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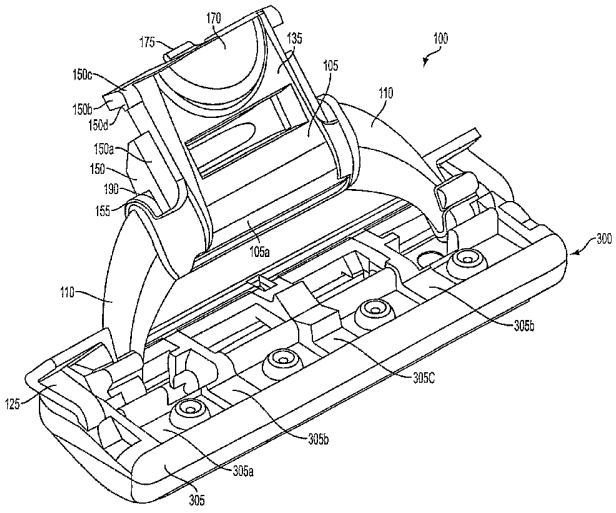
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(54) Title: YOKE STYLE RAZOR CONNECTOR ASSEMBLY



(57) Abstract: A shaving system is provided having a handle, a razor cartridge having at least one blade, and a connector. Embodiments include a handle with a handle body and a handle extension at the front of the handle body. The handle extension has a horizontal bottom wall, a pair of spaced-apart vertical walls, and a pair of top walls extending inward from the vertical walls. The connector includes a central body, a pair of yokes extending forward from the central body, each yoke having a cartridge support at its distal end for supporting the razor cartridge, and a handle-attachment portion extending rearward from the central body. The handle-attachment portion has a pair of guide walls for fitting between the vertical walls of the handle extension, and a pair of latches for engaging a corresponding pair of notches in the top walls of the handle extension, to removably retain the connector on the handle extension between the horizontal, vertical and top walls.

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SHAVING SYSTEM

RELATED APPLICATION

[0001] This application claims the benefit under 35 U.S.C. § 119 of U.S. Provisional Patent Application No 60/650,134 filed on February 7, 2005, entitled "SHAVING SYSTEM" which is incorporated by referenced herein its entirety.

FIELD OF THE INVENTION

[0002] The present invention relates to a wet shaving system. The present invention has particular applicability in wet shaving systems having a pivoting razor cartridge which is connected to a handle by a connector.

BACKGROUND ART

[0003] Many conventional shaving razor systems have handle heads configured to permit rotation of a replaceable razor cartridge about a pivot point. Some arrangements permit free rotation of the razor cartridge through a predetermined range about pins attached to the head and engaging an underside of the razor cartridge. Other types include arcuate bearings formed in the handle head, which mate with hooks on the underside of the razor cartridge. The arcuate bearings determine the range of pivoting motion of the cartridge. The pins or arcuate bearings must be spring-loaded and movable to enable removal and replacement of the razor cartridge.

[0004] Some handle heads spring-load or bias the pivotally mounted razor cartridge toward a neutral position, such as at or near the midpoint of the predetermined range, allowing the cartridge to be displaced away from the neutral position in one direction, and to then move back to the neutral position, using complicated spring configurations or requiring unique or specialized razor cartridges. Still other handle heads have complex spring assemblies which extend from within the handle head to the front of the handle and contact the underside of the pivotally mounted razor cartridge to bias the cartridge to a "home" position.

[0005] Conventional razor mounting arrangements require a complex handle head, a complex razor cartridge, or both. Thus, there is a need for a simplified, inexpensive methodology for mounting a conventional razor cartridge on a handle.

SUMMARY OF THE INVENTION

[0006] An advantage of the present invention is a shaving system having a simple handle with no moving parts, a simple razor cartridge, and a single-piece connector for removably connecting the cartridge to the handle, for providing pivot mounting of the cartridge, and for providing biasing of the cartridge to a home position.

[0007] Additional advantages and other features of the present invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from the practice of the invention. The advantages of the invention may be realized and obtained as particularly pointed out in the appended claims.

[0008] According to the present invention, the foregoing and other advantages are achieved in part by a shaving system comprising a handle, a razor cartridge having at least one blade,

and a connector. The handle has a handle body and a handle extension at the front of the handle body. The handle extension has a horizontal bottom wall, a pair of spaced-apart vertical walls, and a pair of top walls extending inward from the vertical walls. The connector comprises a central body, a pair of yokes extending forward from the central body, each yoke having a cartridge support at its distal end for supporting the razor cartridge, and a handle-attachment portion extending rearward from the central body. The handle-attachment portion has a pair of guide walls for fitting between the vertical walls of the handle extension, and a pair of latches for engaging a corresponding pair of notches in the top walls of the handle extension, to removably retain the connector on the handle extension between the horizontal, vertical and top walls.

[0009] Another aspect of the present invention is a connector for supporting a razor cartridge, and for connecting to a razor handle having a handle body and a handle extension at the front of the handle body, the handle extension having a horizontal bottom wall, a pair of spaced-apart vertical walls, and a pair of top walls extending inward from the vertical walls. The connector comprises a central body, a pair of yokes extending forward from the central body, each yoke having a cartridge support at its distal end for supporting the razor cartridge, and a handle-attachment portion extending rearward from the central body, the handle-attachment portion having a pair of guide walls for fitting between the vertical walls of the handle extension, and a pair of latches for engaging a corresponding pair of notches in the top walls of the handle extension, to removably retain the connector on the handle extension between the horizontal, vertical and top walls.

[0010] A further aspect of the present invention is a razor handle having a handle body and a handle extension at the front of the handle body, the handle extension having a horizontal bottom wall, a pair of spaced-apart vertical walls, and a pair of top walls extending inward from the vertical walls, the top walls each having a notch at their extreme rear end for engaging a latch in a connector to removably retain the connector on the handle extension between the horizontal, vertical and top walls.

[0011] A still further aspect of the present invention is a dispenser for dispensing a razor cartridge/connector assembly, the dispenser comprising a bottom wall having a support for supporting a lower portion of the connector, a vertical tab for extending into a chamber at an underside of the connector, and a snap for biasedly engaging an outside wall of the connector to retain the cartridge/connector assembly in the dispenser. A rear wall is attached to the bottom wall, a cut-down front wall is attached to the bottom wall, and a pair of opposed side walls are attached to the bottom wall, the rear wall and the front wall. The vertical tab and the snap are arranged such that the cartridge does not contact the bottom wall, the rear wall, the front wall or the side walls when it is retained in the dispenser.

[0012] Additional advantages of the present invention will become readily apparent to those skilled in this art from the following detailed description, wherein only selected embodiments of the present invention are shown and described, simply by way of illustration of the best mode contemplated for carrying out the present invention. As will be realized, the present invention is capable of other and different embodiments, and its several details are capable of modifications in various obvious respects, all without departing from the invention.

Accordingly, the drawings and description are to be regarded as illustrative in nature, and not as restrictive.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Reference is made to the attached drawings, wherein elements having the same reference numeral designations represent like elements throughout, and wherein:

[0014] Figure 1 is a perspective view of a shaving system according to an embodiment of the present invention.

[0015] Figure 2A is a front perspective view of a connector according to an embodiment of the present invention.

[0016] Figure 2B is a side view of the connector of Figure 2A.

[0017] Figure 2C is a rear perspective view of the connector of Figure 2A.

[0018] Figure 2D is a perspective view of a connector/cartridge assembly according to an embodiment of the present invention.

[0019] Figures 3-5 are partial side views of the connector/cartridge assembly of Figure 2D.

[0020] Figure 6A is a front perspective view of a razor handle according to an embodiment of the present invention.

[0021] Figure 6B is a front view of the razor handle of Figure 6A.

[0022] Figures 7A-7E are sequential sectional views showing the assembly of the connector/cartridge assembly of Figure 2D to the razor handle of Figure 6A.

[0023] Figures 8A-8E are sequential side views showing the assembly of the connector/cartridge assembly of Figure 2D to the razor handle of Figure 6A.

[0024] Figures 9A-9E are sequential sectional views showing the disassembly of the connector/cartridge assembly of Figure 2D from the razor handle of Figure 6A.

[0025] Figures 10A-10C are perspective views of a dispenser according to an embodiment of the present invention.

[0026] Figure 10D is a front view of the dispenser of Figures 10A-10C.

[0027] Figure 10E is a top view of the dispenser of Figures 10A-10C.

[0028] Figures 10F-10H are sectional views of the dispenser of Figure 10E.

[0029] Figure 10I is a top view of a dispenser according to the present invention holding a connector/cartridge assembly according to the present invention.

[0030] Figures 10J-10P are sectional views of the dispenser and connector/cartridge assembly of Fig. 10I.

[0031] Figures 11A-11B are perspective views of a razor cartridge usable with the present invention.

DESCRIPTION OF THE INVENTION

[0032] Conventional methodologies for attaching a pivoting razor cartridge to a handle and biasing the cartridge require complex handle heads and/or cartridges, which increases the cost of the shaving system. The present invention addresses and solves these problems stemming from conventional complex shaving systems.

[0033] According to the present invention, a single-piece connector attaches to a handle having no moving parts, and also pivotally mounts a razor cartridge and biases the razor cartridge to a home position using springs integrally formed with the connector.

[0034] The inventive shaving system, as shown in Fig. 1, includes a connector 100 which mounts to a razor handle 200. A razor cartridge 300, such as a triple-blade cartridge whose blades are conventionally mounted using a sandwich construction, is pivotally mounted to connector 100. Illustrations of such a cartridge are shown at Figs. 11A-B.

[0035] The pivotal mounting of cartridge 300 to connector 100 will now be described with reference to Figs. 1-5. As shown in Figs. 1, 2A and 2B, connector 100 has a central body 105 and a pair of yokes 110 extending forward from body 105. Each yoke 110 has a boss 115 at its distal end comprising a pair of opposed bearing sections 120 for rotatably supporting one of a pair of platform pivot pins 310 extending from cartridge platform 305 (see Fig. 3). Pins 310 are snapped into place between bearing sections 120 by a slight flexing of yokes 110 towards each other. Each boss 115 further comprises a cartridge return spring 125, a rearward stop 130 and a forward stop 131. When cartridge 300 is mounted on connector 100 via pins 310 and bearing sections 120, springs 125 bear against an upper surface of cartridge platform 305 to bias cartridge 300 downward against rearward stops 130. Rearward stops 130 provide a "home" position for cartridge 300 by preventing further downward cartridge pivoting (see Figs. 3 and 4). Springs 125 are adjacent to rearward stops 130 at the home position. When cartridge 300 is pivoted upward, as in response to shaving forces, springs 125 flex upward to provide controlled movement of cartridge 300, as shown in Fig. 5, then force cartridge 300 back to the home position as the shaving forces are lessened or removed. Forward stops 131 limit upward pivoting of cartridge 300 (see Fig. 5).

[0036] As shown in Figs. 2D and 3, cartridge 300 includes three blades 320a-c, a guard 330 having a single row of dimples (not shown), and a cap 350. Cartridge platform 305 includes support bars 305b, 305c.

[0037] Connector 100 will now be described with reference to Figs. 2A-D. Connector 100 comprises a connector body 105 having a front yoke-supporting portion 105a and a rear handle-attachment portion 105b of reduced width. Yoke-supporting portion 105a has a solid rear wall 145. Attachment portion 105b is made up of a horizontal wall 135 and a pair of vertical walls 140 that depend from horizontal wall 135 (see Figs. 2A and 2C).

[0038] A pair of guide walls 150 is formed outboard of and integrally with vertical walls 140. Each guide wall 150 has a top surface 150a generally parallel to, and lower than, the top surface of horizontal wall 135, thereby forming a step between guide wall top surface 150a and the top surface of wall 135. One end of each guide wall 150 is attached to rear wall 145 of yoke-supporting portion 105a. A pair of latches 150b is located at the rear of walls 140 and extends above guide wall top surface 150a toward the top surface of horizontal wall 135. Each latch 150b has a rearward-and-upward-facing angled notch 150c and a forward-extending dogleg 150d.

[0039] A pair of semicircular bearings 155 extend rearward from the extreme outboard ends of rear wall 145, and are joined to guide walls 150 by cross ribs 190. A bow spring 165 is formed between guide walls 150, and its ends are attached to respective bottom surfaces of vertical walls 140. Bow spring 165 is located to the rear of, and spaced from, rear wall 145. A button 170 extends upward from horizontal wall 135 of attachment portion 105b. A resilient spring tab 175 extends rearward from the extreme rear wall 180 of connector 100.

[0040] A compatible razor handle will now be described with reference to Figs. 6A-B . Handle 200 comprises a handle body 210 and a handle extension 220 on the front of handle body 210. Handle extension 220 comprises a horizontal bottom wall 225 and a pair of vertical side walls 230 spaced apart such that guide walls 150 of connector 100 can fit between them. Side walls 230 each have a semicircular cutout 235 for mating with one of bearings 155 of connector 100, as detailed below. Bottom wall 225 has an upwardly tapering ramp 225a for interacting with bow spring 165 of connector 100, as detailed below. A pair of horizontal top walls 240 extend inward from side walls 230 such that horizontal wall 135 of attachment portion 105b of connector 100 fits between them. Each top wall 240 has a notch 240a and a bevel 240b at its rear end for mating with one of latches 150b and latch dogleg 150d of connector 100, respectively, as detailed below. The rear of handle extension 220 has a wall 245 with a forward-facing step 250 for interacting with spring tab 175 of connector 100, as detailed below.

[0041] The assembly of connector 100 to handle 200 will now be described with reference to Figs. 7A-E and 8A-E. To assemble connector 100 to handle 200, handle extension 220 is moved inside the rear of connector body 105, generally along a straight line, such that latches 150b of connector 100 are below horizontal top walls 240 of handle extension 220, as shown in Fig. 7A (see also Fig. 8A). As connector body 105 enters handle extension 220 between its side walls 230, latches 150b contact the undersides of top walls 240, guided by latch notches 150c, as shown in Fig. 7B, and bow spring 165 on the underside of connector body 105 contacts ramp 225a. See also Fig. 8B. As connector body 105 is moved further into handle extension 220 along the dotted line (see Fig. 7C), bow spring 165 is compressed by

the upward taper of ramp 225a, spring tab 175 is moved forward by contact with step 250 of rear wall 245, and semicircular bearings 155 move into corresponding cutouts 235 (see Fig. 8C), while latches 150b are moved towards alignment with notches 240a in top walls 240.

[0042] As shown in Figs. 7D and 8D, when latches 150b and notches 240a align, connector body 105 pivots upward in the direction of arrow A about the center of bearings 155 due to the bias of compressed bow spring 165. As a result, latches 150b enter and are retained in notches 240a, and guide wall top surfaces 150a contact and are retained in contact with the underside of top walls 240, also due to the bias of bow spring 165. As shown in Figs. 7E and 8E, when latches 150b enter notches 240a, spring tab 175 clears step 250 and bears against rear wall 245 and the top of step 250. Due to the bias on spring tab 175, connector body 105 moves in the direction of arrow C until latch dogleg 150d mates and is retained in engagement with bevel 240b. Connector 100 is retained on handle 200 by the combination of the upward bias of bow spring 165, the bias of spring tab 175 against rear wall 245 and the top of step 250, and the engagement of latch dogleg 150d with bevel 240b.

