(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
26 September 2013 (26.09.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/139622 A1

(51) International Patent Classification:
G02B 6/44 (2006.01)

(21) International Application Number:
PCT/EP2013/054717

(22) International Filing Date:
8 March 2013 (08.03.2013)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/612,772 19 March 2012 (19.03.2012) US

(71) Applicant: **TYCO ELECTRONICS RAYCHEM BVBA** [BE/BE]; Diestsesteenweg 692, B-3010 Kessel-Lo (BE).

(72) Inventors: **WANDELS, Jean-Pierre**; Oude Diestsestraat 11C, B-3473 Waanrode (BE). **BECKERS, Erwin**; Grotestraat 48, B-3118 Werchter (BE).

(74) Agent: **HEINZ-SCHAEFER, Marion**; c/o Tyco Electronics UK Ltd, European Patent Department, Faraday Road, Dorcan, Swindon Wiltshire SN3 5HH (GB).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

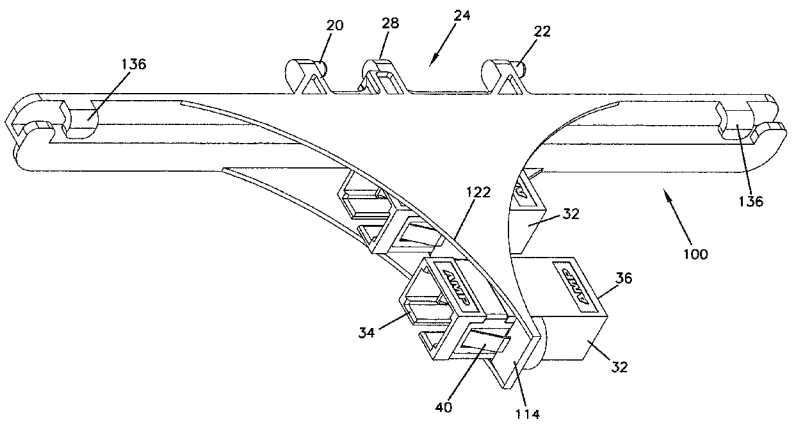
— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

(54) Title: PIVOTAL SUPPORT FRAME FOR A FIBER OPTIC ADAPTER

FIG. 8



(57) Abstract: The present disclosure relates to a fiber optic telecommunications device. The device includes a support frame (100/200/300/400/500) configured to be pivotally coupled to a fixture (10), the support frame (100/200/300/400/500) pivotable about a pivot axis (30). An adapter mount (112/212/312) is integrally mounted to the support frame (100/200/300/400/500) by at least one reinforcement wall (118/120/218/220/418/520), the reinforcement wall (118/120/218/220/418/520) defining a first side edge (122) and a second side edge (124). A fiber optic adapter (32) mounted to the adapter mount (112/212/312) defines a first connector receiving end (34) and a second connector receiving end (36). When the adapter (32) is mounted to the adapter mount (112/212/312), the first and second connector receiving ends (34, 36) of the adapter (32) extend beyond the first and second side edges (122, 24) of the reinforcement wall (118/120/218/220/418/520).

WO 2013/139622 A1

PIVOTAL SUPPORT FRAME FOR A FIBER OPTIC ADAPTER

Field

The present disclosure relates generally to fiber optic telecommunications devices. More specifically, the present disclosure relates to a support frame for pivotally mounting fiber optic adapters to a telecommunications fixture.

Background

As demand for telecommunications increases, fiber optic networks are being extended in more and more areas. Management of the cables, ease of installation, and ease of accessibility for later management are important concerns. Moreover, solutions for cable installation and management that can be used with existing telecommunications fixtures are desired. As a result, there is a need for fiber optic devices and methods of use which address these and other concerns.

Summary

The present invention relates to a fiber optic telecommunications device. The telecommunications device is a support frame for pivotally mounting a fiber optic adapter to a telecommunications fixture, wherein, in one example embodiment, the pivot axis of the support frame is parallel to a connector alignment axis of the mounted fiber optic adapter and connector receiving ends of the fiber optic adapter are accessible for coupling and removal of connectors to and from the fiber optic adapter.

According to one aspect, the support frame defines a first wall that includes a hinge structure for pivotally mounting the fiber optic adapter to a telecommunications fixture. The support frame defines a second wall that protrudes from the first wall for mounting a fiber optic adapter thereto, wherein the second wall exposes connector receiving ends of the fiber optic adapter for access.

According to another aspect of the disclosure, the fiber optic telecommunications device comprises a support frame configured to be pivotally coupled to a fixture, the support frame pivotable about a pivot axis, an adapter mount for mounting a fiber optic adapter to the support frame, the adapter mount integrally mounted to the support frame by at least one reinforcement wall, wherein the at least one reinforcement wall defines a first side edge and a second side edge, and a fiber optic adapter mounted to the adapter mount, the fiber optic adapter defining a first connector receiving end and a second connector receiving end, wherein when the fiber optic adapter is mounted to the adapter mount, the first and second connector receiving ends of the adapter extend beyond the first and second side edges, respectively, of the reinforcement wall.

According to another aspect, the present disclosure relates to a telecommunications device comprising a fixture defining a hinge structure, a support frame pivotally coupled to the hinge structure of the fixture, the support frame pivotable about a pivot axis, and an adapter mount for mounting a fiber optic adapter to the support frame, the adapter mount integrally mounted to the support frame by top and bottom parallel reinforcement walls, wherein each reinforcement wall defines a first side edge and a second side edge. A fiber optic adapter is mounted to the adapter mount, the fiber optic adapter defining a first connector receiving end and a second connector receiving end, wherein the fiber optic adapter is configured to optically align a first fiber optic connector received through the first connector receiving end with a second fiber optic connector received through the second connector receiving end along an alignment axis. When the fiber optic adapter is mounted to the adapter mount, the alignment axis is parallel to the pivot axis and first and second connector receiving ends of the adapter extend beyond the first and second side edges, respectively, of the reinforcement walls, along a direction parallel to the pivot axis.

According to another aspect, the present disclosure relates to a method of mounting a fiber optic adapter to a telecommunications fixture comprising pivotally mounting a support frame to the telecommunications fixture, the support frame pivotable about a pivot axis, wherein the support frame includes an adapter mount integrally mounted to the support frame by top and bottom parallel reinforcement walls, wherein each of the top and bottom parallel reinforcement walls defines a first side edge and a second side edge, providing a fiber optic adapter defining a first connector receiving end and a second connector receiving end, wherein the fiber optic adapter is configured to optically align a first fiber optic connector received through the first connector receiving end with a second fiber optic connector received through the second connector receiving end along an alignment axis, and mounting the fiber optic adapter to the support frame so that the alignment axis is parallel to the pivot axis and first and second connector receiving ends of the adapter extend beyond the first and second side edges, respectively, of the reinforcement walls, along a direction parallel to the pivot axis.

According to yet another aspect, the present disclosure relates to a fiber optic telecommunications device comprising a support frame configured to be pivotally coupled to a fixture, the support frame defining a rear end and a front end, the support frame including a hinge structure at the rear end for pivotably mounting the support frame to the fixture about a pivot axis; and an adapter mount for mounting a fiber optic adapter to the support frame such that a connector alignment axis of the fiber optic adapter is parallel to the pivot axis, the

adapter mount integrally mounted to the support frame by top and bottom parallel reinforcement walls, wherein a width of each of the top and bottom reinforcement walls decreases as the top and bottom reinforcement walls extend from the rear end toward the front end.

A variety of additional inventive aspects will be set forth in the description that follows. The inventive aspects can relate to individual features and combinations of features. It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the broad inventive concepts upon which the embodiments disclosed herein are based.

