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(72) Inventeurs/Inventors:
JOHNSON, ERIC, US;
GAGER, STEVE, US;
MERSMAN, WESLEY D., US;
WILLETTE, JOE, US;
WILKERSON, LARRY A., US

(73) Propriétaire/Owner:
HAWORTH, INC., US

(74) Agent: SHAPIRO COHEN

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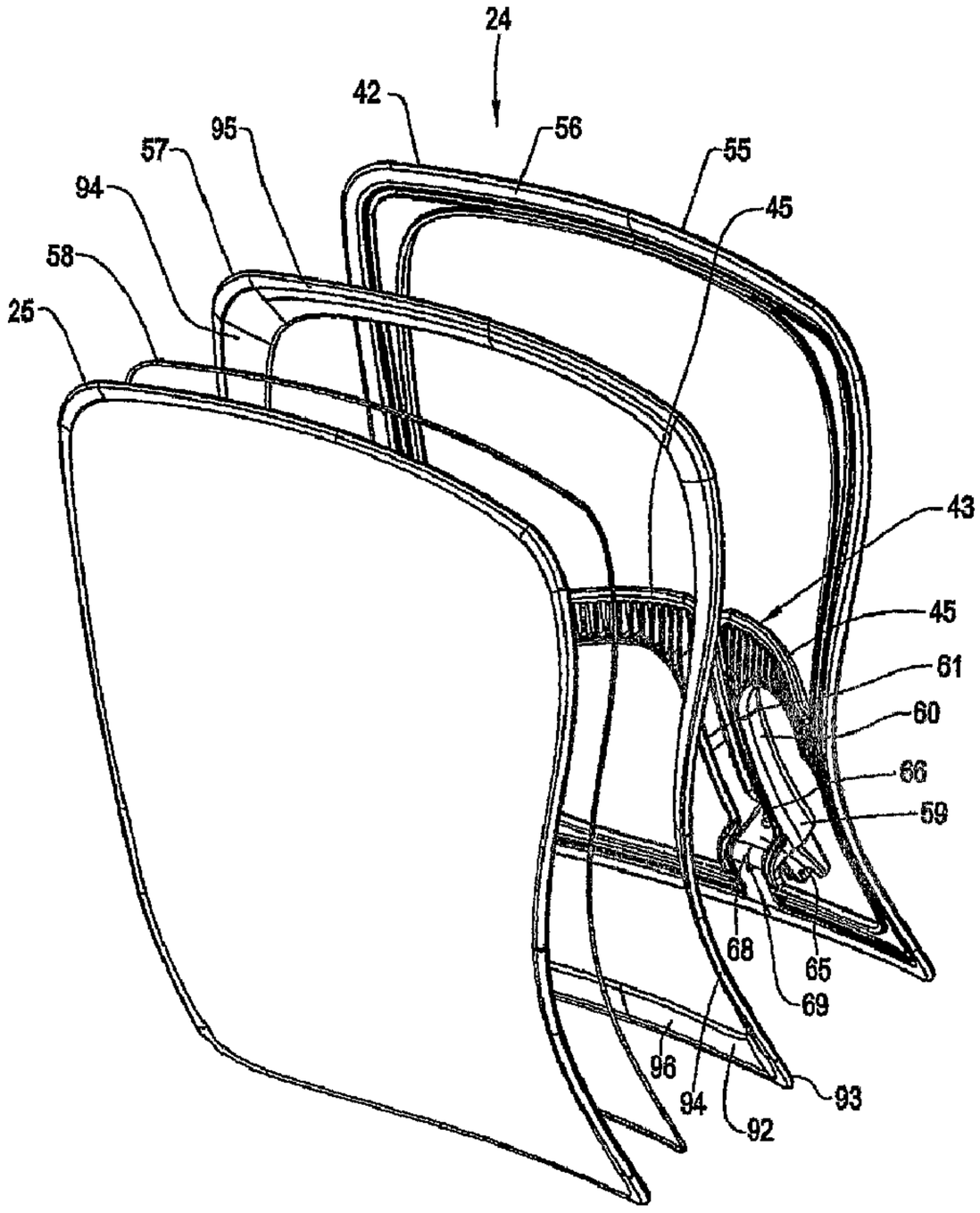

(57) Abrégé/Abstract:
An office chair (10) is provided- having a contoured back assembly (24) comprising a back frame (23) and a suspension fabric (26). The fabric is attached to the back frame through a spline (58) wherein the back frame has a three-dimensional contoured

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(57) Abrégé(suite)/Abstract(continued):
shape formed by overlapped frame rings with the fabric being joined thereto by a spline. The back frame has a split upright section to increase the ability of the left and right halves of the frame to articulate relative to each other. Further, a bayonet connection is provided between the back frame and a support upright which bayonet connection holds together the upper ends of two separate uprights of a tilt control mechanism.

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(71) Applicant *(for all designated States except US)*: **HAWORTH, INC.** [US/US]; One Haworth Center, 1400 Highway M-40, Holland, Michigan 49423 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **JOHNSON, Eric** [US/US]; 1681 Rozeveld Dr., Hudsonville, Michigan 49426 (US). **GAGER, Steve** [US/US]; 16275 Riley Ave., Holland, Michigan 49424 (US). **MERSMAN, Wesley, D.** [US/US]; 285 Glendale Ave., Holland, Michigan 49423 (US). **WILLETTE, Joe** [US/US]; 15506 Groesbeck St., Grand Haven, Michigan 49417 (US). **WILKERSON, Larry, A.** [US/US]; 1340 Buth Ne, Comstock Park, Michigan 49321 (US).

(74) Agents: **MAKI, Mark, L.** et al.; FLYNN, THIEL, BOUTELL & TANIS, P.C., 2026 Rambling Road, Kalamazoo, Michigan 49008-1631 (US).

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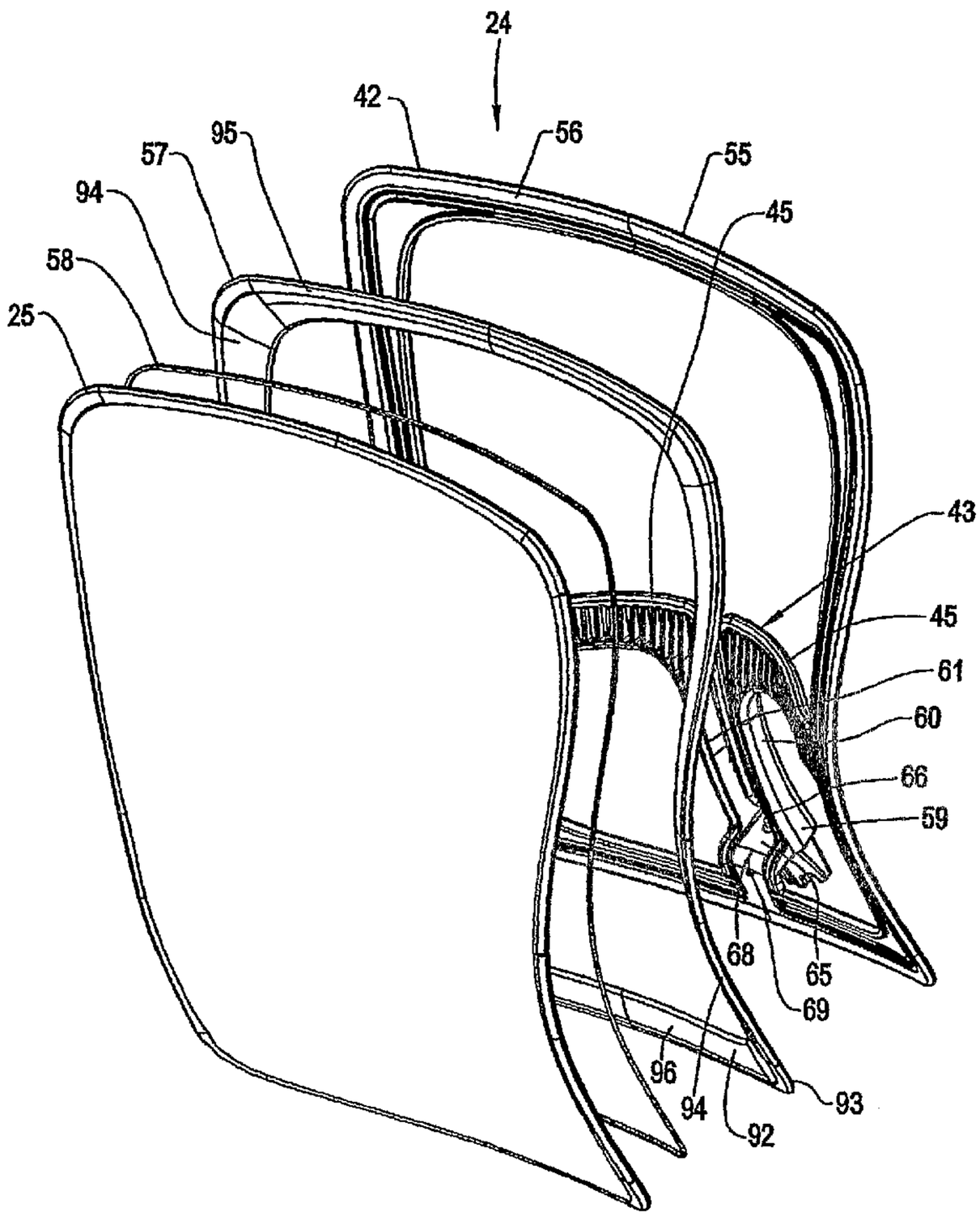

(57) Abstract: An office chair (10) is provided having a contoured back assembly (24) comprising a back frame (23) and a suspension fabric (26). The fabric is attached to the back frame through a spline (58) wherein the back frame has a three-dimensional contoured shape formed by overlapped frame rings with the fabric being joined thereto by a spline. The back frame has a split upright section to increase the ability of the left and right halves of the frame to articulate relative to each other. Further, a bayonet connection is provided between the back frame and a support upright which bayonet connection holds together the upper ends of two separate uprights of a tilt control mechanism.

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CHAIR BACK

FIELD OF THE INVENTION

[0002] The invention relates to an office chair with an improved chair back and more particularly, to a chair back with a peripheral frame and a suspension fabric secured thereto.

BACKGROUND OF THE INVENTION

[0003] Preferably, conventional office chairs are designed to provide significant levels of comfort and adjustability. Such chairs typically include a base which supports tilt control assembly to which a seat assembly and back assembly are movably interconnected. The tilt control mechanism includes a back upright which extends rearwardly and upwardly and supports the back assembly rearwardly adjacent to the seat assembly. The tilt control mechanism serves to interconnect the seat and back assembly so that they may tilt rearwardly together in response to movements by the chair occupant and possibly to permit limited forward tilting of the seat and back. Further, such chairs typically permit the back to also move relative to the seat during such rearward tilting.

[0004] The back assembly of such office chairs may have a variety of constructions wherein one type of construction includes an annular back frame which defines an open interior in which the chair occupant's back is supported. This central open area is enclosed by a suspension mesh which spans the opening and has the outer peripheral edge thereof affixed to the annular frame.

[0005] The back frame further has a section thereof rigidly connected to an upright of the chair. The upright is connected to a tilt control mechanism, which mechanism

supports the seat assembly and governs rearward tilting of the upright. As such, the back assembly moves in combination with the upright when the occupant reclines within the chair.

[0006] It is an object of the invention to provide an office chair having a chair back arrangement which is improved relative to prior chair back constructions.

[0007] Therefore, the invention relates to an office chair and more particularly, to the construction of a chair back assembly and the mounting of this chair back assembly to an upright.

[0007.1] According to one aspect of the present invention, there is provided a chair comprising a seat assembly having a seat frame, a back assembly supported rearwardly adjacent to said seat assembly and comprising a peripheral back frame projecting above the seat frame and having an annular shape which has an inner periphery and an outer periphery and which defines an open area bounded by said inner periphery, the back assembly further including a suspension fabric which overlies the open area and is secured at its periphery to the outer periphery of the back frame, wherein the back frame comprises front and rear back frame sections having rear and front interior faces which fit one over the other in opposing facing relation at their interface and are fixed together, and in that a peripheral channel is defined in the outer periphery between the front and back frame sections at the interface therebetween, and opens radially outwardly to the side of said back frame to receive the periphery of the suspension fabric in a taut condition extending across a front exterior face of the back frame.

[0008] The back assembly comprises an annular frame having a suspension fabric which spans the central opening of the back and has the periphery of the suspension fabric connected to the frame. Preferably, the suspension fabric comprises a single layer of suspension material which connects to the frame by a plastic spline that is press fitted into an annular spline channel formed about the periphery of the back frame.

[0009] The back frame is defined by side frame rails, which extend vertically, and transverse cross rails, which extend horizontally between the side rails at the top and bottom thereof. The back frame has a contoured shape wherein the side frame rails curve rearwardly and outwardly in the sideto-side direction, while the cross rails also curve in the front-to-back direction to provide a contoured shape for the back frame that comfortably conforms to the chair back of the chair occupant.

[0010] To form the spline channel, the back frame is constructed of molded front and back ring sections which are grooved about their respective peripheries to define front and rear channel portions. The front channel portion defines the front wall of the spline channel while the rear channel portion defines the rear channel wall. The front and rear *ring* sections overlie each other in opposing relation and are rigidly secured together by suitable fastening means such as ultrasonic welding; adhesives or even threaded fasteners. When the two frame sections are rigidly joined together, the

grooved portions align with each other and define the spline channel. In this manner, complex contours may be formed in a molded back frame while still permitting the formation of a spline channel about the periphery thereof.

[0011] Once the frame is assembled, the suspension fabric is fastened to the frame by a spline which is press fitted into the spline channel and traps the edge portions of the suspension fabric within this channel.

[0012] The back frame also has an upright frame column which extends into the central opening of the chair and terminates at its upper end in transverse support arms which extend outwardly and are rigidly affixed to the middle of the side frame members to thereby provide further support to the back frame. The lower end of the support column rigidly joins to the upright while the remainder of the support column has a vertically elongate slot which separates the support column into left and right halves. Since the back frame flexes during use as a result of loads applied thereto when the occupant leans against the back assembly, this separation slot provides for increased independent movement of the upper corners of the chair back relative to the other.

[0013] The lower end of the support column also includes an improved bayonet connection which rigidly joins the back frame to the uprights.

[0014] In particular, the uprights are formed as independent arms which are each independently connected to the tilt control mechanism and move together in unison. The rearmost ends of the uprights are disposed adjacent to each other and define a connector hub with an upward opening socket into which the bayonet connector is slidably inserted. Each upright defines one-half of the socket and includes ribs projecting into the socket that are then slidably received within a corresponding tapered slot of the bayonet connector wherein this connector slot of the bayonet connector serves to hold the rear ends of the upright sidewardly together and prevent separation thereof. A further fastener is provided

vertically between the upright hub and the back frame to draw these components vertically together such that the separate uprights are rigidly held together by the bayonet connector and as such move together in unison.

[0015] The foregoing features provide an improved back frame arrangement, wherein other objects and purposes of the invention, and variations thereof, will be apparent upon reading the following specification and inspecting the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Figure 1 is a front elevational view of an office chair having an inventive back assembly arrangement.

[0017] Figure 2 is a side elevational view of the office chair.

[0018] Figure 3 is a rear isometric view thereof.

[0019] Figure 4 is a front isometric view thereof.

[0020] Figure 5 is a side view of a back assembly.

[0021] Figure 6 is a front view thereof.

[0022] Figure 7 is an exploded isometric view of the back assembly with a fastener for mounting the back frame on the tilt control mechanism of the chair.

[0023] Figure 8 is an enlarged exploded view of the mounting section of the back frame.

[0024] Figure 9 is an exploded isometric view of the back components forming the back assembly.

[0025] Figure 10 is a side cross-sectional view of the back assembly as taken along the centerline of the back assembly.

[0026] Figure 11 is a rear view of the back frame.

[0027] Figure 12 is a front view of the back frame.

[0028] Figure 13 is a diagrammatic view illustrating the manufacture of sheets of suspension fabric from a stock material.

[0029] Figure 14 is a top cross-sectional view of a side frame member as taken along line 14-14 of Figure 6.

[0030] Figure 15 is a side cross-sectional view of the top frame member as taken along line 15-15 of Figure 6.

[0031] Figure 16 is a side cross-sectional view of the bottom frame member as taken along line 16-16 of Figure 6.

[0032] Figure 17 is a front view of a cushion adapted for mounting to the back assembly over the suspension fabric.

[0033] Figure 18 is an exploded isometric view of the cushion components.

[0034] Figure 19 is an enlarged side cross-sectional view of the bottom frame member with a bayonet connection along with a pelvic support member mounted to the bottom frame member.

[0035] Figure 20 is an enlarged, partial front view of the back frame.

[0036] Figure 21 is a rear view of the pelvic support.

[0037] Figure 22 is a side view of the pelvic support.

[0038] Figure 23 is a side cross-sectional view of the pelvic support.

[0039] Figure 24 is an enlarged partial isometric view of the back assembly, seat assembly and tilt control mechanism.

[0040] Figure 25 is an enlarged rear view of the bayonet connector.

[0041] Figure 26 is an enlarged side view of the bayonet connector.

[0042] Figure 27 is a top cross-sectional view of the bayonet connector as taken along line 27-27 of Figure 26.

[0043] Figure 28 is a top cross-sectional view of the bayonet connector as taken along line 28-28 of Figure 26.

[0044] Figure 29 is an interior side view of a support upright.

[0045] Figure 30 is a front view of the upright.

[0046] Figure 31 is a top cross-sectional view of a hub section of the upright as taken along line 31-31 of Figure 29.

[0047] Figure 32 is a top cross-sectional view of the hub section as taken along line 32-32 of Figure 29.

[0043] Figure 33 is a top cross-sectional view of the bayonet connector seated within a socket defined by a hub of the uprights.

[0049] Figure 34 is an exploded isometric view of the second embodiment of a back assembly.

[0050] Figure 35 is a top cross-sectional view of the back frame of the second embodiment of Figure 34.

[0051] Figure 36 is an isometric view of the suspension fabric assembly for covering the back frame.

[0052] Figure 37 is a front view of a spline adapted for attachment to a suspension fabric of Figure 36.

[0053] Figure 38 is a top view of a first spline section.

[0054] Figure 39 is a top view of a second spline section.

[0055] Certain terminology will be used in the following description for convenience and reference only, and will not be limiting. For example, the words "upwardly", "downwardly", "rightwardly" and "leftwardly" will refer to directions in the drawings to which reference is made. The words "inwardly" and "outwardly" will refer to directions toward and away from, respectively, the geometric center of the arrangement and designated parts thereof. Said terminology will include the words specifically mentioned, derivatives thereof, and words of similar import.

DETAILED DESCRIPTION

[0056] Referring to Figures 1-4, the invention generally relates to an office chair 10 which includes various inventive features therein which accommodate the different physical characteristics and comfort preferences of a chair occupant and also improve the assembly of the chair 10.

[0057] Generally, this chair 10 includes improved height adjustable arm assemblies 12 which are readily adjustable.

[0058] The chair 10 is supported on a base 13 having radiating legs 14 which are supported on the floor by casters 15. The base 12 further includes an upright pedestal 16 which projects vertically and supports a tilt control mechanism 18 on the upper end thereof. The pedestal 16 has a pneumatic cylinder therein which permits adjustment of the height or elevation of the tilt control mechanism 18 relative to a floor.

[0059] The tilt control mechanism 18 includes a control body 19 on which a pair of generally L-shaped uprights 20 are pivotally supported by their front ends. The uprights 19 converge rearwardly together to define a connector hub 22 on which is supported the back frame 23 of a back assembly 24.

[0060] The back assembly has a suspension fabric 25 supported about its periphery on the corresponding periphery of the frame 23 to define a suspension surface 26 against which the back of a chair occupant is supported.

[0061] To provide additional support to the occupant, the back assembly 24 also includes a lumbar support assembly 28 which is configured to support the lumbar region of the occupant's back and is adjustable to improve the comfort of this support.

[0062] Additionally, the chair 10 includes a seat assembly 30 that defines an upward facing support surface 31 on which the seat of the occupant is supported.

[0063] More particularly as to the back assembly 24, the back assembly 24 is generally illustrated in Figures 5-7. The back frame 23 comprises a pair of vertical side frame rails 35, a top frame rail 36, and a bottom frame rail 37

which are joined together at the upper corners 38 of the back assembly 24 as well as the lower corners 39 to define an annular or endless frame having a central opening 40.

[0064] As can be seen in Figures 5-7, the back frame 23 has a contoured shape which ergonomically supports the back of the user. In particular, the side rails 35 curve backwardly as seen in Figures 5 and 7 as well as outwardly (Figure 6) relative to the bottom portions of the side rails 35. Further, the top rail 36 and bottom rail 37 each have a respective curvature to closely conform to the curvature of a typical chair occupant.

[0065] To support the occupant, the back assembly 24 includes the suspension fabric 25 which is secured taughtly on the frame. Specifically, the back frame 23 includes a peripheral spline channel 42, in which is fixed the peripheral edge of the suspension fabric 25 as will be discussed in further detail herein.

[0066] The back frame 23 also generally includes a support structure 43 to which the side rails 35 and bottom rail 37 are rigidly interconnected. This support structure 43 comprises an upright support column 44 which extends along the chair centerline 41 (Figure 7) to an elevation located just below the middle of the side rails 35. The upper end of the support column 44 includes a pair of support arms 45 which extend sidewardly and have each respective outer end connected rigidly to one of the side rails 35.

[0067] The lower end of the support column 43 includes a generally L-shaped connector flange 46 (Figures 5 and 7) which projects forwardly and then downwardly into fixed engagement with the lower cross rail 37. Still further, this lower column end includes a bayonet connector 49 which projects downwardly for rigid connection to the uprights 20 by fastener bolt 50 and nut 51 as will be described in further detail hereinafter.

[0068] Referring more particularly to the components of the back assembly 24, Figure 9 illustrates these components in an exploded view thereof. In particular, the frame 23 comprises a molded rear frame unit 55 that includes the support structure 44 described above as well as a rear frame ring 56 which is supported on the support arms 45 of the support structure 44. The back frame 24 further includes a molded front frame ring 57 which is adapted to be mounted to the rear frame ring 56 in overlying relation to define the spline channel 42 about the periphery thereof. Further, the back assembly 24 includes the above-described suspension fabric 25 and an elastomeric spline 58.

