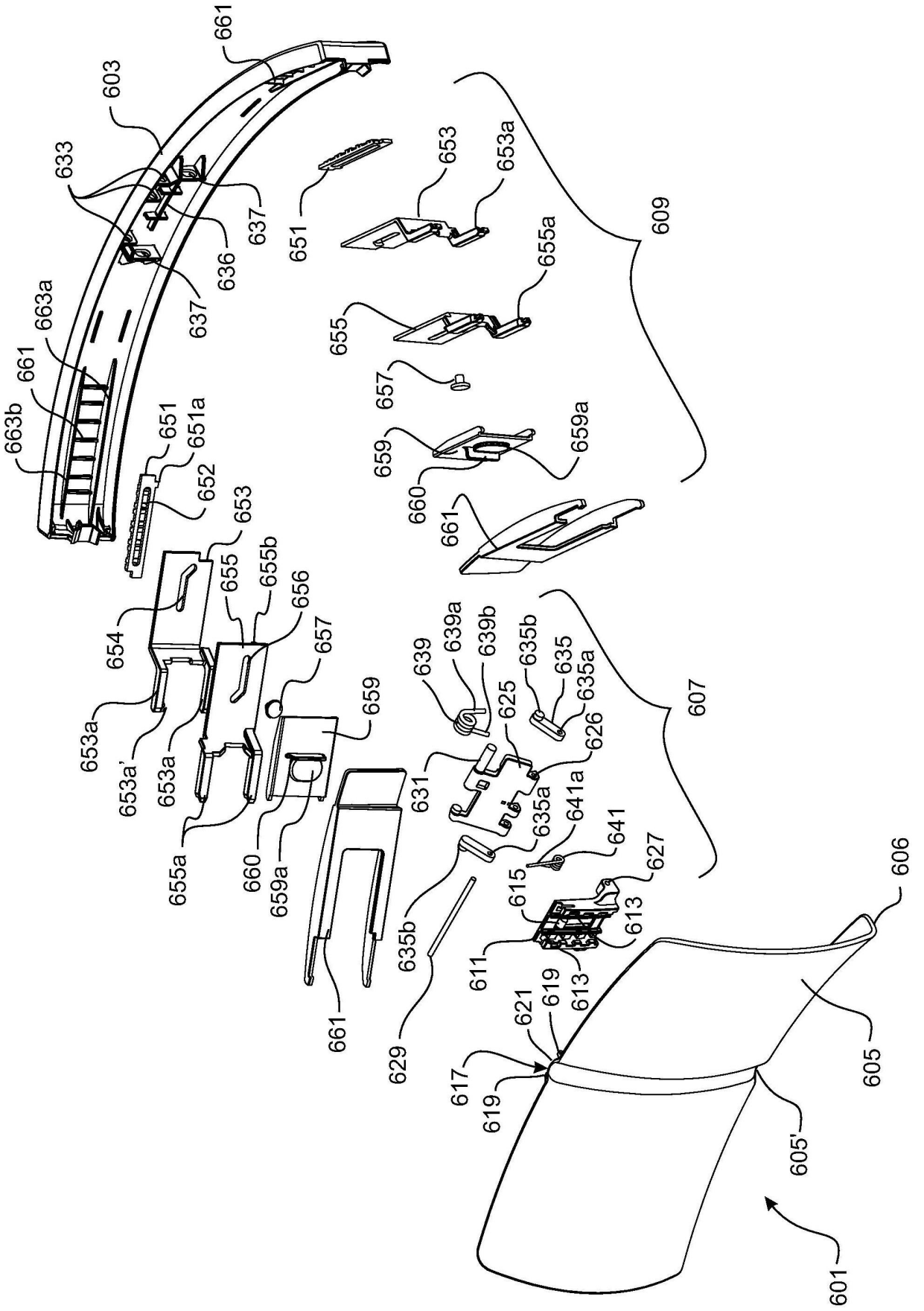
661
603
633
637
636
637
663a
661
663b
651
651a
652
653
655
655b
656
654
657
659
653a
653a'
653a
655a
660
659a
661
651
653
653a
655
655a
657
659
659a
660
661
609
639
639a
639b
635b
635
635a
625
626
631
635a
641a
641
627
615
613
611
619
613
621
619
617
619
629
635b
607
606
605
605'
601