Brief Description of the Drawings

FIG. 1 is a top, front, right side perspective view of a telecommunications fixture including mounted thereon a cable management tray, a splice tray, a first embodiment of an adapter support frame, and a second embodiment of an adapter support frame according to the present invention;

FIG. 2 is a front view of the telecommunications fixture of FIG. 1;

FIG. 3 is another top, front, right side perspective view of the telecommunications fixture of FIG. 1;

FIG. 4 is a bottom, front, right side perspective view of the telecommunications fixture of FIG. 1;

FIG. 5 is a left side view of the telecommunications fixture of FIG. 1;

FIG. 6 is a right side view of the telecommunications fixture of FIG. 1;

FIG. 7 is a top, front, right side perspective view of the first embodiment of the adapter support frame, shown in isolation, removed from the telecommunications fixture of FIG. 1;

FIG. 7A illustrates the adapter support frame of FIG. 7 without the fiber optic adapters mounted thereon;

FIG. 8 is a top, front, left side perspective view of the adapter support frame of FIG. 7;

FIG. 9 is a top, rear, left side perspective view of the adapter support frame of FIG. 7;

FIG. 10 is a top, rear, right side perspective view of the adapter support frame of FIG. 7;

FIG. 11 is a top view of the adapter support frame of FIG. 7;

FIG. 12 is a bottom view of the adapter support frame of FIG. 7;

FIG. 13 is a rear view of the adapter support frame of FIG. 7;

FIG. 14 is a front view of the adapter support frame of FIG. 7;

FIG. 15 is a right side view of the adapter support frame of FIG. 7;

FIG. 16 is a left side view of the adapter support frame of FIG. 7;

FIG. 17 is a top, front, right side perspective view of the second embodiment of the adapter support frame, shown in isolation, removed from the telecommunications fixture of FIG. 1;

FIG. 18 is a top, front, left side perspective view of the adapter support frame of FIG. 17;

FIG. 19 is a top, rear, left side perspective view of the adapter support frame of FIG. 17;

FIG. 20 is a top, rear, right side perspective view of the adapter support frame of FIG. 17;

FIG. 21 is a bottom, rear, right side perspective view of the adapter support frame of FIG. 17;

FIG. 22 is a top view of the adapter support frame of FIG. 17;

FIG. 23 is a bottom view of the adapter support frame of FIG. 17;

FIG. 24 is a rear view of the adapter support frame of FIG. 17;

FIG. 25 is a front view of the adapter support frame of FIG. 17;

FIG. 26 is a right side view of the adapter support frame of FIG. 17;

FIG. 27 is a left side view of the adapter support frame of FIG. 17;

FIG. 28 is a top, rear, left side perspective view of a third embodiment of an adapter support frame according to the invention, the adapter support frame configured for mounting on a telecommunications fixture such as the telecommunications fixture shown in FIG. 1;

FIG. 29 is a bottom, rear, right side perspective view of the adapter support frame of FIG. 28;

FIG. 30 is a top, front, left side perspective view of the adapter support frame of FIGS. 28-29, shown without the fiber optic adapters mounted thereon;

FIG. 31 is a top, front, right side perspective view of the adapter support frame of FIG. 30;

FIG. 32 is a top, rear, left side perspective view of the adapter support frame of FIG. 30;

FIG. 33 is a top, rear, right side perspective view of the adapter support frame of FIG. 30;

FIG. 34 is a top view of the adapter support frame of FIG. 30;

FIG. 35 is a bottom view of the adapter support frame of FIG. 30;

FIG. 36 is a rear view of the adapter support frame of FIG. 30;

FIG. 37 is a front view of the adapter support frame of FIG. 30;

FIG. 38 is a right side view of the adapter support frame of FIG. 30;

FIG. 39 is a left side view of the adapter support frame of FIG. 30;

FIG. 40 is a top, front, right side perspective view of another embodiment of an adapter support frame including features similar to the adapter support frame of FIGS. 7-16, the adapter support frame of FIG. 40 defining a single reinforcement wall; and

FIG. 41 is a bottom, front, left side perspective view of another embodiment of an adapter support frame including features similar to the adapter support frame of FIGS. 28-39, the adapter support frame of FIG. 41 defining a single reinforcement wall.

Detailed Description

Reference will now be made in detail to examples of inventive aspects of the present disclosure which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

According to the present disclosure, a number of different embodiments of support frames for supporting fiber optic adapters are described and illustrated. The support frames described and illustrated herein are configured to be mounted to existing fiber optic equipment fixtures and are configured to be usable with existing telecommunications equipment in providing further solutions in cable installation and management and fiber optic connectivity.

Referring to FIGS. 1-6, a telecommunications fixture (i.e., groove plate) 10 that is used to illustrate the inventive aspects of the different embodiments of the adapter support frames 100, 200, 300, 400, 500 of the present invention is shown. The telecommunications fixture 10 is designed for mounting a number of telecommunications equipment in a stacked arrangement. The fixture 10 depicted in the present disclosure may be used with a variety of telecommunications devices such as telecommunications closures. The fixture 10 depicted in the present disclosure defines a plurality of parallel hinge structures 12. The fixture hinge structures 12 are configured to receive the hinge structures of the telecommunications equipment for mounting. The hinge arrangement between the fixture 10 and the mounted equipment allow the equipment to be pivoted out of the way for accessing other equipment above or below thereof.

In FIGS. 1-6, the fixture 10 is shown as including mounted thereon a variety of telecommunications equipment such as a splice tray 14, a cable management tray 15, a first

embodiment of an adapter support frame (i.e., module) 100 according to the invention, and a second embodiment of an adapter support frame 200 according to the invention. A third embodiment of an adapter support frame 300 in accordance with the invention that can be mounted on the depicted fixture 10 is shown in FIGS. 28-39. A fourth embodiment of an adapter support frame 400 in accordance with the invention that can be mounted on the depicted fixture 10 is shown in FIG. 40 and a fifth embodiment of an adapter support frame 500 in accordance with the invention that can be mounted on the depicted fixture 10 is shown in FIG. 41.

Each hinge structure 12 of the fixture 10 defines a first socket 16 and a second socket 18. The first and second sockets 16, 18 are configured to receive first and second mounting pins 20, 22 of the hinge structures 24 of the telecommunications equipment that are designed to be mounted to the fixture 10. In the depicted hinge structure arrangement, the first and second mounting pins 20, 22 of the telecommunications equipment are inserted into or removed from the first and second sockets 16, 18 of the fixture hinge structures 12 in a single direction (i.e., rightwardly or leftwardly). During insertion of the equipment, a flexible tab 26 on the fixture hinge structure 12, which is lifted upwardly in receiving the equipment, elastically moves back to its previous position after the first and second pins 20, 22 have been inserted into the first and second sockets 16, 18, respectively. When in place, the tab 26 abuts a retaining portion 28 of the hinge structure 24 of the telecommunications equipment to prevent slidable removal of the equipment in a direction opposite the insertion direction. Please see FIG. 3.

It should be noted that the depicted hinge structure arrangement is only one example arrangement that can be used to pivotally and removably mount telecommunications equipment to the fixture 10. Other arrangements are possible.

Also, the telecommunications fixture or groove plate 10 depicted herein is simply one example fixture used for describing and illustrating the inventive aspects of the adapter support frames 100, 200, 300, 400, 500 of the present invention. The adapter support frames 100, 200, 300, 400, 500 of the present disclosure can be configured to be pivotally mounted to other types of fixtures 10.

Referring now to FIGS. 7-16, the first embodiment of the support frame 100 defines a front end 102, a rear end 104, a first side end 106, and a second side end 108. In the depicted embodiment of the support frame 100, the hinge structure 24 is formed at a rear wall 110 of the support frame 100. The hinge structure 24 defines a pivot axis 30 for the support frame 100. Thus, as shown, the first and second side ends 106, 108 of the support frame 100 are

defined generally along the direction of the pivot axis 30 and the front and rear ends 102, 104 of the support frame 100 are defined in a direction generally transverse to the pivot axis 30.

Extending forwardly from the rear wall 110 is an adapter mount 112 that is configured for mounting fiber optic adapters 32 to the support frame 100. The adapter mount 112 defines a mounting wall 114 that is perpendicular to at least a portion of the rear wall 110. The mounting wall 114 includes at least one opening 116 for receiving a fiber optic adapter 32 in a direction along the pivot axis 30. In the depicted first embodiment of the support frame 100, the mounting wall 114 defines two separate openings 116 (see FIG. 7A) for receiving two fiber optic adapters 32. As will be described in further detail below, other numbers are possible.