[0069] Referring to Figures 11 and 12, the rear frame unit 55 comprises the support structure 43 and the rear frame ring 56. Both the support structure 43 and the rear frame ring 56 are molded simultaneously together in a one-piece monolithic construction having the contoured shape described above. To facilitate molding of this contoured shape while still possessing the spline channel 42 mentioned above, the rear frame ring 56 and front frame ring 57 are molded separate from each other and then affixed together.

[0070] Turning to the support structure 43, the support column 44 thereof is located centrally within the lower half of the central frame opening 40. The support column 44 has a base end 59 and a pair of column halves 60 and 61 which are separated from each other by a vertically elongate column slot 62. The column 44 therefore is formed as a split column by the slot 62 which extends along a substantial portion of

the length of the column 44 with the column halves 60 and 61 being joined together by the solid base section 59. As such, the column halves 60 and 61 are supported in cantilevered relation by the base section 59. The rear frame unit 55 and front frame ring 57 are formed from a glass filled nylon material that is molded into the desired shapes wherein this material has limited flexure so as to permit flexing of the various areas of the frame when placed under load by a chair occupant. Since the column halves 60 and 61 are separated from each other by the slot 62, these column halves 60 and 61 may articulate independently of each other to facilitate flexing and movement of the various frame corners 38 and 39.

[0071] The upper ends of the frame halves 60 and 61 join integrally to the transverse arms 45. The outer ends of the arms 45 extend outwardly and are molded integral with the vertical sides of the rear frame ring 56. As seen in Figure 12, the inside faces of the column halves 60 and 61 and the support arms 45 have an appropriate pattern of ribbing 64 to selectively rigidify the support structure 43 while still permitting flexure thereof.

[0072] In the column base 59, this column base 59 terminates at a bottom wall 65 (Figures 9, 10 and 12), which is formed with a bore 66 extending vertically therethrough. The bottom wall 65 further is formed integral with the bayonet connector 49 wherein the bore 66 extends vertically through this bottom wall 65 and the bayonet 49 as seen in Figure 10. When joining the back frame 23 to the chair uprights 20, the fastener 50 extends upwardly from the uprights 20 as will be described in further detail herein and extends through the fastener bore 66 so that it projects vertically above the bottom column wall 65. The upper end of the fastener 50 is engaged by the threaded nut 51 as seen in Figure 10 to thereby secure the back frame 23 to the uprights 20. This interconnection between these components will be described in further detail hereinafter.

[0073] Further as to the bottom wall 65, this wall extends forwardly to define a horizontal leg 68 of the L-shaped flange 46, which flange 46 then turns downwardly to define a vertical leg 69 (Figures 5, 7 and 10). The bottom column section 59 serves to rigidly support the bottom cross rail 37 of the back frame 23. As such, the bottom frame rail 37 is more rigidly supported and has less relative movement under occupant loads than the middle frame areas supported by the support arms 45 or even the upper frame corners 38 which have the greatest amount of displaceability. In this manner, the rear frame unit 55 provides for controlled flexing of the entire back frame 23.

[0074] Referring to Figures 11 and 12, the rear frame ring 56 comprises top and bottom ring sections 71 and 72 and left and right ring sections 73 which extend vertically. As seen in Figure 14, each side ring section 73 includes raised connector ribs 74 and 75 as well as an additional rib 76 which defines the inside end of the spline channel 42 and is also located directly adjacent to a spline groove 77 that is adapted to accommodate the thickness of the spline 58. The outer edge of the ring side section 73 includes a thinner portion 78 and essentially defines the rear side portion of the spline channel 42.

[0075] As to the horizontal rail section 71, this rail section 71 includes an interior rib 80, a channel rib 81 and an intermediate connector face 82. Adjacent to the channel rib 81, a spline groove 83 is provided to accommodate the thickness of the spline 58 while the outer edge portion 73 continues across the top ring section 71.

[0076] Referring to Figures 16 and 20, the lower rail section 72 includes a spline channel 85 along its entire lateral width so as to accommodate the spline 58. Here again, the outer edge portion 78 continues through this region to define the back portion of the spline channel 42. In the middle of the lower ring section 72, a recessed pocket 87 is defined which opens upwardly and is located vertically

adjacent to a locking post 88, the function of which will be described in further detail hereinafter.

[0077] The pocket 87 is defined by side walls 89 which side walls 89 include notches 90 at the bottom end thereof directly adjacent to the spline groove 85. It is noted that all of the spline grooves 77, 83 and 85 are arranged in end-to-end relation so as to define a continuous groove for continuously accommodating the spline 58 therein. Further, the channel ribs disposed directly adjacent to these spline grooves 77, 83 and 85 are formed continuously in end-to-end relation.

[0078] Turning next to the front frame ring 57, this frame ring 57 has a front face 92 which faces forwardly and a rear face 93 which faces rearwardly towards the rear frame ring 56 and is adapted to abut thereagainst and be fixedly secured thereto. This frame ring 57 is defined by vertical ring sections 94 and a top ring section 95 and a bottom ring section 96.

[0079] As to the side ring sections 94 (Figure 14), these ring sections 94 include a rearwardly projecting connector rib 98 and an interior edge portion 99 which are adapted to abut against and be fixedly secured to the connector ribs 75 on the rear frame ring 56. Preferably, the front and rear frame rings 57 and 56 respectively are joined together by ultrasonic welding of these components with the faces disposed in contact being welded together. The front ring sections 94 are molded with a channel rib 99 disposed directly adjacent to a spline groove 100, which spline groove 100 is disposed in opposing relation with the other spline groove 77 to define an enlarged interior portion in which the spline 58 may be received. The outer edge portion 101 of the front ring 57 is disposed adjacent to but spaced apart from the other edge portion 78 to thereby define the entry portion of the spline channel 42.

[0080] As to the top ring section 95 (Figure 15), this is formed similar in that it includes a channel rib 102 and a spline groove 103 which is disposed directly adjacent to the

outer edge portion 101 to thereby form the spline channel 42 in cooperation with the spline groove 83 and outer edge portion 78 of the rear frame ring 56. The outer edge portion 101 of the front frame ring 57 furthermore extends downwardly along the other vertical ring section 93 and then across the bottom ring section 96.

[0081] The bottom ring section 96 (Figure 16) is formed with a spline groove 105 extending thereacross in alignment with the opposing rear spline groove 85. In this manner, the rear frame ring 56 defines a rear portion of the spline groove 42 while the front frame ring 57 defines a front portion thereof which said frame rings 56 and 57 when disposed in opposing relation define the channel 42 so that it opens radially outwardly and has an enlarged interior groove in which the spline 58 and associated fabric material may be received in non-removable engagement. As best seen in Figure 14, the fabric 25 is wrapped around the spline 58 to essentially define a folded hem which folded hem is then pressed into the spline channel 42 by an appropriate tool or tooling.

[0082] In this manner, the suspension fabric 25 is tightly fitted onto the back frame 23 so that the fabric material 25 is stretched taut as generally illustrated in Figure 10 and then angles away from the back frame 23 and spans the central frame opening 40.

[0083] The suspension fabric 25 is formed of any suitable suspension material which preferably is elasto-meric and preferably has an open weave that provides for breathability. Figure 13 generally illustrates the formation of the pieces of suspension fabric 25 wherein Figure 13 illustrates an initial stock material 110 from which is cut multiple pieces of the suspension fabric 25. The suspension fabric 25 preferably is formed as a single layer but may have multiple overlying layers and may also include cushioning included therein.

[0084] In the office chair 10 of the invention, the chair 10 may be provided with a separate cushioned pad 111

(Figures 17 and 18) that covers the suspension fabric 25. The pad 111 has an upper pocket 112 and a lower pocket 113 that are adapted to be pulled over and fitted onto the back frame 23. The pad 111 is formed as a composite pad having a rear fabric layer 114, an intermediate cushion 115 and a front fabric layer 116 which layers 114, 115 and 116 are all sewn together about their peripheral edges.

[0085] To define the upper pocket 112, upper and lower pocket walls 117 and 118 are provided which are formed of a flexible fabric material and are sewn on three sides to the adjacent peripheral edges of the composite pad 111. The pad 111 is installed by first placing one of the pockets 112 or 113 over the associated horizontal edge of the back frame 23 and then pulling the other pocket vertically and fitting this on the opposite horizontal frame edge.

[0086] More particularly as to the frame mounting pocket 87 formed in the back frame ring 56, the front side of the pocket 87 is enclosed by the front frame ring 57. This pocket 87 is provided to support the lower end of a pelvic support unit or pusher 120 which faces forwardly and is adapted to press against the rear pelvic region of a chair occupant. Referring to Figures 21-23, the pelvic support 120 has an enlarged panel or pad 121 that is supported on a cantilevered support arm 122. The lower end of the support arm 122 has a plug portion 123 which is forked to define a pair of locking legs 124. The distal ends of the legs 124 include nubs 125 that project sidewardly or outwardly for engagement with the notches 90 formed in the pocket 87. Also the plug portion 123 includes a locking recess 126 which opens rearwardly and essentially is defined by a blind bore.

[0087] When the front and rear frame rings 56 and 57 are fixed together such as by welding, the support pocket 87 still opens upwardly from between the interface between these two ring sections. This permits the plug portion 123 of the pelvic support 120 to be plugged downwardly into the pocket 87. During this downward insertion, the connector

legs 124 deflect inwardly toward each other until the nubs 125 align with the corresponding pocket notches and then return to their undeflected condition with the nubs 125 seated in the notches 90.

[0088] Since the pelvic support 120 is formed of a resiliently deflectable material such as plastic, the support arm 122 is able to be bent forwardly during insertion or even for removal to permit the pocket post 88 to slide along the face of the pelvic support 120 until it aligns with the corresponding locking recess 126, after which the support arm 122 returns to its undeflected condition with the post 88 seated within the recess 126. These cooperating components prevent unintentional vertical displacement of the pelvic support 120. Since the resiliently deflectable suspension fabric 25 lies against the front face 127 of the support panel 121, the fabric 25 tends to press the pelvic support 120 rearwardly so that the stop post 88 is most effective in preventing removal of the pelvic post 120. However, since the suspension fabric 25 also is stretchable, the pelvic support 120 may still be bent forwardly to permit removal of same from the support pocket 87.

[0089] Turning to the connection of the back assembly 24 to the tilt control mechanism 19, this is accomplished through the bayonet connector 49 referenced above. The tilt control mechanism 19 has two separate uprights 20 which project rearwardly from opposite sides of the chair and have their upper ends aligned in side by side relation to define the aforementioned connector hub 22. The above-described central column of the back assembly 24 fits into this hub 22 and rigidly holds the uprights 20 in aligned side by side relation through use of the aforementioned bolt 50.

[0090] Referring to Figures 25-28, the bayonet connector 49 projects downwardly from a lower surface 130 of the column base 59. As seen in Figure 25, the downwardly projecting bayonet connector 49 has the fastener bore 66 extending through the vertical length thereof. The lateral sides 131 of

the bayonet connector 49 have a shallow taper wherein the sides 131 converge inwardly downwardly. In the middle of the bayonet back face 132, a vertically elongate slot 133 is provided along the entire length of the bayonet connector 49. This slot 133 has a bottom opening 134 and convergent slot edges 135 which taper inwardly upwardly.

[0091] Referring to Figure 26, the bayonet front face 136 also is tapered relative to the back face 132 although the taper of the back face 132 is shallower than the taper of the front face 136. Hence, the bayonet 49 is tapered in both the front to back plane and the side to side plane. The lowermost corners of this front face 136 are provided with reliefs or cutouts 137.

[0092] Figures 27 and 28 are cross-sectional views as taken through the bayonet connector 49. As can be seen, the central bore 66 extends vertically therethrough. The front face 136 faces forwardly and has facets that curve generally sidewardly until terminating in the reliefs 137 in the bottom area thereof.

[0093] In the center portion of the front face 136, a front groove 138 is provided between a pair of protuberances 139. When comparing Figures 27 and 28, the groove 138 is deeper near the top of the bayonet connector 49 as seen in Figure 27 and is shallower at the lower end (Figure 28). The protuberances 139 also decrease in height when comparing the top end (Figure 27) and the lower end (Figure 28).

[0094] As to the slot 133, this slot 133 is shallower at the lower end (Figure 28) as compared to the upper end (Figure 27). This slot 133 as well as the groove 138 tend to draw the upper ends of the uprights 20 sidewardly together and hold these ends in side by side relation. At the same time, the tapered side faces 131 and the tapered front and back faces 132 and 136 facilitate a snug fit when these components are drawn together by the bolt 50.

[0095] More particularly as to the upright 20, Figures 29 and 30 illustrate a left side upright 20. The opposite right

side upright 20 is formed substantially as a mirror image relative to the upright of Figures 29 and 30 and hence, a detailed discussion thereof is not required.

[0096] More particularly, the front end of the upright 20 includes a hexagonal hole 141 which fits onto the end of a pivot shaft disposed within the tilt control housing 19. The opposite upright 20 also mounts onto the opposite end of this pivot shaft so that both of the uprights 20 pivot downwardly in unison during rotation of the shaft.

[0097] The intermediate section of each upright 20 includes a seat mount 142 on which the back end of the seat assembly 30 is supported.

[0098] Most importantly, at the back end of the upright 20, a hub section 143 is provided which defines one-half of the hub 22 mentioned above. The hub section 143 includes a chamber 144 that has an open upper end 145 and an open inner side 146. On the left side upright 20 illustrated in Figures 29 and 30, a locator knob 145 projects sidewardly from the inside face 146 of the hub section 143. With respect to the right side upright 20, this locator knob 145 is instead replaced with a shallow locator bore in which the knob 145 is received in tight-fitting engagement. The illustration of the inside face of this right side upright 20 is identical to Figure 29 except it is a mirror image thereof wherein the illustrated knob 145 of Figure 29 would in fact be a circular recess.

[0099] Referring to Figures 31 and 32, the shape of the socket section 144 has an interior profile as illustrated in Figures 31 and 32 which is substantially a negative image of the exterior profile of the bayonet connector 49 illustrated in Figures 27 and 28.

[00100] More particularly, the socket section 144 has a bottom wall 150 that has one-half of a bore 151 formed therein adjacent to the inside hub face 147. When two hub sections 143 are joined side by side, the bore sections 151 align sidewardly adjacent to each other to define a circular

bore through which the bolt 50 passes. These bore sections 151 open downwardly adjacent to a bottom wall face 152 against which the head 153 of the bolt 50 abuts as illustrated in Figure 19.

[00101] The socket sections 144 also each include a socket side face 155 which tapers upwardly outwardly, and a back face 156 which also tapers upwardly outwardly. The front socket face 157 has a curved profile and tapers upwardly outwardly with a more pronounced taper as compared to the back face 156. This front face then curves to define a projection 158 that is progressively thicker in the upward direction as seen in Figures 32 and 31. Further, the back face 156 terminates at a central rib section 160.

[00102] Referring to Figure 33, when the two hub sections 143 are joined side by side to each other the two socket sections 144 are aligned sidewardly in registry to define an upward opening socket 162 of the hub 22, and the rib sections 160 essentially define a vertically elongate rib 161. This rib 161 slidably fits within the corresponding slot 133 of the bayonet connector 49. Since the slot 133 is tapered, this draws the rib sections 160 sidewardly together and prevents any sideward displacement of the hub sections 143 away from each other once the back assembly 24 is installed within the hub 22. Similarly, the projections 158 define a shallow rib 164 which fit into the groove 138 to further assist in drawing these hub sections 143 sidewardly together.

[00103] The tapered shape of the bayonet connector 49 and the corresponding socket 162 provides for a snug fit between the opposing faces of these components. It will be understood that Figure 33 includes some clearance space between these spaces for diagrammatic purposes to assist in the illustration thereof but that the spacing between such surfaces is much closer in practice to prevent any undesirable looseness in the back assembly 24. Referring to Figure 19, the hub 22 is generally depicted by the bottom wall 150 thereof. During assembly, the bayonet connector 49 is fitted into the

socket 162 of the hub 22 and then these components are drawn tightly together by insertion of the bolt 50 through the bore 66 and then the nut 51 is threaded thereon to place these components in compression. A Bellville washer 165 or other resilient or mechanical locking means may be provided to prevent any loosening of the bolt 50 and nut 51.

[00104] As an additional feature of this connector arrangement, this arrangement also may be used to secure the lumbar assembly 28 in place. Referring to Figure 10, this lumbar assembly 28 may include an upright support bracket 170 having a bottom bracket wall 171. As seen in Figure 19, this bottom bracket wall 171 includes a rearward opening slot 172 to permit the bracket 170 to be slid around or straddle the bolt 50 wherein the nut 51 then presses directly downwardly on this bracket wall 171 to secure the lumbar assembly 128 in place. Alternatively, as generally depicted in Figure 7, this lumbar assembly 28 also need not be provided wherein the nut 51 would be positioned directly onto the upper face of the column wall 65.

[00105] Hence, the bayonet connection 49 not only serves to join the bayonet connector 49 to the hub 22, but also serves as the connector arrangement for the lumbar assembly 28 which optionally may be installed on this chair 10.

[00106] With respect to the above-described chair 10, the back frame 24 is assembled by first joining the rear frame ring 56 to the front frame ring 57 by ultrasonic welding. Thereafter, the suspension fabric 25 is resiliently stretched over the back frame 23 with the peripheral edges of the fabric 25 being affixed into the spline groove 42 by the spline 58. If desired, the pelvic support 120 may be plugged into the appropriate pocket 87 formed in the bottom frame rail 37.

[00107] Thereafter, to mount the back assembly 24 to the tilt control mechanism 19, the frame bayonet connector 49 is plugged into the socket 162 of the hub 22. The appropriate fastener 50 with its associated Bellville washer 165 are

inserted upwardly through the fastener bore 60 and then nut 51 is threaded on the upper end of the bolt 50. If the lumbar assembly 28 is being provided, this would then be positioned by sliding its bracket 170 onto the bolt 50 after which the nut 51 would then be tightened to secure all of these components together. In this manner, the back assembly 24 is rigidly connected to the uprights 20 and tilts rearwardly therewith.

[00108] As an alternative to the above described frame construction, Figures 34 and 35 illustrate a multi-component back frame 180 which comprises a rear frame unit 181 and a front frame ring 182. The rear frame unit 181 and front frame ring 182 are substantially similar to the components described above and thus a detailed discussion of these components is not believed to be required with the following discussion primarily relating to additional modifications to this frame construction.

[00109] In this regard, these frame components 181 and 182 would include appropriate fastener bores 183 such that the rear frame unit 181 and front frame ring 182 could be fastened together by screws 184. Once these two frame sections 181 and 182 are joined together, they essentially define a spline groove 185 in a manner substantially similar to that described above. Thereafter, the back frame 180 also includes an elastomeric pad ring 190 which generally conforms to the shape of the front frame ring 182 but is formed of a compressible material such as a spongy foam. Figure 35 illustrates in phantom outline the initial cross-sectional profile of this pad ring 190 when secured to the front frame ring 182.

[00110] The back frame 180 also includes a suspension fabric 191 that has a spline 192 sewn to its periphery by threads 193 or other suitable fastening means. This spline 192 fits into the spline channel 185 to secure the suspension fabric 191 in place.

[00111] The suspension fabric 191 preferably is an elastomeric material which is tensioned when installed. To

facilitate tensioning of this suspension fabric 191, the pad ring 190 preferably is compressed as illustrated in solid outline in Figure 35 wherein the compression of the pad 190 adds an additional outward biasing force to the suspension fabric 191 to increase the tension therein. As an additional function, the pad ring 190 also overlies the screws 184 and hides these components from view.

[00112] Referring to Figure 35 as well as additional Figures 36-39, the spline 192 also has an improved inventive construction. More particularly, the suspension fabric 191 comprises an initial pattern of sheet material 195 formed of an elastomeric fabric cut to an appropriate shape as seen in Figure 36. The spline itself comprises two U-shaped spline sections 196 and 197. Initially as seen in Figures 38 and 39, these spline sections 196 and 197 are formed in a straight configuration with V-shaped cut-outs provided therein. In particular, these V-shaped cut-outs facilitate bending of the spline sections 196 and 197.

[00113] Referring to Figure 35, it is noted that the spline section has a relatively wide cross-sectional shape defined by a bulbous end portion 200 and an interior edge 201. One side of the spline section 196 includes slide ribs 202 while the opposite side includes a locking rib 203 thereon. This locking rib 203 projects outwardly and inwardly into the groove to tightly squeeze the material of the suspension fabric against the interior side wall of the spline groove 185.

[00114] Because of this wide shape, it is necessary to provide the patterns of cut-outs to facilitate bending of this wide plastic spline piece. More particularly, each of the spline sections 196 and 197 as illustrated in Figures 38 and 39 include first and second groups of V-shaped cut-outs 205, 206, 207 and 208 which correspond to the corners of the back frame, as well as additional individual cut-outs 209. The patterns of cut-outs at the corners 205, 206, 207 and 208 provide for a significant amount of bending while the

additional individual cut-outs 209 are only needed to provide gentle curvature.

[00115] As seen in Figures 36 and 37 the splines 196 and 197 initially have the cut-outs facing outwardly after which the spline sections 196 and 197 are sewn directly onto the fabric material 195 by the threads 193. These threads 193 pierce directly through the fabric material as well as the plastic of the spline sections 196 and 197.

[00116] To effect insertion of the spline 192 into the spline groove 185, the spline sections 196 and 197 are then flipped or folded inwardly wherein the edge 201 initially starts at the outside of the fabric 195 as seen in Figure 36 and then is folded inwardly so that it is seated within the inner end of the spline groove 185. The various cut-outs therefore first serve to permit bending to the shape illustrated in Figures 36 and 37 wherein the cut-outs are located along the outer edge and then are flipped inwardly and permits a reverse bend in the spline sections 196 and 197 with the cut-outs now being located on the inside end of the spline groove 185. In this manner, the spline 192 is installed by folding the spline inwardly and inserting same into the peripheral spline groove 185 formed in the back frame 180.

[00117] Although particular preferred embodiments of the invention have been disclosed in detail for illustrative purposes, it will be recognized that variations or modifications of the disclosed apparatus, including the rearrangement of parts, lie within the scope of the present invention.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A chair comprising a seat assembly having a seat frame, a back assembly supported rearwardly adjacent to said seat assembly and comprising a peripheral back frame projecting above the seat frame and having an annular shape which has an inner periphery and an outer periphery and which defines an open area bounded by said inner periphery, the back assembly further including a suspension fabric which overlies the open area and is secured at its periphery to the outer periphery of the back frame, wherein the back frame comprises front and rear back frame sections having rear and front interior faces which fit one over the other in opposing facing relation at their interface and are fixed together, and in that a peripheral channel is defined in the outer periphery between the front and back frame sections at the interface therebetween, and opens radially outwardly to the side of said back frame to receive the periphery of the suspension fabric in a taut condition extending across a front exterior face of the back frame.