[0043] Disassembly of connector 100 from handle 200 will now be described with reference to Figs. 9A-E. As shown in Figs. 9A to 9C, button 170 is manually moved in the direction of arrow B to disengage latches 150b from notches 240a as connector body 105 pivots downward about the center of bearings 155 (not shown), latch doglegs 150d slide downward on bevels 240b, and spring tab 175 compresses and slides onto step 250. Referring to Figs. 9C and 9D, after latches 150b and notches 240a are disengaged, spring tab 175 returns to its unloaded (i.e., non-compressed) position, and connector body 105 can be moved in the direction of arrow C. Latches 150b contact and slide along the undersides of top walls 240

while bow spring 165 slides along ramp 225a, allowing connector body 105 to be removed from handle extension 220 (see Fig. 9E). Bow spring 165 returns to its unloaded position after it disengages from ramp 225a in handle extension bottom wall 225.

[0044] The razor cartridge/connector assembly is dispensed from a "two pocket" dispenser, which holds two razor cartridge/connector assemblies until they are to be used for shaving. As shown in Figs. 10A-C, dispenser 1100 holds two cartridge/connector assemblies 1200 side-by-side, and is stackable. Dispenser 1100 comprises a bottom wall 1105, a rear wall 1110, a cut-down front wall 1115, and a pair of opposed side walls 1120. Centrally-located divider walls 1125, 1125a divide the dispenser 1100 into two cavities 1100a, 1100b. The bottom wall 1105 has a pair of transverse support structures 1130 in each cavity 1110a, 1110b, for supporting the lower front portion of a connector 100. Each support structure 1130 has a vertical tab 1135 which extends into the chamber at the front underside of connector 100 to locate a connector on top of support structures 1130. Transverse walls 1150 extend into cavities 1110a, 1100b abutting transverse support structures 1130 and divider walls 1125, 1125a. The bottom wall 1105 also has a resilient cantilever beam-type snap 1140 in each cavity 1100a, 1100b, disposed between the pair of transverse support structures 1130, for retaining the connector 100 in the dispenser 1100 by engaging a recess 160 in the front wall of connector body 105 of connector 100. Longitudinal support walls 1145 also extend from bottom wall 1105 for supporting the bottom of connector 100 at bow spring 165.

[0045] Referring now to Fig. 10I-P, in each cavity 1100a, 1100b of the dispenser 1100, the snap 1140 in the bottom wall 1105 biasedly engages recess 160 in the front wall of connector 100 (see Fig. 10L, Section C-C), while the underside chamber of connector 100 straddles

vertical tabs 1135 of support structures 1130 (see Fig. 10M, Section B-B), to retain assembly 1200 in dispenser 1100. As shown in Sections C-C, B-B and A-A, of Figs. 10L-N, respectively, cartridge 300 does not contact the walls of dispenser 1100 when it is stored in dispenser 1100. Referring to Section A-A of Fig. 10N, to dispense an assembly 1200, a handle (not shown) is inserted into connector 100 in the direction of arrow X, and lifted upward in the direction of arrow Y to disengage snap 1140 from connector 100, thereby releasing assembly 1200 from dispenser 1100. The handle/connector/cartridge assembly is then lifted upwards away from dispenser 1100.

[0046] The present invention can be practiced by employing conventional materials, methodology and equipment. Accordingly, the details of such materials, equipment and methodology are not set forth herein in detail. In the previous descriptions, numerous specific details are set forth, such as specific materials, structures, chemicals, processes, etc., in order to provide a thorough understanding of the present invention. However, it should be recognized that the present invention can be practiced without resorting to the details specifically set forth. In other instances, well known processing structures have not been described in detail, in order not to unnecessarily obscure the present invention.

[0047] Only an exemplary embodiment of the present invention and but a few examples of its versatility are shown and described in the present disclosure. It is to be understood that the present invention is capable of use in various other combinations and environments and is capable of changes or modifications within the scope of the inventive concept as expressed herein.

WHAT IS CLAIMED IS:

1. A shaving system comprising:

a handle having a handle body and a handle extension at the front of the handle body, the handle extension having a horizontal bottom wall, a pair of spaced-apart vertical walls, and a pair of top walls extending inward from the vertical walls;

a razor cartridge comprising at least one razor blade; and

a connector comprising:

a central body,

a pair of yokes extending forward from the central body, each yoke having a cartridge support at its distal end for supporting the razor cartridge, and

a handle-attachment portion extending rearward from the central body, the handle-attachment portion having a pair of guide walls for fitting between the vertical walls of the handle extension, and a pair of latches for engaging a corresponding pair of notches in the top walls of the handle extension, to removably retain the connector on the handle extension between the horizontal, vertical and top walls.

2. The shaving system of claim 1, wherein the latches are located proximal the extreme rear end of the handle-attachment portion, and the notches are located proximal the extreme rear end of the top walls of the handle extension.

3. The shaving system of claim 1, wherein the connector comprises a pair of semicircular bearings, each bearing extending rearward from the connector body outboard of one of the guide walls, and each of the side walls of the handle extension comprises a semicircular cutout for mating with one of the bearings when the latches engage the notches.

4. The shaving system of claim 1, wherein the guide walls of the handle-attachment portion of the connector each have a top surface for engaging a bottom surface of one of the top walls of the handle extension, and the handle-attachment portion further comprises a spring for biasing the top surface of the guide walls against the bottom surfaces of the top walls, and for biasing the latches in engagement with the notches.

5. The shaving system of claim 4, wherein the spring is a bow spring formed between the guide walls on an underside of the handle-attachment portion, and the bow spring is for bearing against the bottom wall of the handle extension.

6. The shaving system of claim 5, wherein the bottom wall of the handle extension has an upwardly tapering ramp for engaging and compressing the bow spring when the guide walls of the connector are slid between the vertical side walls of the handle extension.

7. The shaving system of claim 4, wherein the handle-attachment portion of the connector has a spring tab extending rearward from its extreme rear wall, and the handle extension has a rear wall with a forward-facing step for engaging the spring tab to bias the latches in engagement with the notches.

8. The shaving system of claim 1, wherein the cartridge support of each yoke has a bearing for rotatably supporting a pivot pin extending from a cartridge platform of the cartridge.

9. The shaving system of claim 8, wherein the bearing comprises a pair of opposed bearing sections.

10. The shaving system of claim 8, wherein the cartridge support of each yoke has a rearward stop and an integral cartridge return spring for bearing against the cartridge platform to bias the cartridge against the rearward stop.

11. The shaving system of claim 10, wherein the cartridge support of each yoke has a forward stop for engaging the cartridge platform to limit upward pivoting of the cartridge.

12. A connector for supporting a razor cartridge, and for connecting to a razor handle having a handle body and a handle extension at the front of the handle body, the handle extension having a horizontal bottom wall, a pair of spaced-apart vertical walls, and a pair of top walls extending inward from the vertical walls, the connector comprising:

a central body,

a pair of yokes extending forward from the central body, each yoke having a cartridge support at its distal end for supporting the razor cartridge, and

a handle-attachment portion extending rearward from the central body, the handle-attachment portion having a pair of guide walls for fitting between the vertical walls of the handle extension, and a pair of latches for engaging a corresponding pair of notches in the top walls of the handle extension, to removably retain the connector on the handle extension between the horizontal, vertical and top walls.

13. The connector of claim 12, wherein the latches are located proximal the extreme rear end of the handle-attachment portion, and the notches are located proximal the extreme rear end of the top walls of the handle extension.

14. The connector of claim 12 comprising a pair of semicircular bearings, each bearing extending rearward from the connector body outboard of one of the guide walls, for mating with a semicircular cutout in each of the side walls of the handle extension when the latches engage the notches.

15. The connector of claim 12, wherein the guide walls of the handle-attachment portion each have a top surface for engaging a bottom surface of one of the top walls of the handle extension, and the handle-attachment portion further comprises a spring for biasing the top surface of the guide walls against the bottom surfaces of the top walls, and for biasing the latches in engagement with the notches.

16. The connector of claim 15, wherein the spring is a bow spring formed between the guide walls on an underside of the handle-attachment portion, and the bow spring is for bearing against the bottom wall of the handle extension.

17. The connector of claim 15, wherein the handle-attachment portion has a spring tab extending rearward from its extreme rear wall for engaging a forward-facing step of a rear wall of the handle extension to bias the latches in engagement with the notches.

18. The connector of claim 12, wherein the cartridge support of each yoke has a bearing for rotatably supporting a pivot pin extending from a cartridge platform of the cartridge.

19. The connector of claim 18, wherein the bearing comprises a pair of opposed bearing sections.

20. The connector of claim 18, wherein the cartridge support of each yoke has a rearward stop and an integral cartridge return spring for bearing against the cartridge platform to bias the cartridge against the rearward stop.

21. The connector of claim 20, wherein the cartridge support of each yoke has a forward stop for engaging the cartridge platform to limit upward pivoting of the cartridge.

22. A razor handle having a handle body and a handle extension at the front of the handle body, the handle extension having a horizontal bottom wall, a pair of spaced-apart vertical walls, and a pair of top walls extending inward from the vertical walls, the top walls each having a notch at their extreme rear end for engaging a latch in a connector to removably retain the connector on the handle extension between the horizontal, vertical and top walls.

23. The razor handle of claim 22, wherein a front distal end of each of the side walls of the handle extension comprises a semicircular cutout for mating with a corresponding semicircular bearing of the connector when the latches engage the notches.

24. The razor handle of claim 22, wherein the bottom wall of the handle extension has an upwardly tapering ramp for engaging and compressing a bow spring of the connector when the connector is slid between the vertical side walls of the handle extension.

25. The razor handle of claim 22, wherein the handle extension has a rear wall with a forward-facing step for engaging a spring tab of the connector to bias the latches in engagement with the notches.

26. A dispenser for dispensing a razor cartridge/connector assembly, the dispenser comprising:

a bottom wall having a support for supporting a lower portion of the connector, a vertical tab for extending into a chamber at an underside of the connector, and a snap for biasedly engaging an outside wall of the connector to retain the cartridge/connector assembly in the dispenser;

a rear wall attached to the bottom wall;

a cut-down front wall attached to the bottom wall; and

a pair of opposed side walls attached to the bottom wall, the rear wall and the front wall;

wherein the vertical tab and the snap are arranged such that the cartridge does not contact the bottom wall, the rear wall, the front wall or the side walls when it is retained in the dispenser.

27. The dispenser of claim 26, wherein the support comprises a pair of transverse support structures, and each of the transverse support structures has one of the vertical tabs; and

wherein the snap comprises a cantilever beam extending from the bottom wall.

28. The dispenser of claim 27, further comprising a longitudinal support wall extending from the bottom wall for supporting the bottom of the connector.