Even though in the depicted examples of support frames of the present disclosure, the adapter mount 112 is shown as being located generally at the center of the support frame, generally halfway between the first side end 106 and the second side end 108, in other embodiments, the adapter mount 112 can be positioned off-center, closer to either the first side end 106 or the second side end 108. This configuration may be used in embodiments wherein the two cables that are connected through the mounted fiber optic adapters 32 have a different minimum bend radius.

Each fiber optic adapter 32 mounted to the support frame 100 defines a first connector receiving end 34 and a second connector receiving end 36. Each fiber optic adapter 32 is configured to optically align a first fiber optic connector received through the first connector receiving end 34 with a second fiber optic connector received through the second connector receiving end 36 along an alignment axis 38. As shown, when the fiber optic adapter 32 is mounted to the adapter mount 112, the alignment axis 38 is parallel to the pivot axis 30 of the support frame 100.

Even though in the depicted examples of support frames of the present disclosure, the mounting wall 114 of the adapter mount 112 is shown as being perpendicular to at least a portion of the rear wall 110 such that when the fiber optic adapter 32 is mounted to the adapter mount 112, the alignment axis 38 is parallel to the pivot axis 30 of the support frame 100, it should be noted that in other embodiments, the adapter mount 112 can be configured such that the alignment axis 38 of a mounted fiber optic adapter 32 is not parallel to the pivot axis 30. Again, this configuration may be used in embodiments wherein the two cables that are connected through the mounted fiber optic adapters 32 have different minimum bend radius.

In the depicted embodiment shown in FIGS. 7-16, the support frame 100 also includes top and bottom parallel reinforcement walls 118, 120 that extend from the rear wall 110 forwardly toward the adapter mount 112. The top and bottom reinforcement walls 118, 120 support the mounting wall 114 of the adapter mount 112 relative to the support frame 100. Each of the top and bottom parallel reinforcement walls 118, 120 defines a first side edge 122 and a second side edge 124. As shown, each reinforcement wall 118, 120 defines a tapering configuration wherein a width 126 of each wall 118, 120 extending between the first and second side edges 122, 124 decreases as it extends from the rear wall 110 toward the front end 102 of the support frame 100. As they taper, the first side edge 122 and the second side edge 124 of each reinforcement wall 118, 120 also define a curved configuration as they extend from the rear wall 110 forwardly.

The tapering configuration of the reinforcement walls 118, 120 allows the first and second connector receiving ends 34, 36 of the adapters 32 to be able to extend beyond the first and second side edges 122, 124 thereof, respectively. In this manner, the reinforcement walls 118, 120 allow access for mounting or removal of connectors to or from the fiber optic adapters 32 while providing reinforcement of the mounting wall 114 of the adapter mount 112 against any deflection with respect to the rear wall 110 or the hinge structure 24 of the support frame 100.

Even though adapter support frames 100, 200, 300 have been shown to include both a top and a bottom reinforcement wall, in other embodiments, the adapter support frames can be configured to have at least one reinforcement wall. For example, FIG. 40 illustrates the fourth embodiment of the adapter support frame 400 that includes features similar to the adapter support frame of FIGS. 7-16 with the exception of it defining a single reinforcement wall (e.g., a top reinforcement wall) 418. Similarly, FIG. 41 illustrates the fifth embodiment of the adapter support frame 500 that includes features similar to the adapter support frame of FIGS. 28-39 with the exception of it defining a single reinforcement wall (e.g., a bottom reinforcement wall) 520.

Referring now back to FIGS. 7-16, as shown, in the first embodiment of the support frame 100, the depicted fiber optic adapters 32 are SC adapters. In the depicted embodiment, the SC adapters 32 are removably mounted to the adapter mount 112 with flexible spring clips 40 known in the art. In other embodiments, the adapters 32 may be removably mounted with other methods such as with screw type fasteners. In other embodiments, the adapters 32 may be fixedly mounted to the adapter mount 112, such as by ultrasonic welding.

As is known in the art, access to the ends 34, 36 of an SC type fiber optic adapter 32 is important in removing an SC type fiber optic connector from the adapter 32. An SC type connector normally includes an outer housing that has to be slidably moved with respect to an inner housing that is held by flexible latches of the SC adapter 32. Exposing the ends 34, 36 of the SC type adapter 32 provides access to the outer housing portion of the SC connector that may need to be grabbed and slid by a user in removing the connector.

As is also known in the art, an SC type adapter 32 is generally of a rectangular profile and defines a major dimension 42 and a minor dimension 44, wherein the major dimension 42 is greater than the minor dimension 44. In the depicted embodiment of the support frame 100, the openings 116 on the mounting wall 114 are configured such that the two SC fiber optic adapters 32 mounted to the support frame 100 are aligned along their major dimension 42. As such, a height 128 defined between the top and bottom reinforcement walls 118, 120 is similar in dimension to a minor dimension 44 defined by the SC fiber optic adapter 32. Since, the overall height 130 of the support frame is defined by the top and bottom reinforcement walls 118, 120, the support frame 100 is able to provide a low profile by aligning the SC adapters 32 along their major dimension 42. This arrangement allows the support frame 100 to be mounted to existing fixtures such as the fixture 10 shown in FIGS. 1-6 in a stacked arrangement along with other low profile equipment such as fiber optic splice trays 14 and maintain a dense environment.

The first embodiment of the support frame 100 also provides for cable management features for cables extending from the support frame 100. Connectorized cables that lead from the adapters 32 mounted on the adapter mount 112 are managed by a first cable management structure 132 adjacent the first side end 106 and a second cable management structure 134 adjacent the second side end 108 of the support frame 100. In the depicted embodiment, the first and second cable management structures 132, 134 are defined by cable management fingers 136. Cables extending from the support frame 100 may be lead to other telecommunications equipment such as those shown mounted to the telecommunications fixture 10 in FIGS. 1-6.

FIGS. 17-27 illustrate the second embodiment of the support frame 200 according to the invention. The second embodiment of the support frame 200 includes features similar to the first embodiment of the support frame 100 such as the reinforcement walls 218, 220 and the cable management fingers 236. However, instead of being configured for SC type fiber optic adapters 32, the second embodiment is configured for mounting LC type fiber optic adapters 32.

In the depicted embodiment, four LC adapters 32 formed as an integral LC block 46 are mounted within a single opening 216 on the mounting wall 214 of the adapter mount 212. The opening 216 can be configured to accommodate other numbers. As known in the art, the LC adapter block 46 is mounted to the mounting wall 214 with a spring clip 40. Other methods of removable mounting such as using screw type fasteners or methods of fixedly mounting the adapters 32 are also contemplated.

Again, exposing the connector receiving ends 34, 36 of the LC adapters 32 is important since an LC connector defines a flexible latch that has to be accessed and pressed downwardly toward the main body of the connector before it can be freed from an LC adapter 32. Exposing the ends 34, 36 of the adapter 32 provides access to the latch portion or the trigger portion that activates the latch portion of an LC connector that is normally adjacent the adapter ends 34, 36.

FIGS. 28-39 illustrate the third embodiment of a support frame 300 according to the present invention. As in the second embodiment of the support frame 200, the third embodiment of the support frame 300 also includes features similar to the first embodiment of the support frame 100.

The third embodiment of the support frame 300 is configured with an opening 316 in the mounting wall 314 that is sized to receive an integral duplex SC adapter 32. Again, as in the first embodiment, the duplex SC adapter 32 is mounted such that the major dimensions 42 of the SC adapters 32 are aligned in a front to back direction, perpendicular to the pivot axis 30. This arrangement provides a low profile for the support frame 300 and allows the support frame 300 to be mounted to existing fixtures such as the fixture 10 shown in FIGS. 1-6 in a stacked arrangement along with other low profile equipment such as fiber optic splice trays 14.

Similar to the first and second embodiments, the third embodiment of the support frame 300 defines cable management structures 332, 334 for managing cables extending from the support frame 300. However, in the third embodiment of the support frame 300, the cable management structure 332/334 at each side end 306, 308 is configured such it that can lead connectorized cables extending from the fiber optic adapter 32 toward either the first and second side ends 306, 308 of the support frame 300 or toward the rear end 304 of the support frame 300. As shown, each cable management structure 332, 334 defines a first cable path 333 that leads toward the side ends 306, 308 of the support frame 300 and a second cable path 335 that leads toward the rear end 304 of the support frame 300. The cables are retained within the paths by cable management fingers 336.