2. A chair according to Claim 1, wherein said front and rear frame sections are contoured moulded frames having a contour such that said opposing interior faces of said front and rear frame sections have a three-dimensional shape such that each of said interior faces is curved.

3. A chair according to Claim 1 or 2, wherein said interior faces abut in continuous contact with each other about the periphery of said back frame.

4. A chair according to any one claims 1 to 3, wherein said fabric is affixed continuously about the periphery thereof to the corresponding peripheral edge of said back frame.

5. A chair according to any one of claims 1 to 4, wherein said suspension fabric is stretched to a taut condition when said periphery of said fabric is joined to said back frame.

6. A chair according to any one of claims 1 to 5, wherein said back frame is supported on said seat assembly by a column structure comprising an upright support column having a lower end joined to said seat assembly by a base connector such that said support column is supported in cantilevered relation with respect to said seat assembly, an upper end portion of said support column including transverse column arms which extend sidewardly from said support column and have outer sideward ends which are joined to said back frame intermediate the upper and lower edges of said back frame, said support column having separated left and right column halves which each support a respective one of said transverse arms thereon such that said column halves and said arms are movable separate from each other at the upper end portion of said support column while said column halves are joined together at the bottom end of said support column proximate to said

base connector, said column halves permitting separate movement of said back frame on the left and right sides thereof.

7. A chair according to any one of claims 1 to 6, wherein said back frame is joined to said seat assembly by a base connector wherein said base connector is a bayonet connector which projects downwardly and has a tapered shape which tapers inwardly in the downward direction; and

said seat assembly comprises an upright having a front end joined to said seat assembly and a rearward end which extends rearwardly and joins to said bayonet connector of said back frame, said upright comprising separate frame sections on opposite sides of said chair which have respective front ends joined to said seat assembly and respective rearward ends which converge towards each other and abut against each other to define a connector hub, said connector hub comprising an upward opening socket in which said bayonet connector is slidably received and fixedly joined thereto.

8. A chair according to Claim 1, wherein said periphery of said suspension fabric is in non-removable engagement with said peripheral channel.

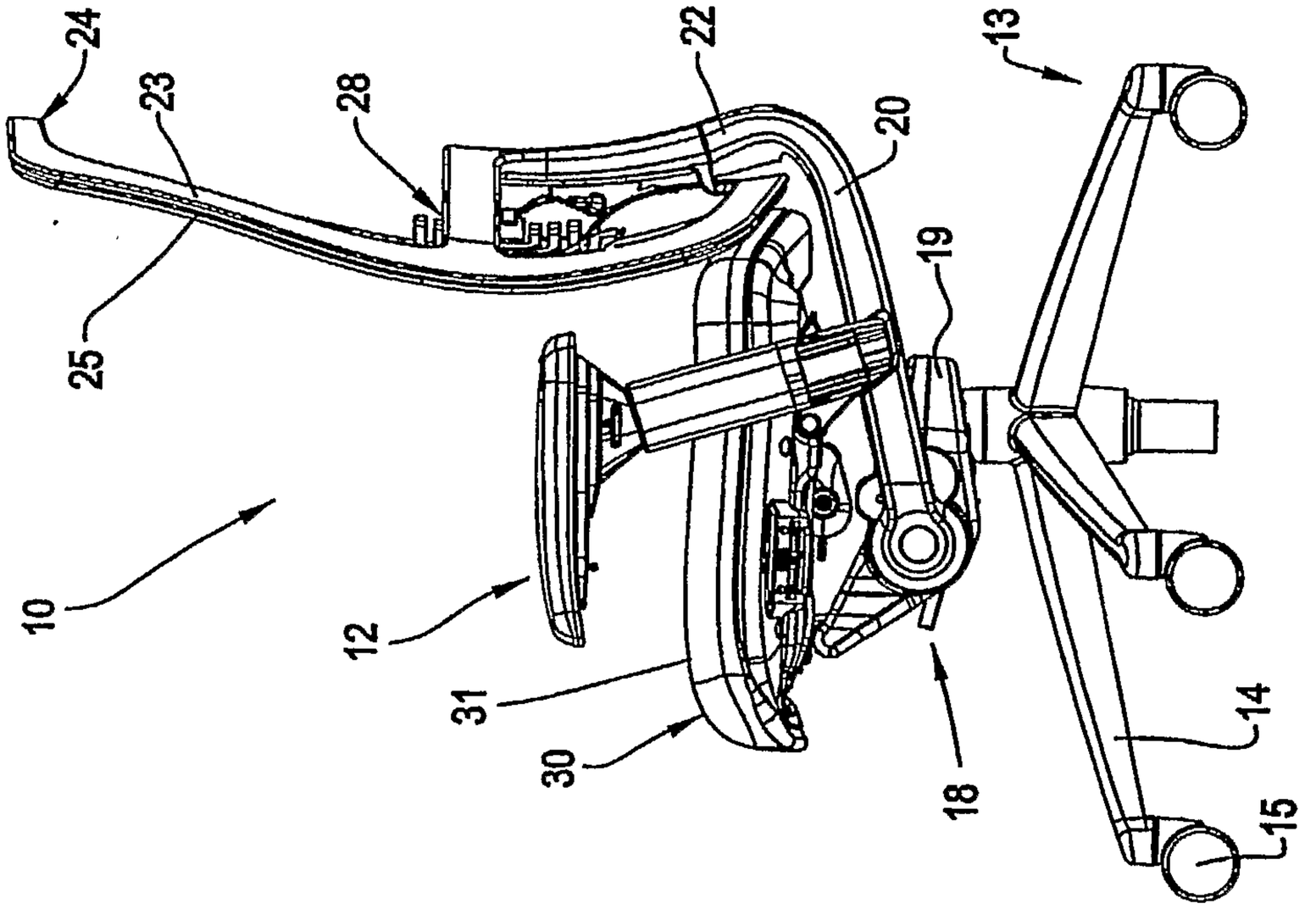
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FIG. 2

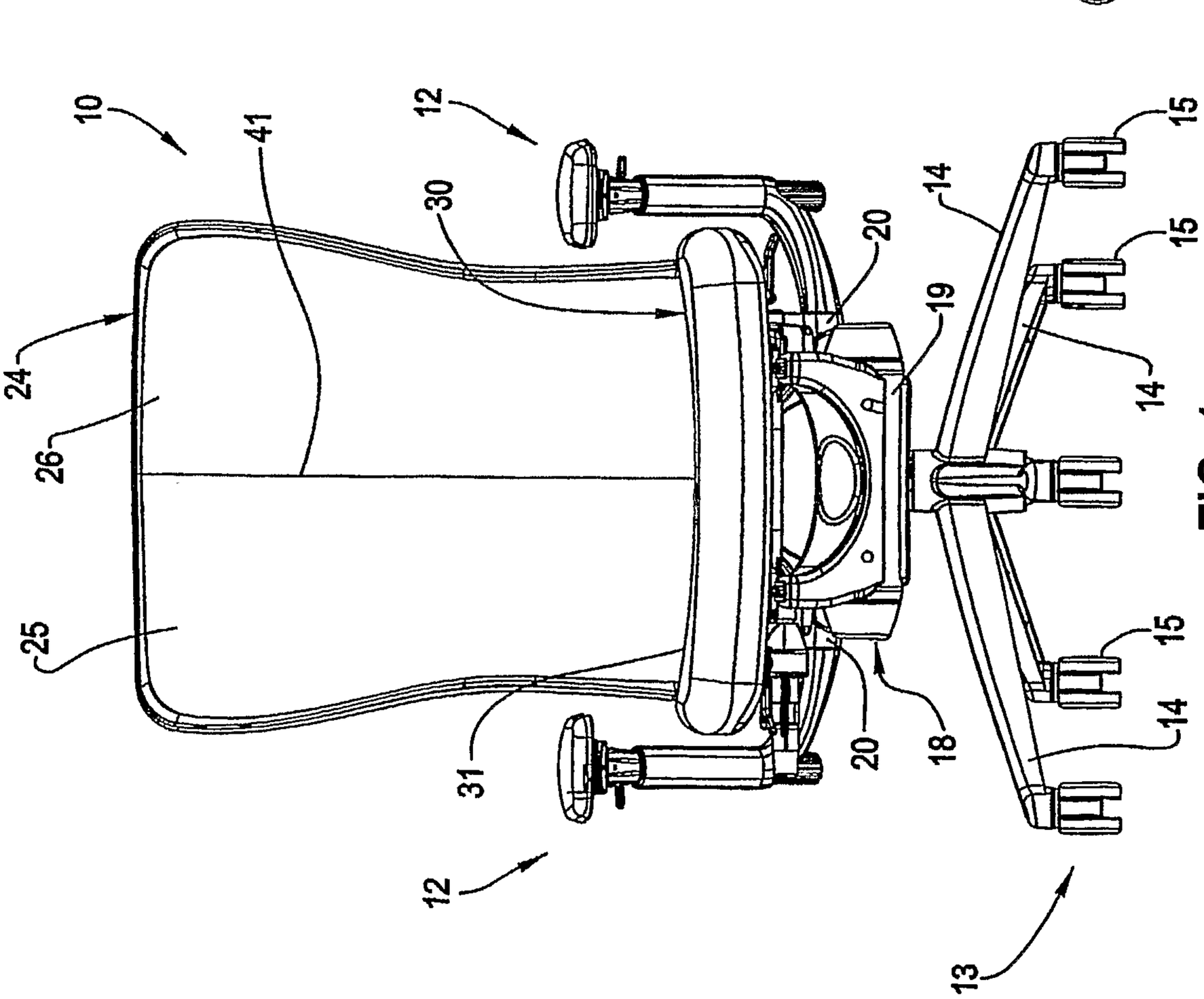
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FIG. 1

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FIG. 4

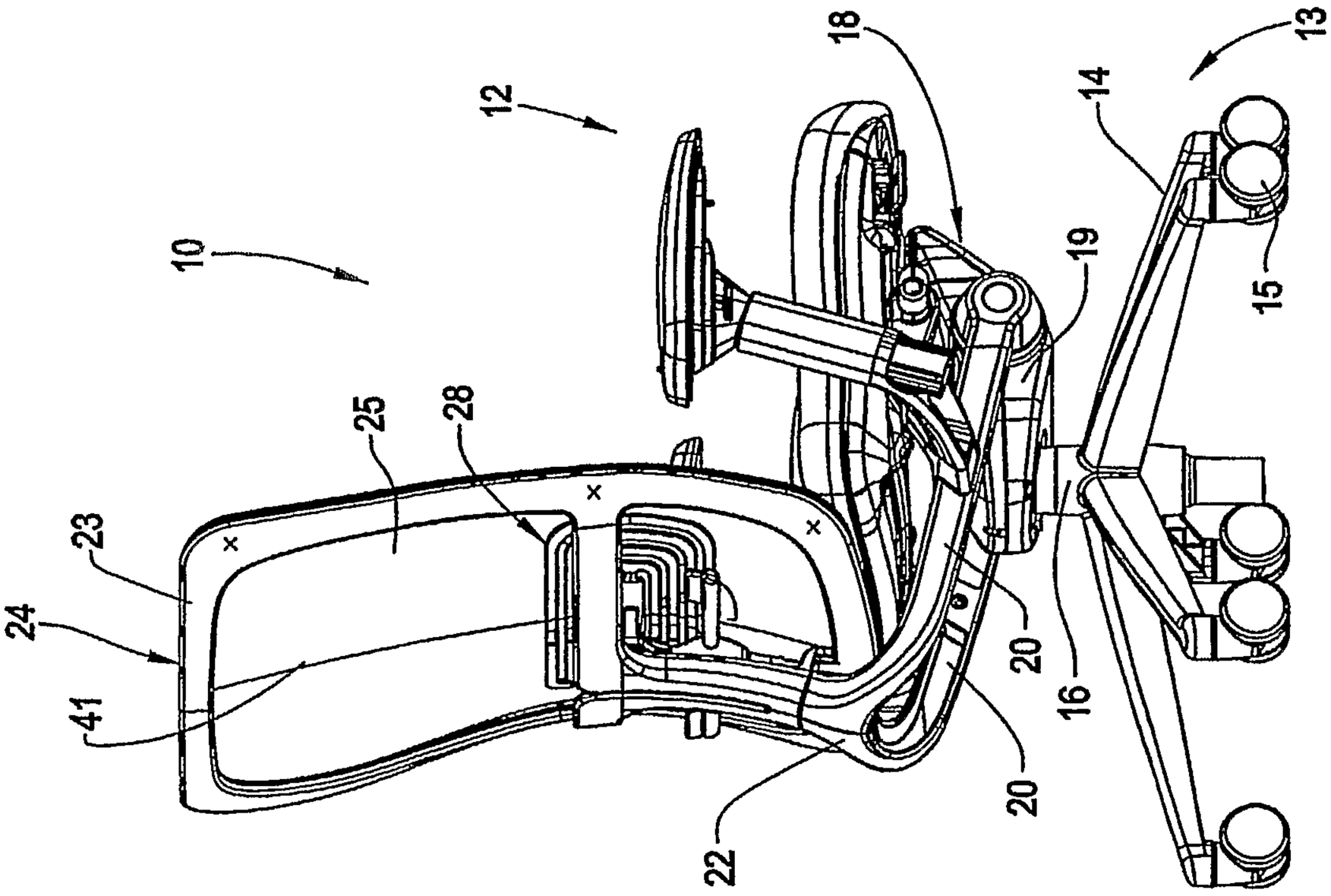
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FIG. 3

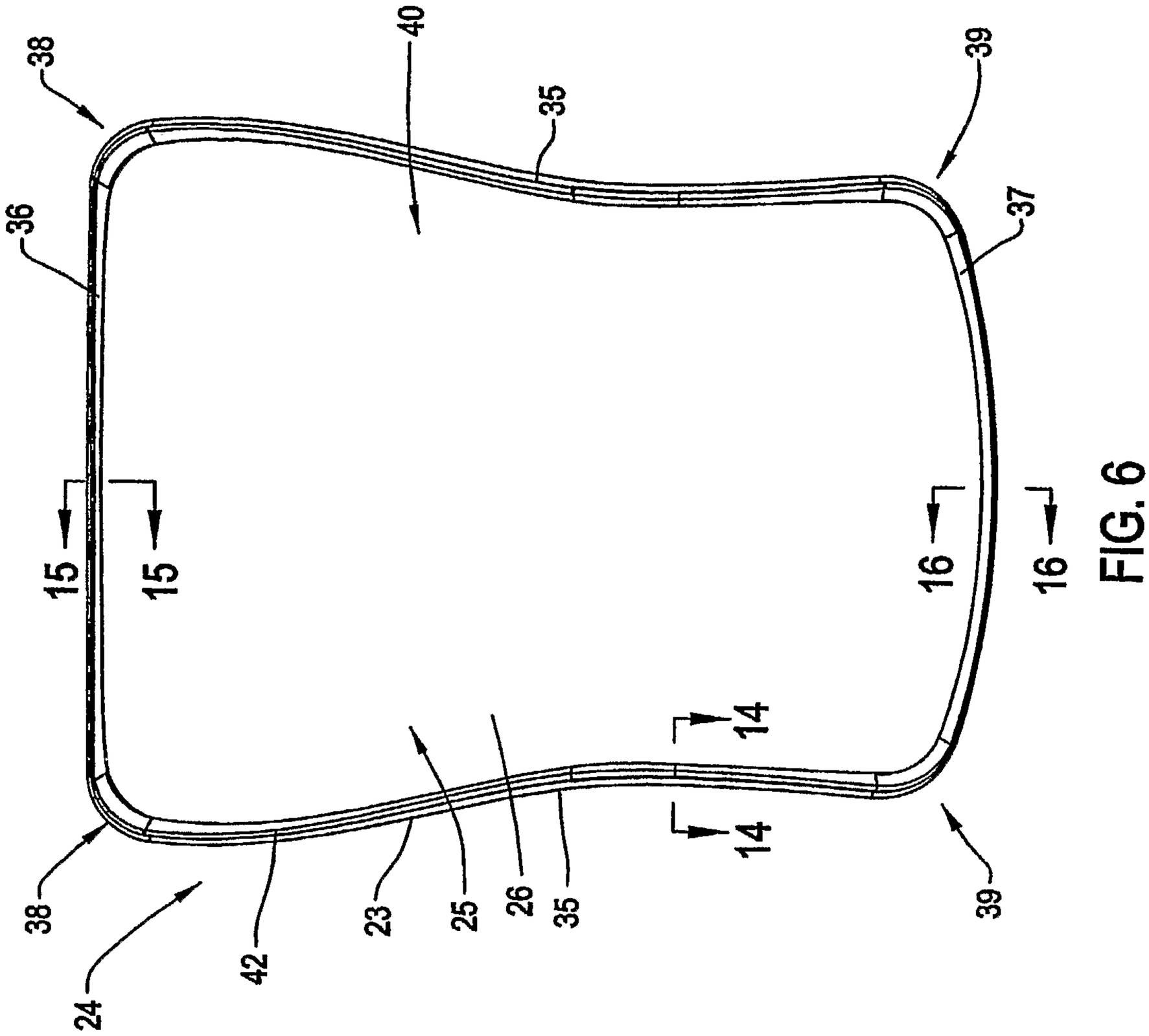
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FIG. 6

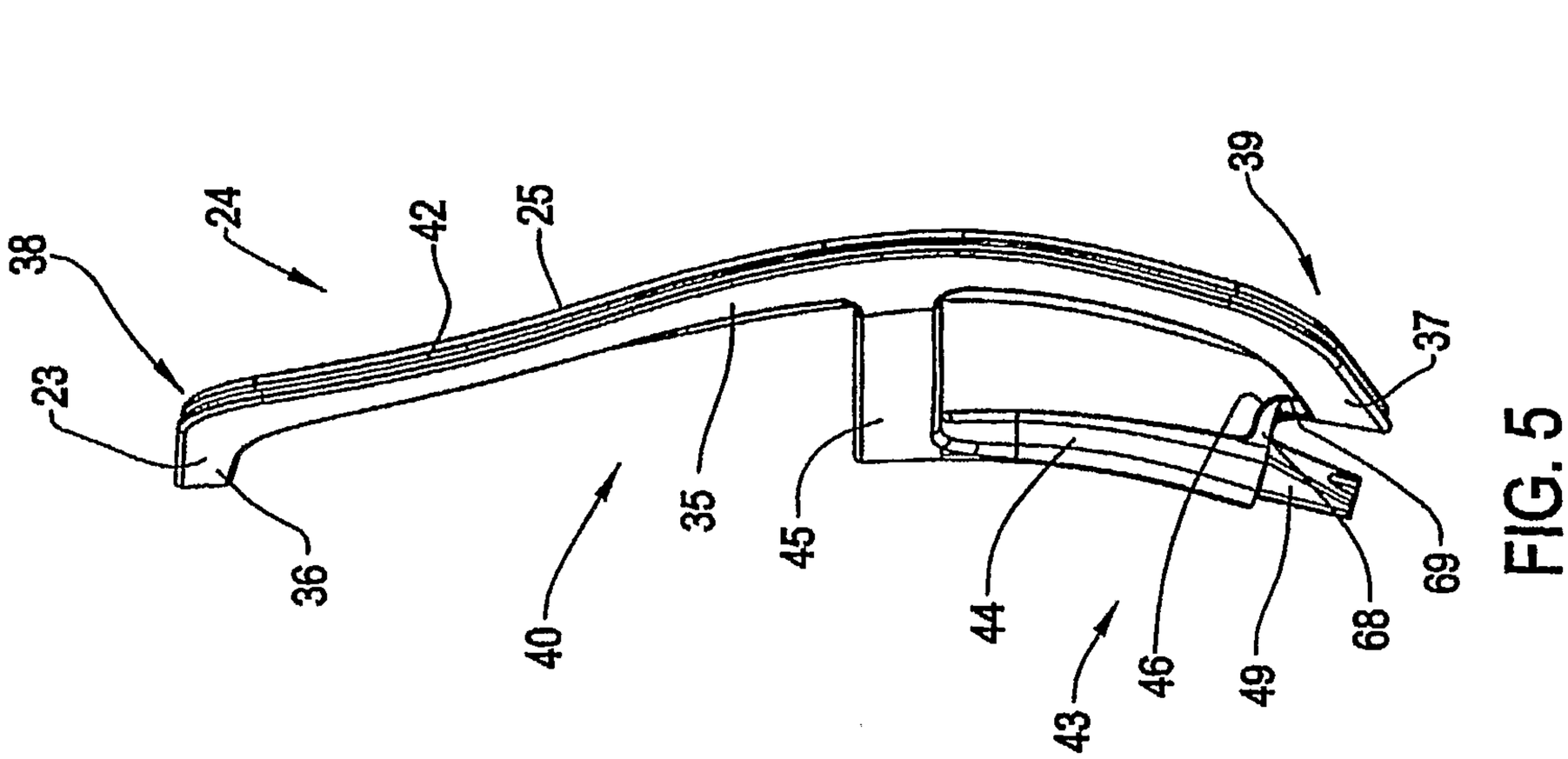
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FIG. 5