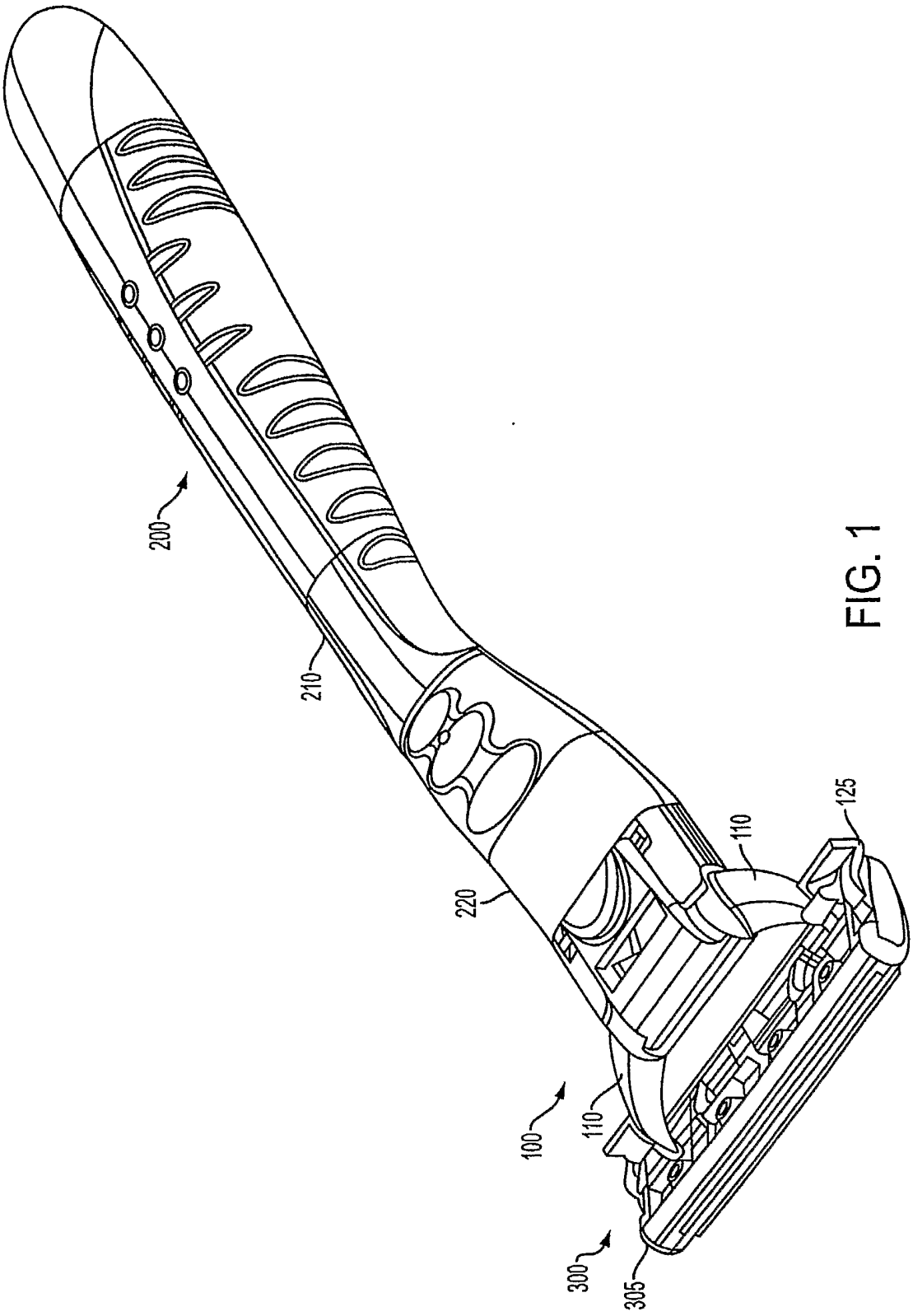


FIG. 1

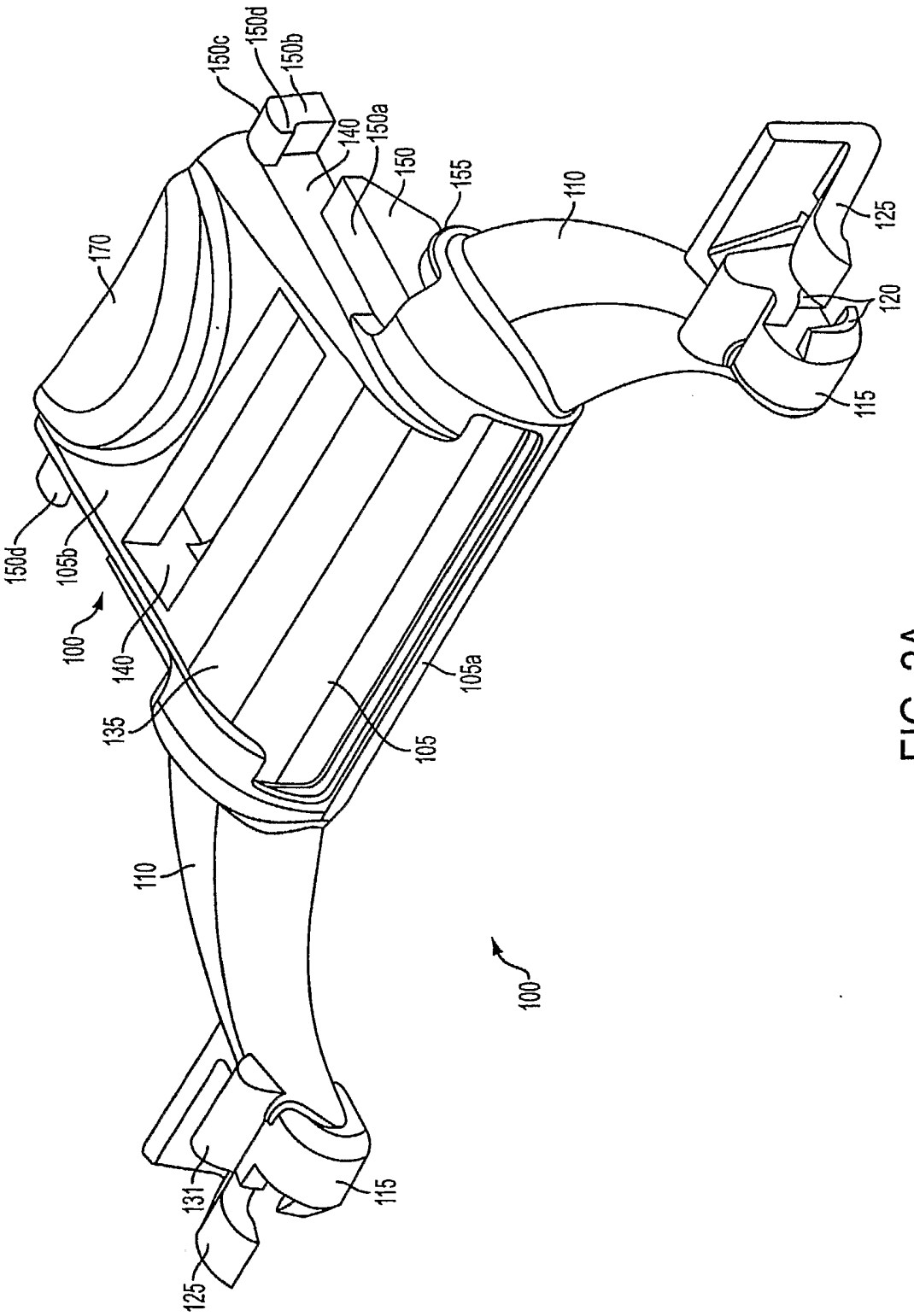

150c
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FIG. 2A

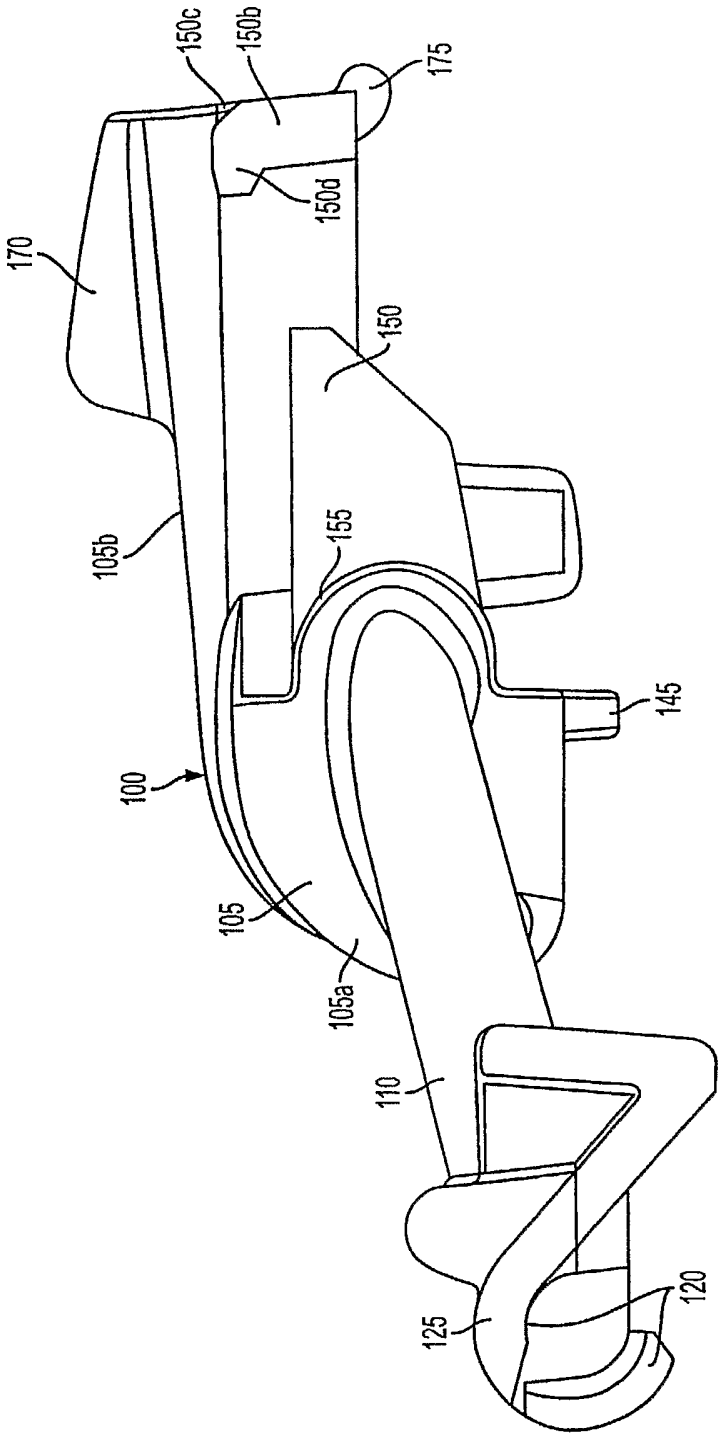

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105a
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125

FIG. 2B

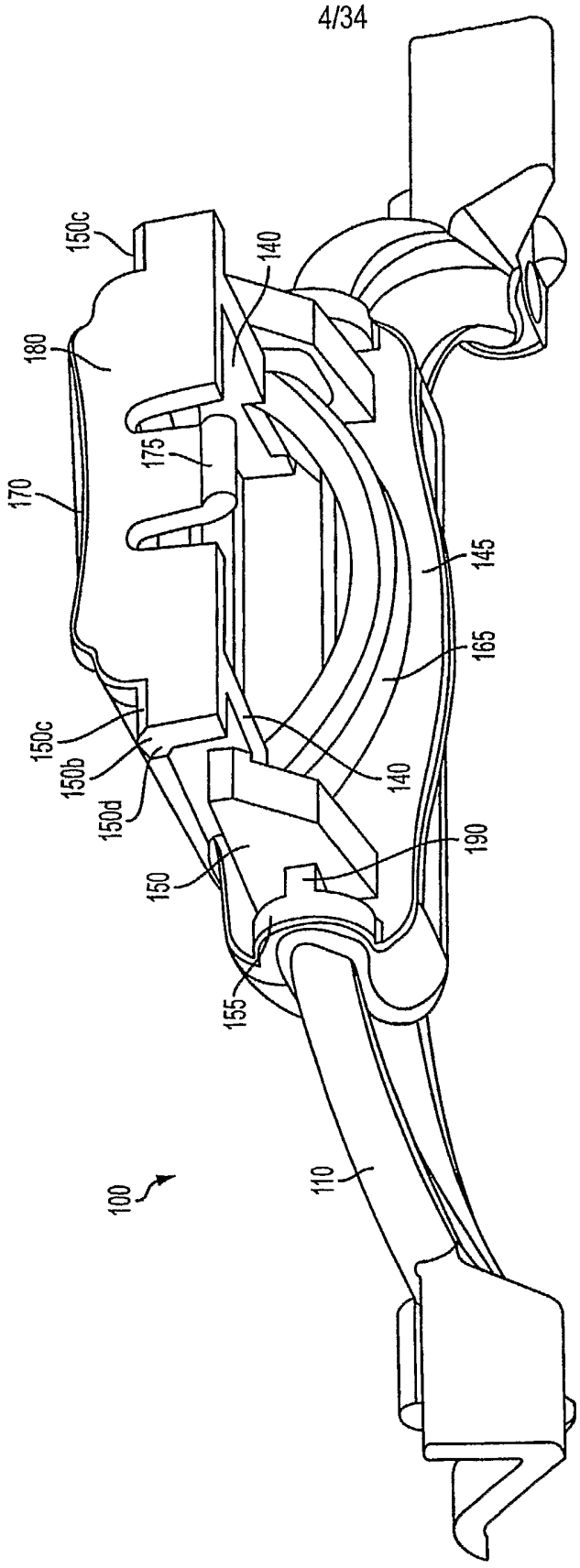

150c
140
180
175
170
145
165
150c
150b
150d
140
190
150
155
100
110

FIG. 2C

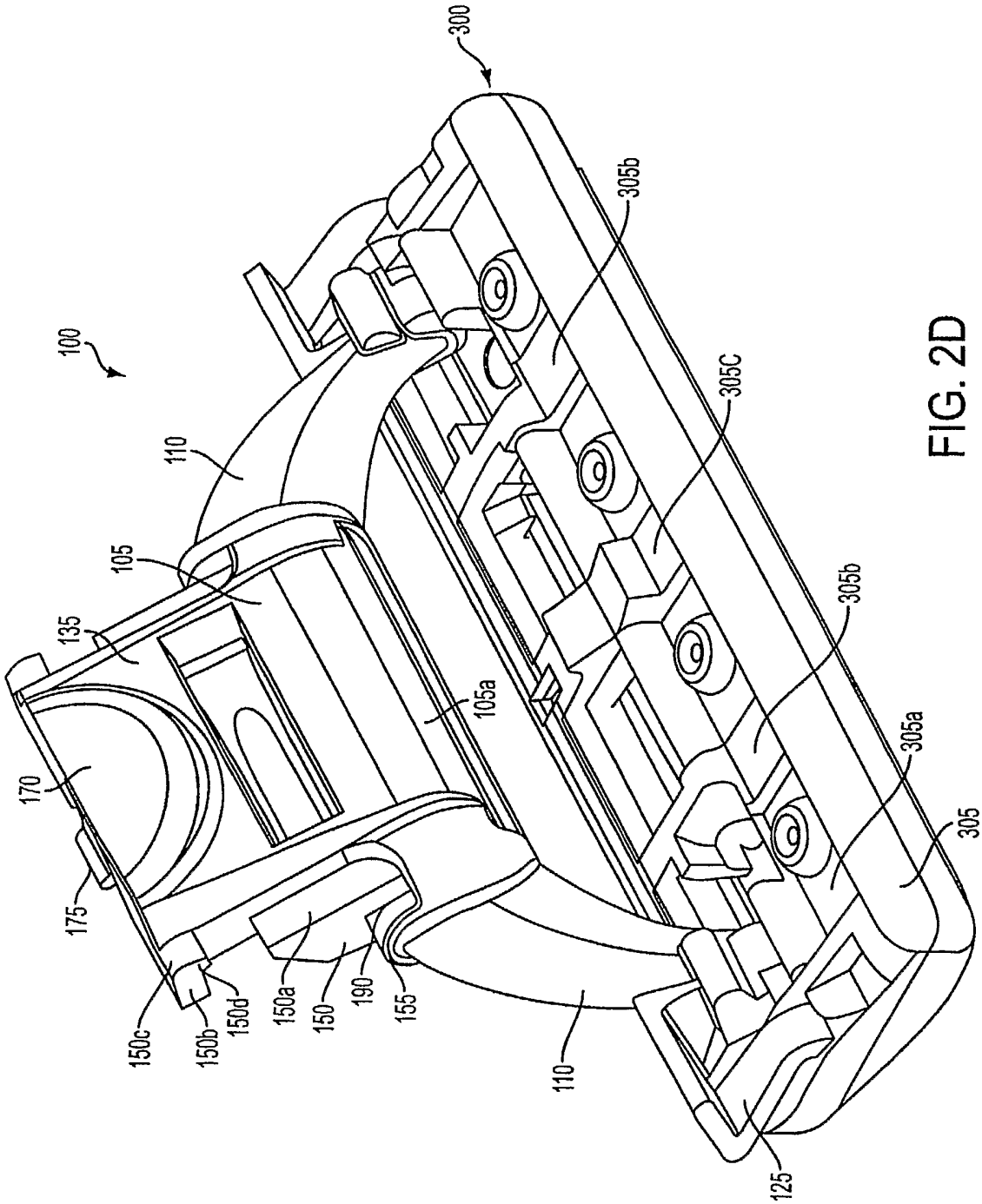

300
305b
100
110
305C
105
305b
135
105a
305a
170
305
175
150c
150b
150d
150a
150
190
155
110
125