In addition to sharing with the first two embodiments a rear wall 310 supporting the hinge structure 24, the third embodiment of the support frame 300 additionally defines a front wall 311 that extends from the adapter mount 312 toward each of the first and second side ends 306, 308 of the support frame 300. The front wall 311 defines a curved portion 313 as it extends from the adapter mount 312 toward each of the cable management structures 332, 334 wherein the curved portion 313 is designed to provide bend radius protection for cables extending from the adapters 32 toward the cable management structures 332, 334. The wall 311 also forms portions of the first and second cable paths 333, 335 at the first and second side ends 306, 308 for directing cables away from the support frame 300.

Even though the above example embodiments of the support frames 100, 200, 300 have been described and illustrated as being usable with SC and LC type fiber optic adapters 32, it should be noted that the support frames of the present disclosure can be adapted to be used with various other different types of fiber optic adapters such as E2000, FC, MU, DIN, and ST style adapters.

Although in the foregoing description, terms such as "top", "bottom", "front", "back", "right", "left", “upper”, and “lower” might have been used for ease of description and illustration, no restriction is intended by such use of the terms. The telecommunications devices described herein can be used in any orientation, depending upon the desired application.

Having described the preferred aspects and embodiments of the present invention, modifications and equivalents of the disclosed concepts may readily occur to one skilled in the art. However, it is intended that such modifications and equivalents be included within the scope of the claims which are appended hereto.

List of Reference Numerals and Corresponding Features

10 – Telecommunications fixture/groove plate

12 – Fixture hinge structure

14 – Splice tray

15 – Cable management tray

16 – First socket of fixture hinge structure

18 – Second socket of fixture hinge structure

20 – First mounting pin of equipment hinge structure

22 – Second mounting pin of equipment hinge structure

24 – Equipment hinge structure

26 – Flexible tab of fixture hinge structure

28 – Retaining portion of equipment hinge structure

30 – Pivot axis

32 – Fiber optic adapter

34 – First connector receiving end of adapter

36 – Second connector receiving end of adapter

38 – Alignment axis of adapter

40 – Spring clip of adapter

42 – Major dimension of SC adapter

44 – Minor dimension of SC adapter

46 – LC adapter block

100 – First embodiment of adapter support frame/module

102 – Front end of support frame

104 – Rear end of support frame

106 – First side end of support frame

108 – Second side of support frame

110 – Rear wall of support frame

112 – Adapter mount

114 – Mounting wall of adapter mount

116 – Opening of mounting wall

118 – Top reinforcement wall

120 – Bottom reinforcement wall

122 – First side edge of reinforcement walls

124- Second side edge of reinforcement walls

126 – Width of reinforcement walls

128- Height between the top and bottom reinforcement walls

130- Overall height of the support frame

132 – First cable management structure

134- Second cable management structure

136 – Cable management fingers

200 – Second embodiment of adapter support frame

212 – Adapter mount

214 – Mounting wall of adapter mount

216 – Opening of mounting wall

218 – Top reinforcement wall

220 – Bottom reinforcement wall

236 – Cable management fingers

300 – Third embodiment of adapter support frame

306 – First side end

308 – Second side end

310 – Rear wall

311 – Front wall

312 – Adapter mount

313 – Curved portion of front wall

314 – Mounting wall of adapter mount

316 – Opening of mounting wall

332 – First cable management structure

333 – First cable path

334 – Second cable management structure

335 – Second cable path

336 – Cable management fingers

400 – Fourth embodiment of an adapter support frame

418 – Top reinforcement wall

500 – Fifth embodiment of an adapter support frame

520 – Bottom reinforcement wall

Claims

1. A fiber optic telecommunications device comprising:
a support frame (100/200/300/400/500) configured to be pivotally coupled to a fixture (10), the support frame (100/200/300/400/500) pivotable about a pivot axis (30),
an adapter mount (112/212/312) for mounting a fiber optic adapter (32) to the support frame (100/200/300/400/500), the adapter mount (112/212/312) integrally mounted to the support frame (100/200/300/400/500) by at least one reinforcement wall (118/120/218/220/418/520), wherein the at least one reinforcement wall (118/120/218/220/418/520) defines a first side edge (122) and a second side edge (124); and
a fiber optic adapter (32) mounted to the adapter mount (112/212/312), the fiber optic adapter (32) defining a first connector receiving end (34) and a second connector receiving end (36), wherein, when the fiber optic adapter (32) is mounted to the adapter mount (112/212/312), and first and second connector receiving ends (34, 36) of the adapter (32) extend beyond the first and second side edges (122, 124), respectively, of the at least one reinforcement wall (118/120/218/220/418/520).
2. A fiber optic telecommunications device according to claim 1, wherein the fiber optic adapter (32) is configured to optically align a first fiber optic connector received through the first connector receiving end (34) with a second fiber optic connector received through the second connector receiving end (36) along an alignment axis (38) and wherein, when the fiber optic adapter (32) is mounted to the adapter mount (112/212/312), the alignment axis (38) is parallel to the pivot axis (30) and the first and second connector receiving ends (34, 36) of the adapter (32) extend beyond the first and second side edges (122, 124), respectively, of the at least one reinforcement wall (118/120/218/220/418/520) along a direction parallel to the pivot axis (30).
3. A fiber optic telecommunications device according to claim 2, wherein a second fiber optic adapter (32) is mounted to the support frame (100/200/300/400/500) such that an alignment axis (38) of the second fiber optic adapter (32) is also parallel to the pivot axis (30).
4. A fiber optic telecommunications device according to claim 1, wherein the support frame (100/200/300/400/500) includes a hinge structure (24) for pivotably mounting the support frame (100/200/300/400/500) to the fixture (10) about the pivot axis (30).

5. A fiber optic telecommunications device according to claim 4, wherein the support frame (100/200/300/400/500) defines a rear wall (110/310) including the hinge structure (24), wherein the adapter mount (112/212/312) defines a mounting wall (114/214/314) perpendicular to the rear wall (110/310).
6. A fiber optic telecommunications device according to claim 5, wherein the mounting wall (114/214/314) defines an opening (116/216/316) therethrough for receiving the fiber optic adapter (32).
7. A fiber optic telecommunications device according to claim 1, wherein the fiber optic adapter (32) is removably mounted to the adapter mount (112/212/312).
8. A fiber optic telecommunications device according to claim 1, wherein the support frame (100/200/300/400/500) defines a rear end (104/304), a front end (102), a first side end (106/306), and a second side end (108/308), the first and second side ends (106/306, 108/308) defined generally along the pivot axis (30) and the front and rear ends (102, 104/304) defined in a direction generally transverse to the pivot axis (30), the support frame (100/200/300) further including a first cable management structure (132/332) adjacent the first side end (106/306) and a second cable management structure (134/334) adjacent the second side end (108/308).
9. A fiber optic telecommunications device according to claim 8, wherein the first cable management structure (332) and the second cable management structure (334) are configured to lead connectorized cables extending from the fiber optic adapter (32) toward either the first and second side ends (306, 308) of the support frame (300) or toward the rear end (304) of the support frame (300).
10. A fiber optic telecommunications device according to claim 1, wherein the fiber optic adapter (32) defines an SC footprint.
11. A fiber optic telecommunications device according to claim 10, wherein two SC fiber optic adapters (32) are mounted to the support frame (100/300/400/500) in a parallel side-by-side configuration.
12. A fiber optic telecommunications device according to claim 11, wherein the two SC fiber optic adapters (32) are formed integrally as part of a duplex SC adapter (32).
13. A fiber optic telecommunications device according to claim 11, wherein each SC fiber optic adapter (32) defines a minor dimension (44) and a major dimension (42), the two SC fiber optic adapters (32) mounted to the support frame (100/300/400/500) so as to be aligned along their major dimension (42).

14. A fiber optic telecommunications device according to claim 1, wherein the adapter mount is (112/212/312) integrally mounted to the support frame (100/200/300) by top and bottom parallel reinforcement walls (118/218, 120/220).