图 72

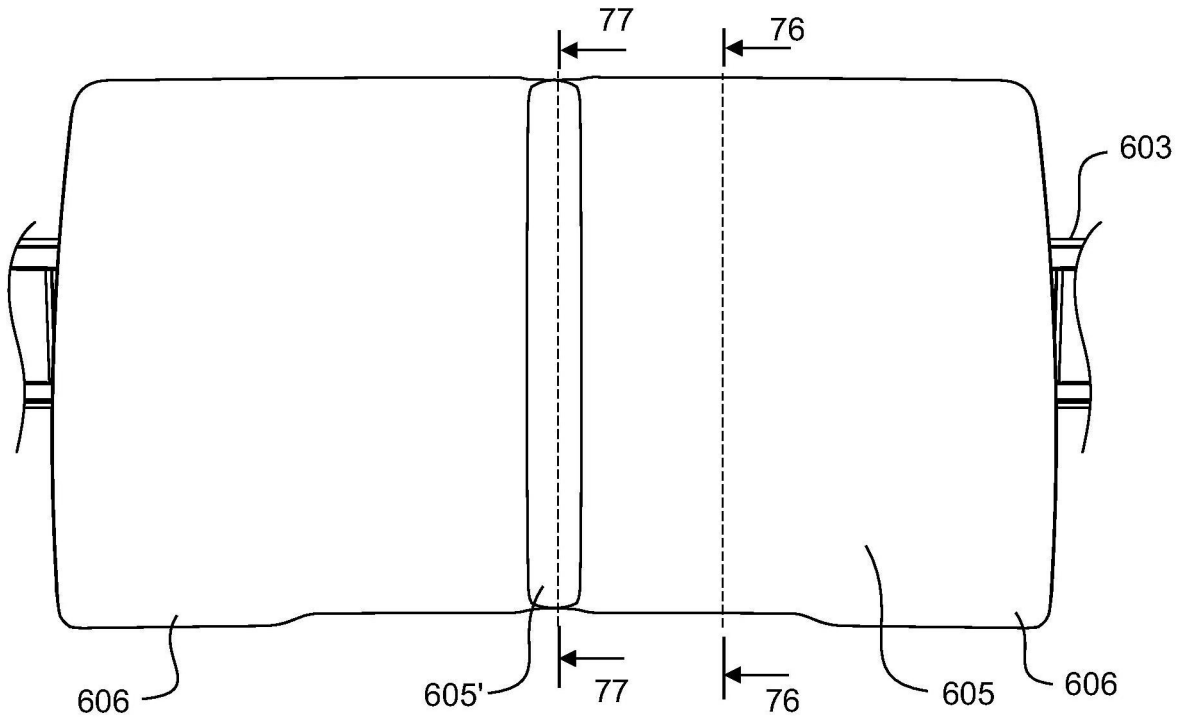

图 73

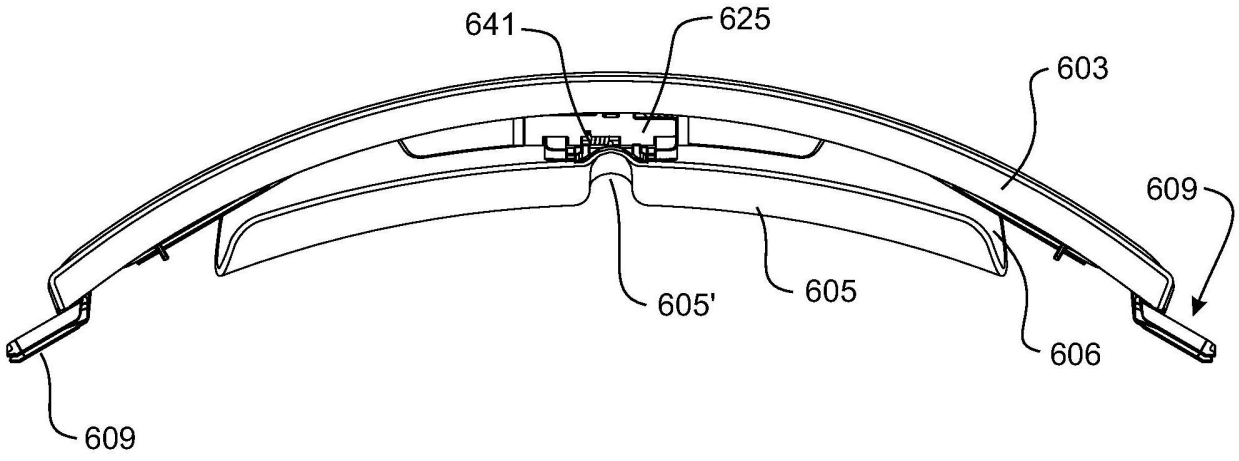

图 74

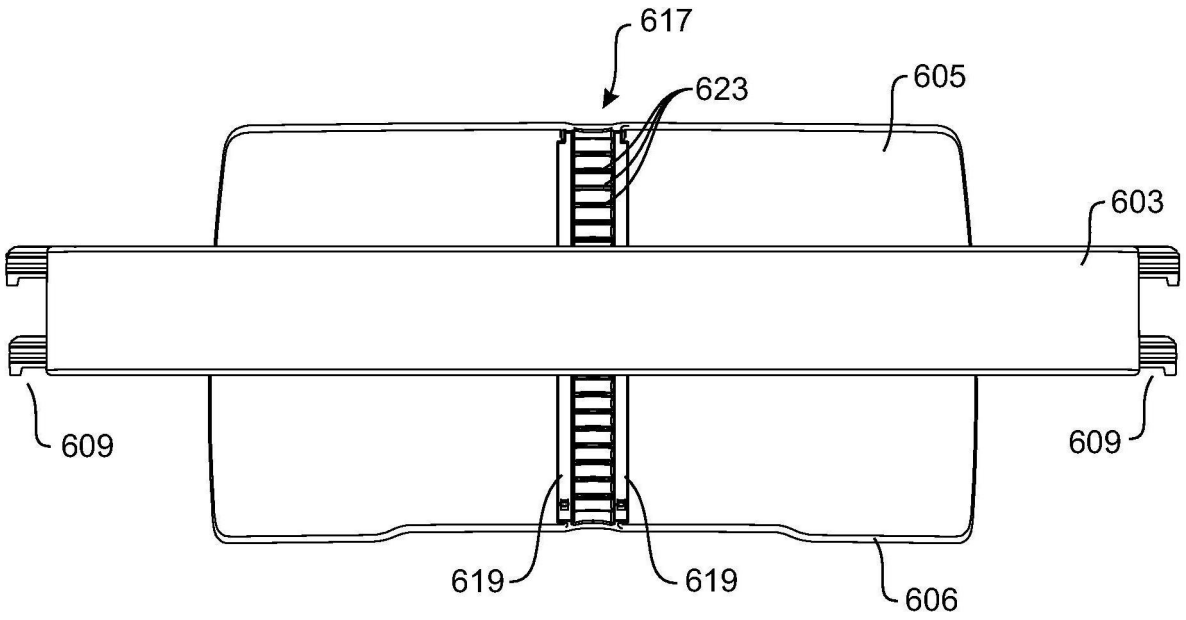

图 75