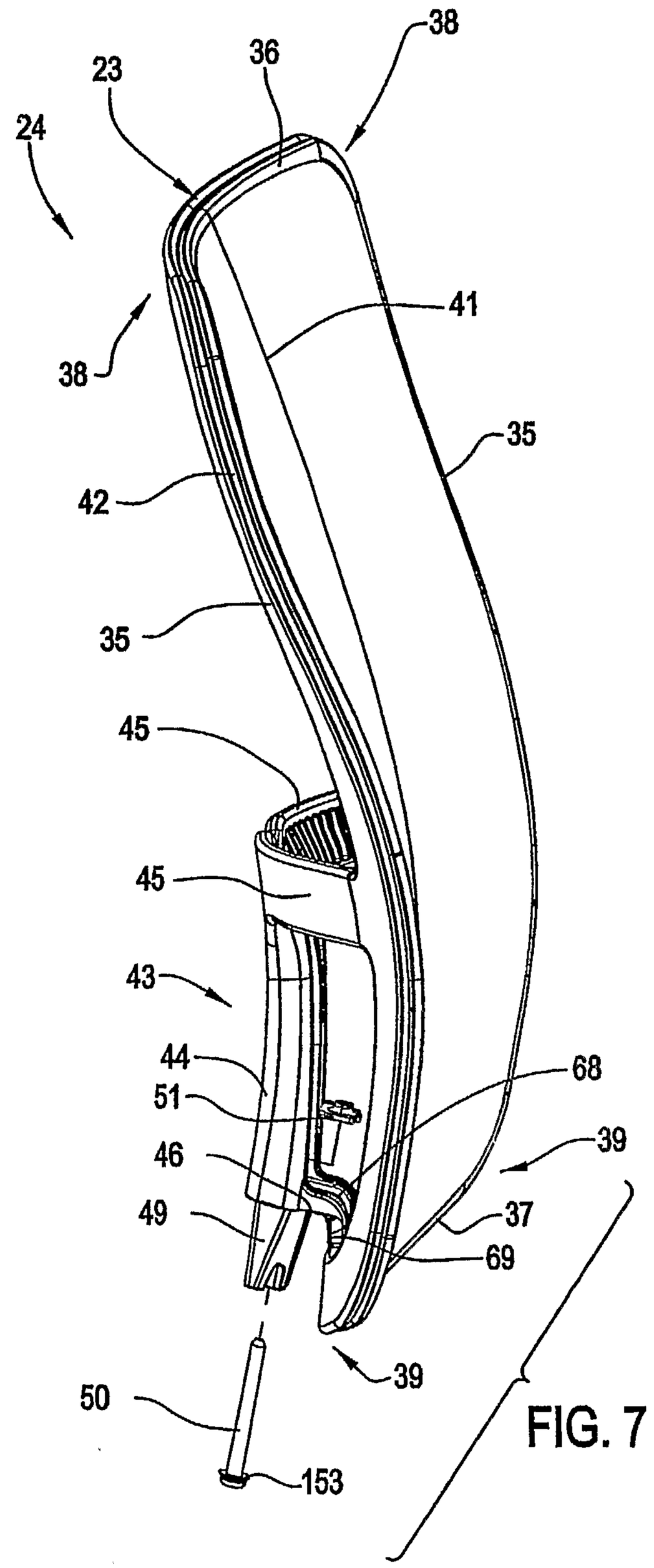


FIG. 7

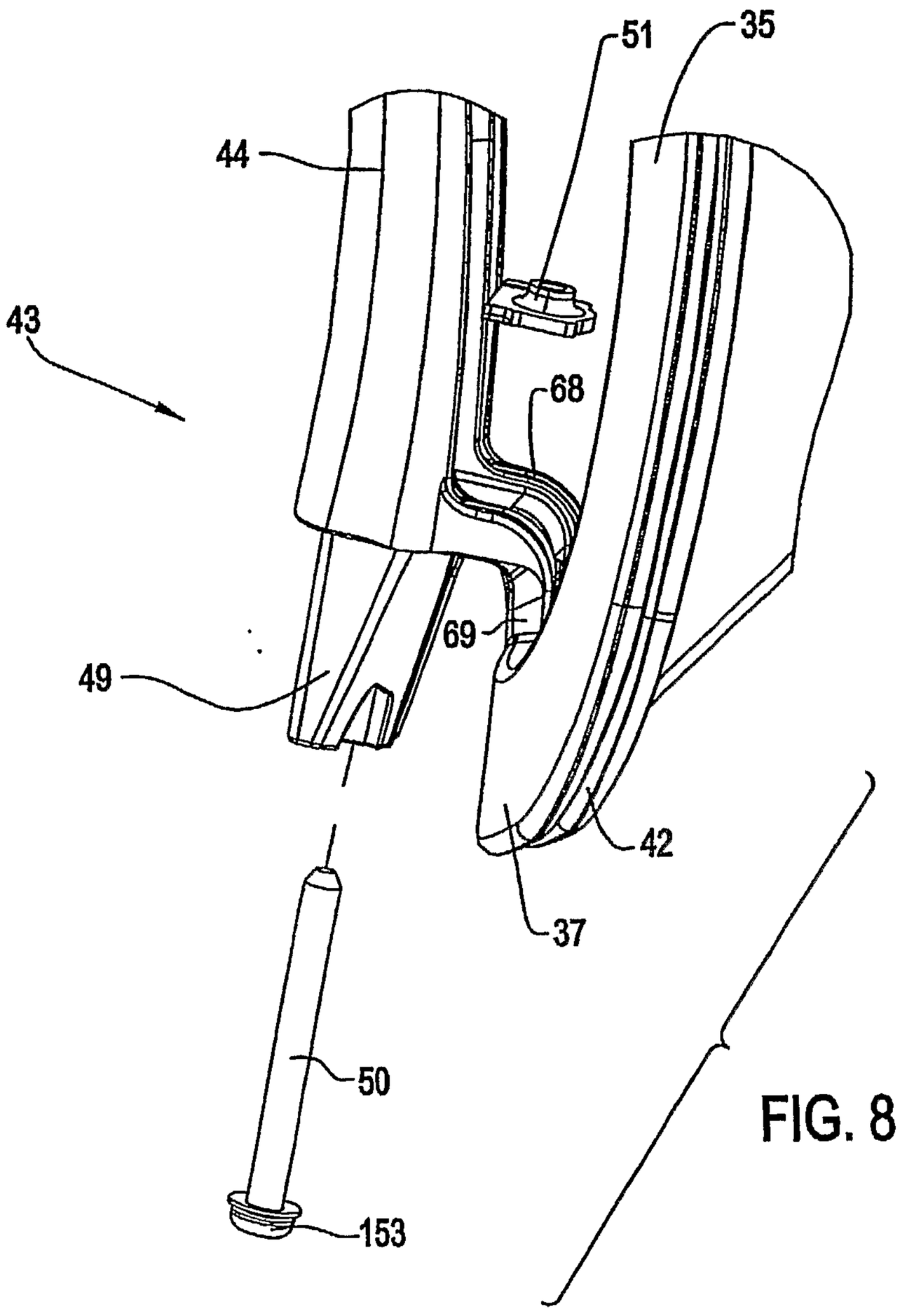


FIG. 8

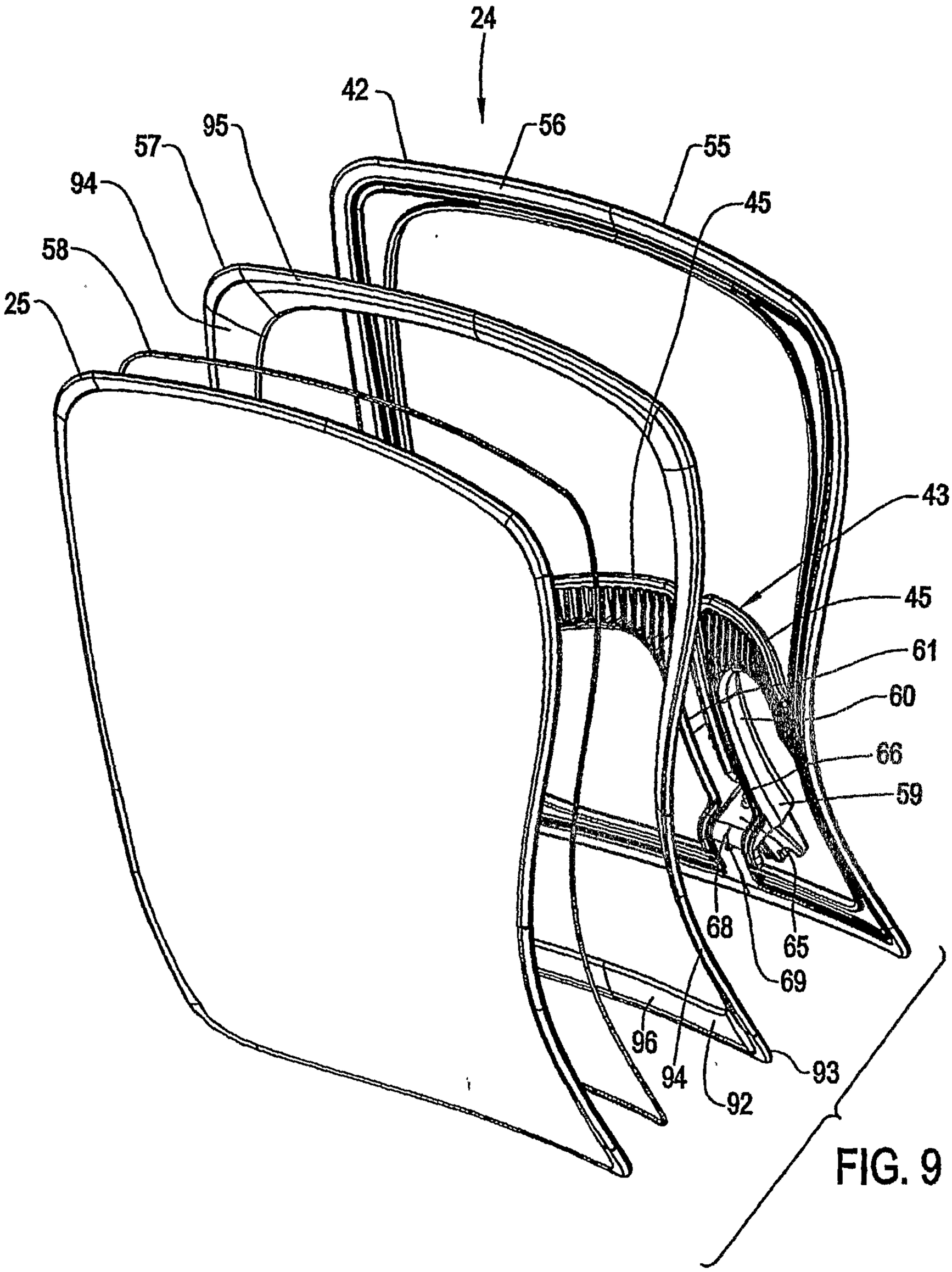
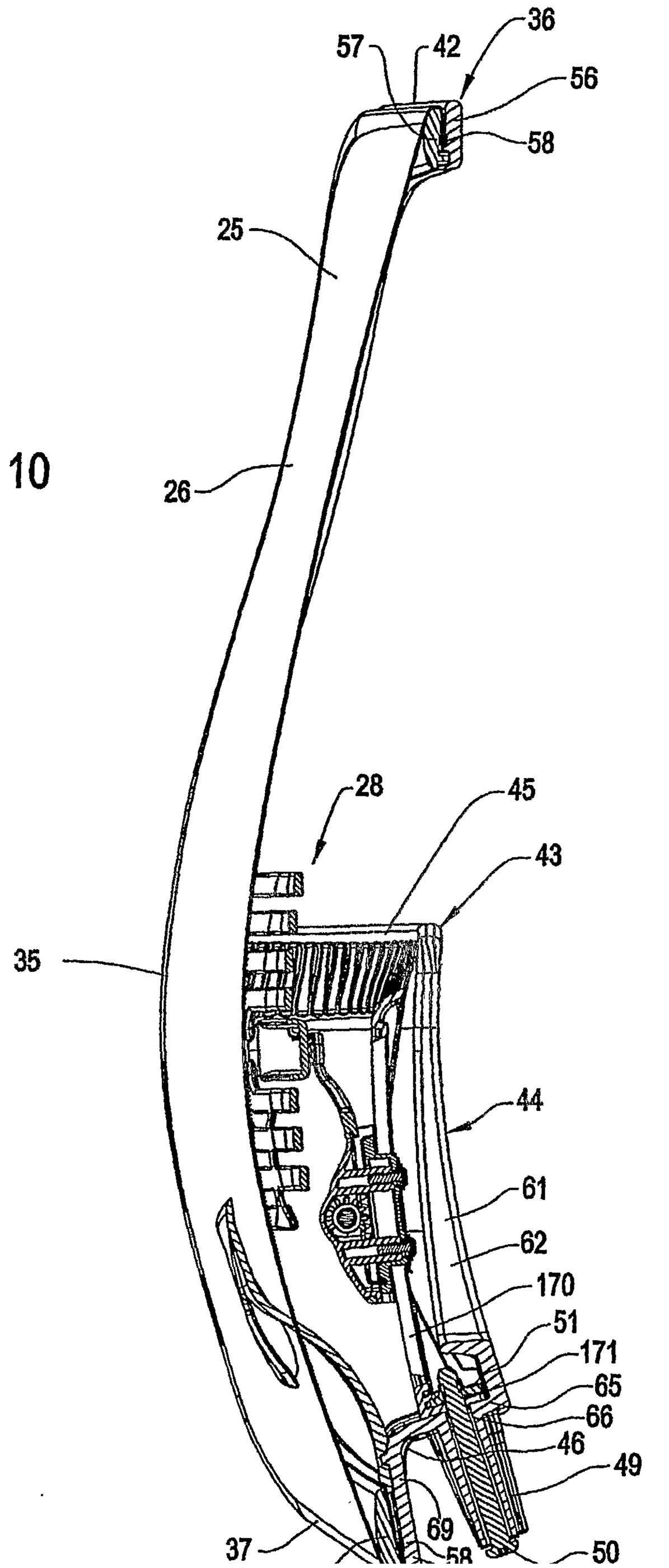


FIG. 9

FIG. 10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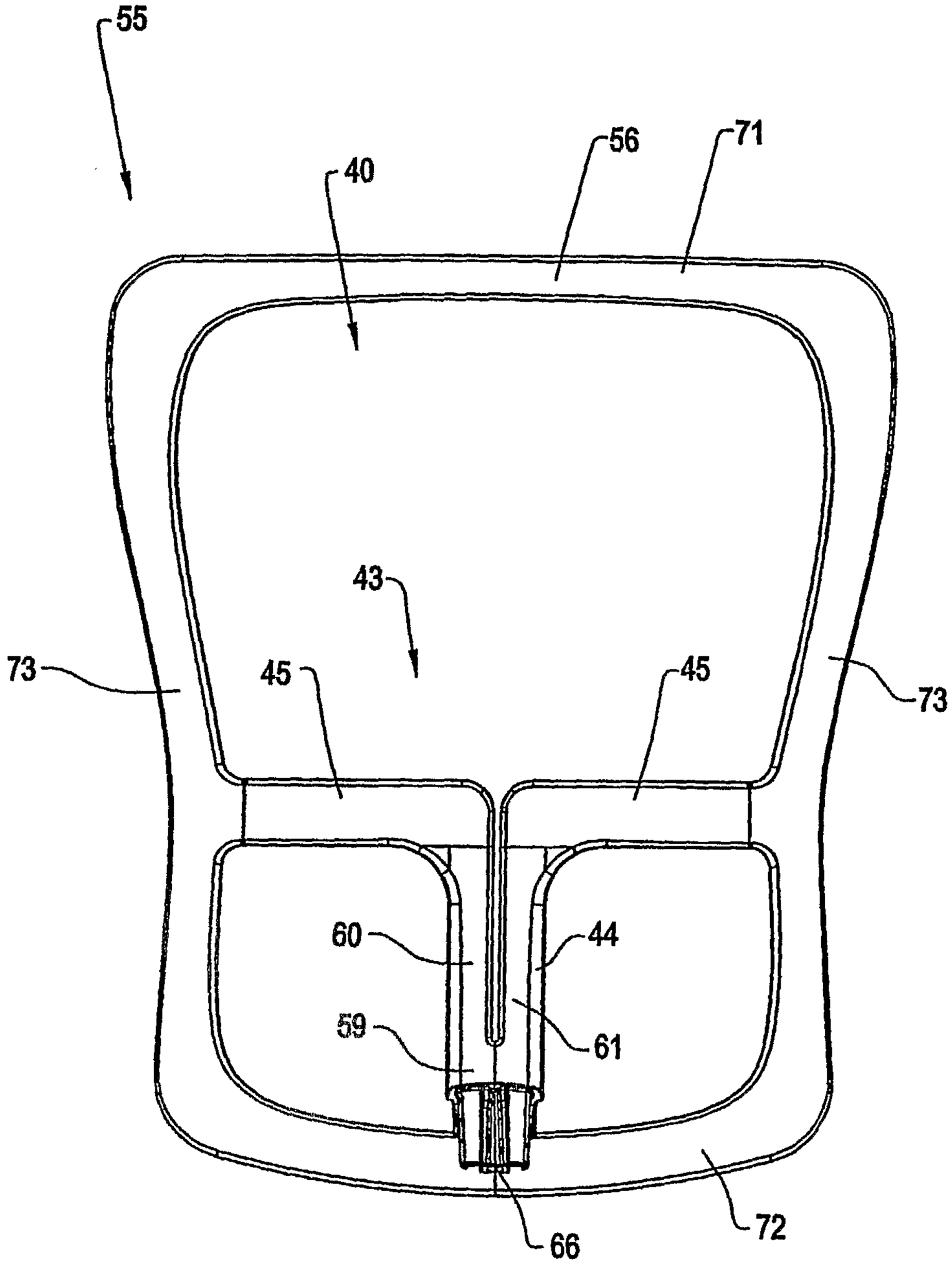

FIG. 11

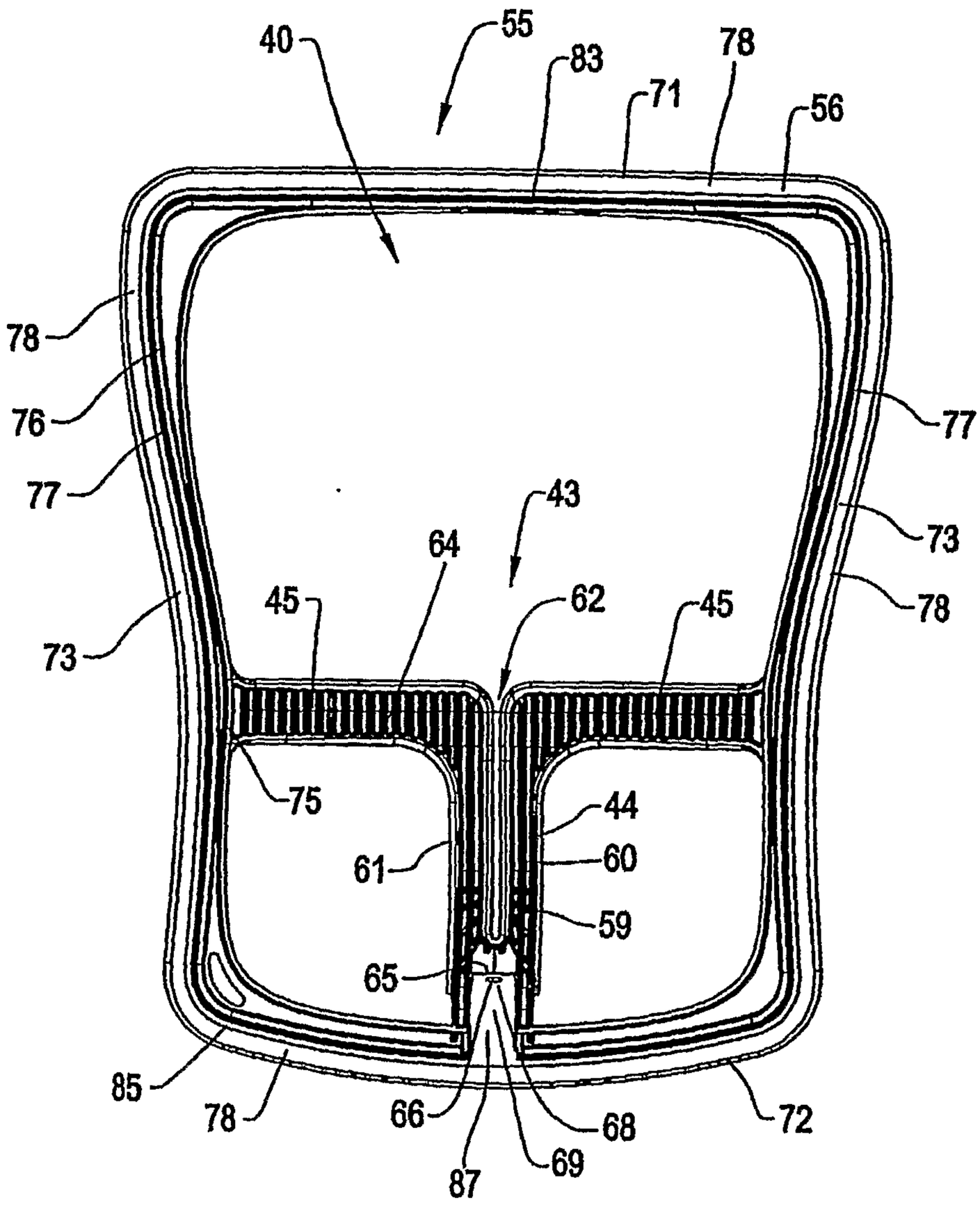
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FIG. 12