15. A fiber optic telecommunications device according to claim 14, wherein the fiber optic adapter (32) defines and SC footprint and wherein a height (128) defined between the top and bottom reinforcement walls (118, 120) is similar in dimension to a minor dimension (44) defined by the SC fiber optic adapter (32).

16. A fiber optic telecommunications device according to claim 15, wherein an overall height (130) of the support frame (100/300) is defined by the top and bottom reinforcement walls (118, 120).

17. A fiber optic telecommunications device according to claim 1, wherein the fiber optic adapter (32) defines an LC footprint.

18. A fiber optic telecommunications device according to claim 17, wherein four LC fiber optic adapters (32) are mounted to the support frame (200) in a parallel, side-by-side configuration.

19. A fiber optic telecommunications device according to claim 4, wherein the at least one reinforcement wall (118/120) defines a width (126) that tapers down in dimension as it extends from the hinge structure (24) toward the adapter mount (112).

20. A telecommunications device comprising:

a fixture (10) defining a hinge structure (12);

a support frame (100/200/300) pivotally coupled to the hinge structure (12) of the fixture (10), the support frame (100/200/300) pivotable about a pivot axis (30);

an adapter mount (112/212/312) for mounting a fiber optic adapter (32) to the support frame (100/200/300), the adapter mount (112/212/312) integrally mounted to the support frame (100/200/300) by top and bottom parallel reinforcement walls (118/218, 120/220), wherein each of the top and bottom parallel reinforcement walls (118/218, 120/220) defines a first side edge (122) and a second side edge (124); and

a fiber optic adapter (32) mounted to the adapter mount (112/212/312), the fiber optic adapter (32) defining a first connector receiving end (34) and a second connector receiving end (36), wherein the fiber optic adapter (32) is configured to optically align a first fiber optic connector received through the first connector receiving end (34) with a second fiber optic connector received through the second connector receiving end (36) along an alignment axis (38), wherein, when the fiber optic adapter (32) is mounted to the adapter mount (112/212/312), the alignment axis (38) is parallel to the pivot axis (30) and

first and second connector receiving ends (34, 36) of the adapter (32) extend beyond the first and second side edges (122, 124), respectively, of the reinforcement walls (118/218, 120/220), along a direction parallel to the pivot axis (30).

21. A telecommunications device according to claim 20, wherein the fixture (10) defines a plurality of hinge structures (12) defining parallel pivot axes and a plurality of support frames (100/200/300) are pivotally coupled to the plurality of hinge structures (12).

22. A telecommunications device according to claim 20, wherein the fixture (10) defines a plurality of hinge structures (12) defining parallel pivot axes and a splice tray (14) is pivotally coupled to one of the plurality of hinge structures (12) of the fixture (10).

23. A telecommunications device according to claim 20, wherein the support frame (100/200/300) is removably coupled to the hinge structure (12).

24. A telecommunications device according to claim 20, wherein the hinge structure (12) defines an elastically flexible portion (26) for receiving the support frame (100/200/300).

25. A method of mounting a fiber optic adapter (32) to a support frame (100/200/300), the method comprising:

- providing a support frame (100/200/300) that is configured to be pivotable about a pivot axis (30), the support frame (100/200/300) including an adapter mount (112/212/312) integrally mounted to the support frame (100/200/300) by top and bottom parallel reinforcement walls (118/218, 120/220), wherein each of the top and bottom parallel reinforcement walls (118/218, 120/220) defines a first side edge (122) and a second side edge (124);
- providing a fiber optic adapter (32) defining a first connector receiving end (34) and a second connector receiving end (36), wherein the fiber optic adapter (32) is configured to optically align a first fiber optic connector received through the first connector receiving end (34) with a second fiber optic connector received through the second connector receiving end (36) along an alignment axis (38); and
- mounting the fiber optic adapter (32) to the support frame (100/200/300) so that the alignment axis (38) is parallel to the pivot axis (30) and first and second connector receiving ends (34, 36) of the adapter (32) extend beyond the first and second side edges (122, 124), respectively, of the reinforcement walls (118/218, 120/220), along a direction parallel to the pivot axis (30).

26. A method according to claim 25, further comprising mounting a second fiber optic adapter (32) to the support frame (100/200/300) such that an alignment axis (38) of the second fiber adapter (32) is also generally parallel to the pivot axis (30).

27. A method according to claim 25, further comprising mounting four fiber optic adapters (32) to the support frame (200), wherein each fiber optic adapter (32) has an alignment axis (38) parallel to the pivot axis (30).

28. A method according to claim 25, further comprising pivotally mounting the support frame (100/200/300) to a telecommunications fixture (10) and pivoting the support frame (100/200/300) about the pivot axis (30) and coupling a fiber optic connector to at least one of the first and second connector receiving ends (34, 36) of the fiber optic adapter (32) in a direction generally parallel to the pivot axis (30).

29. A method according to claim 25, further comprising pivotally mounting the support frame (100/200/300) to a telecommunications fixture (10) and pivoting the support frame (100/200/300) about the pivot axis (30) and removing a fiber optic connector from at least one of the first and second connector receiving ends (34, 36) of the fiber optic adapter (32) in a direction generally parallel to the pivot axis (30).

30. A method according to claim 25, wherein the fiber optic adapter (32) defines an SC footprint.

31. A method according to claim 25, wherein the fiber optic adapter (32) defines an LC footprint.

32. A fiber optic telecommunications device comprising:

a support frame (100/200/300) configured to be pivotally coupled to a fixture (10), the support frame (100/200/300) defining a rear end (104/304) and a front end (102), the support frame (100/200/300) including a hinge structure (24) at the rear end (104, 304) for pivotably mounting the support frame (100/200/300) to the fixture (10) about a pivot axis (30); and

an adapter mount (112/212/312) for mounting a fiber optic adapter (32) to the support frame (100/200/300) such that a connector alignment axis (38) defined by the fiber optic adapter (32) is parallel to the pivot axis (30), the adapter mount (112/212/312) integrally mounted to the support frame (100/200/300) by top and bottom parallel reinforcement walls (118/218, 120/220), wherein a width (126) of each of the top and bottom reinforcement walls (118/218, 120/220) decreases as the top and bottom reinforcement walls (118/218, 120/220) extend from the rear end (104/304) toward the front end (102).