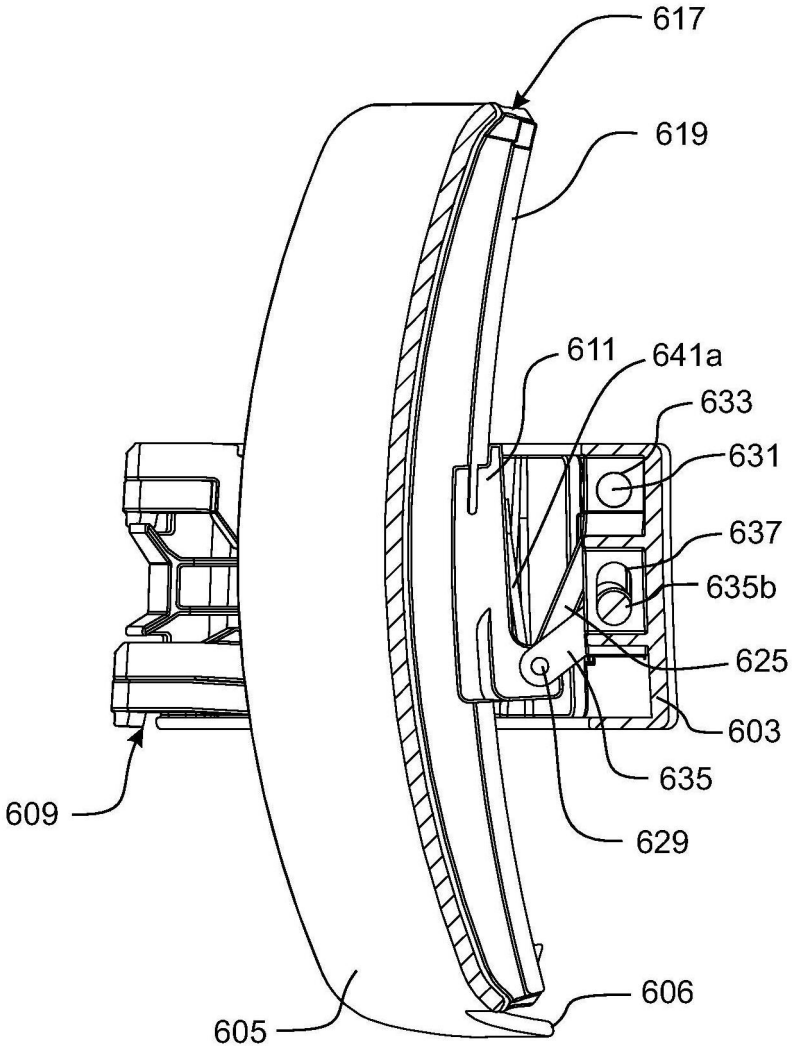

图 76

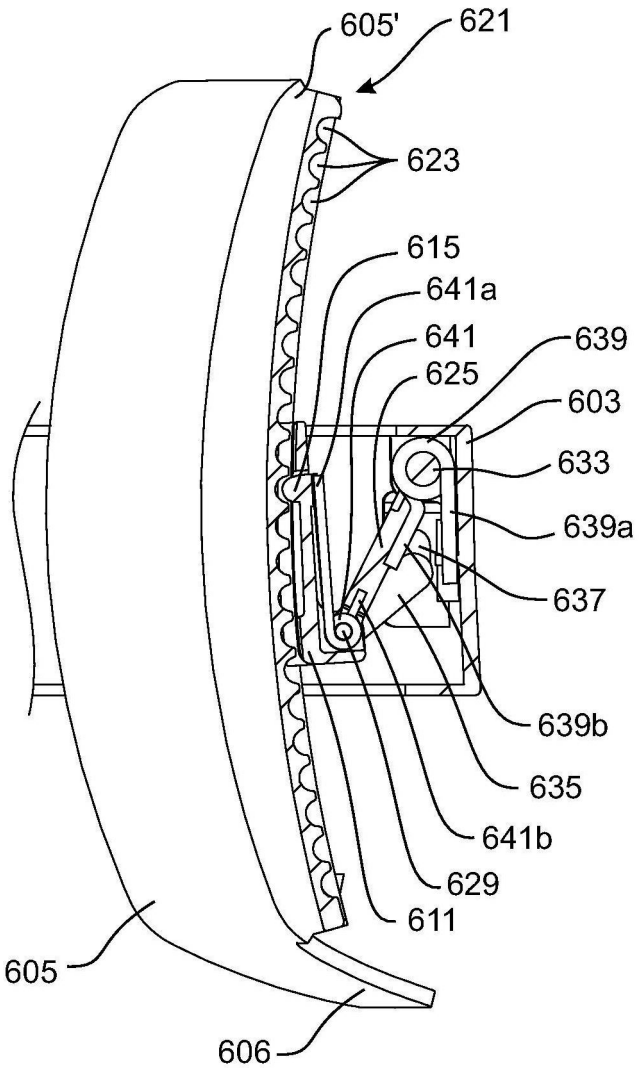
605'
621
623
615
641a
641
639
625
603
633
639a
637
639b
635
641b
629
611
605
606