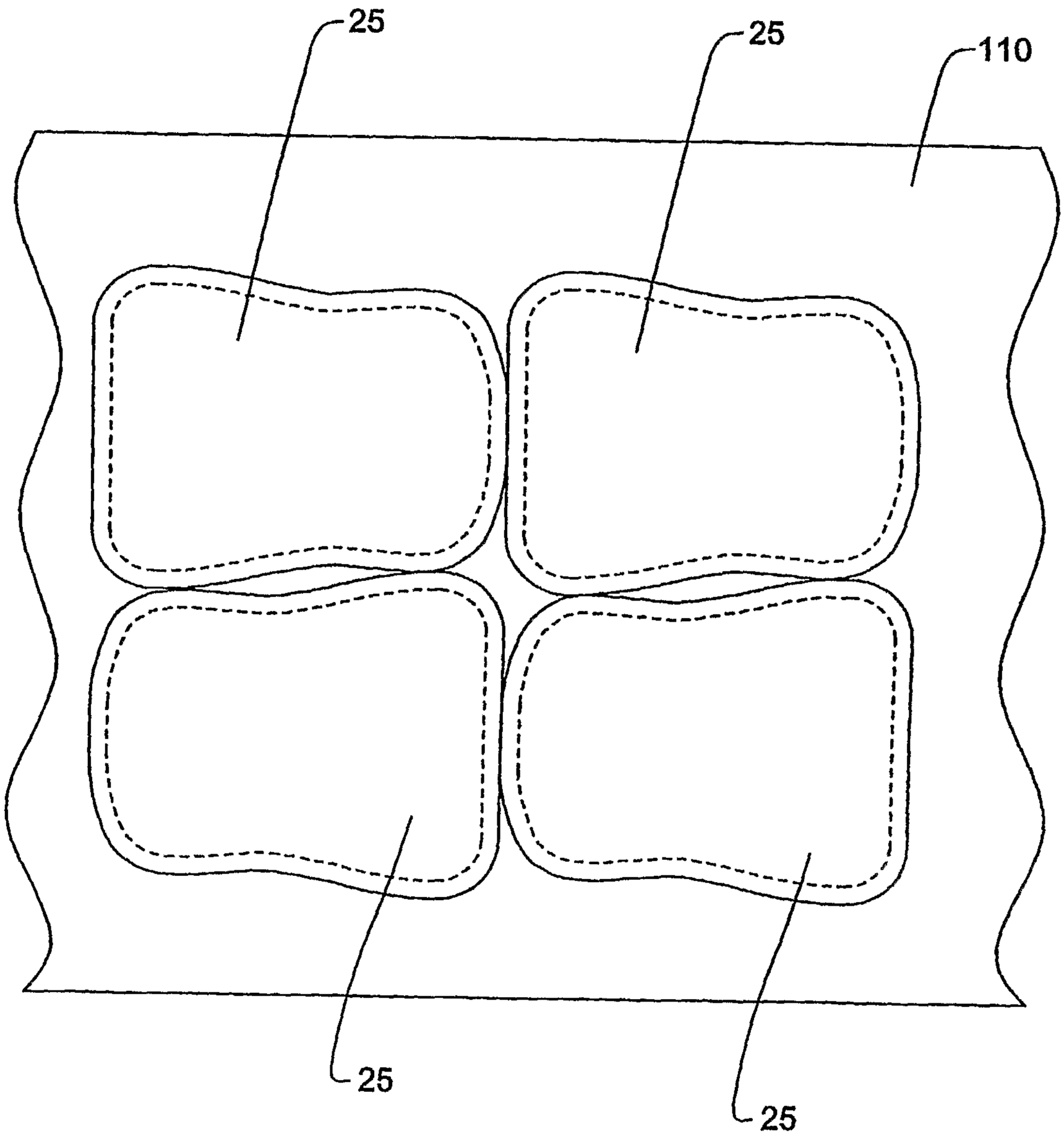

FIG. 13

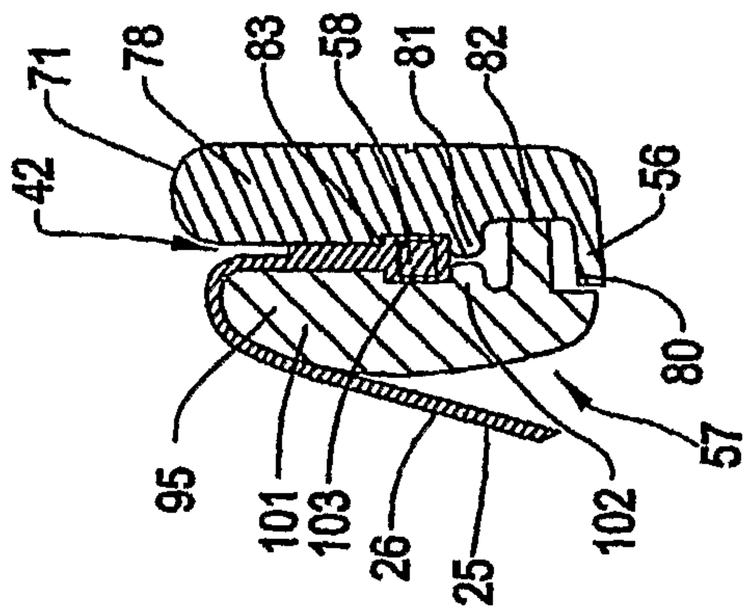
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FIG. 15

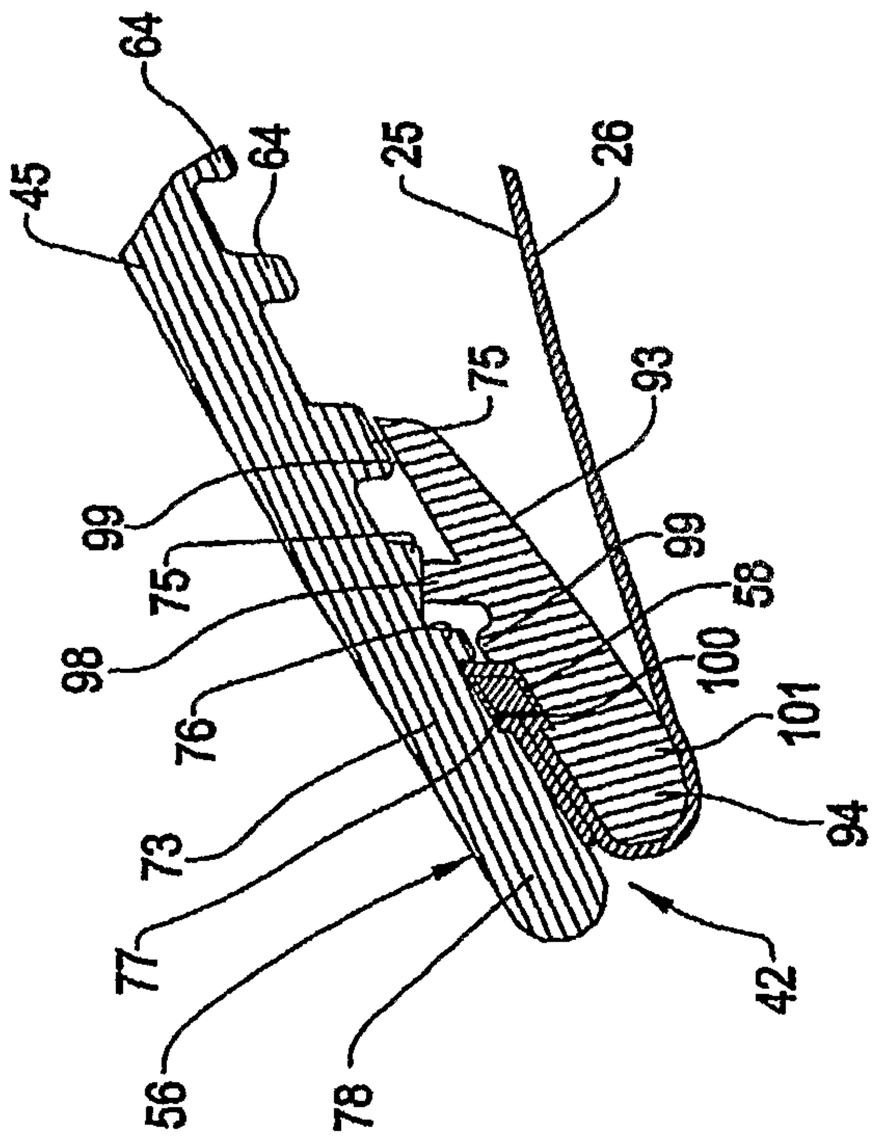
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FIG. 14

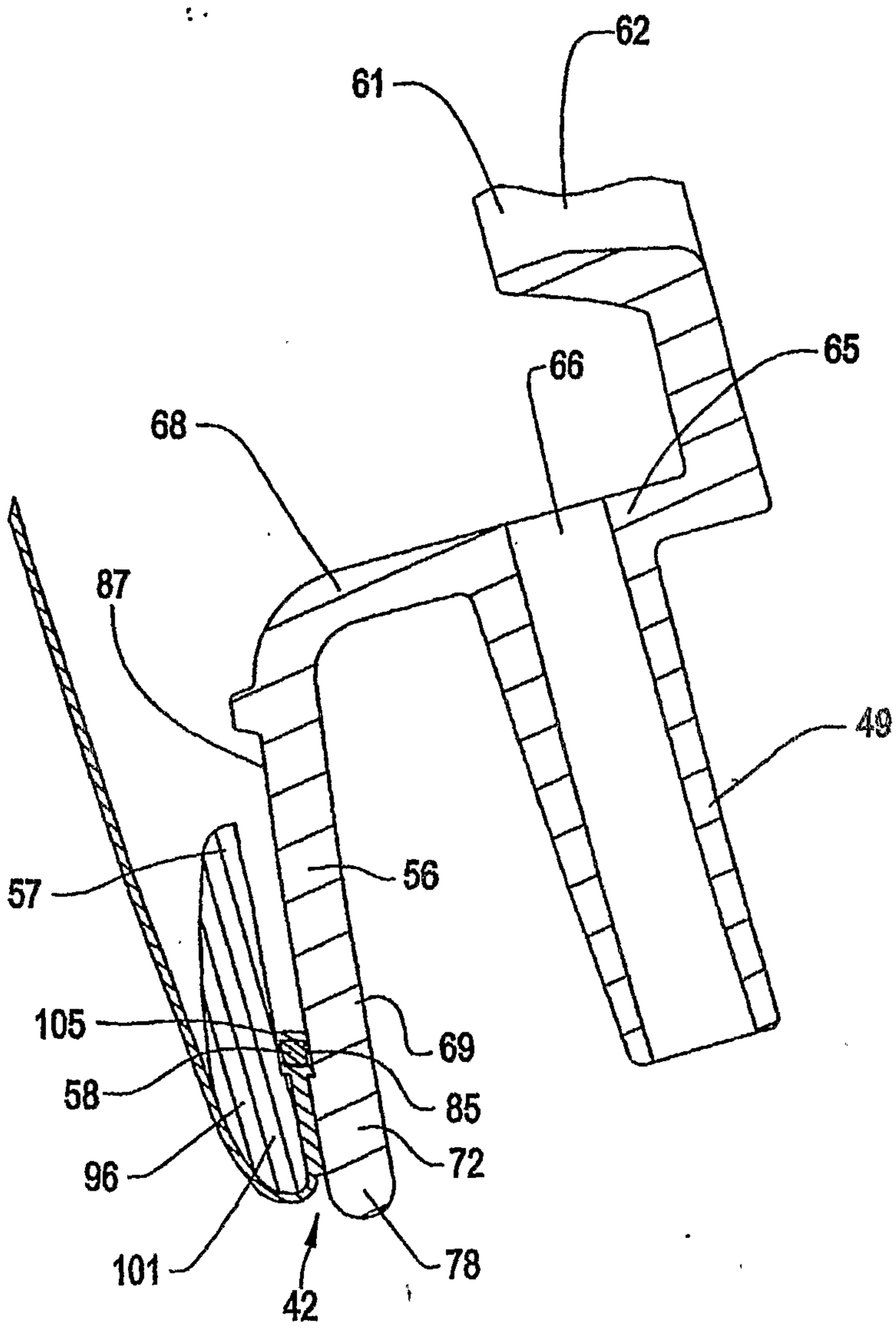

FIG. 16

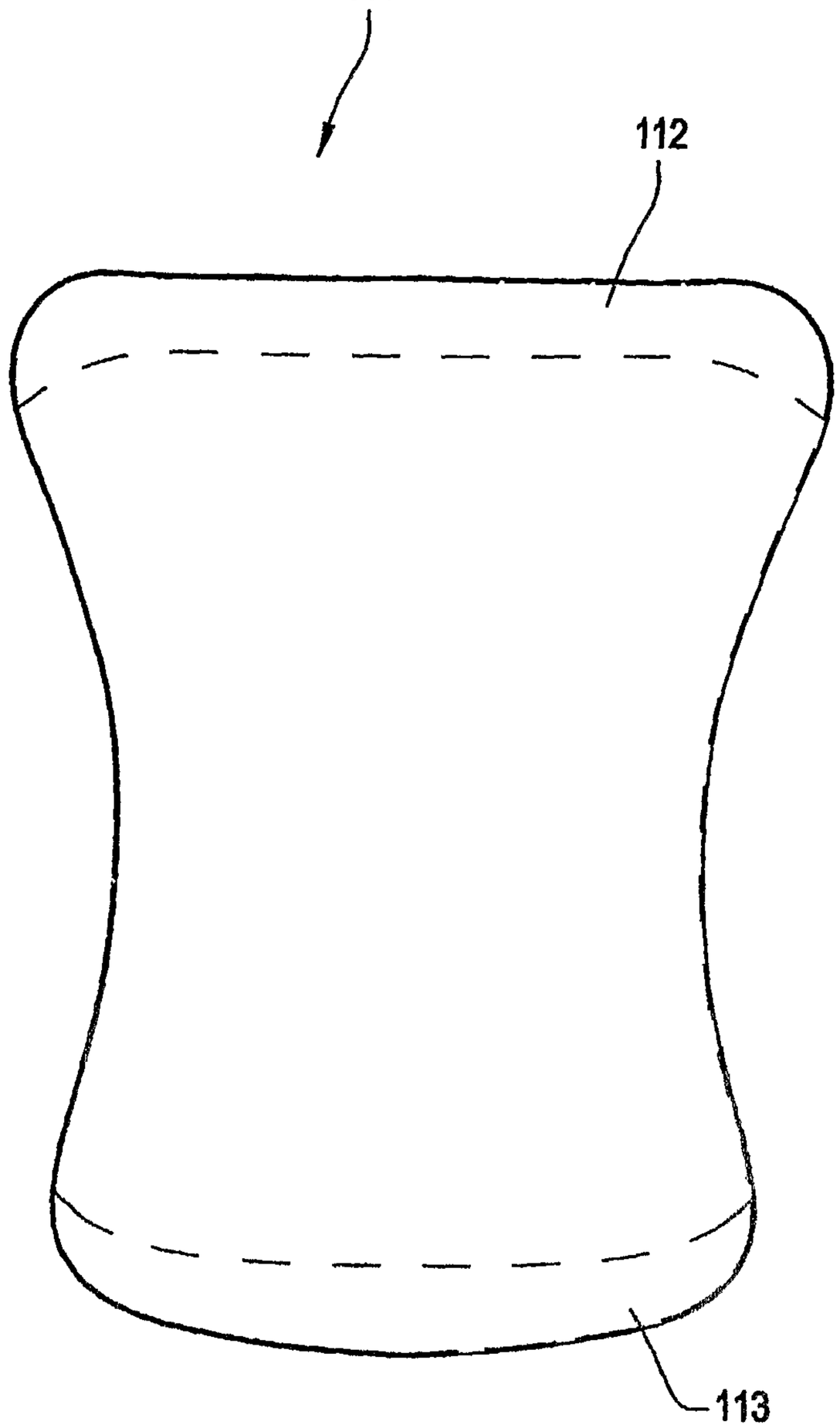

FIG. 17

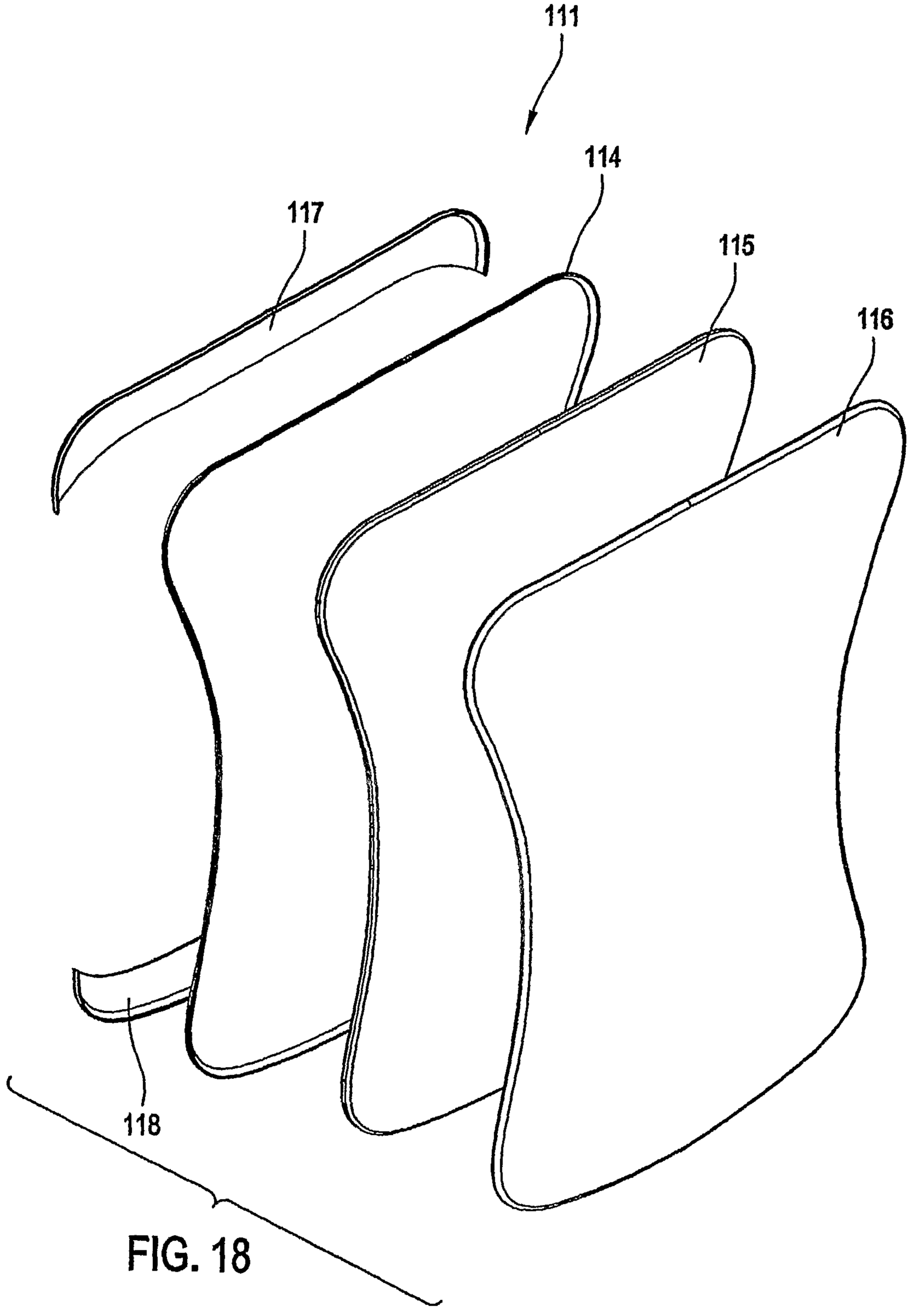

FIG. 18

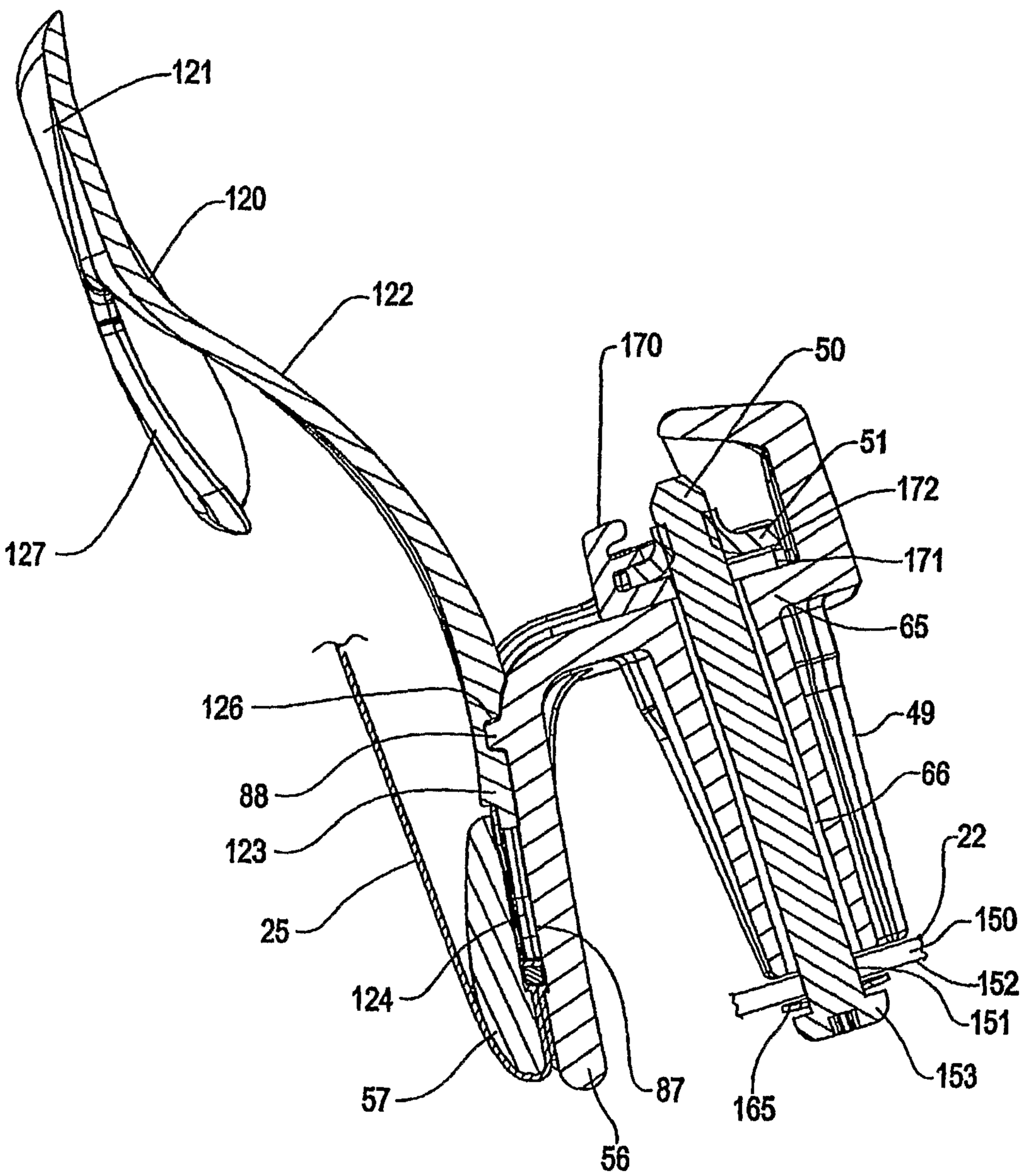
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FIG. 19