FIG. 1

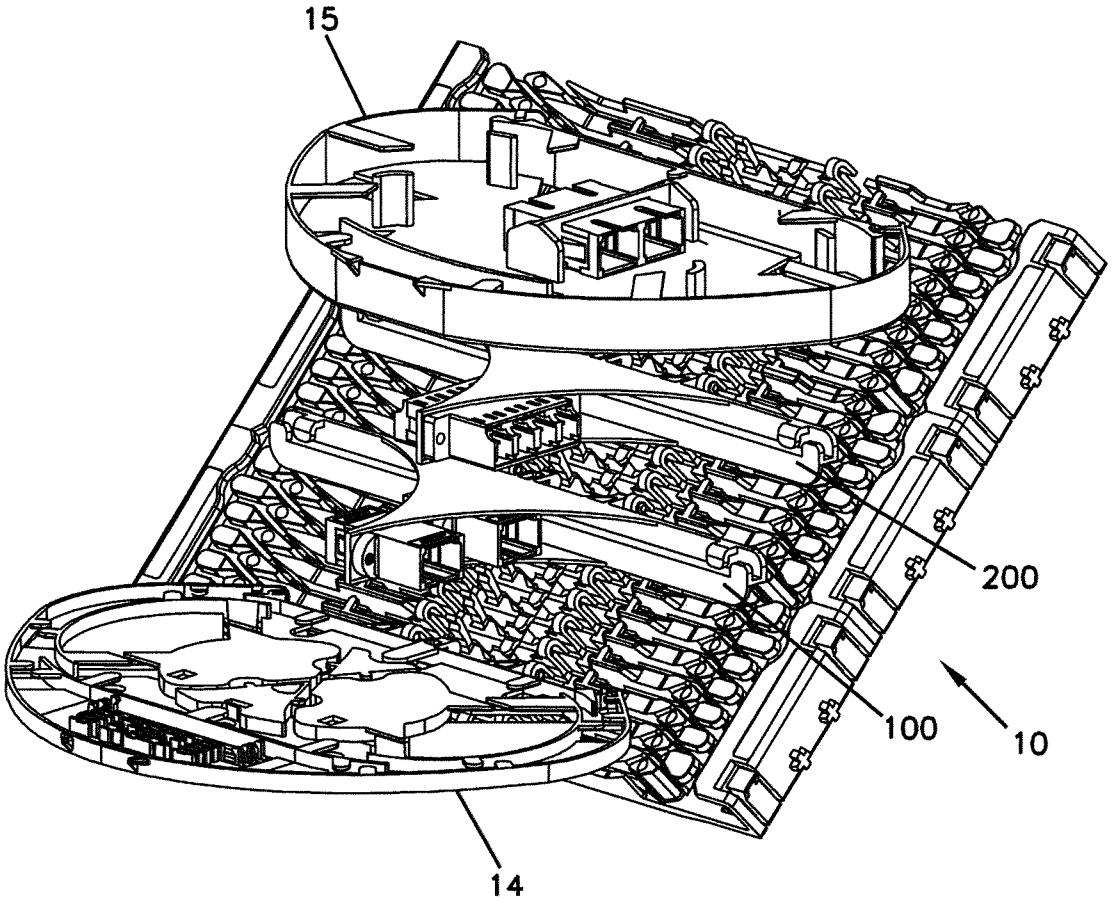


FIG. 2

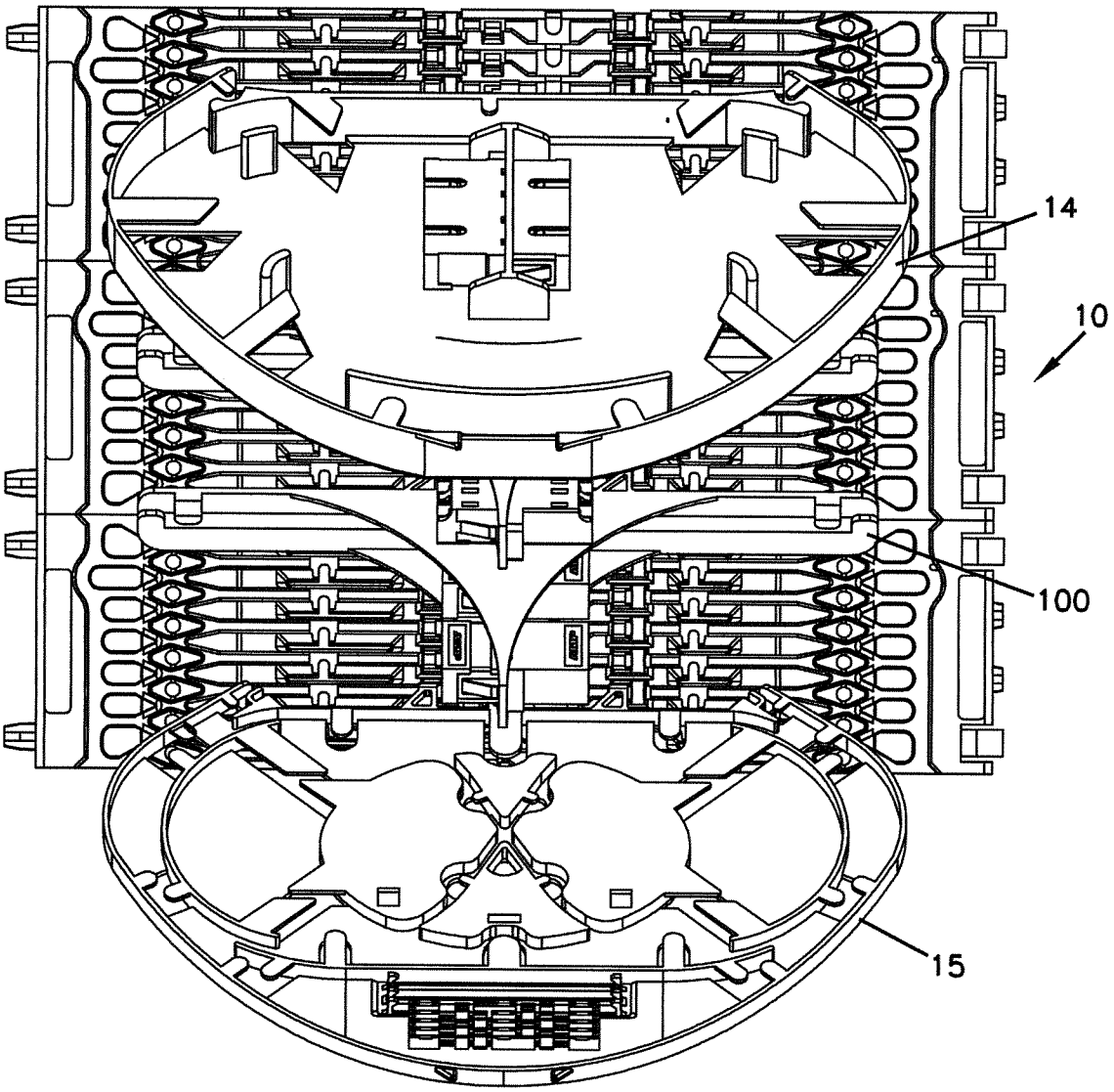
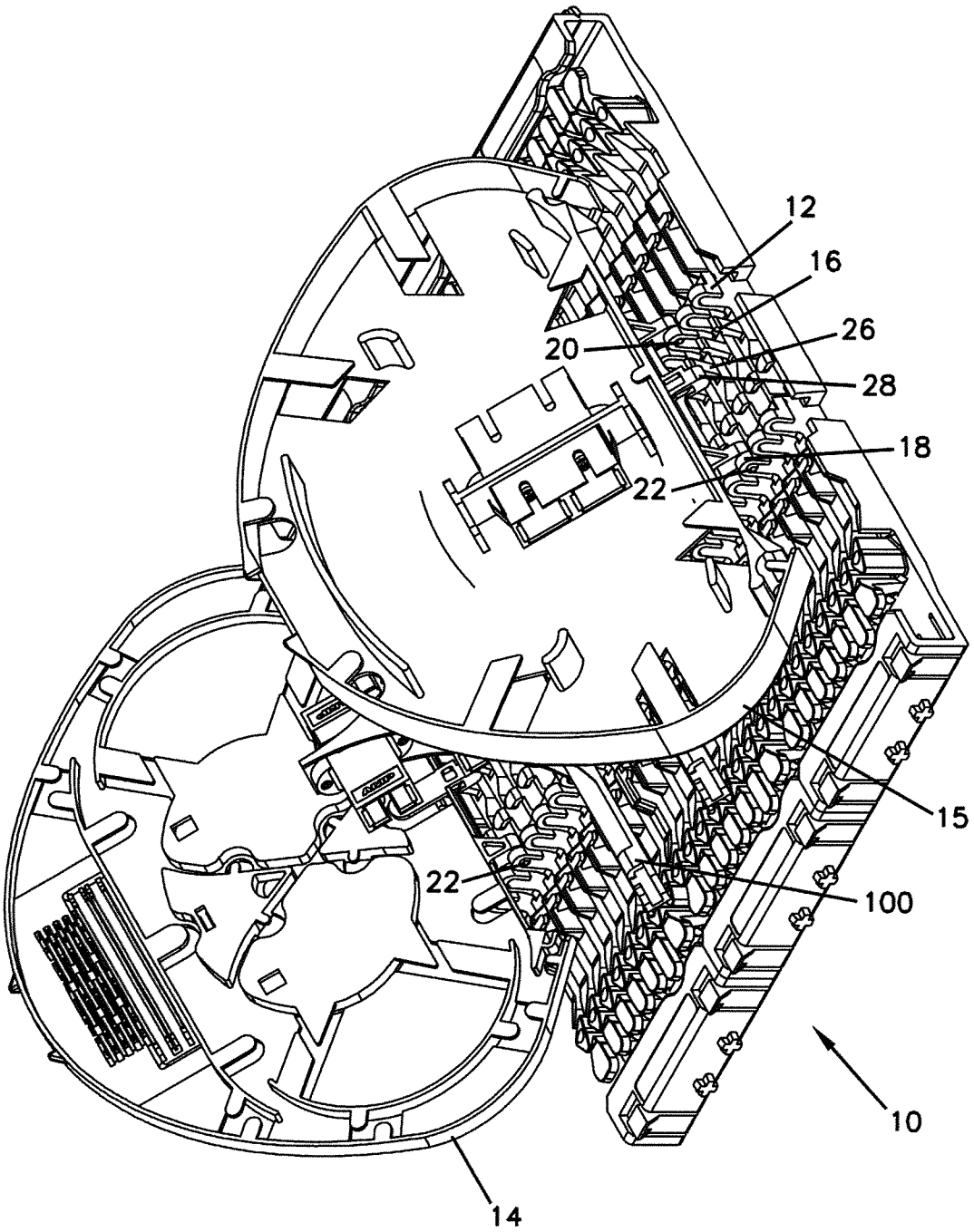