图 77(a)

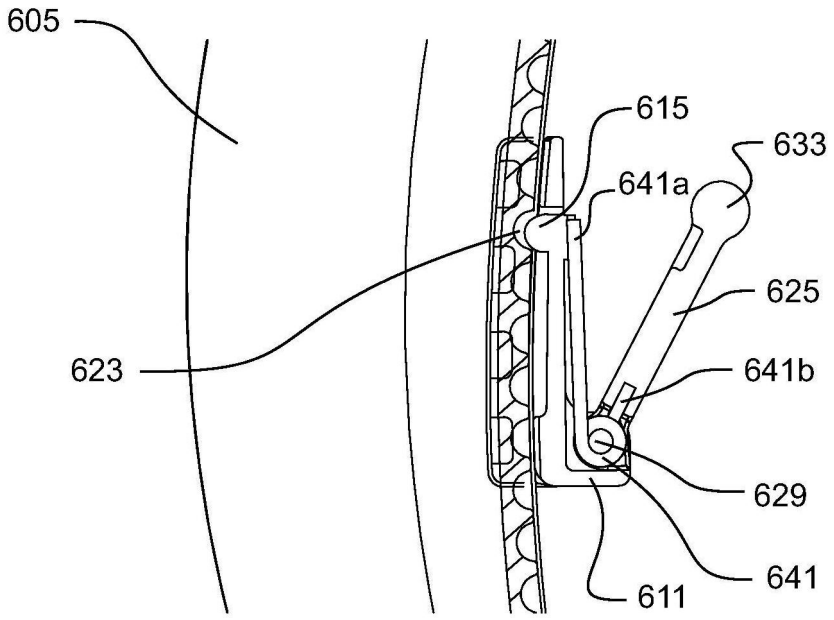

图 77(b)

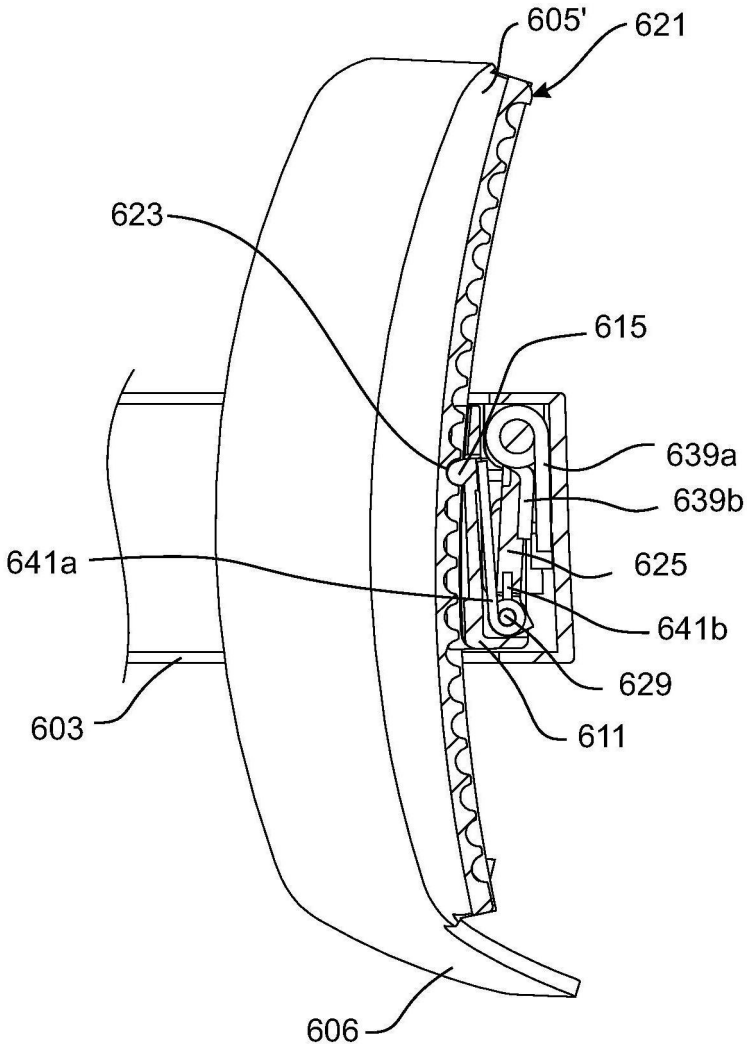

图 78(a)