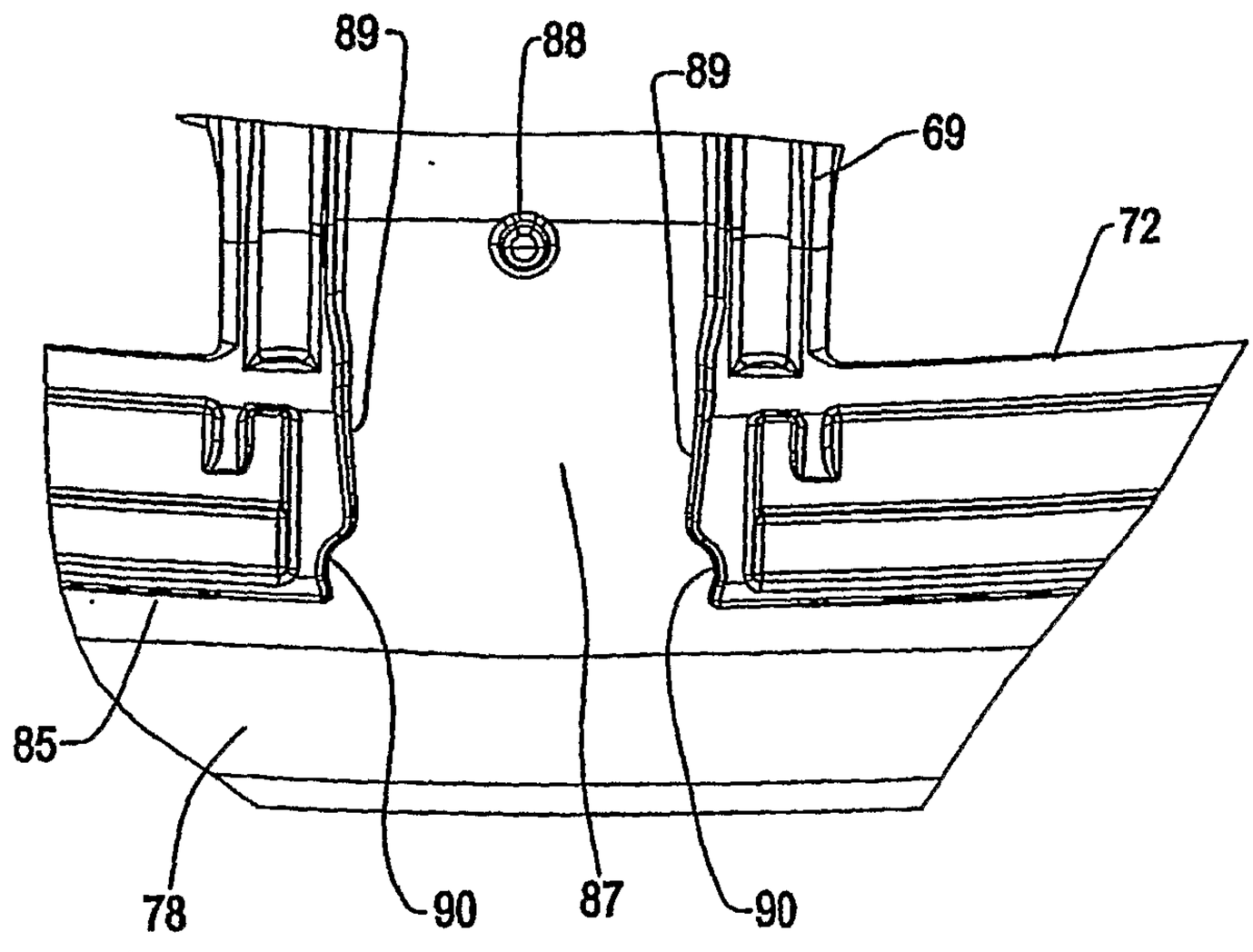

FIG. 20

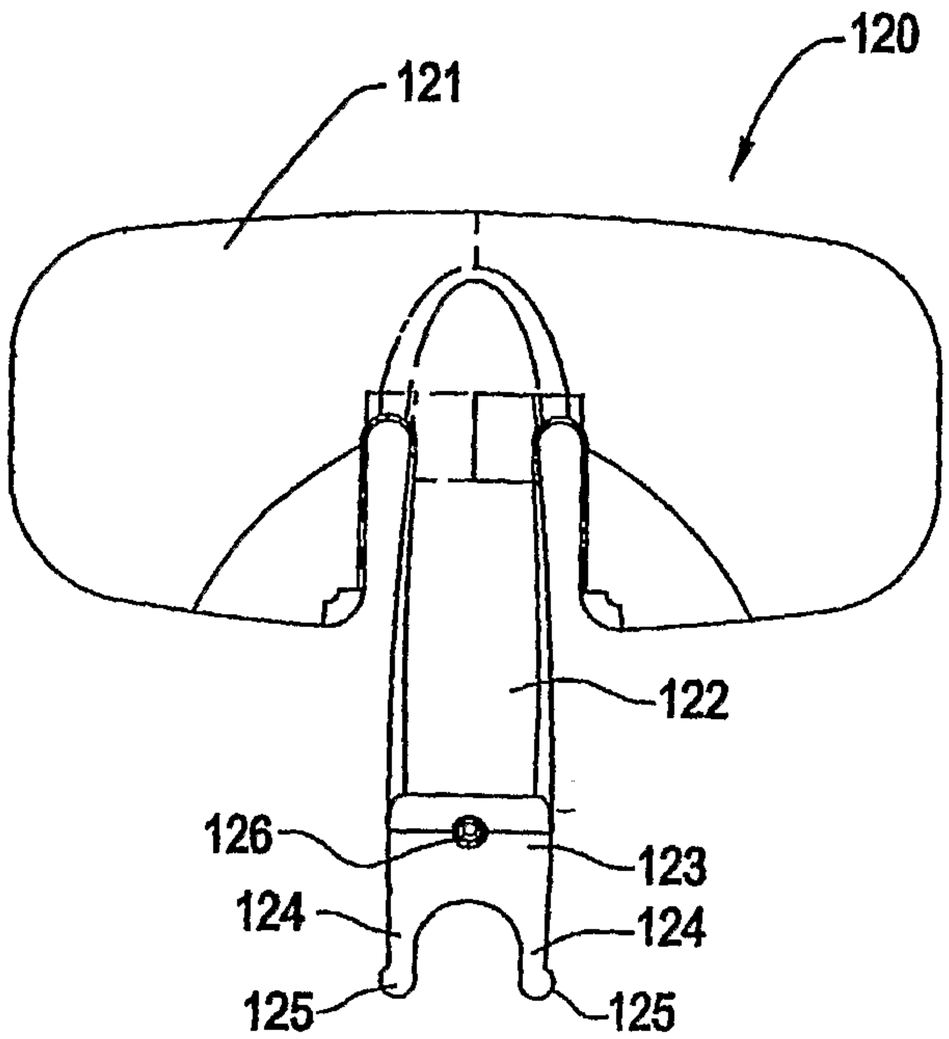

FIG. 21

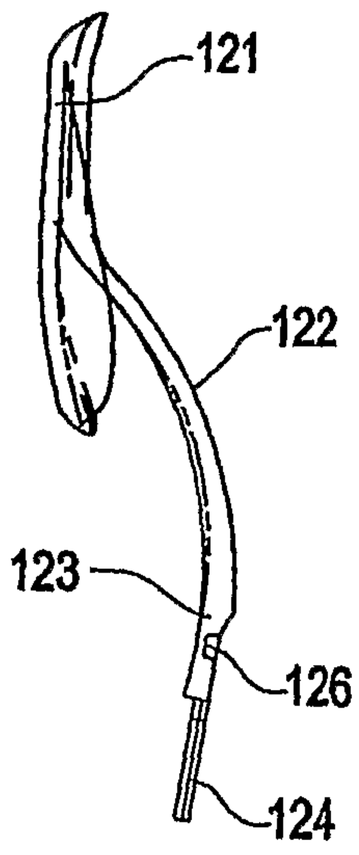

FIG. 22

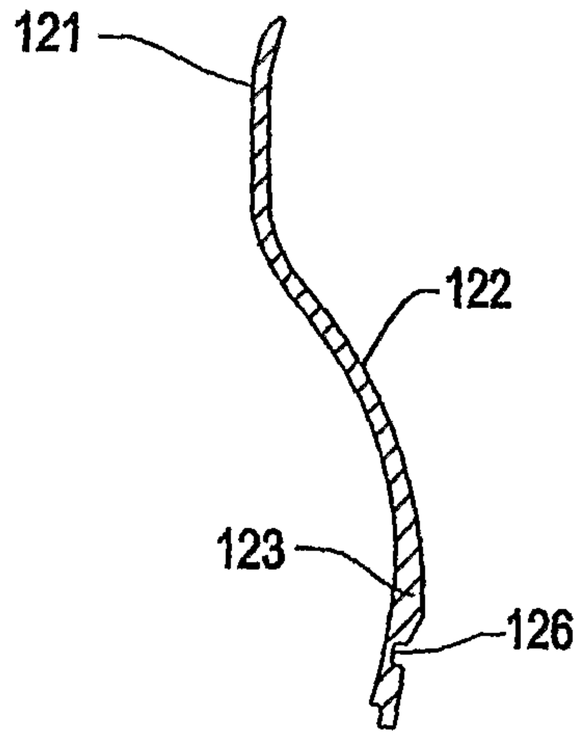

FIG. 23

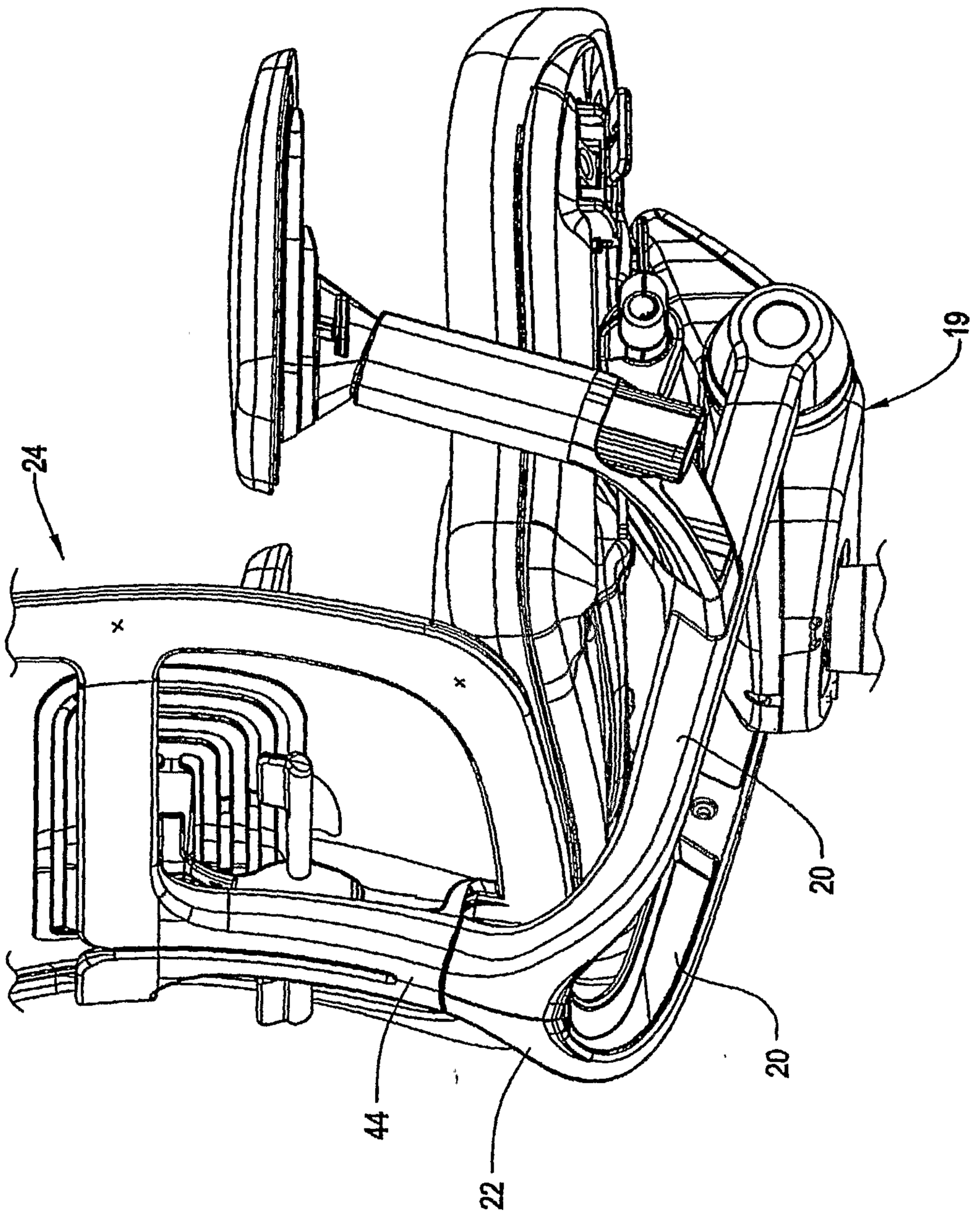

FIG. 24

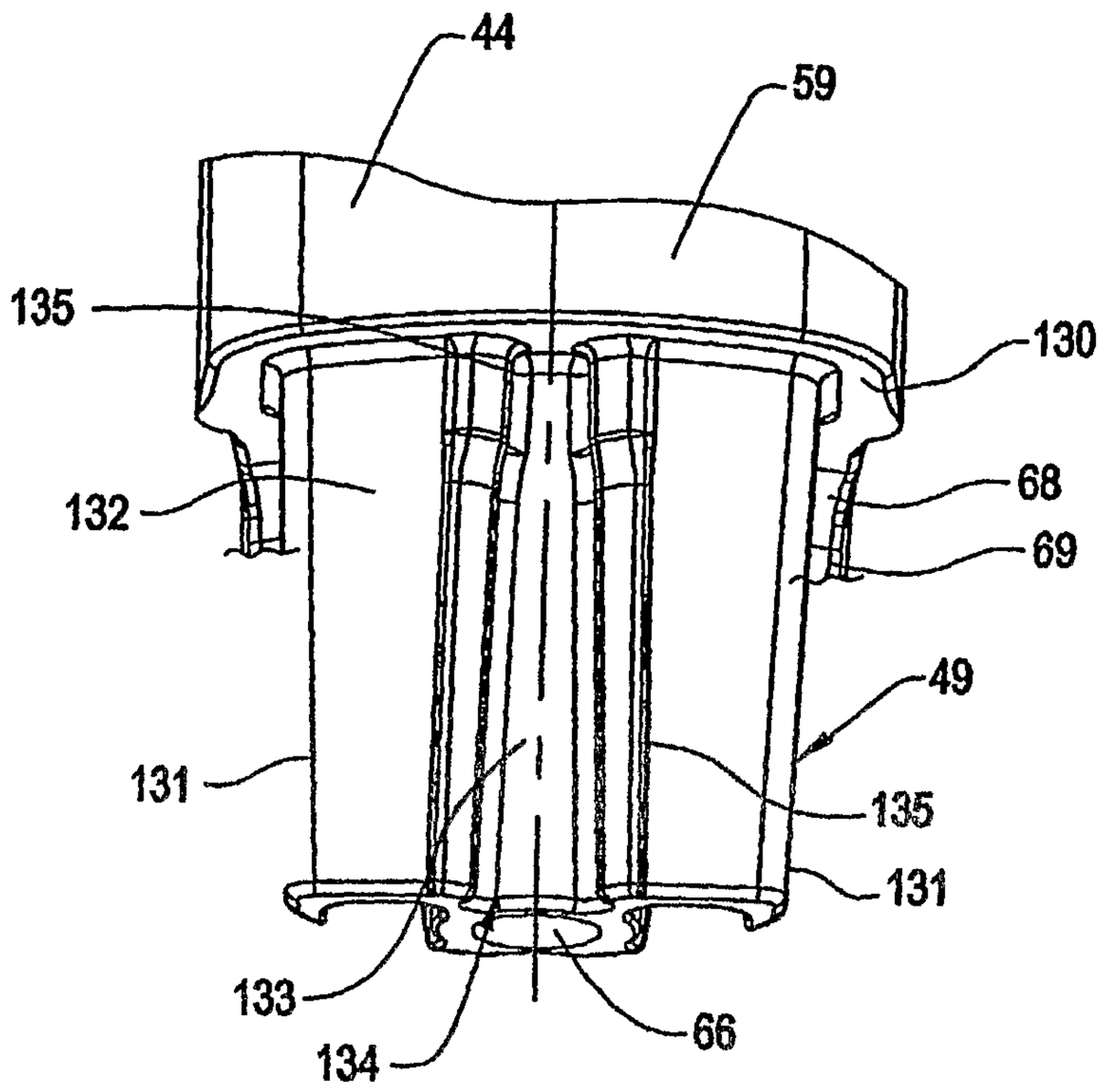

FIG. 25

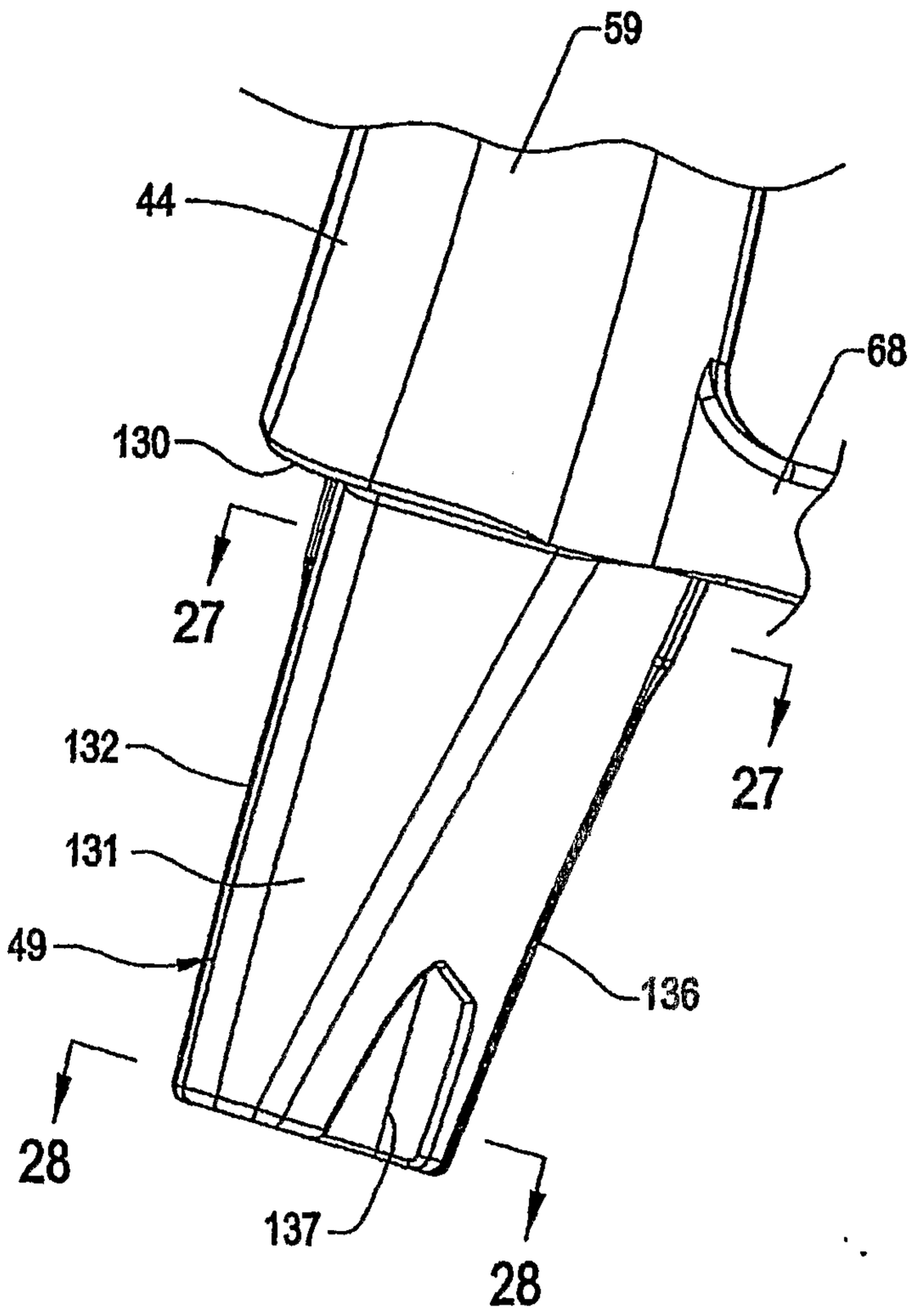

FIG. 26

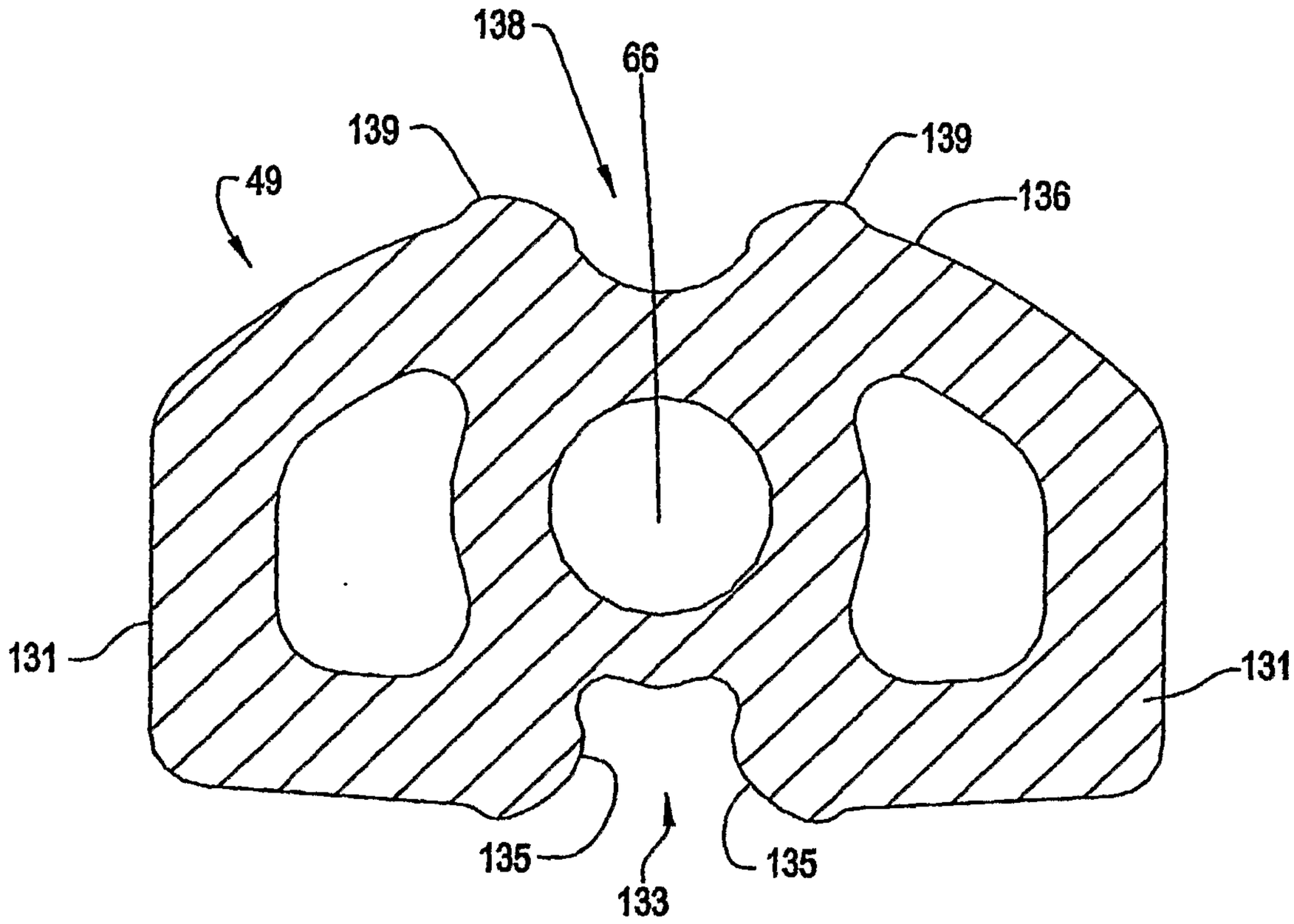
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FIG. 27