FIG. 2D

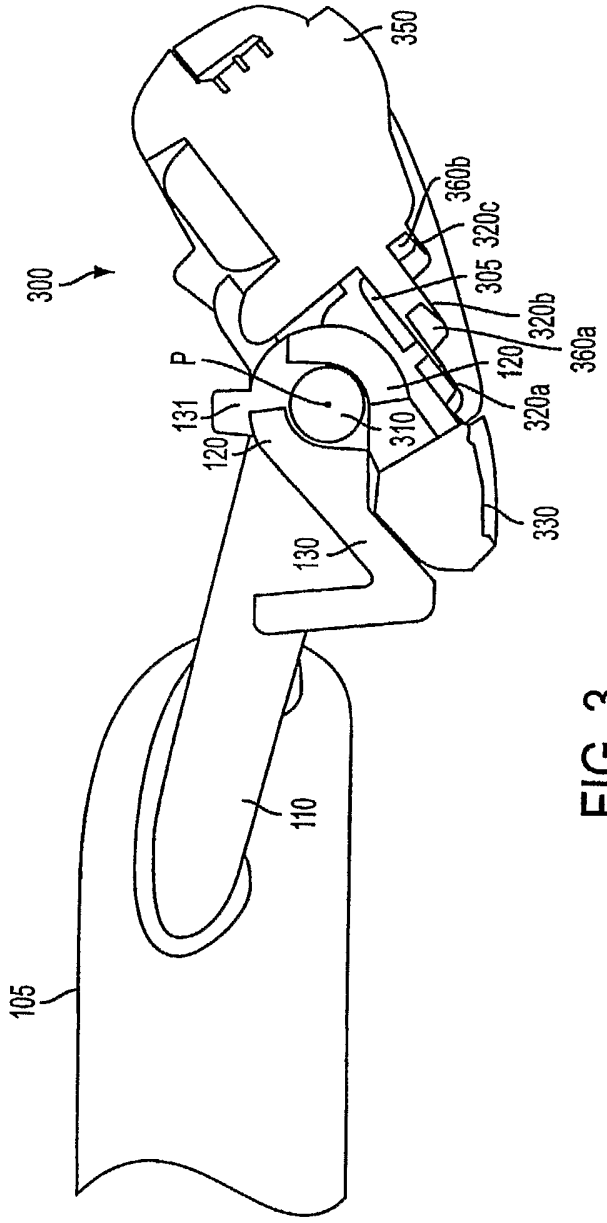

350
360b
320c
305
320b
360a
120
320a
310
330
130
110
105
300
P
131
120

FIG. 3

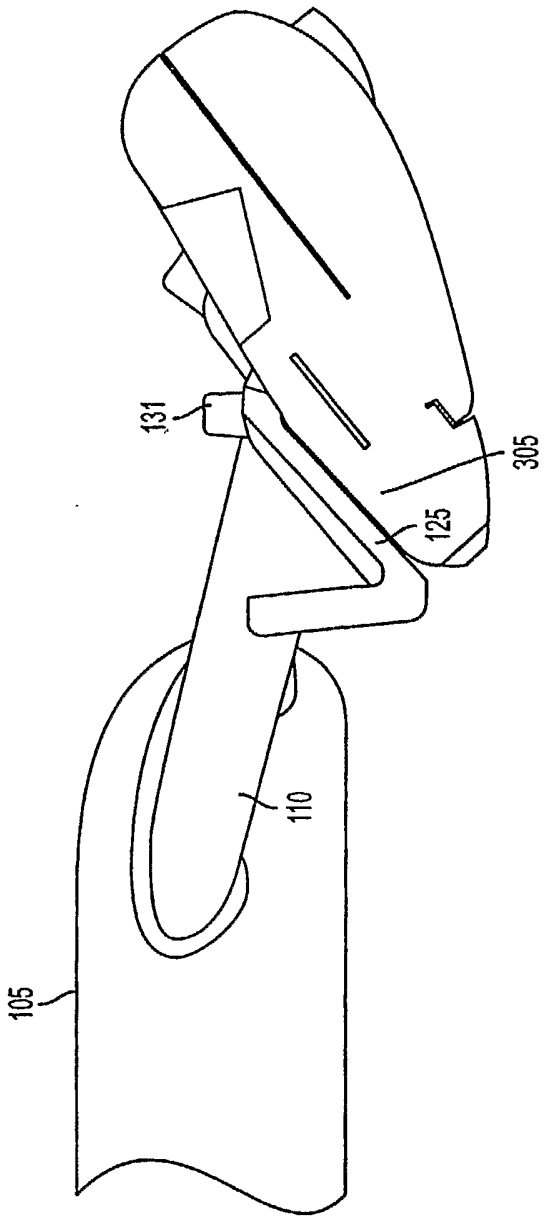


FIG. 4

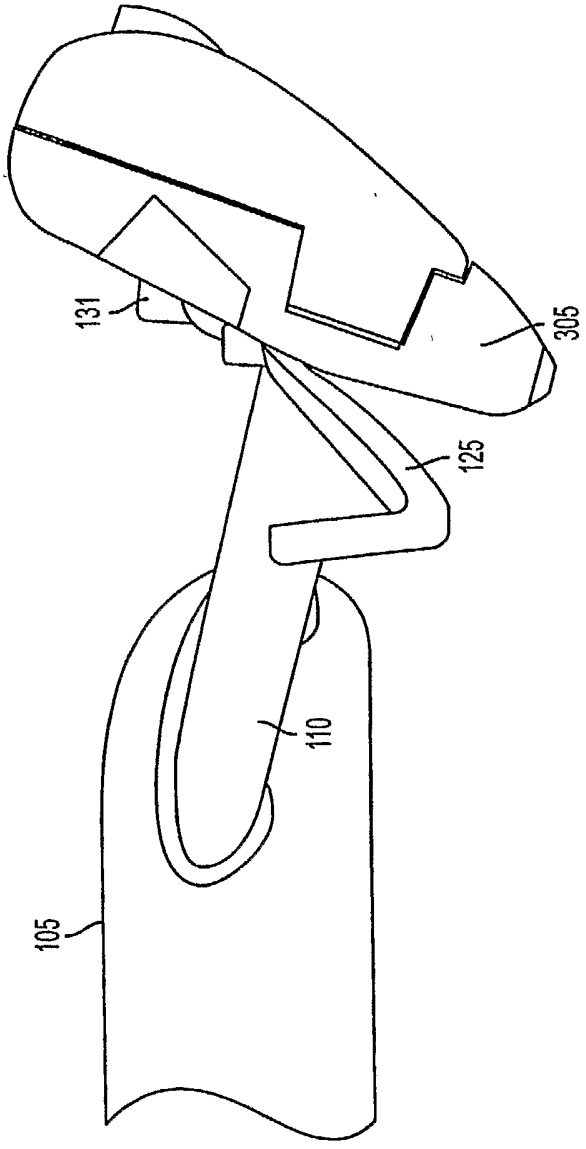


FIG. 5

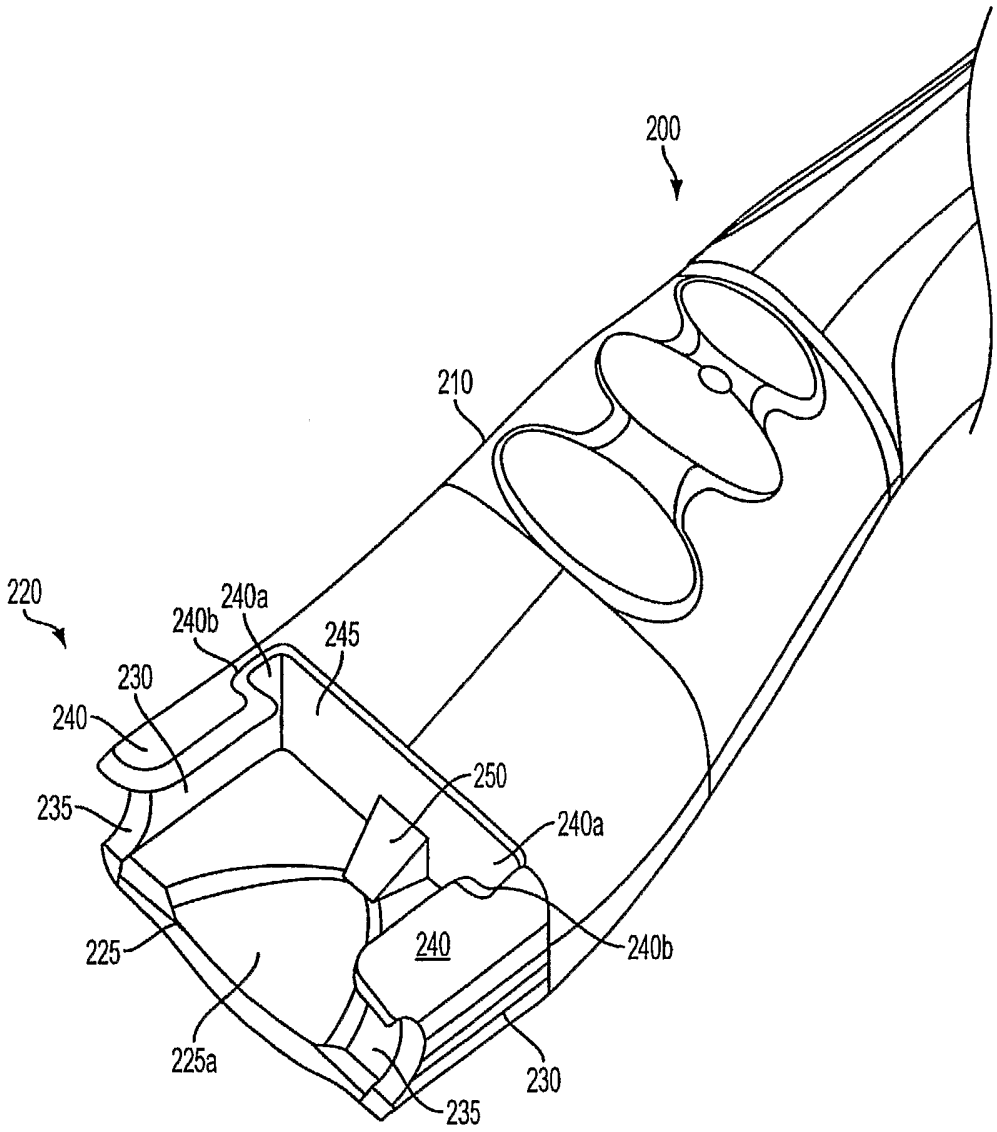

200
210
220
240b
240a
245
230
240
250
235
240a
225
240
240b
225a
230
235

FIG. 6A