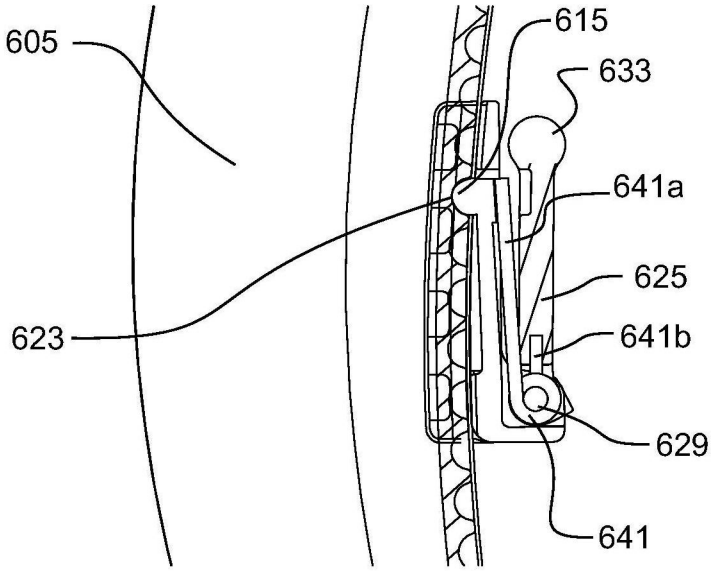
605
615
633
641a
625
623
641b
629
641

图 78(b)

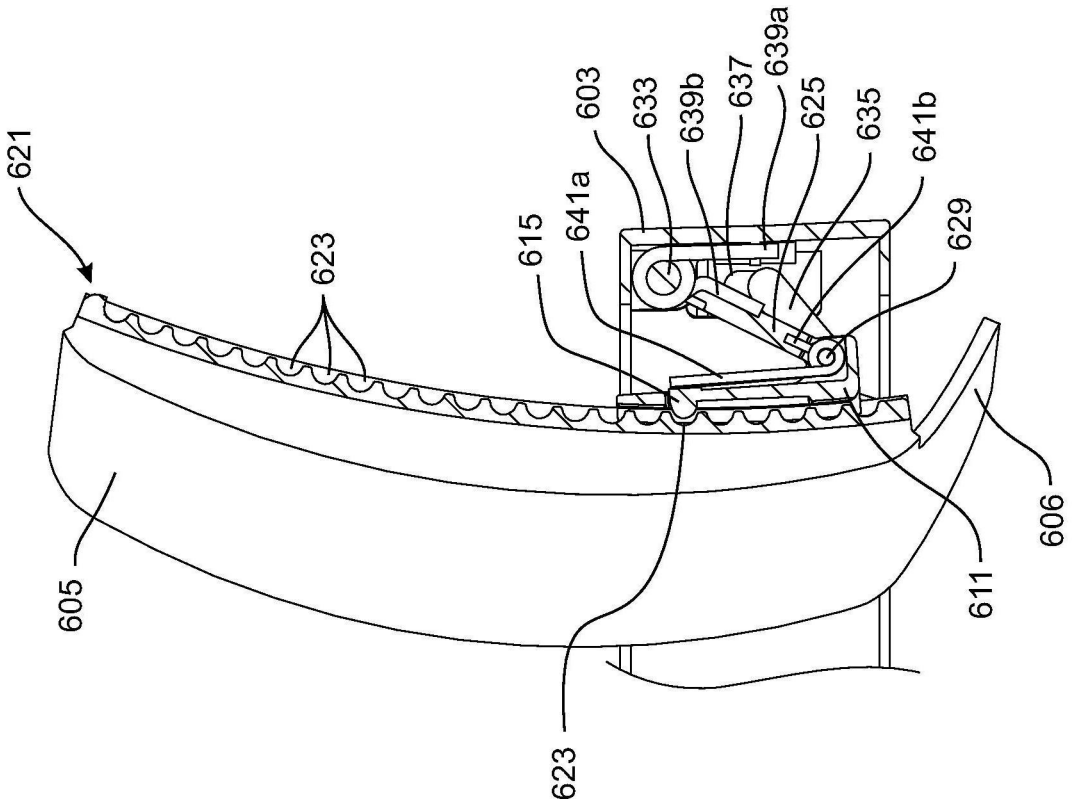
621
623
615
641a
603
633
639b
637
639a
625
635
641b
629
606
605
611
623