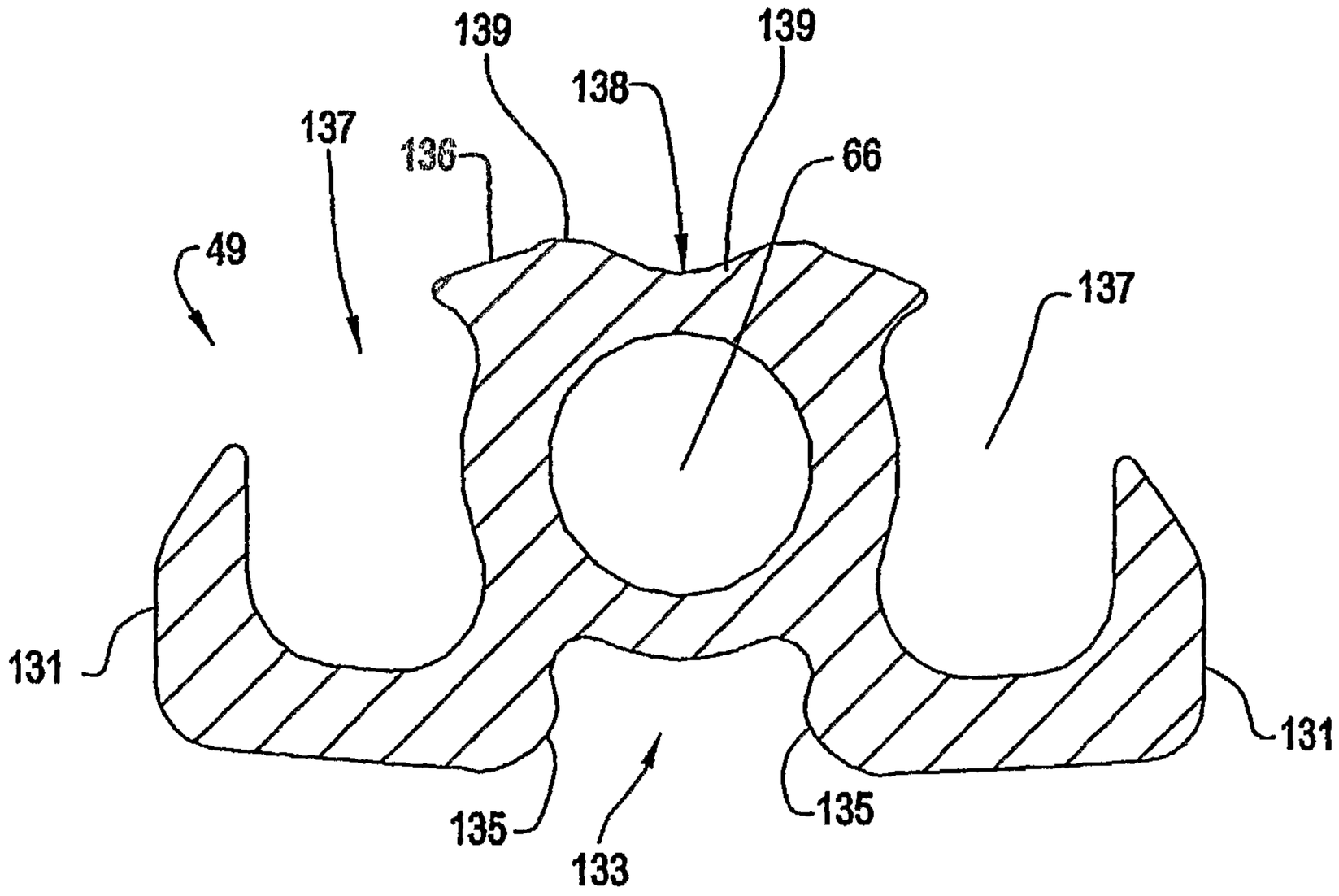
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FIG. 28

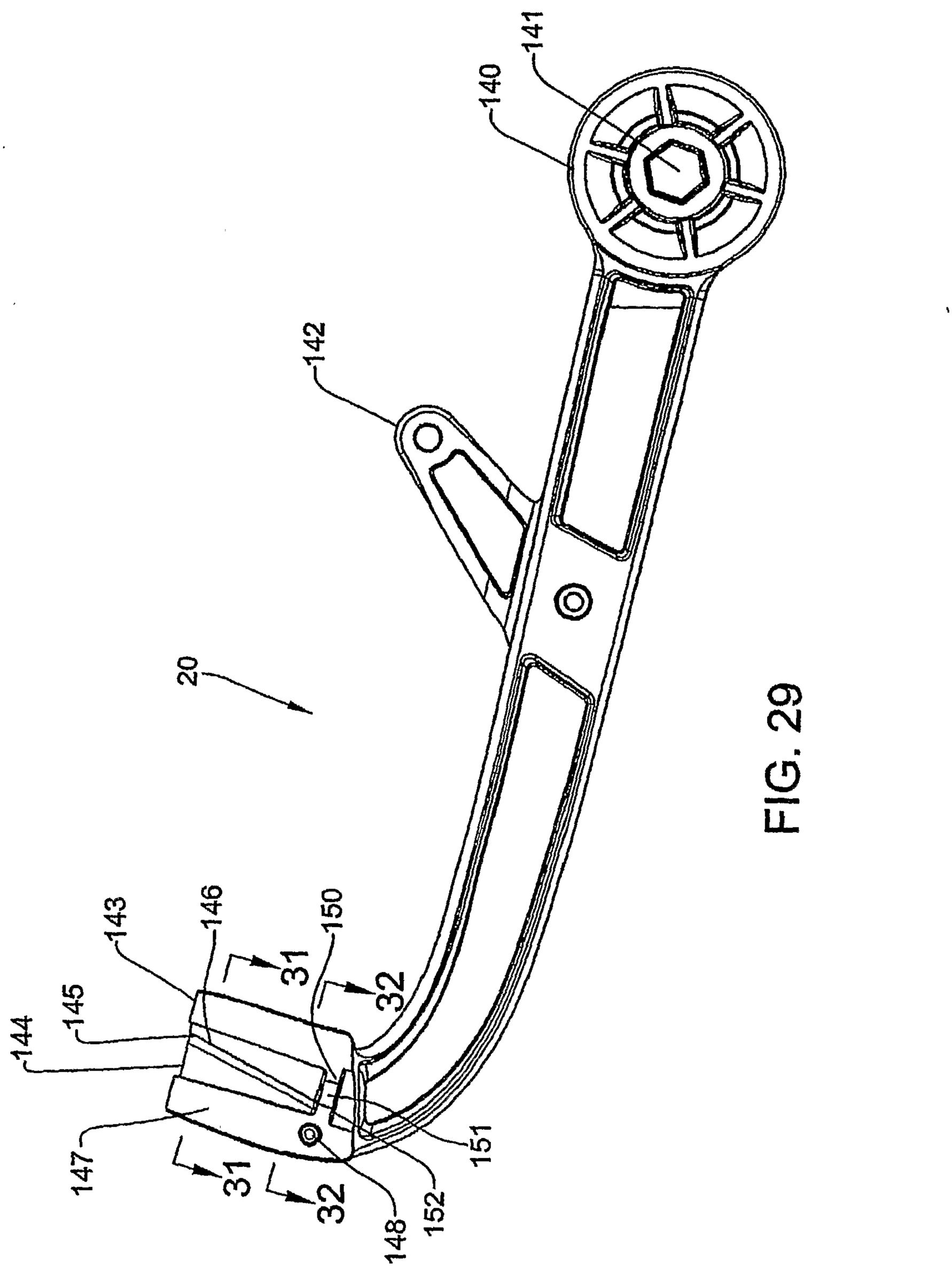

FIG. 29

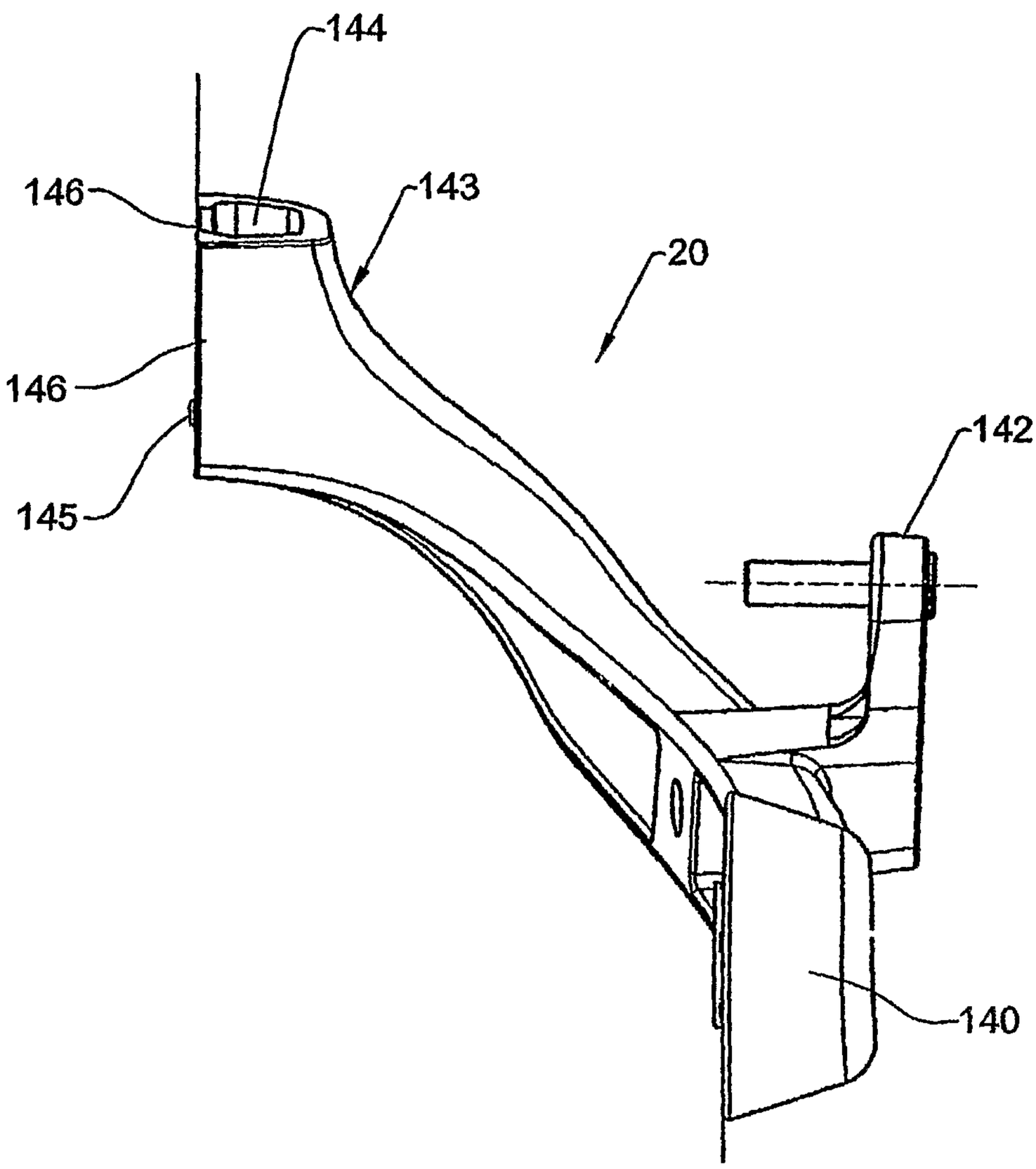

FIG. 30

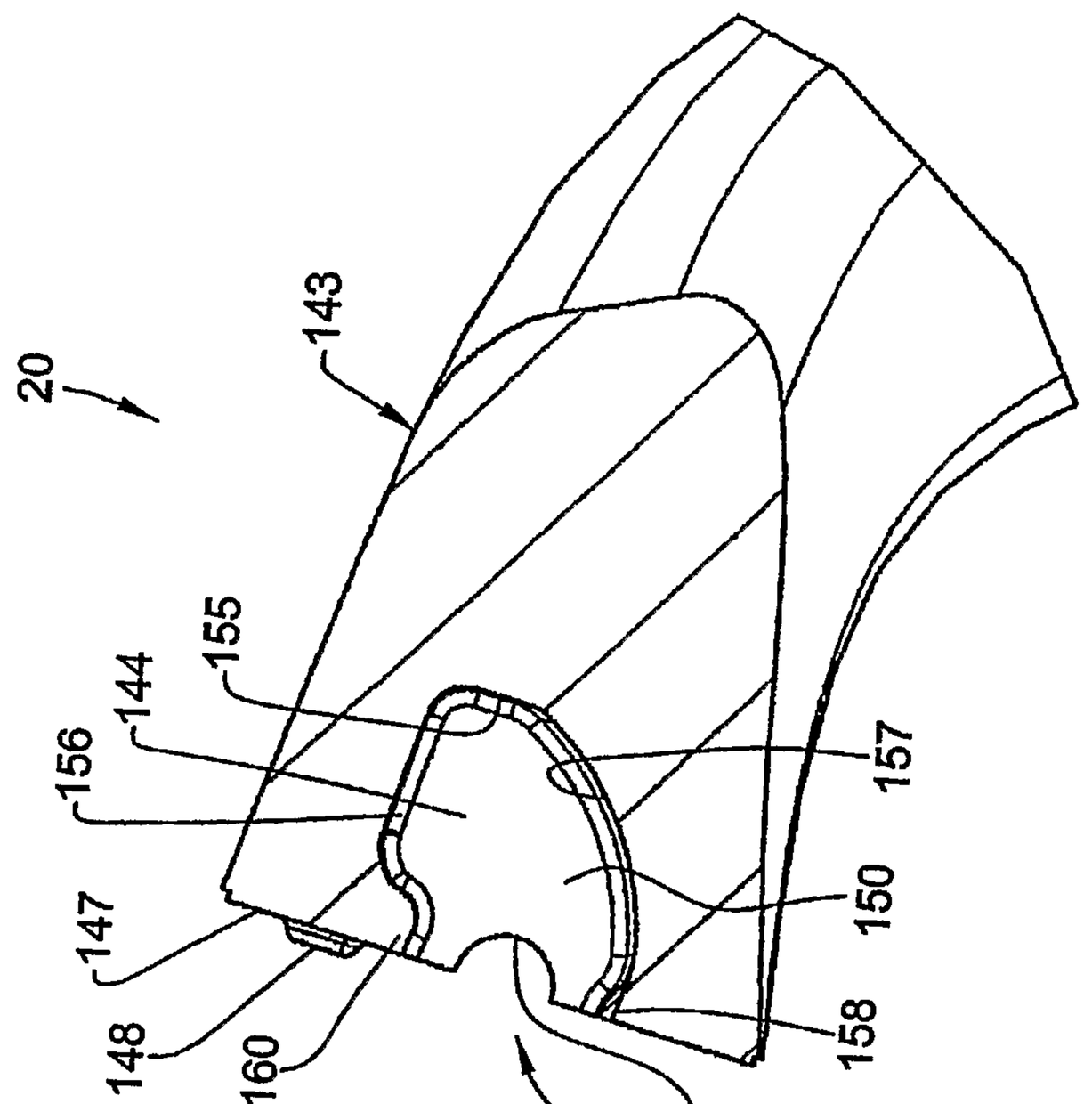
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FIG. 32

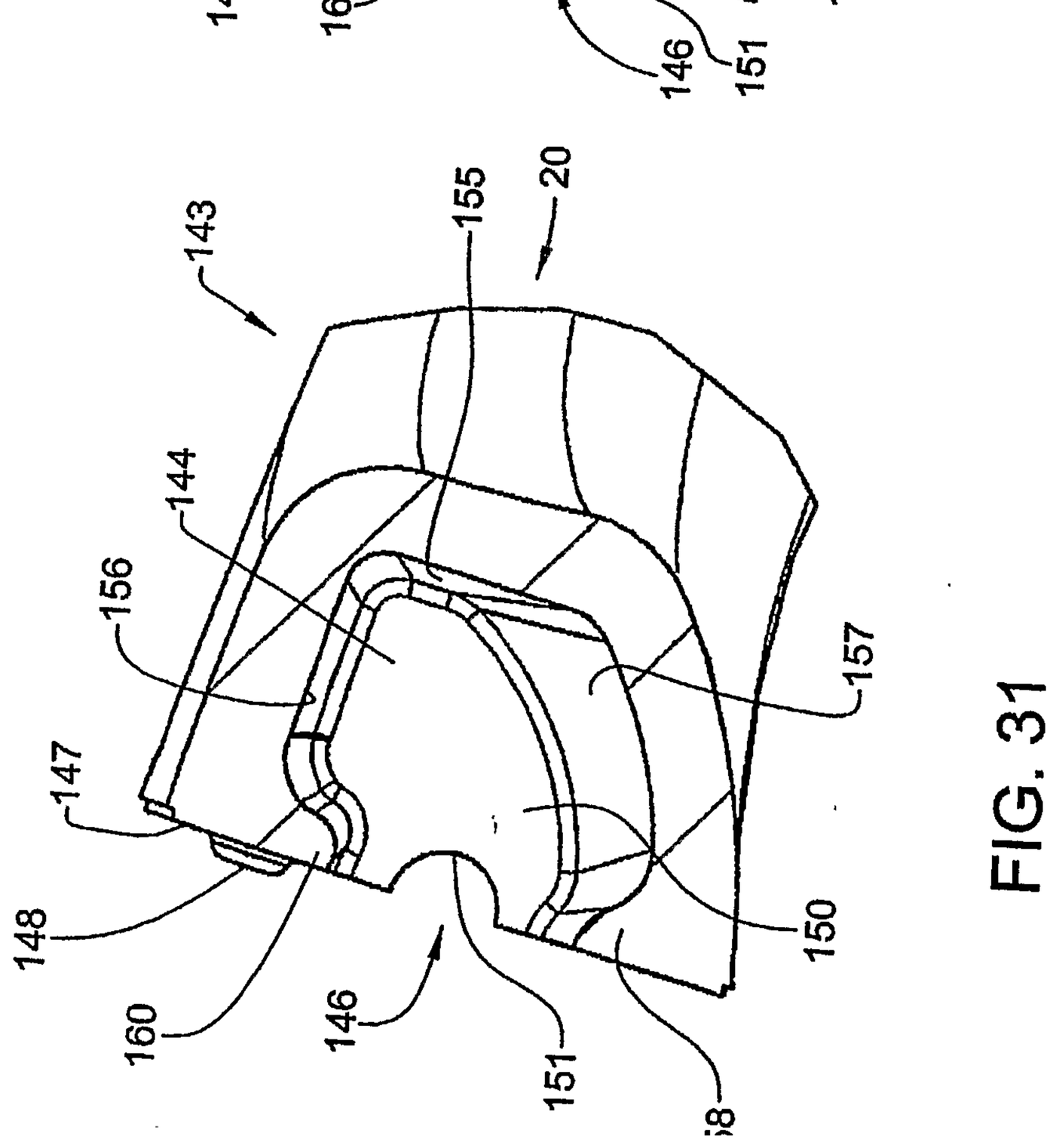
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FIG. 31