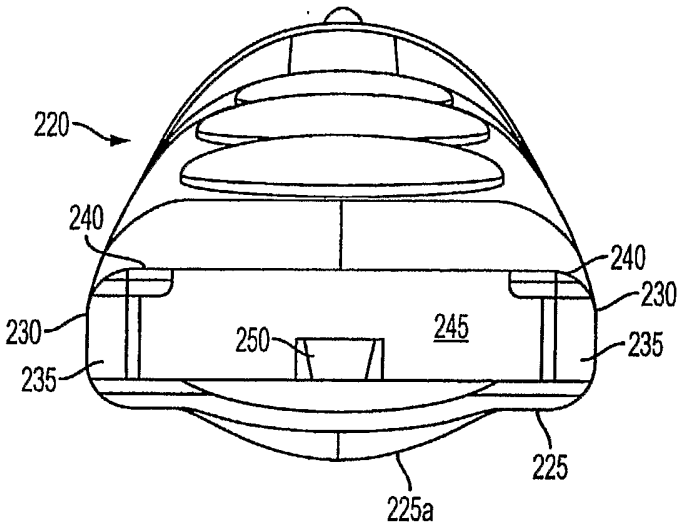


FIG. 6B

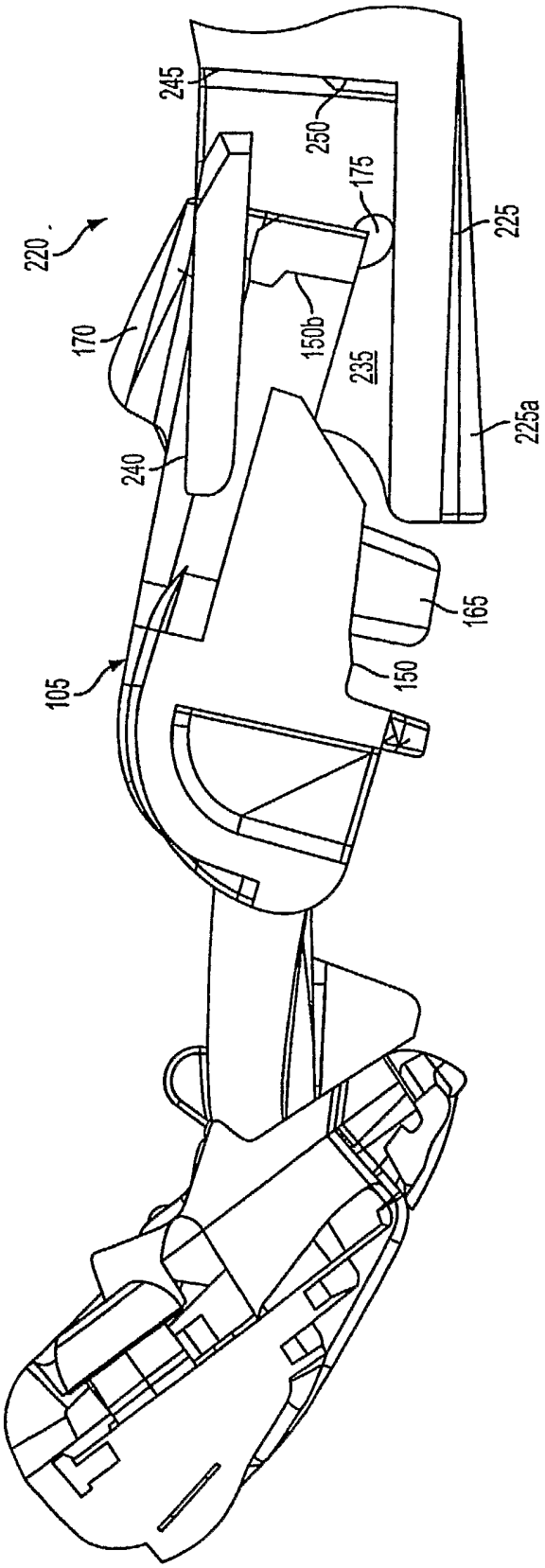


FIG. 7A

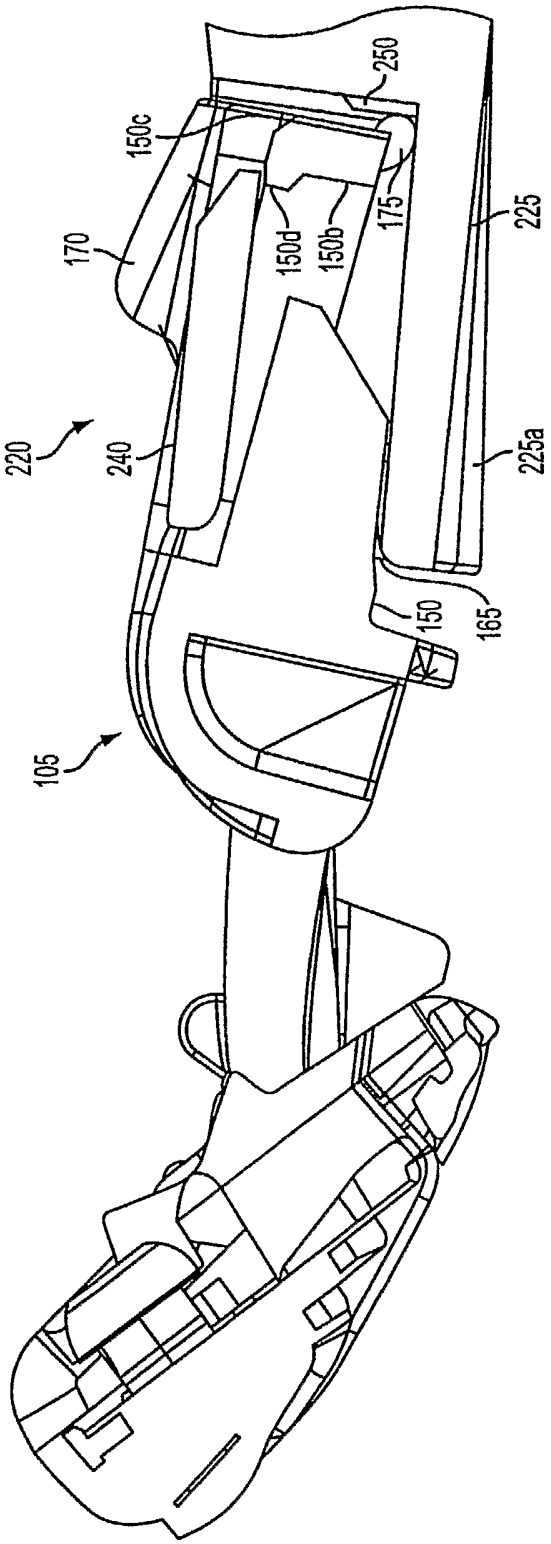


FIG. 7B

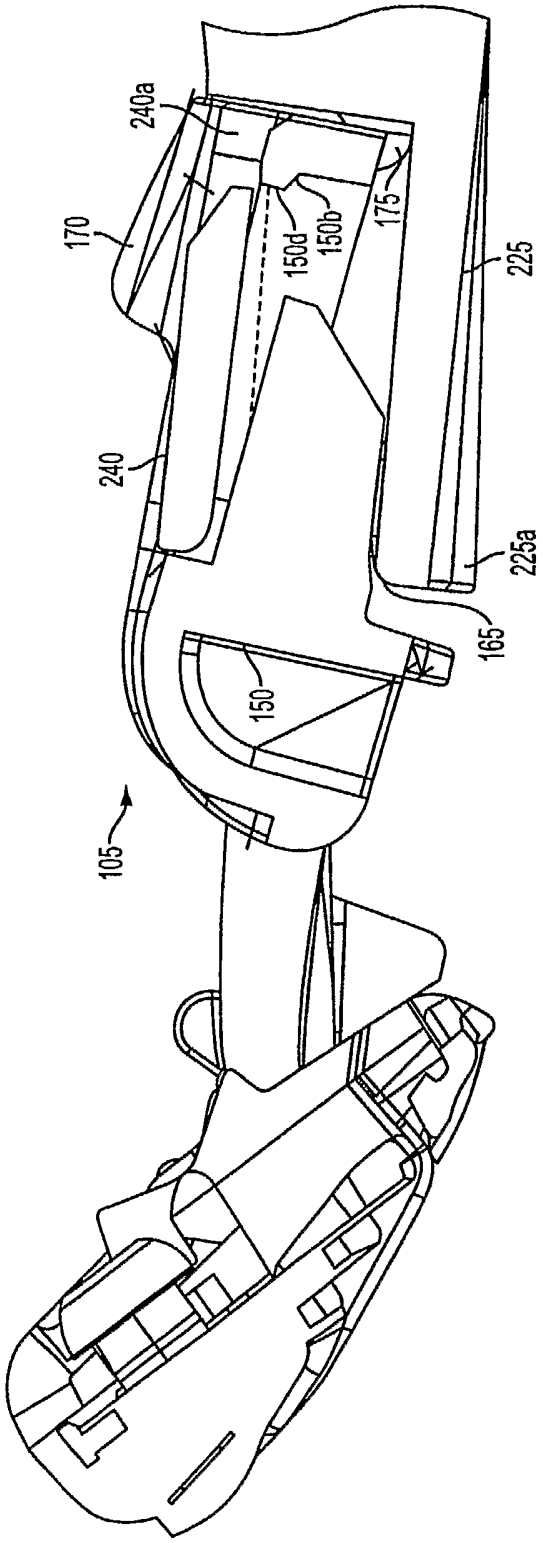


FIG. 7C

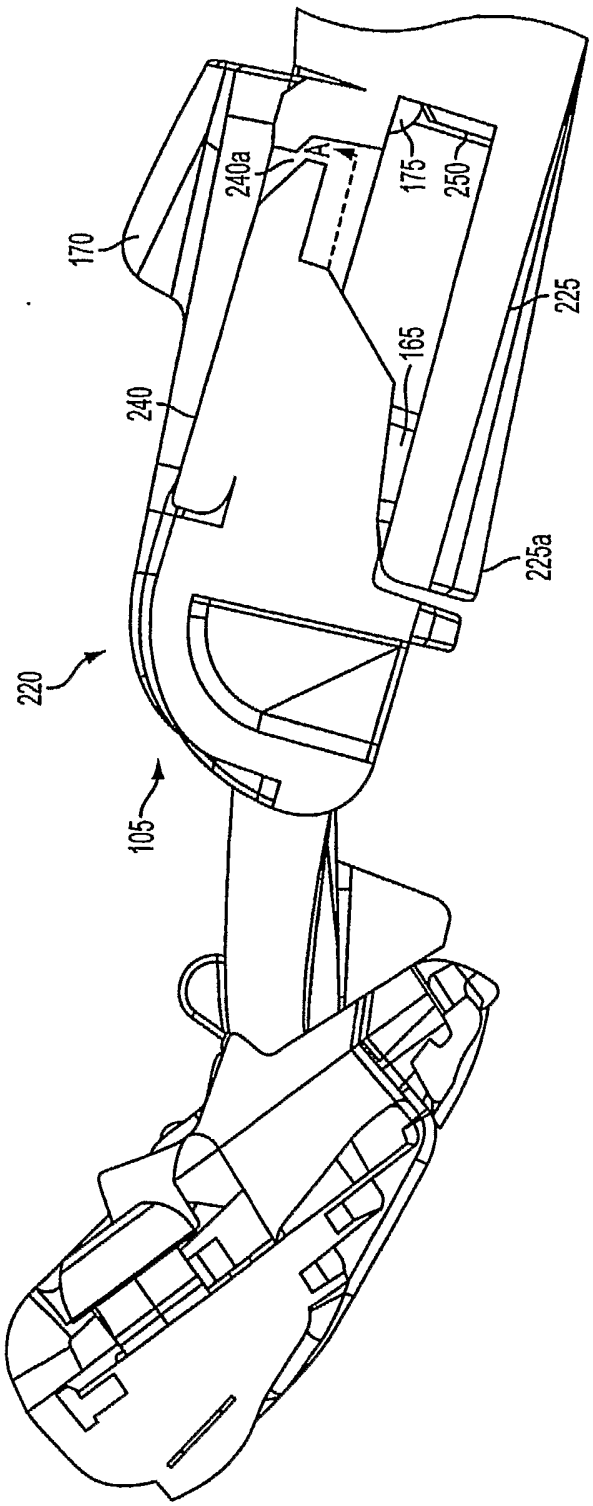


FIG. 7D

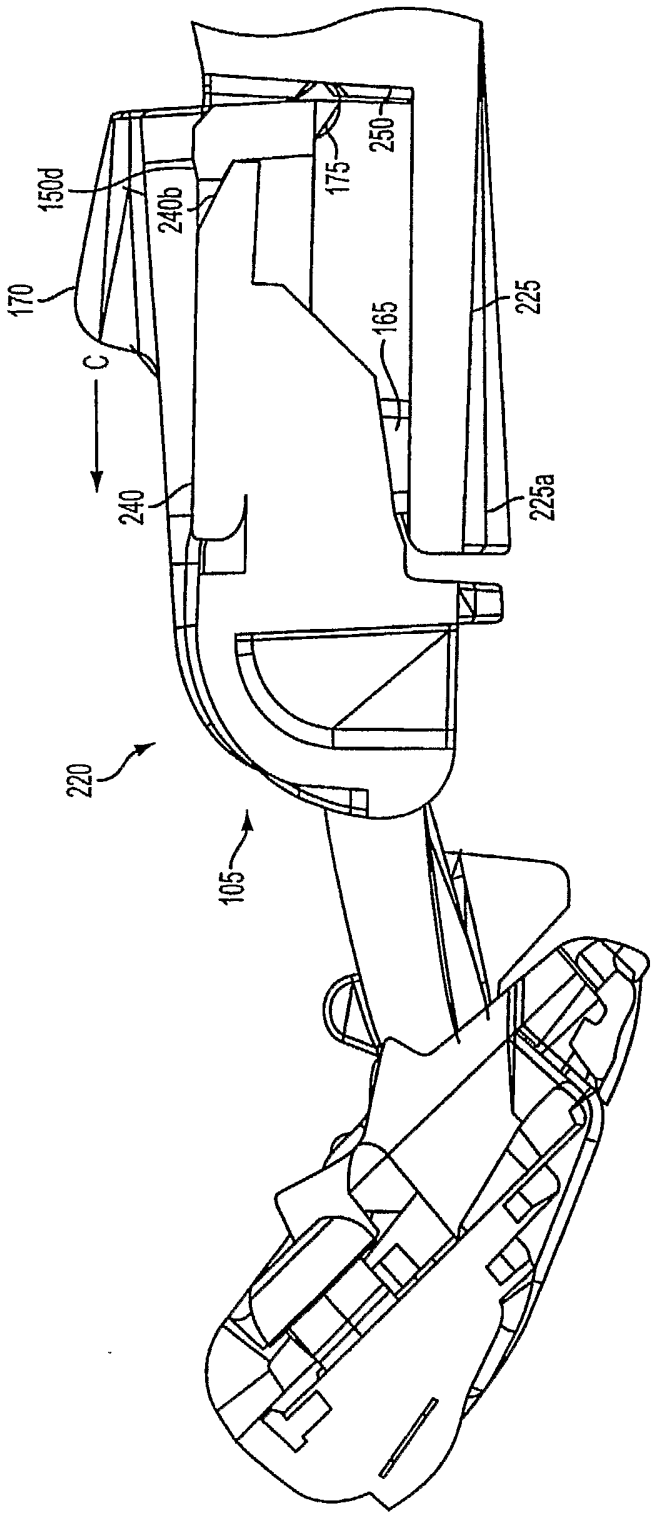


FIG. 7E

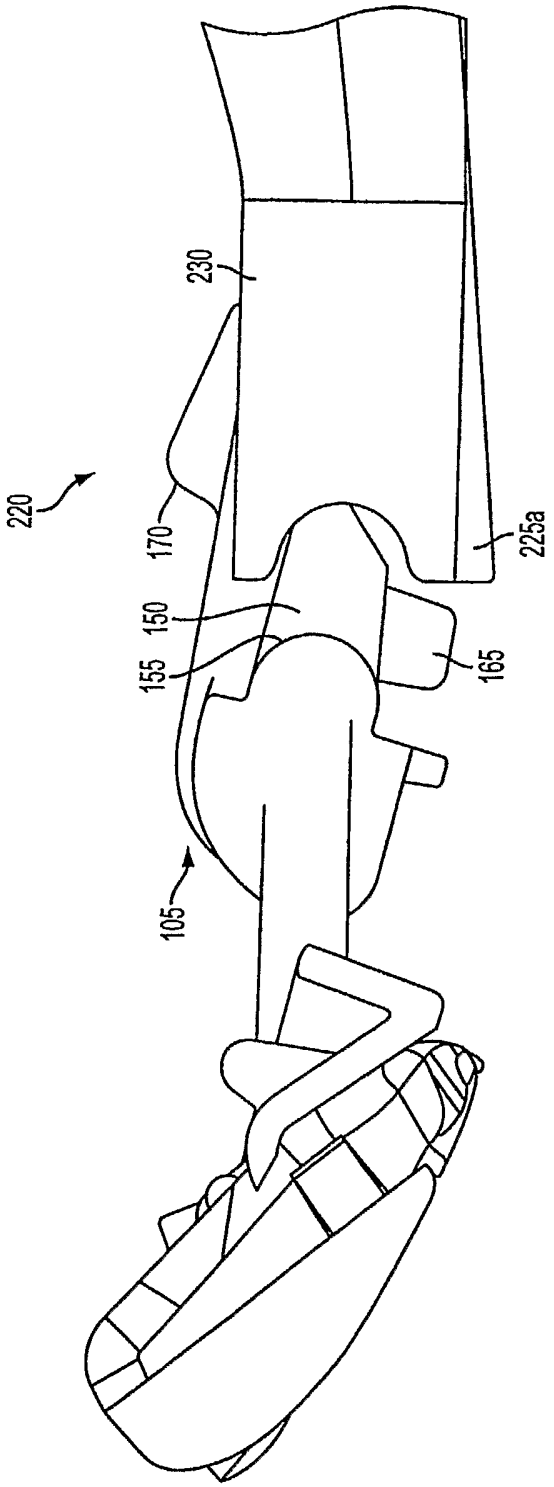


FIG. 8A