图 79

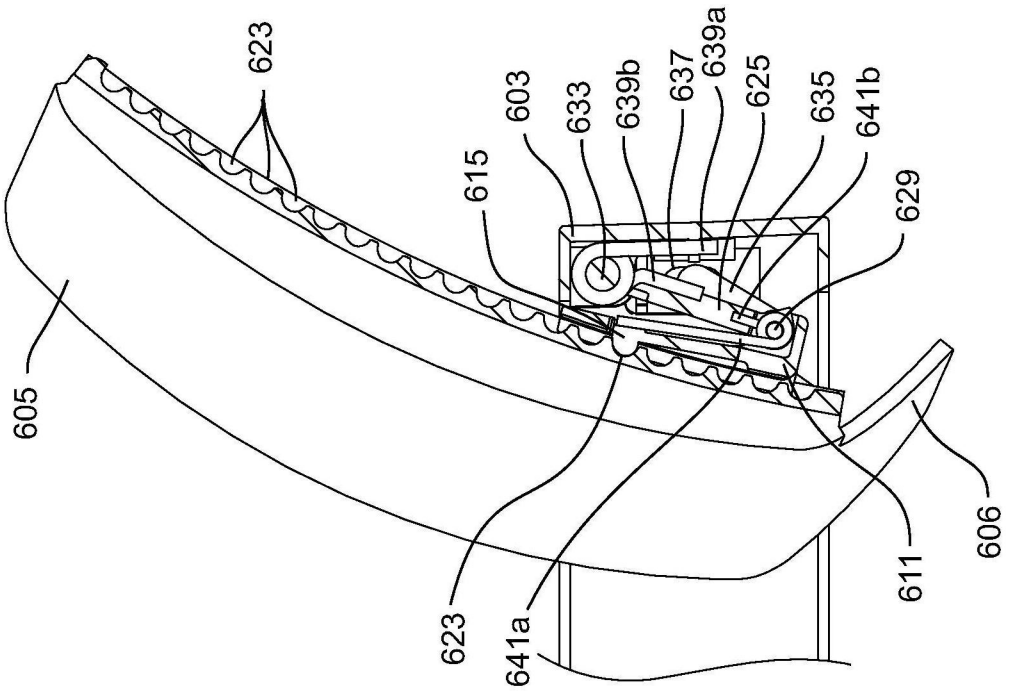
623
603
633
639b
637
639a
625
635
641b
615
629
605
606
611
623
641a

图 80

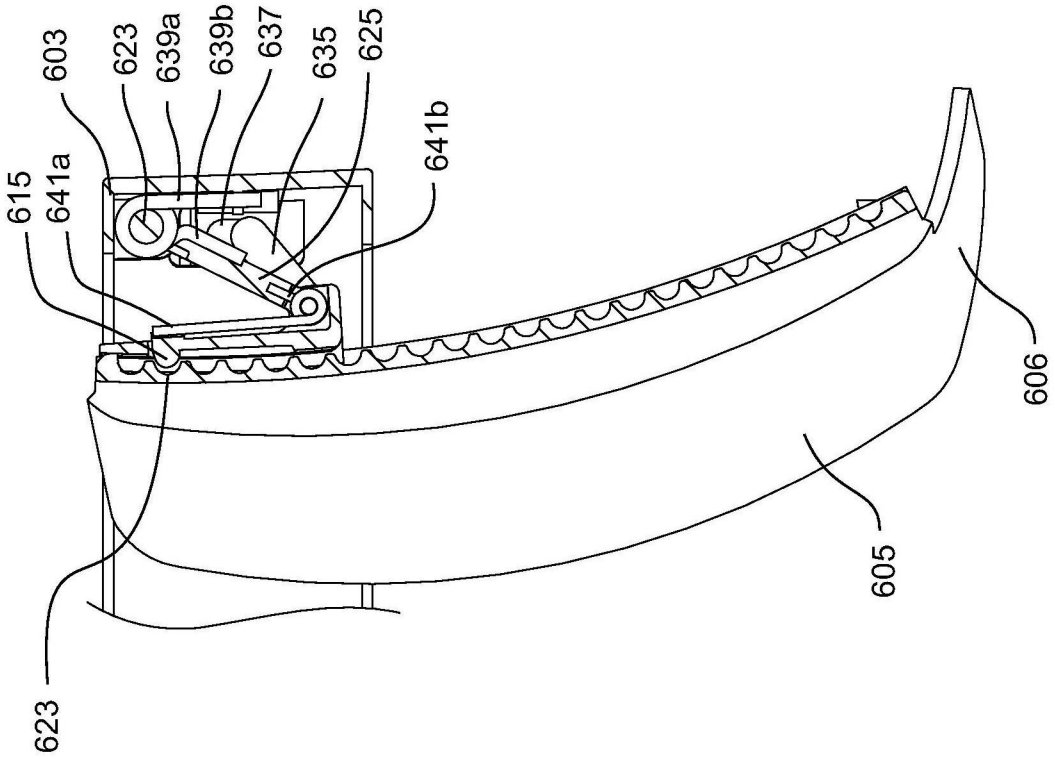
603
623
639a
639b
637
635
625
641b
615
641a
606
605
623