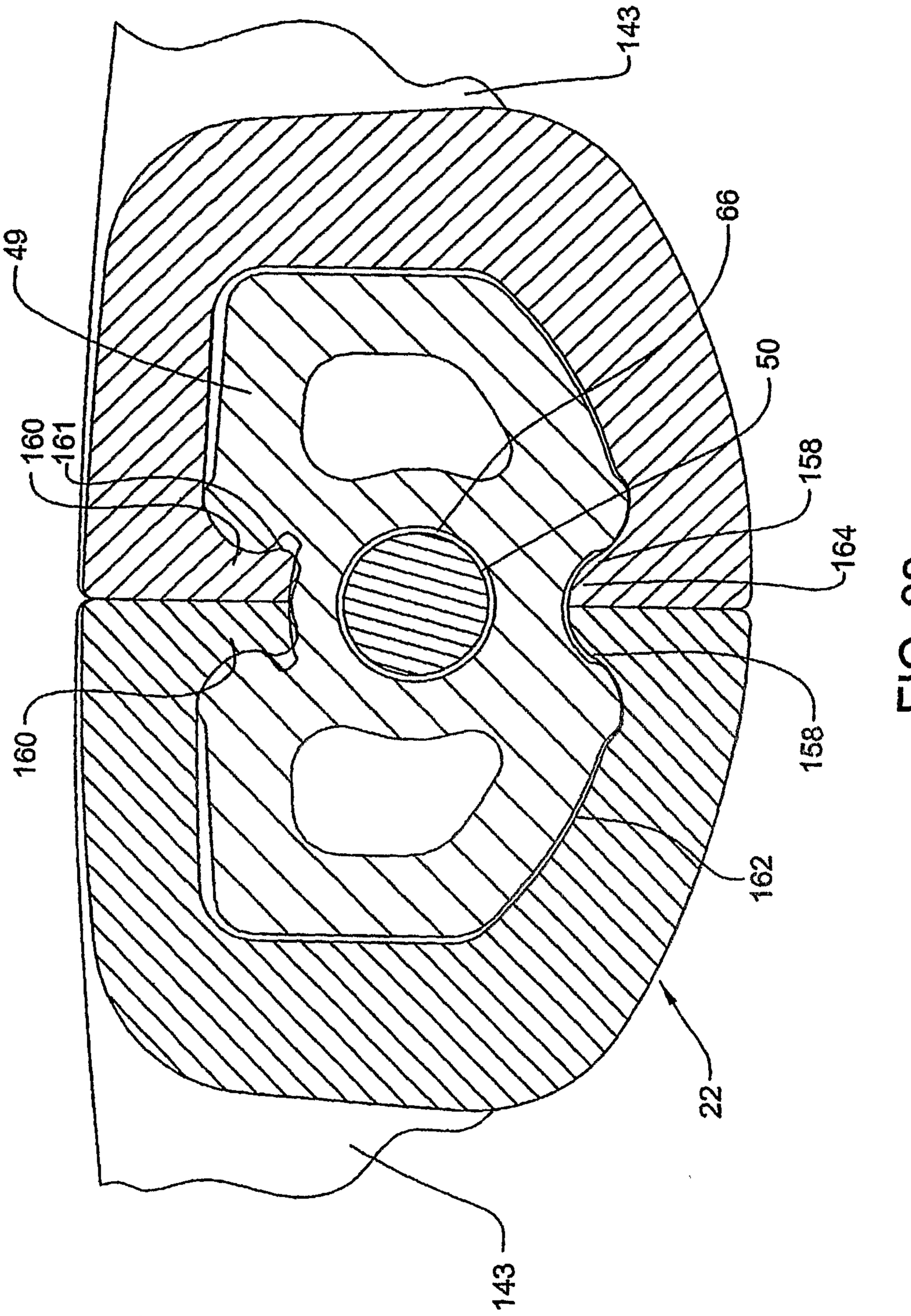

FIG. 33

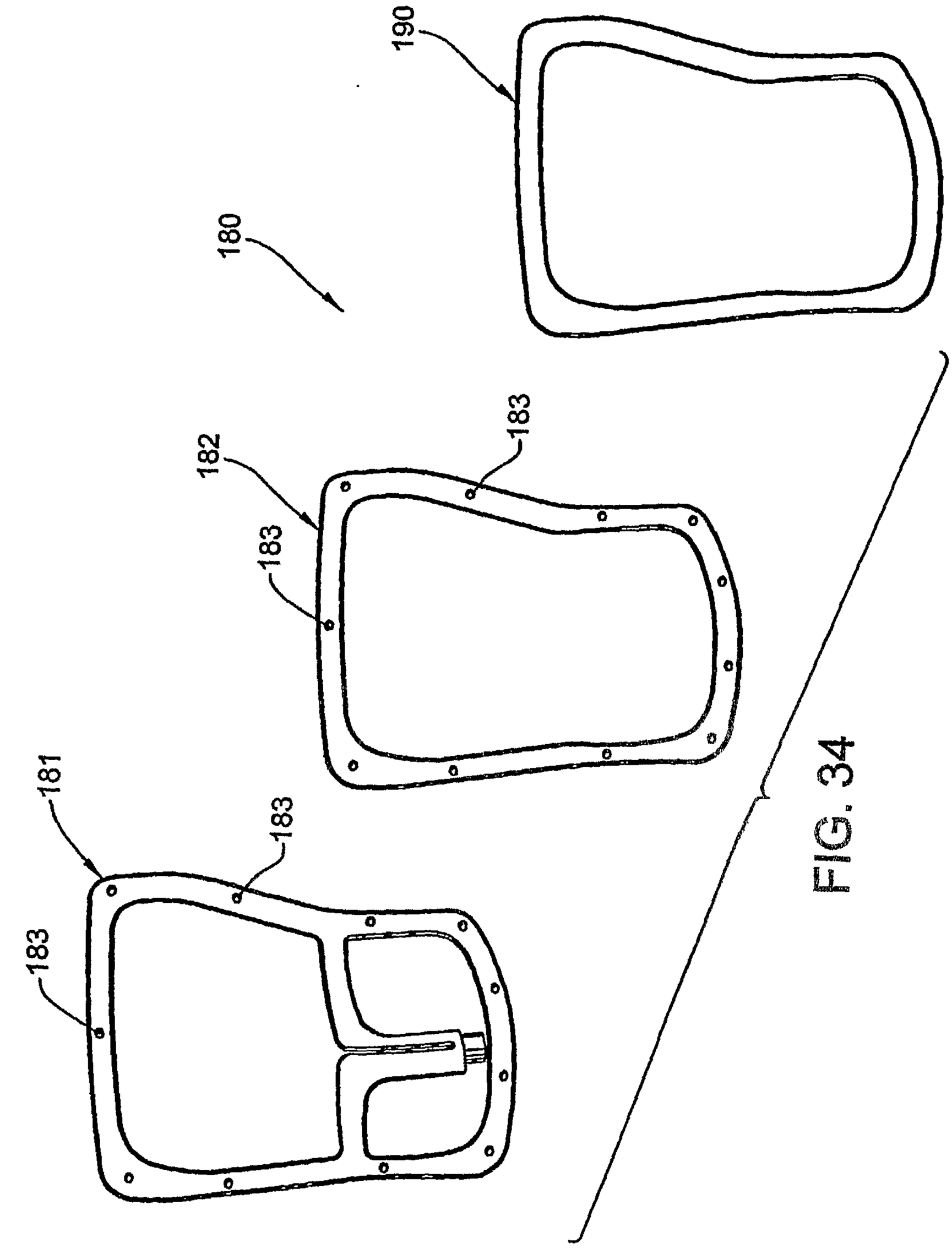

FIG. 34

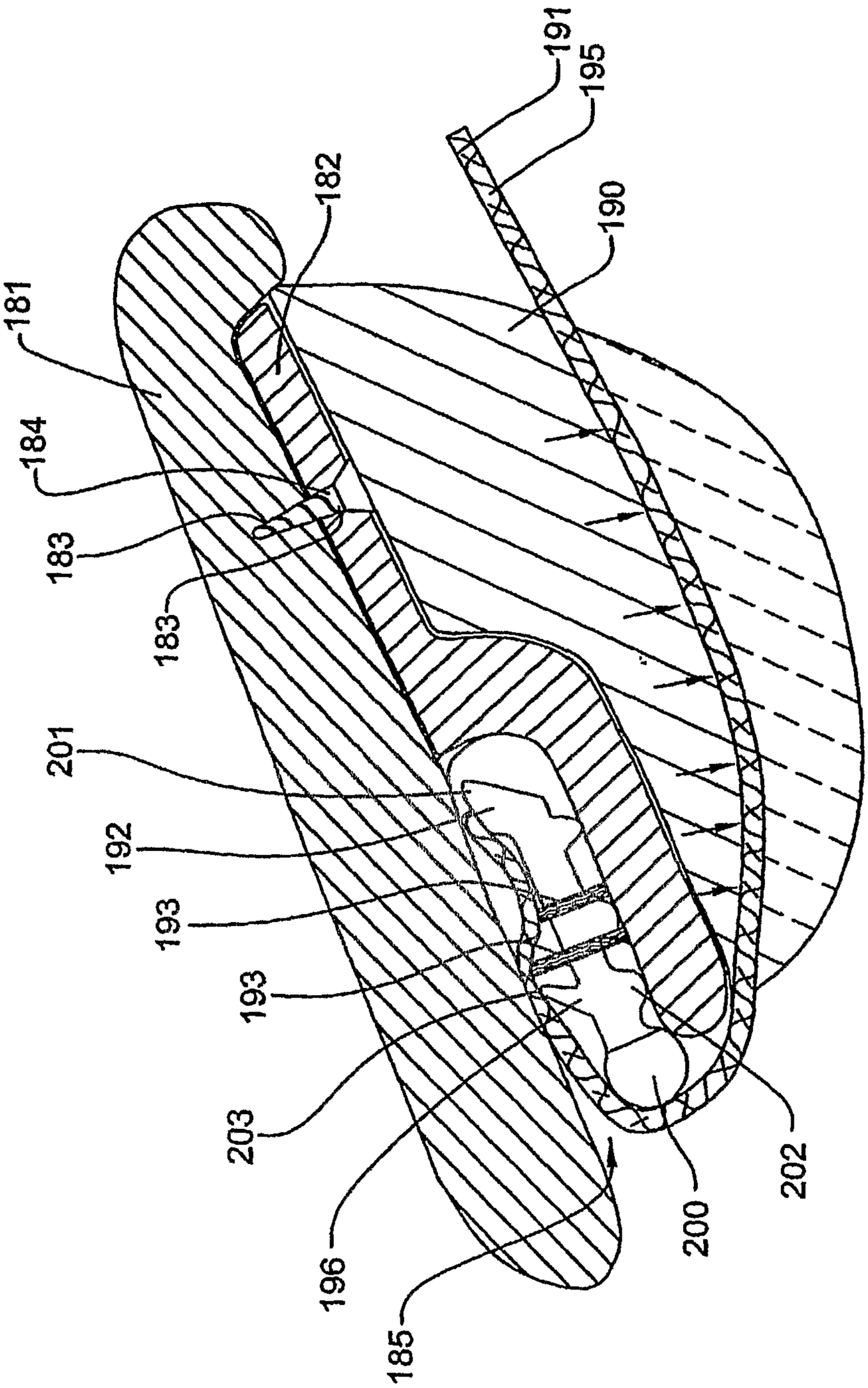
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FIG. 35

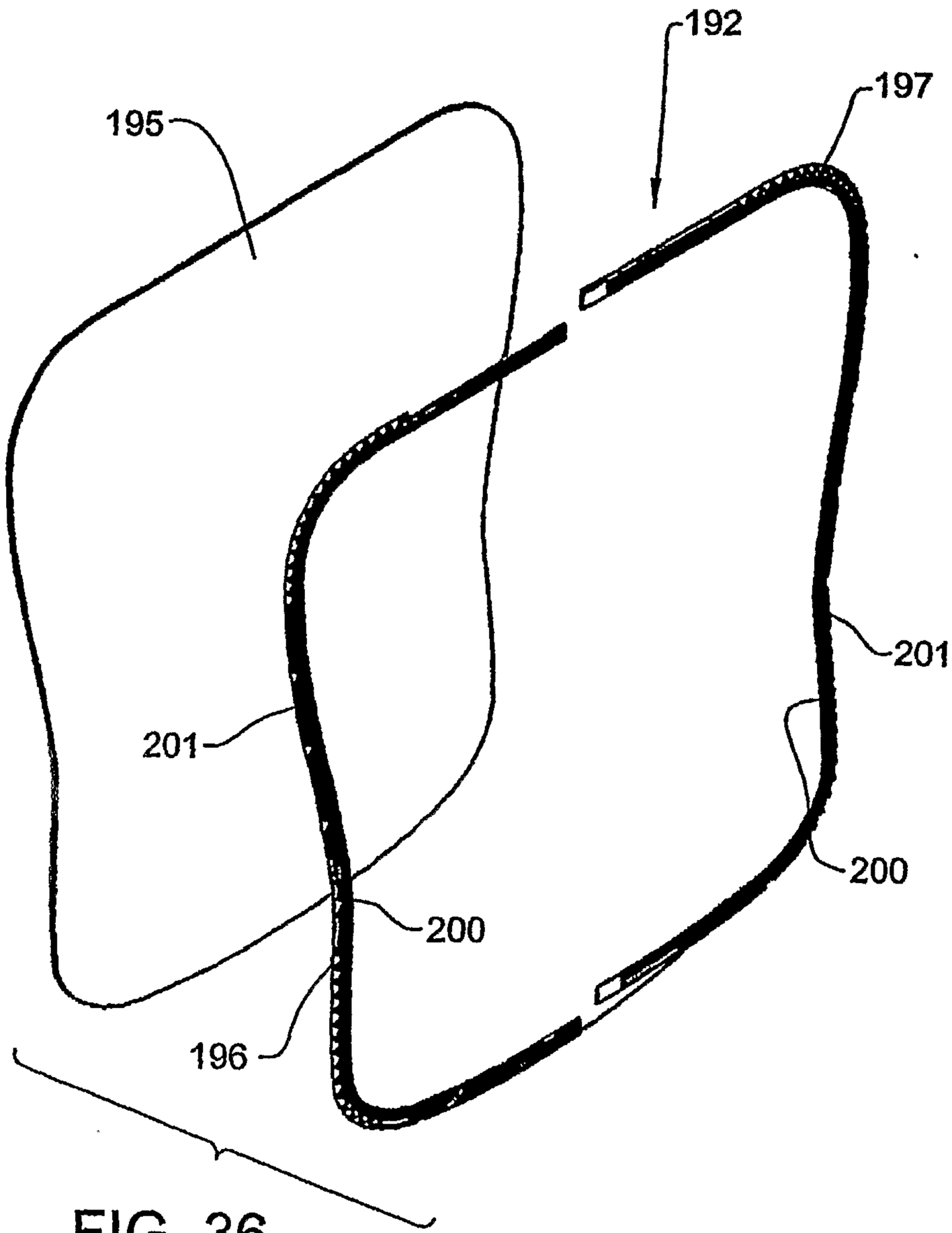

FIG. 36

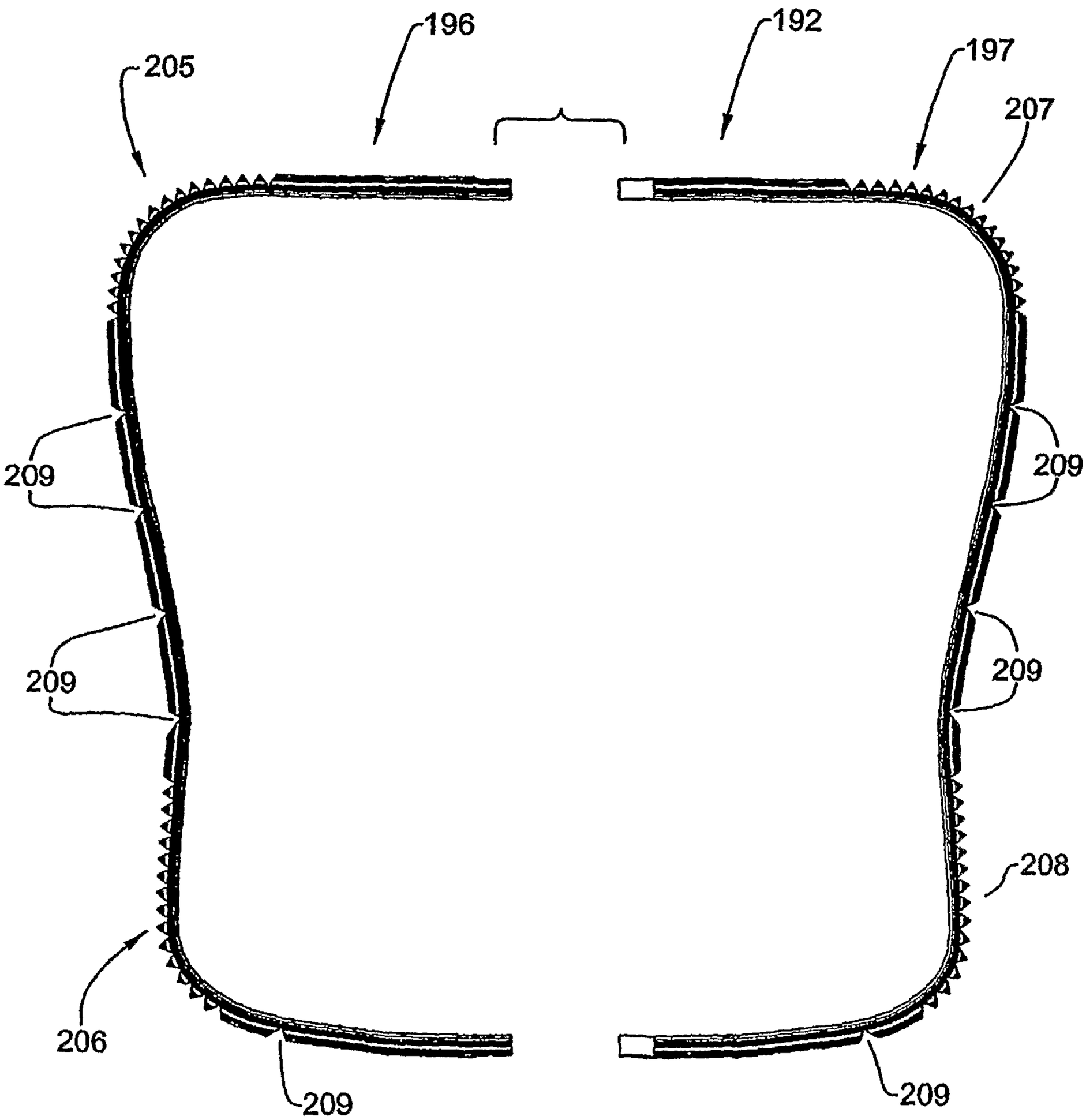

FIG. 37

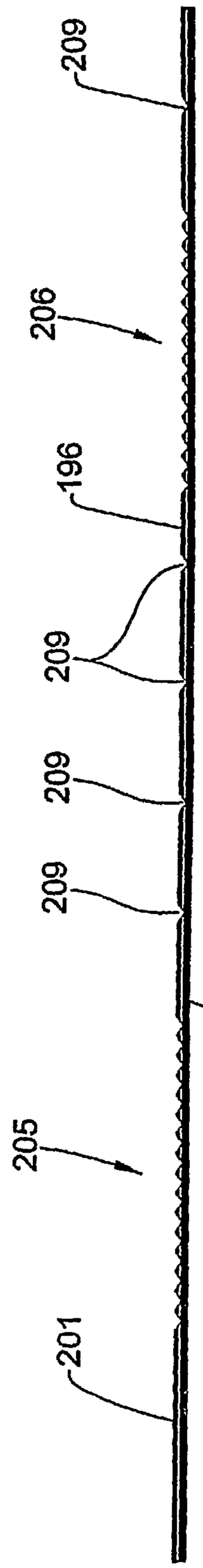
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FIG. 38

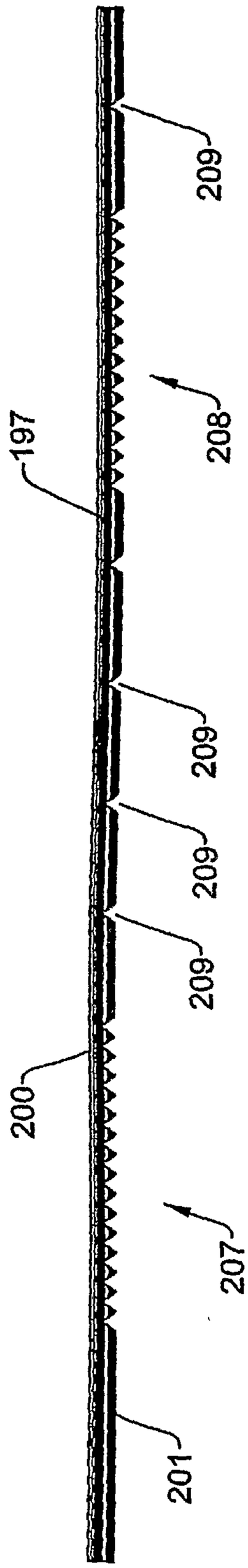
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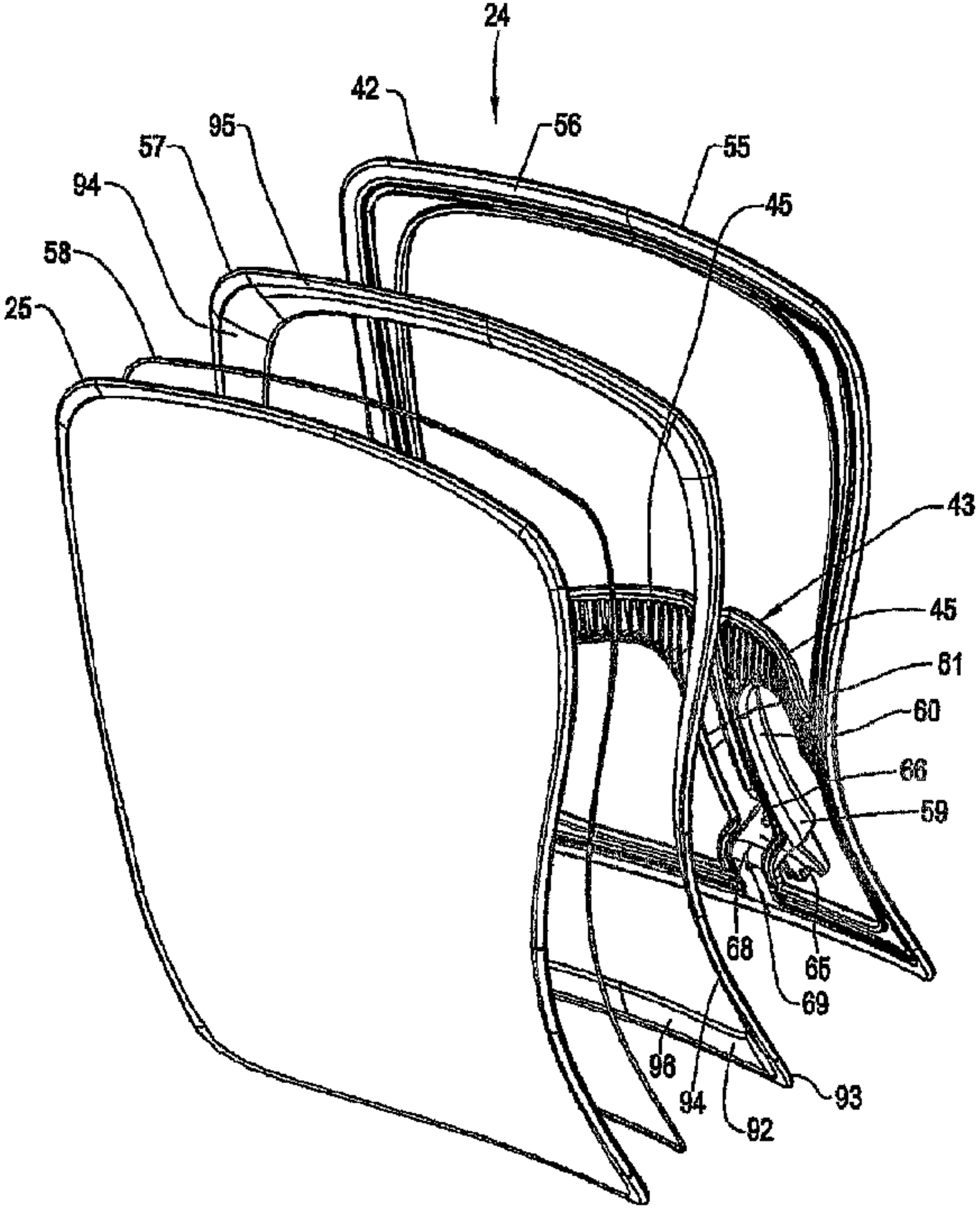
FIG. 39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