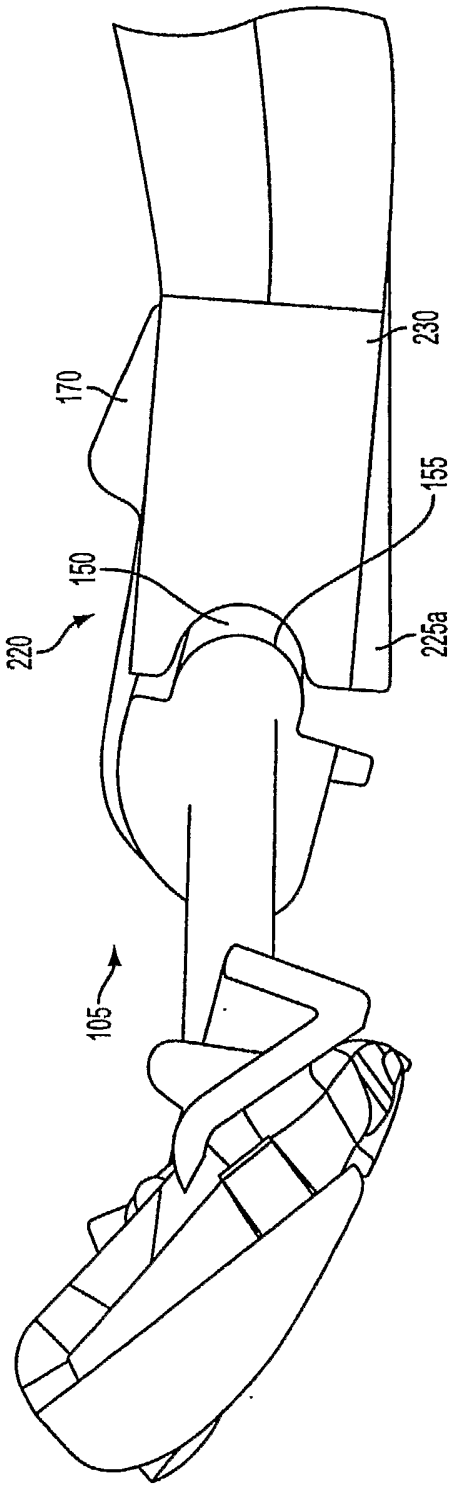


FIG. 8B

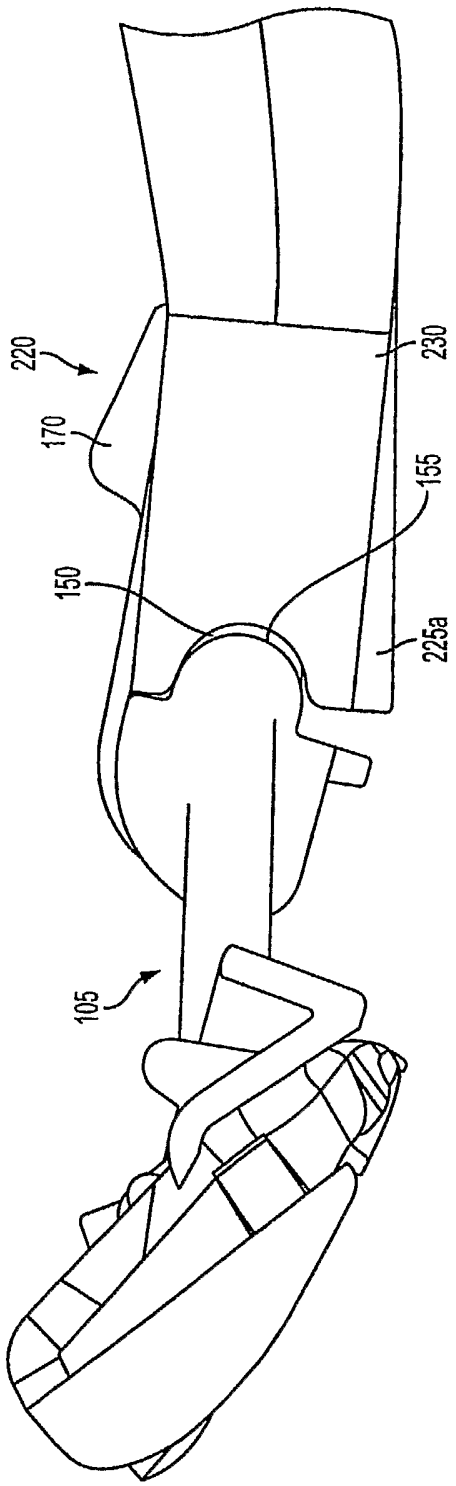


FIG. 8C

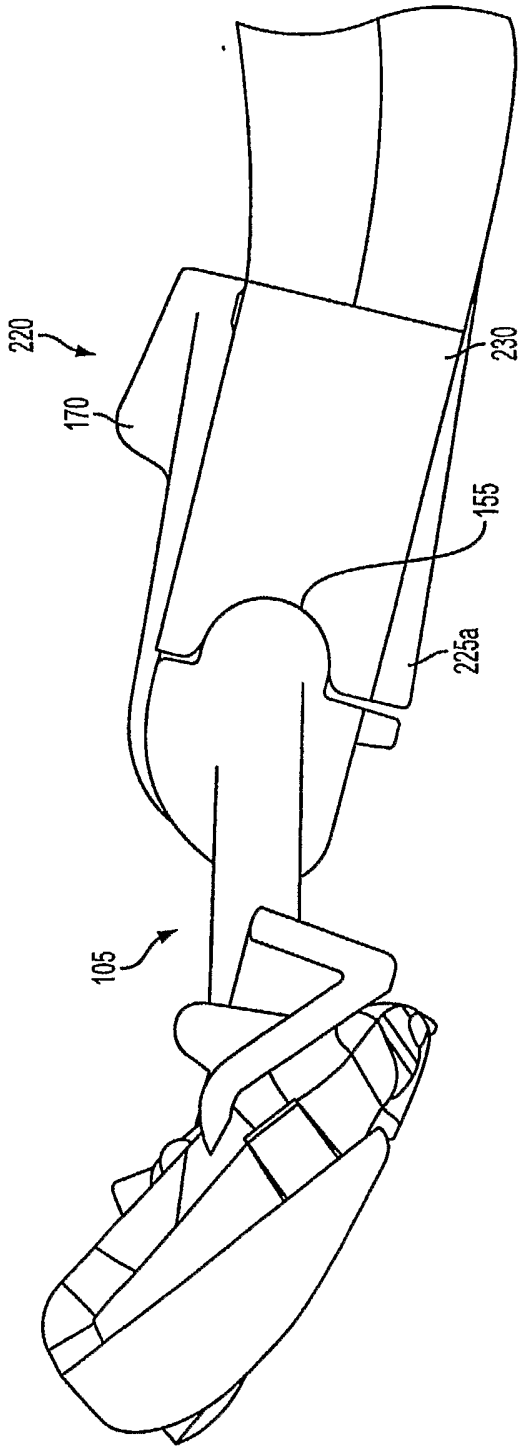


FIG. 8D

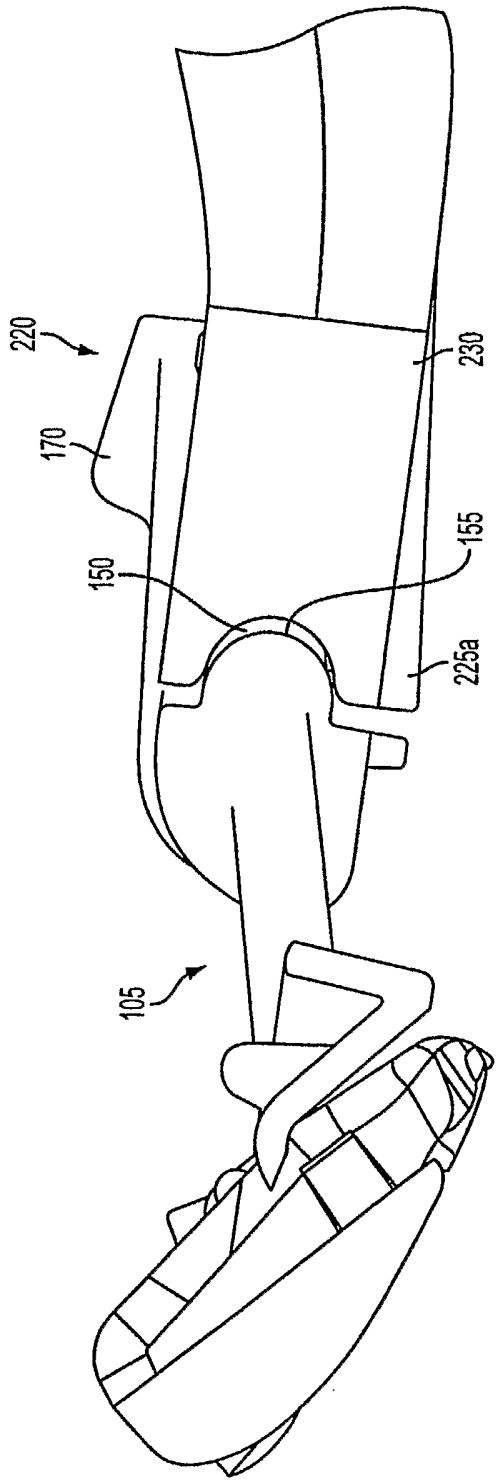


FIG. 8E

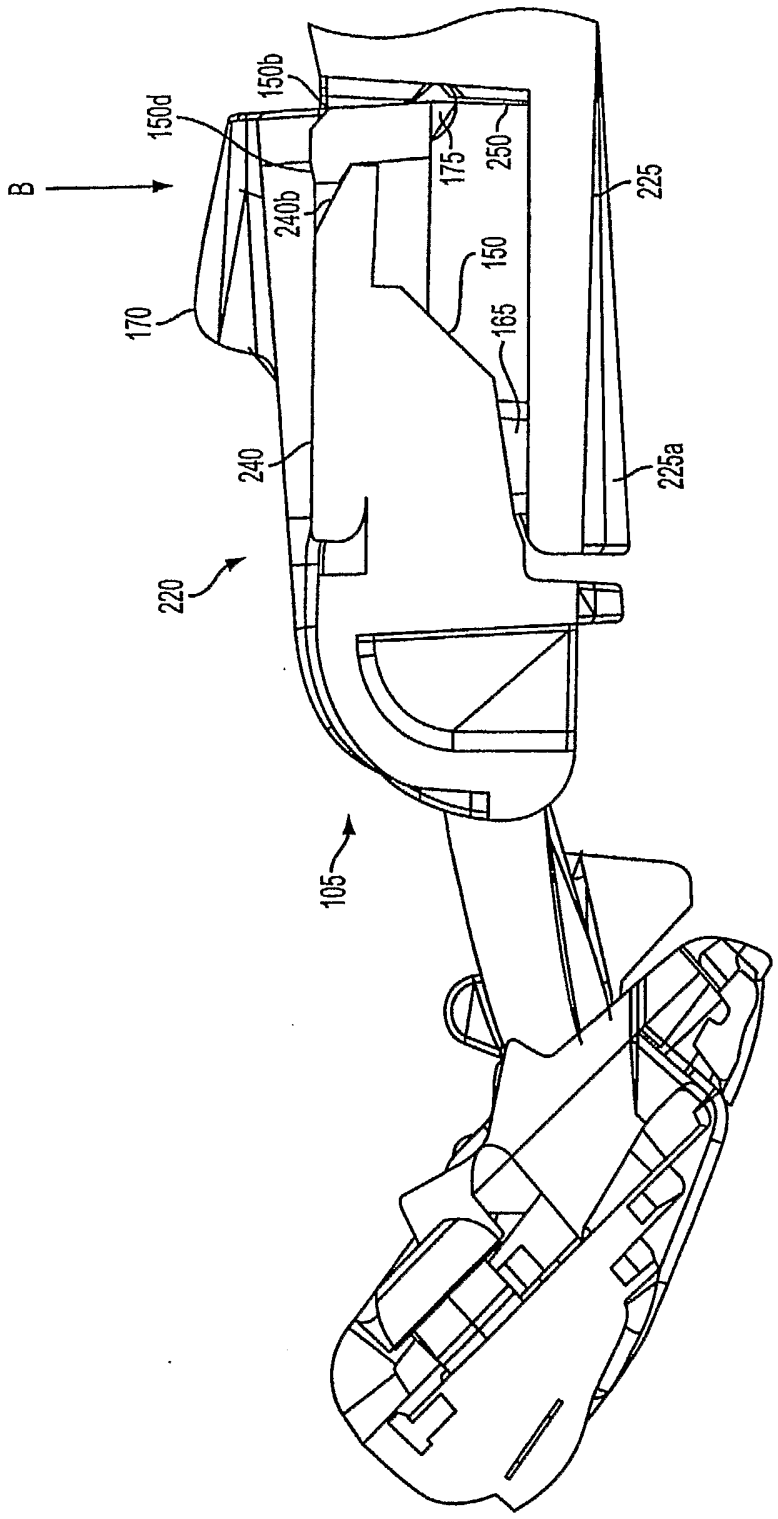


FIG. 9A

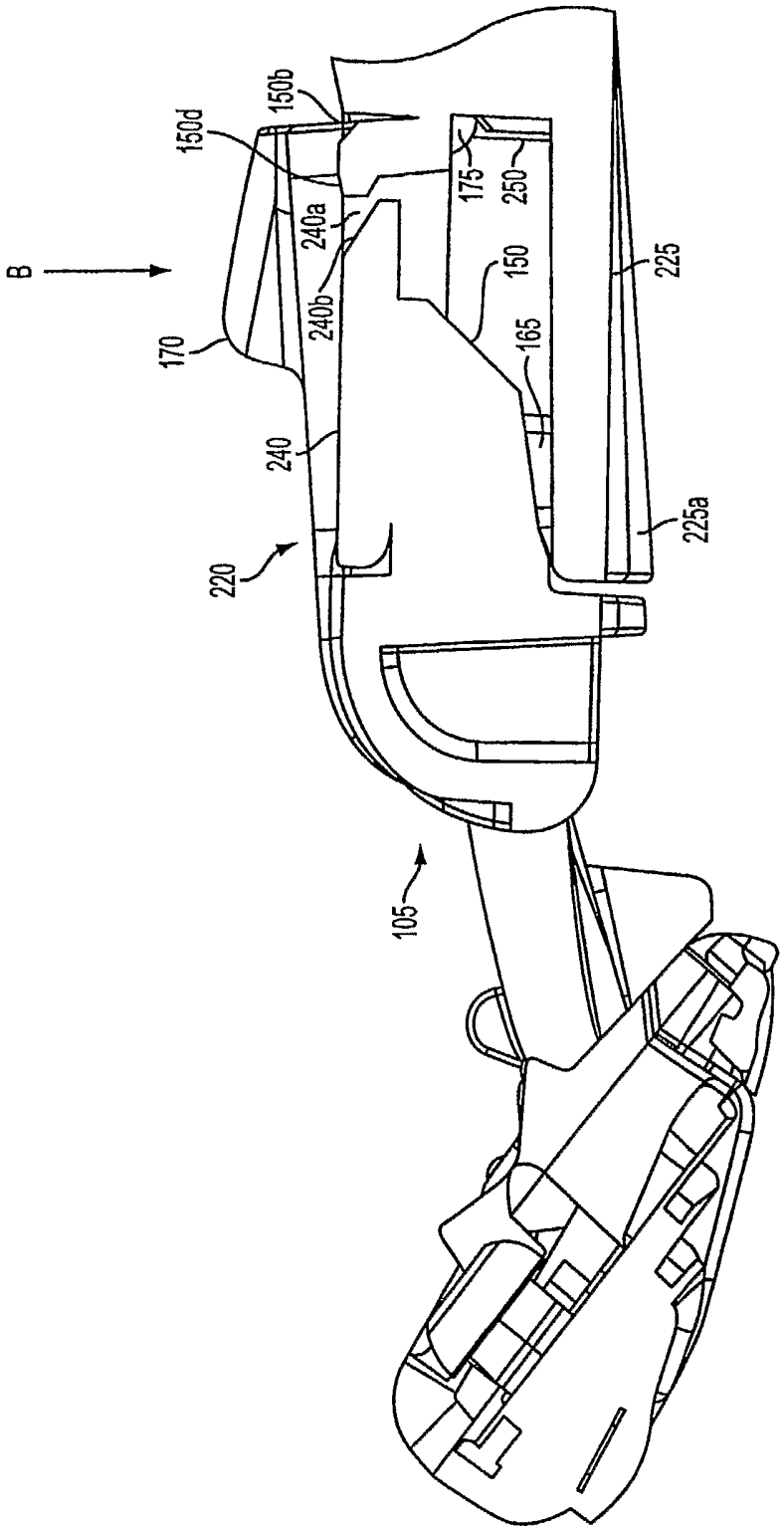


FIG. 9B

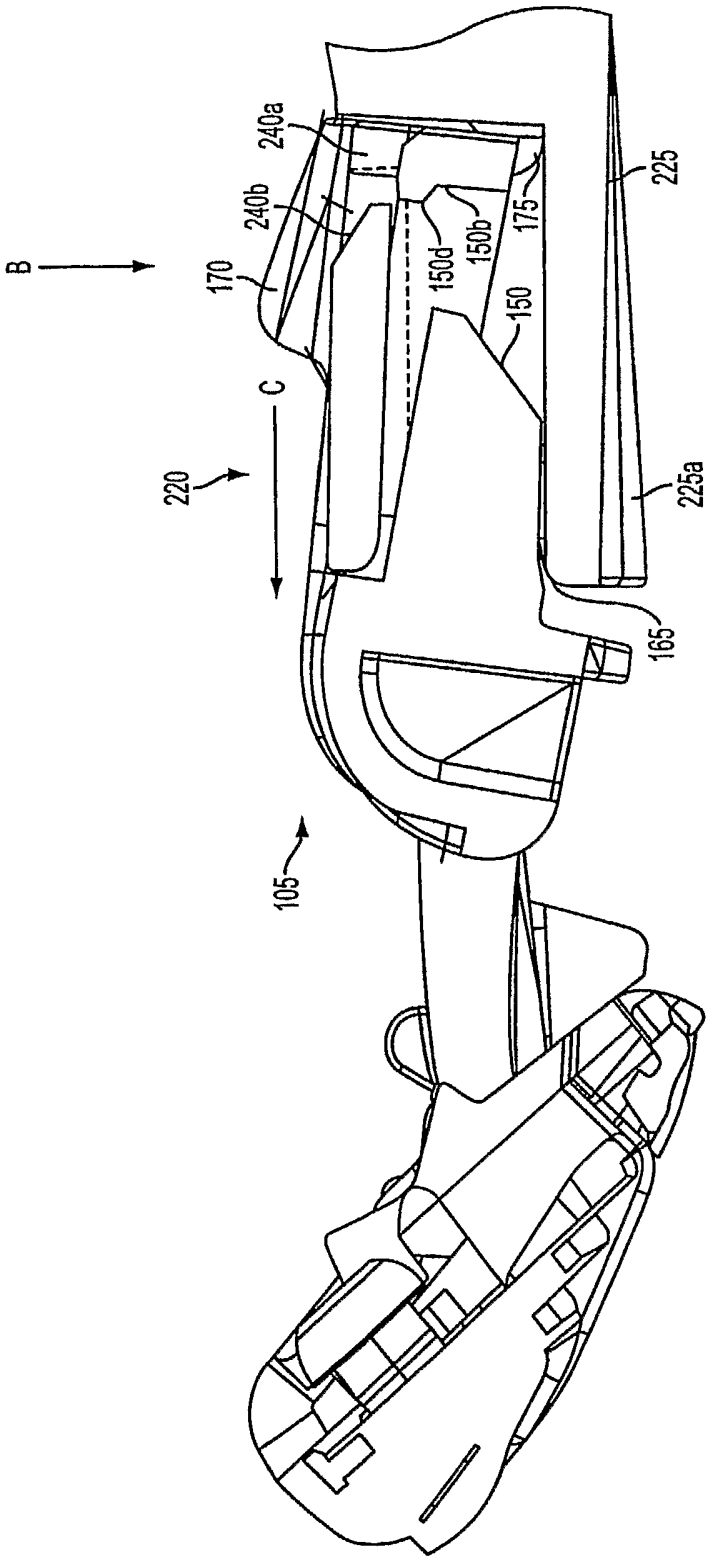


FIG. 9C

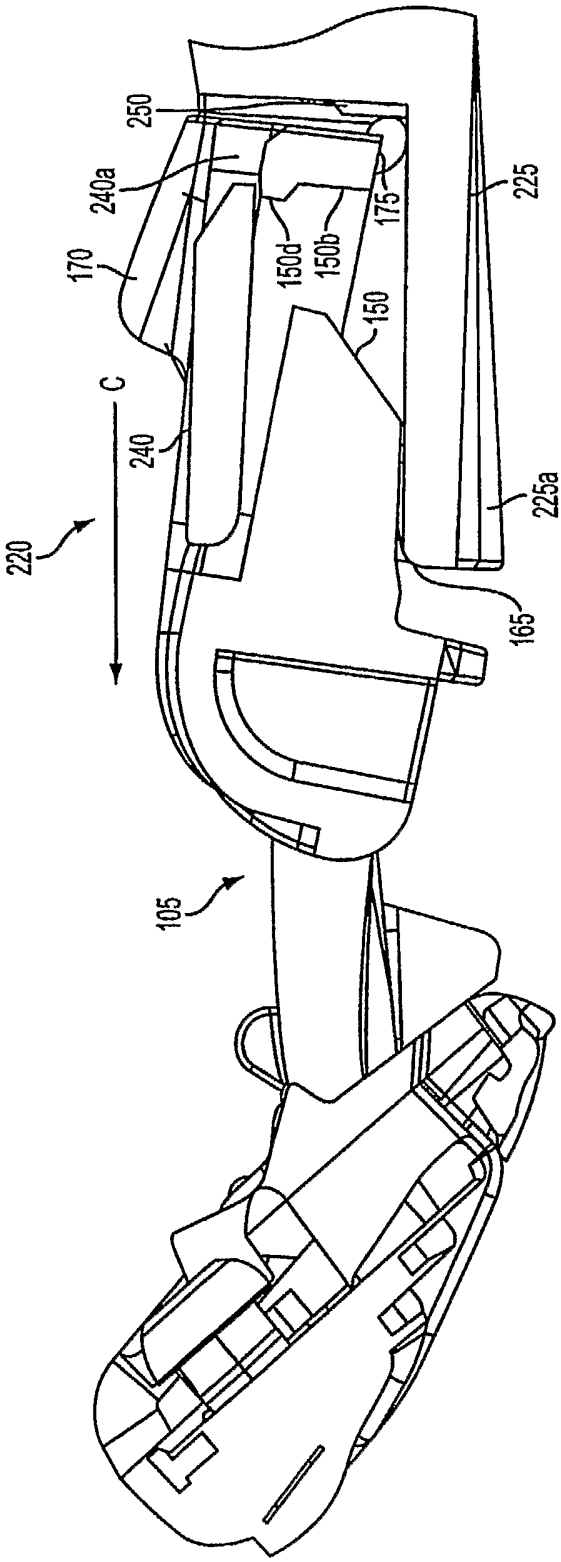