图 81

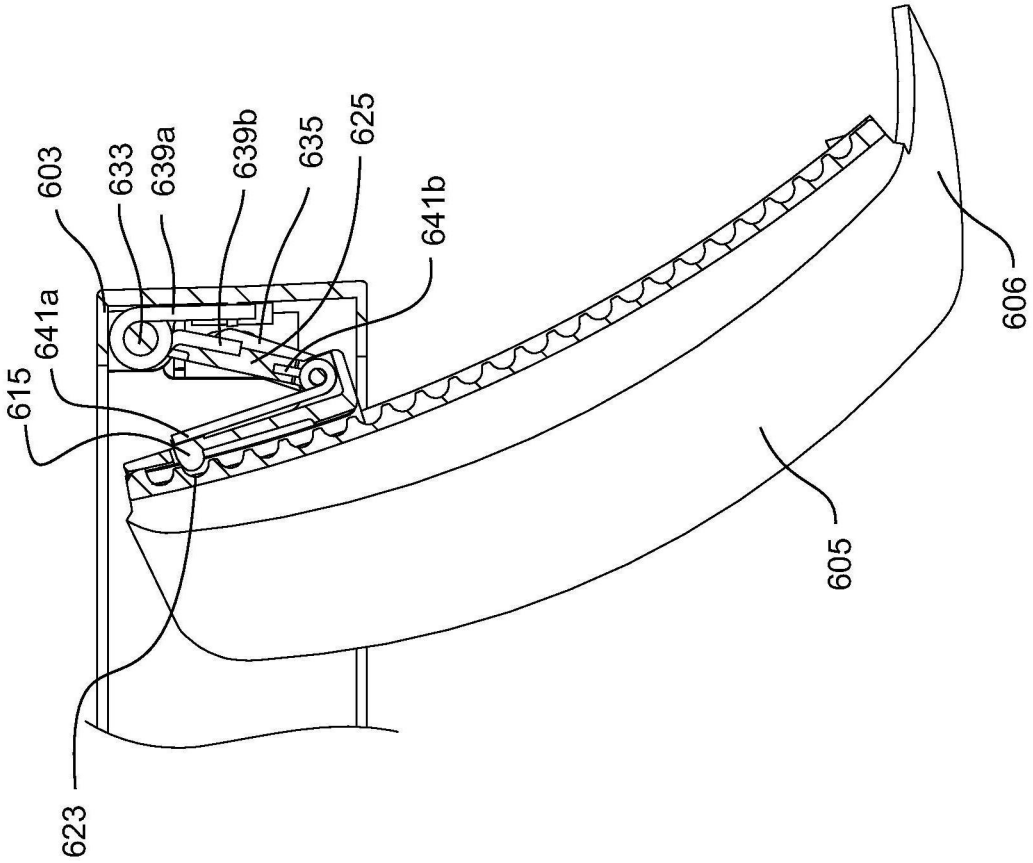

图 82

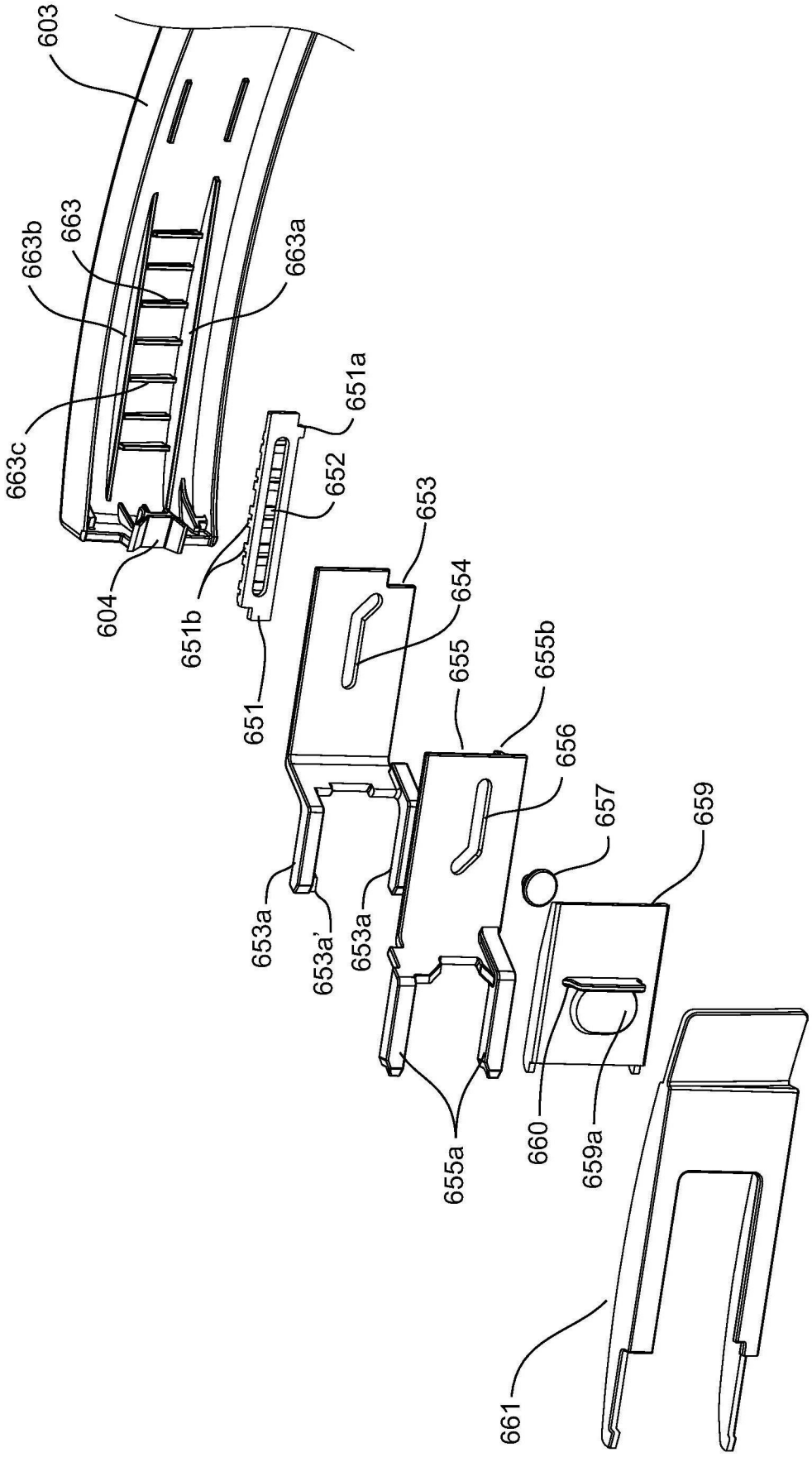
603
663b
663
663a
663c
651a
652
653
654
604
651b
655
655b
651
656
657
659
653a
653a'
653a
660
659a
655a
661