FIG. 3



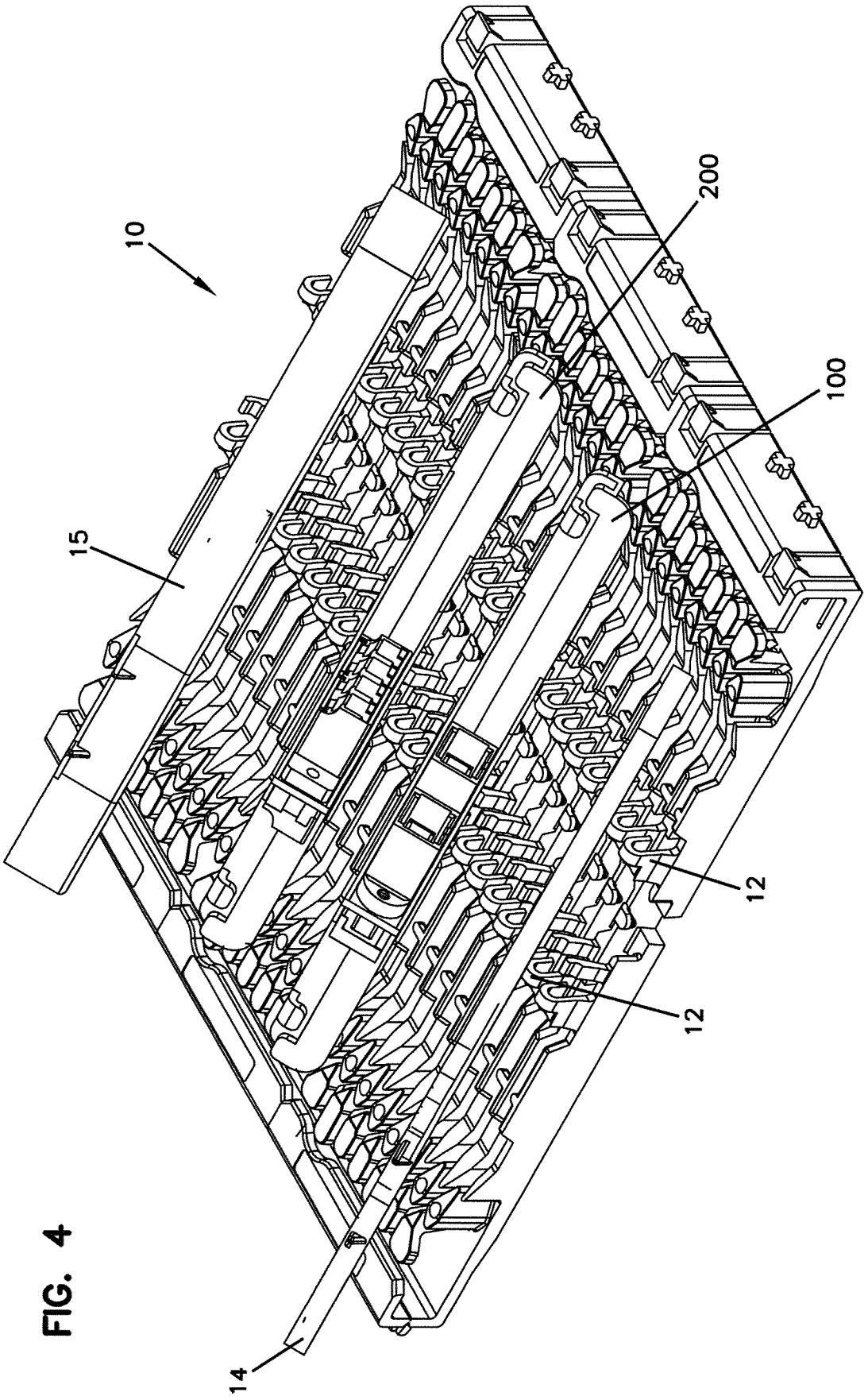
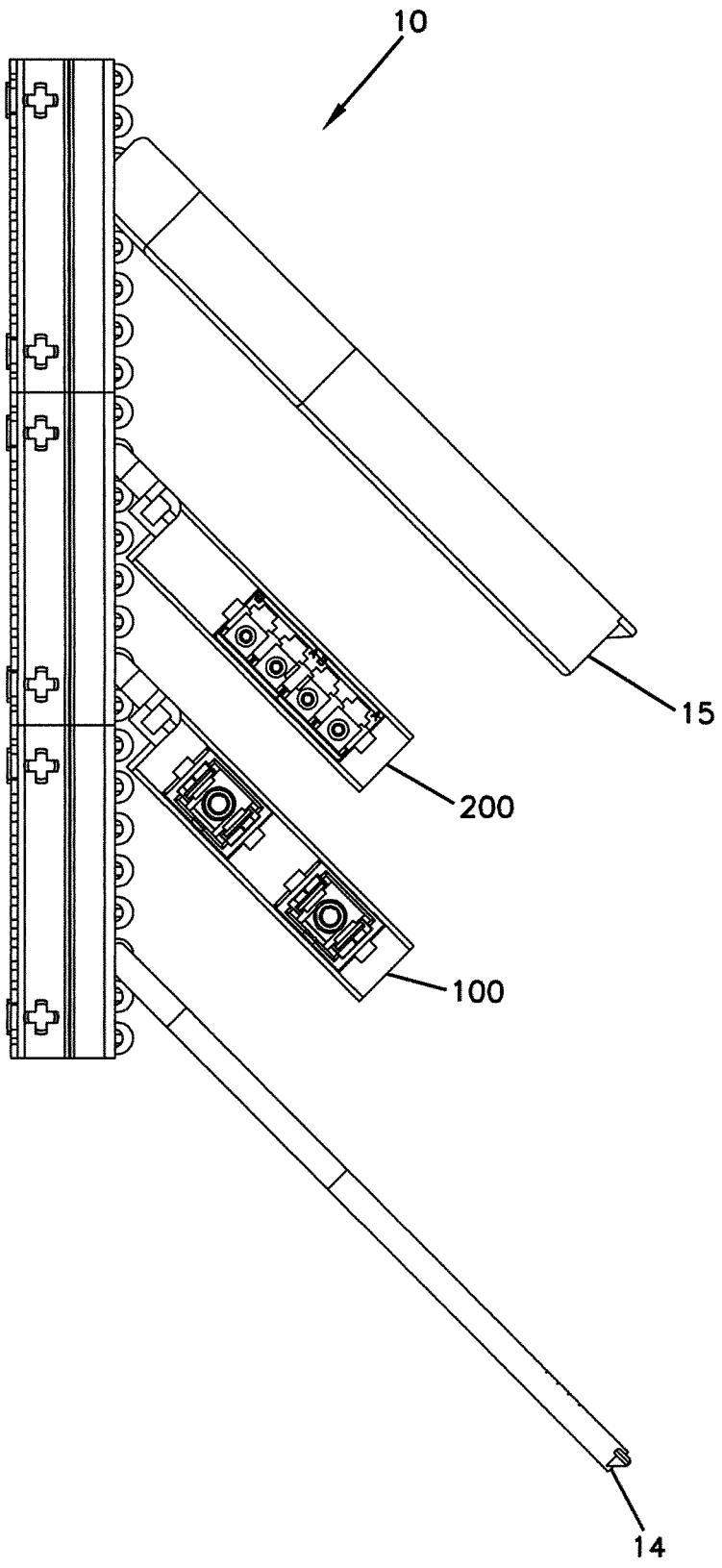