FIG. 9D

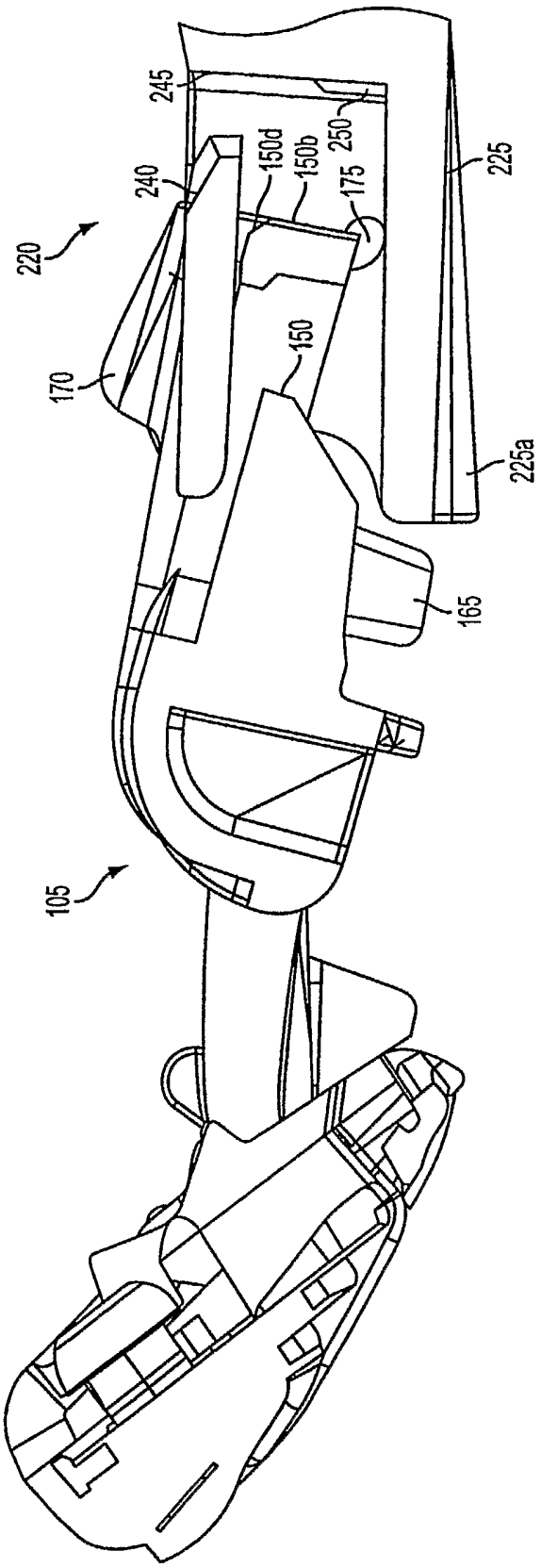


FIG. 9E

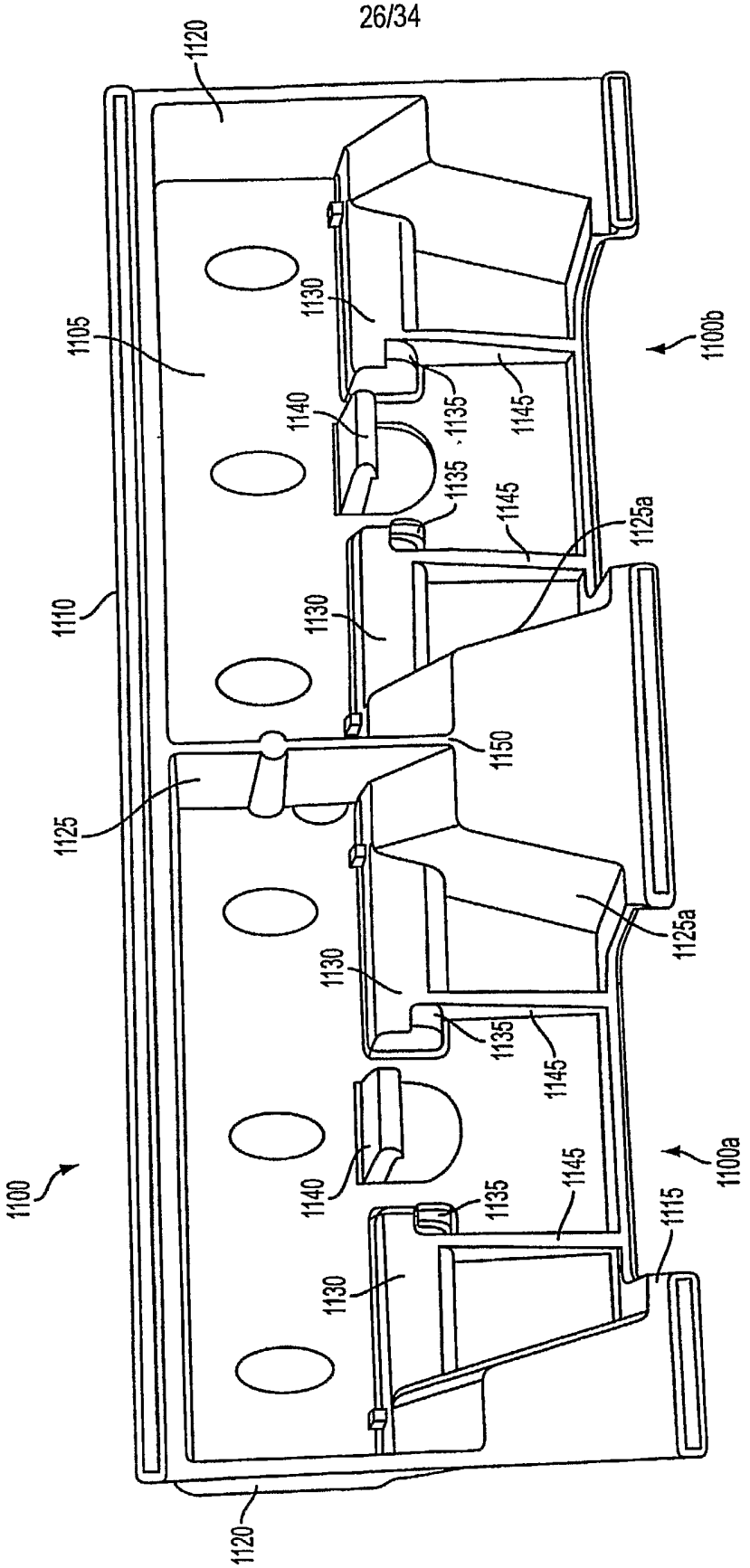

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1140
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1100b
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1130
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1100a
1100
1115
1130
1120