图 83

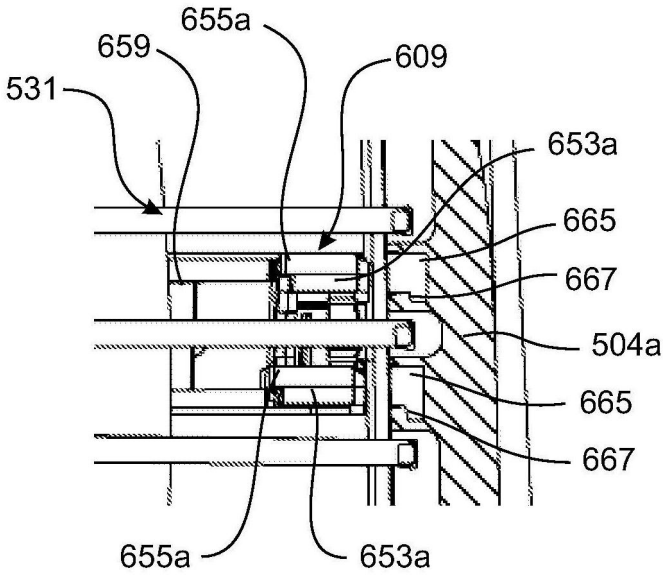
655a
659
609
531
653a
665
667
504a
665
667
655a
653a

图 84(a)

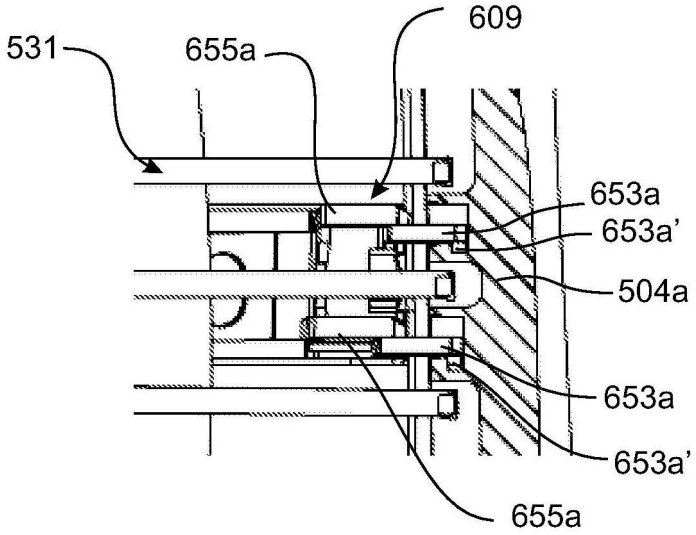
609
531
655a
653a
653a'
504a
653a
653a'
655a

图 84(b)

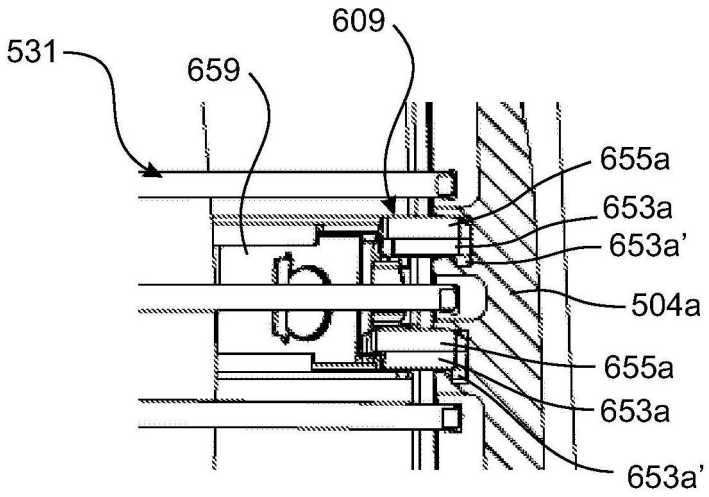

图 84(c)