FIG. 10A

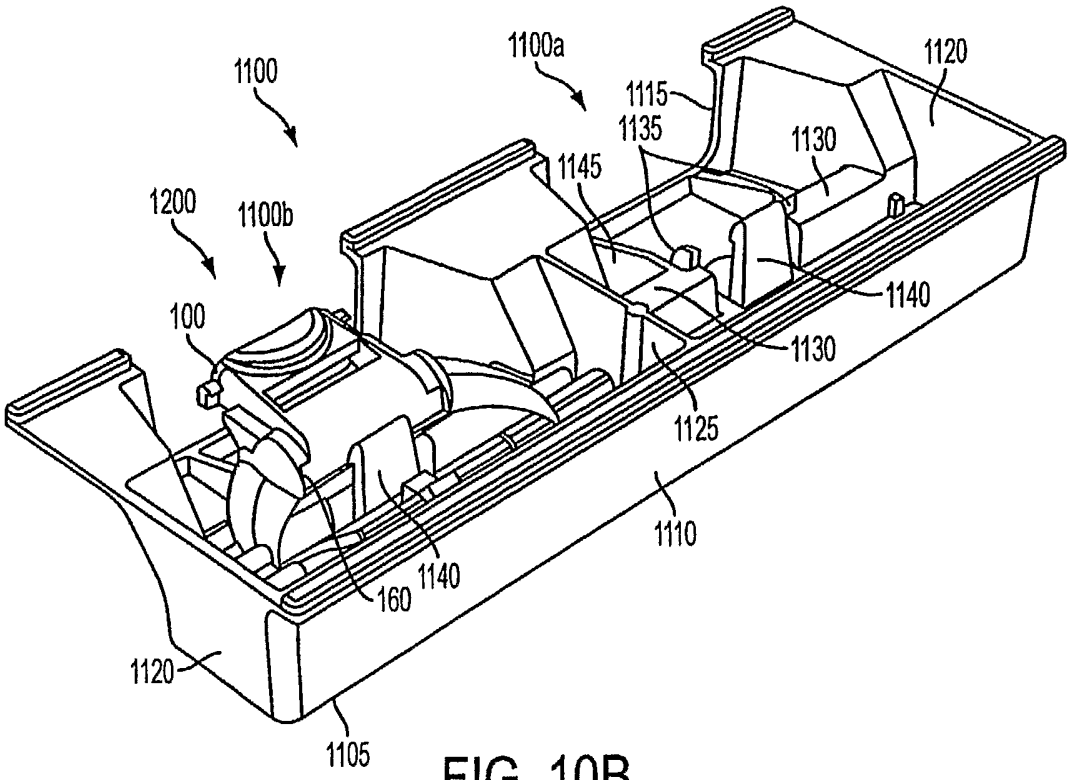


FIG. 10B

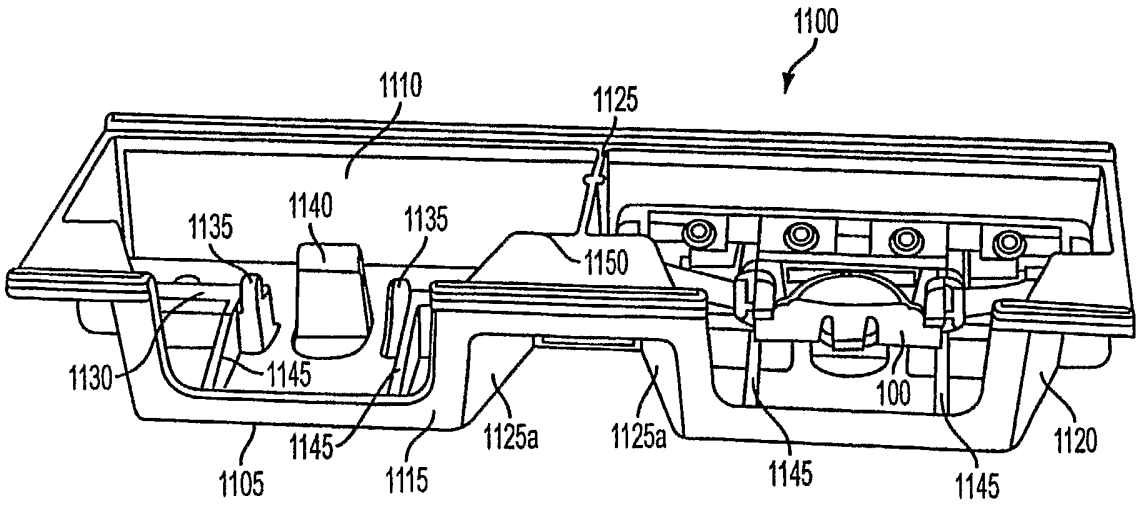


FIG. 10C

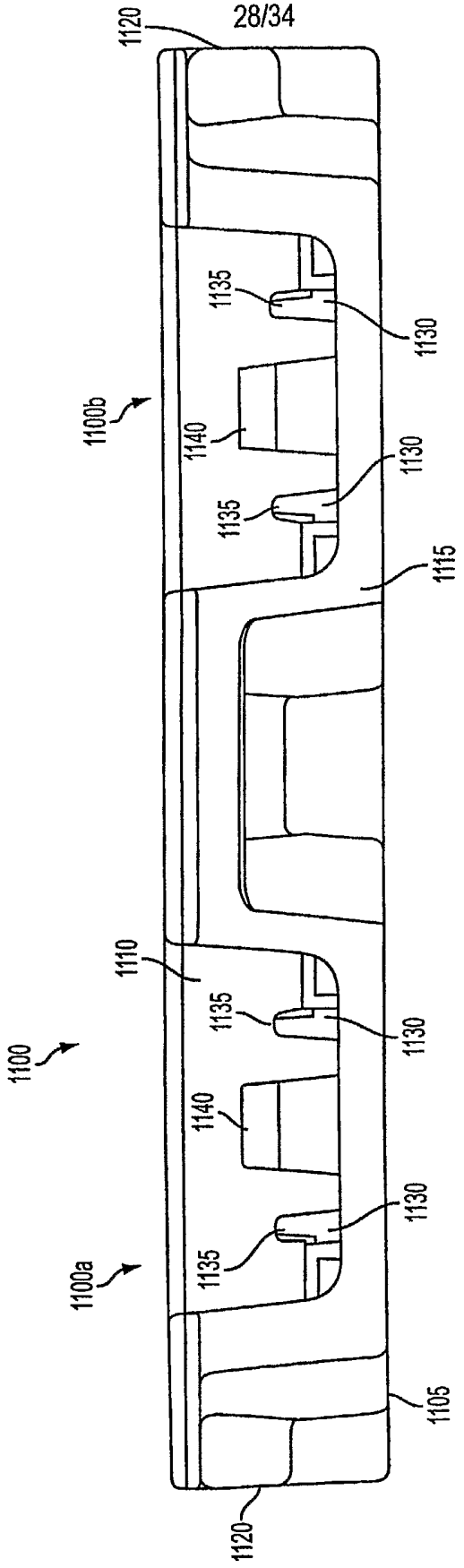

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1100a
1105
1120

FIG. 10D

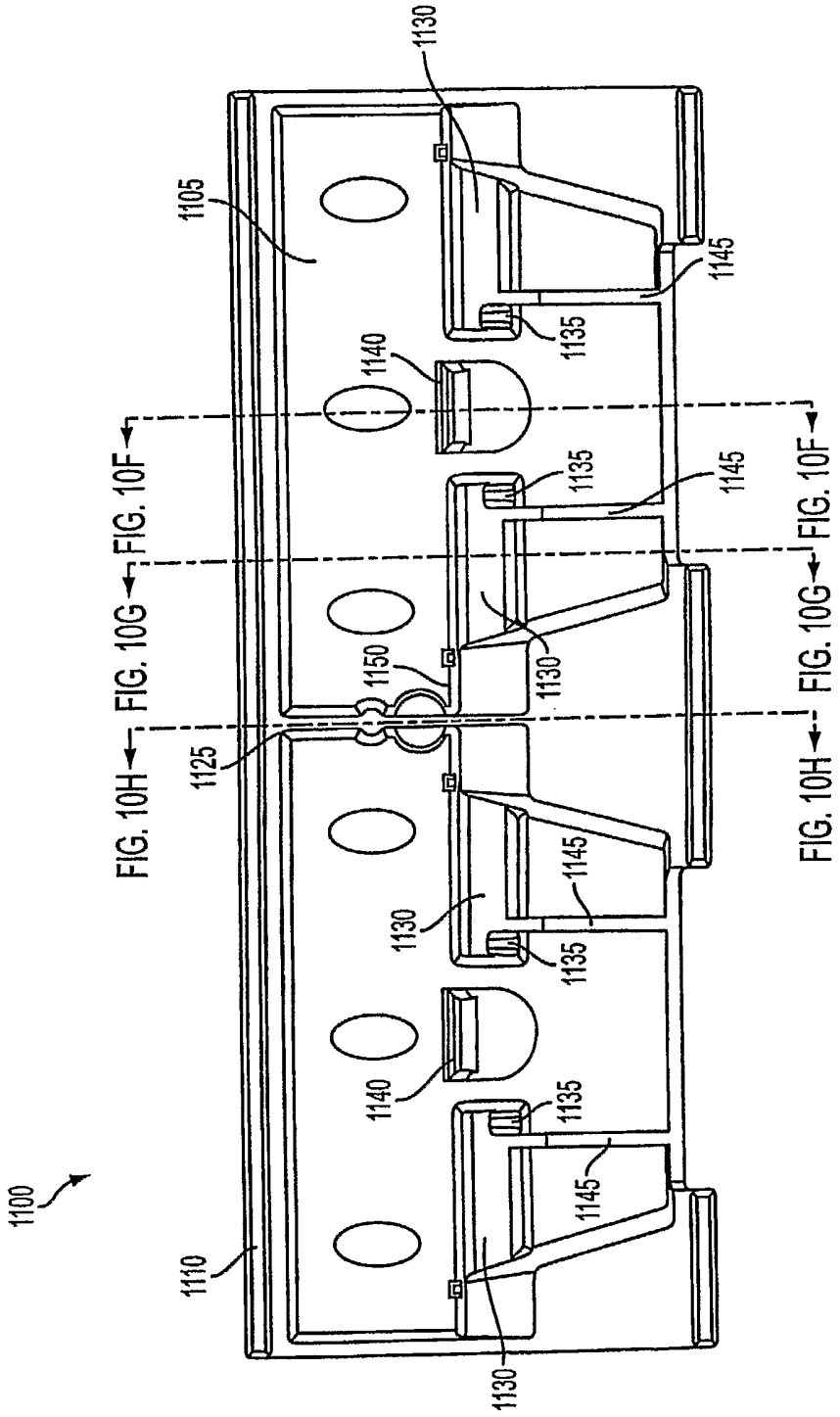

1130
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FIG. 10F
1135
1145
FIG. 10G
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FIG. 10H
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1145
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1110
1130

FIG. 10E

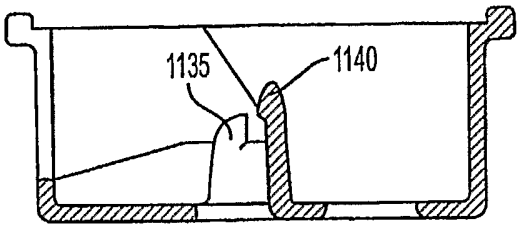


FIG. 10F

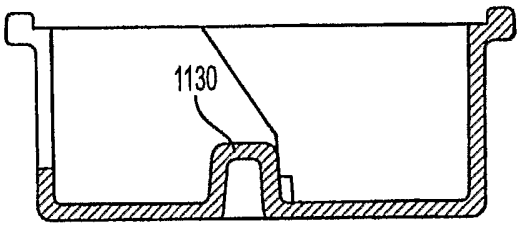


FIG. 10G

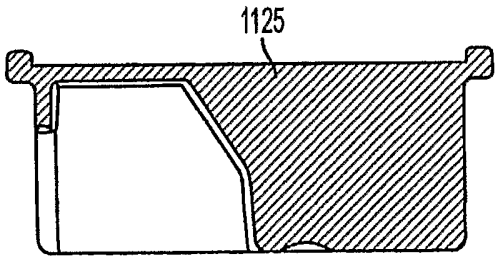


FIG. 10H

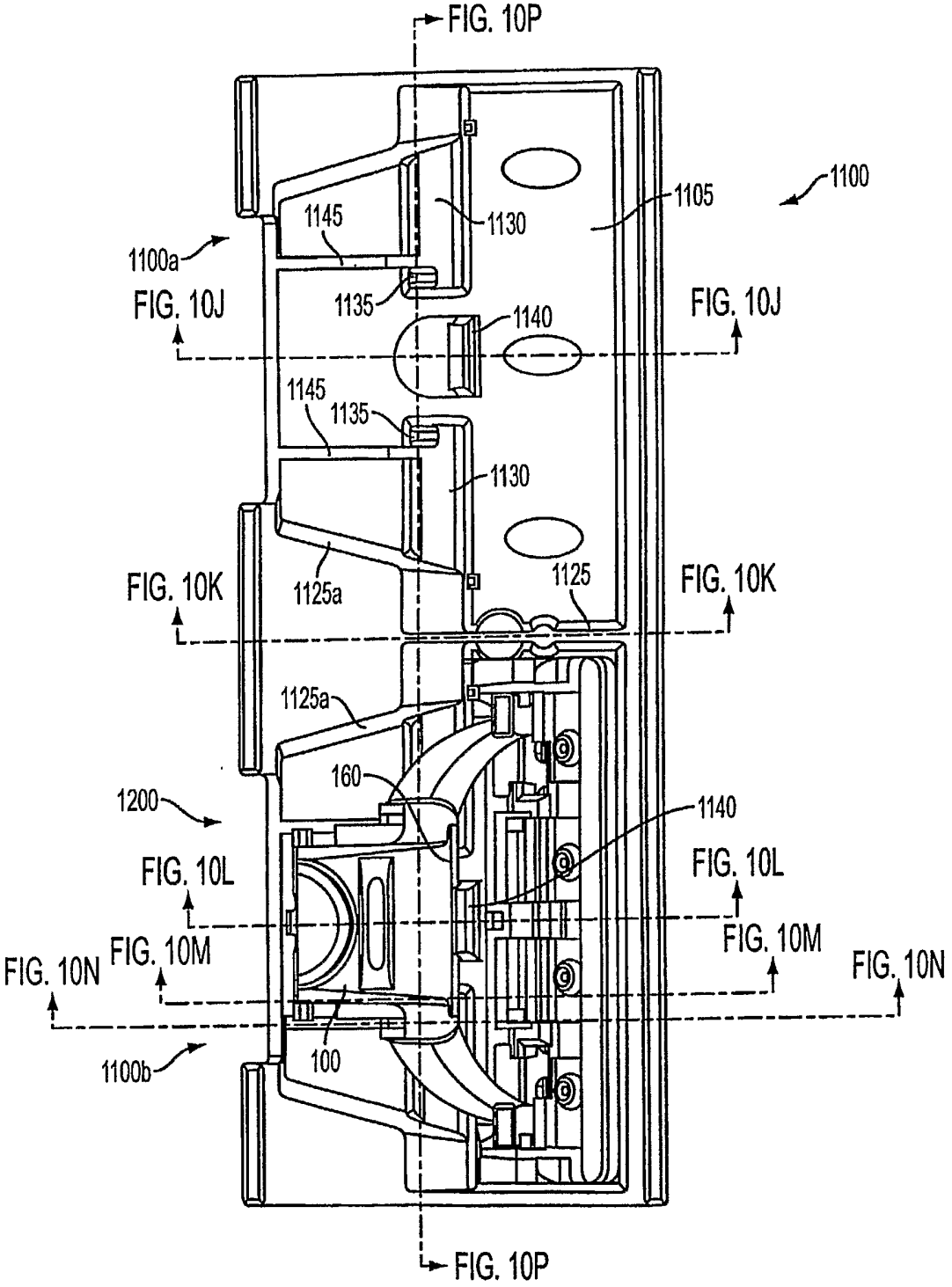

FIG. 10P
1100
1105
1145
1130
1100a
FIG. 10J
1135
1140
FIG. 10J
1145
1135
1130
FIG. 10K
1125a
1125
FIG. 10K
1125a
160
1200
1140
FIG. 10L
FIG. 10L
FIG. 10M
FIG. 10N
FIG. 10M
FIG. 10N
100
1100b
FIG. 10P

FIG. 10I

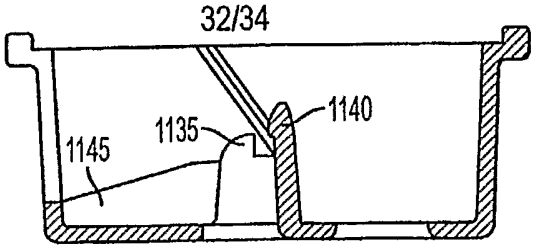


FIG. 10J

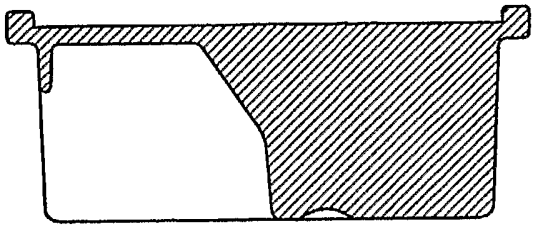


FIG. 10K

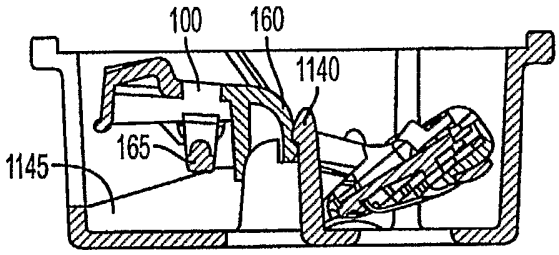


FIG. 10L

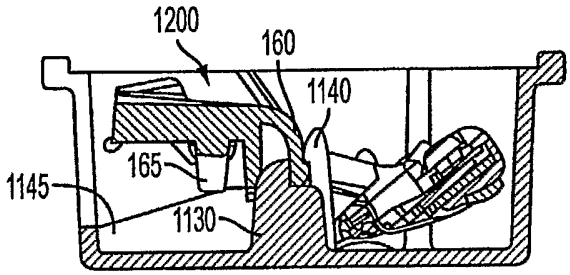


FIG. 10M

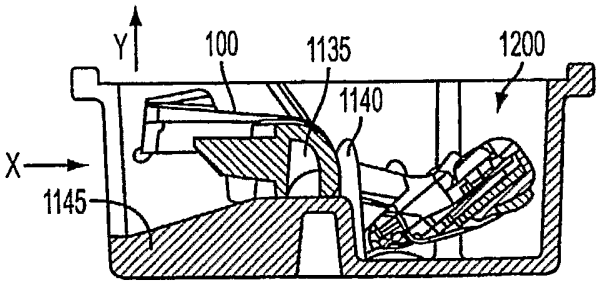


FIG. 10N

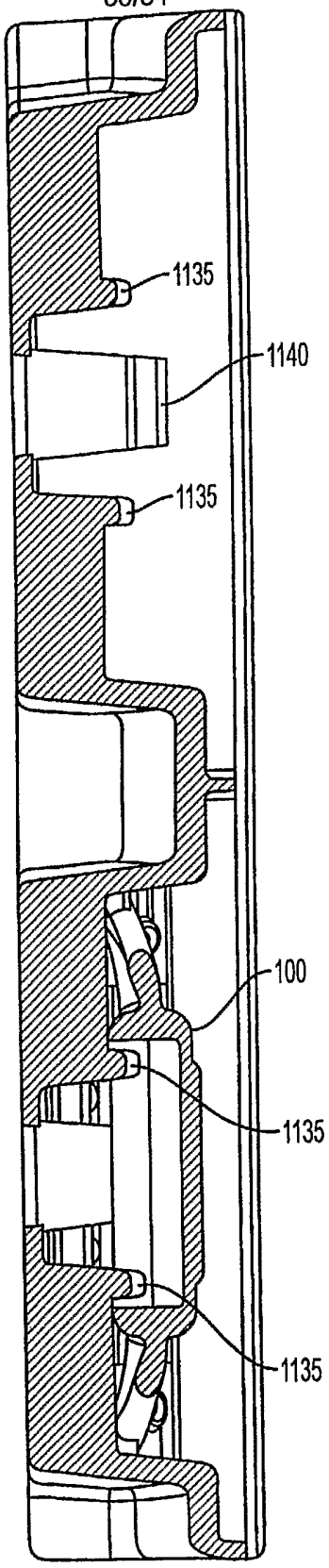


FIG. 10P

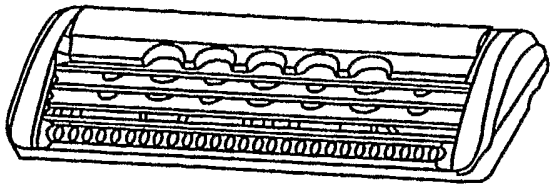


FIG. 11A

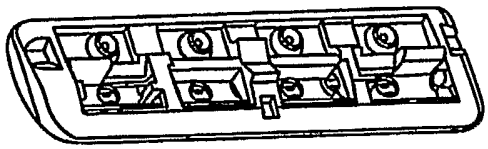


FIG. 11B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US06/04135

A. CLASSIFICATION OF SUBJECT MATTER
IPC: **B26B 21/52**(2006.01)

USPC: 30/527,32
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)
U.S. : 30/527, 32, 50

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2002/0138992 A1 (Richard) 03 October 2002, Figures 4,5 and 8.	1-25
A	US 6,434,839 B1 (Lee et al.) 20 August 2002, Figure 4a. Column 7. Also Column 5.	1-25
A	US 5,784,790 A (Carson, III et al.) 28 July 1998, Figure 2.	2, 7, 13, 10, 11, 17, 20, 21
A	US 4,785,534 A (Lazarchick) 22 November 1988, Figure 1 Column 2 lines 1-7, Column 1 lines 45-65.	3, 5, 14, 16, 23, 24
X --- Y	US 5,518,114 A (Kohring et al.) Figure 11.	26 --- 27, 28

☐ Further documents are listed in the continuation of Box C.

☐ 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 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
18 April 2006 (18.04.2006)

Date of mailing of the international search report
03 JUL 2006

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Form PCT/ISA/210 (second sheet) (April 2005)