FIG. 4

FIG. 5



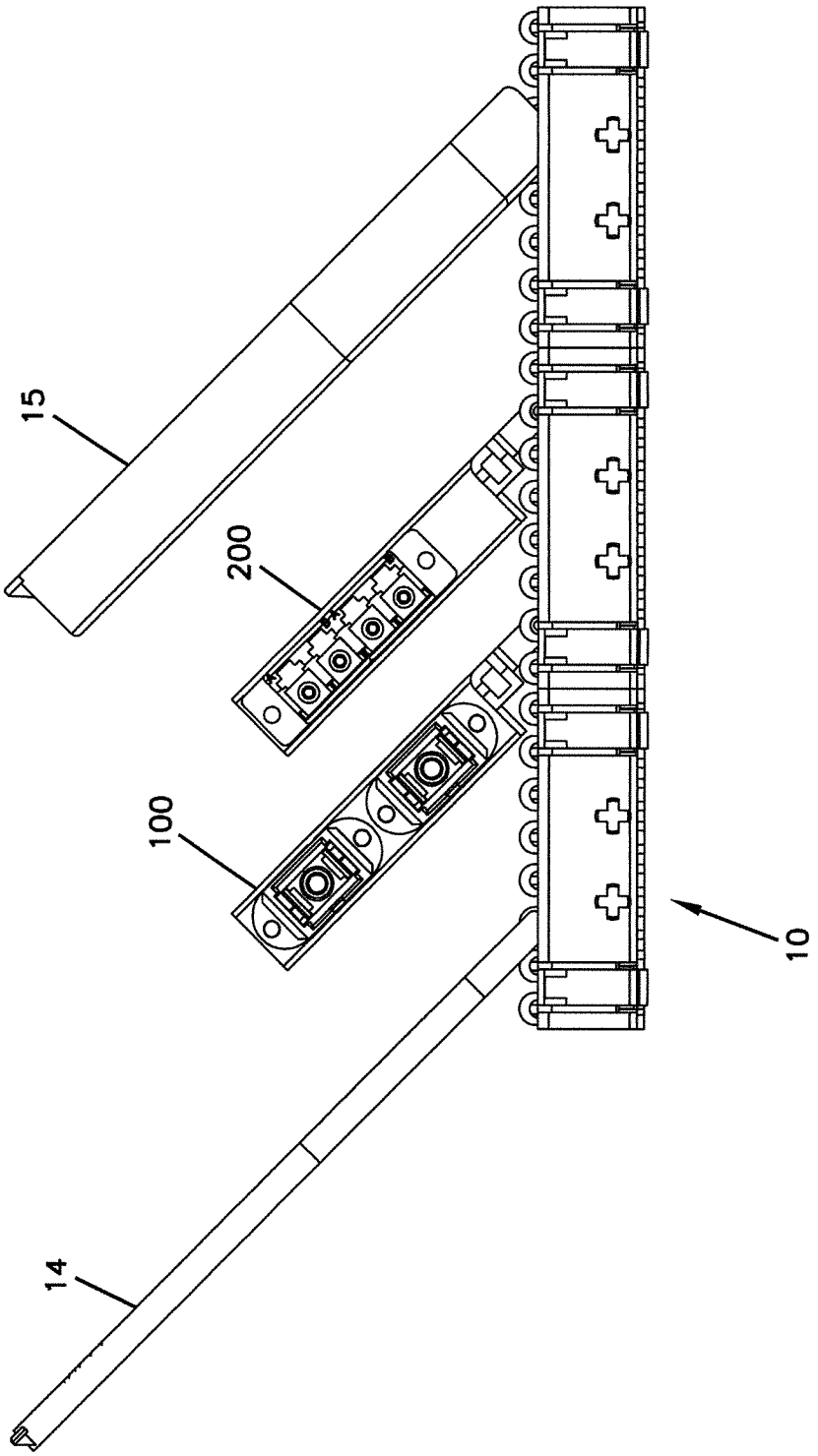


FIG. 6

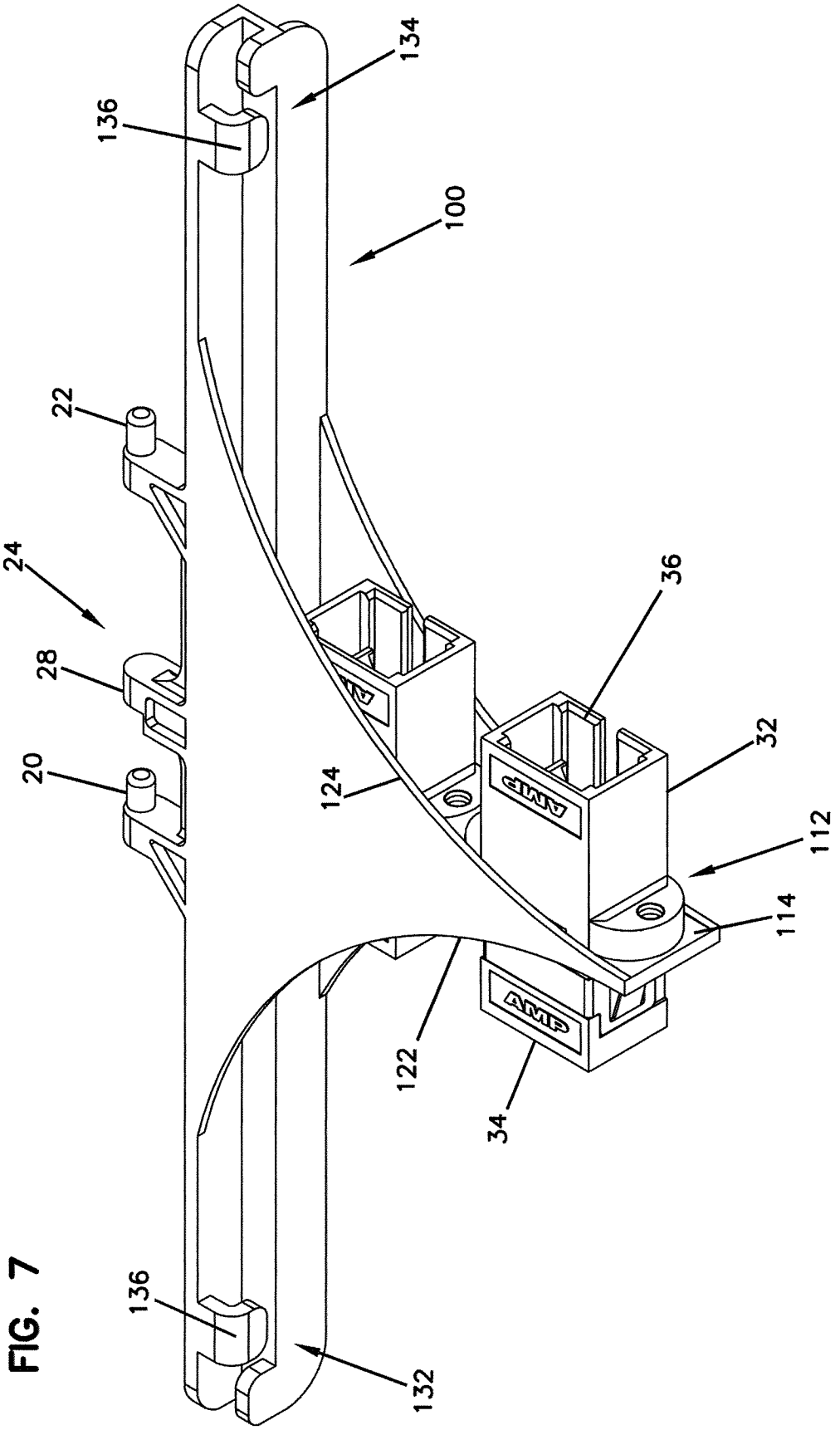


FIG. 7

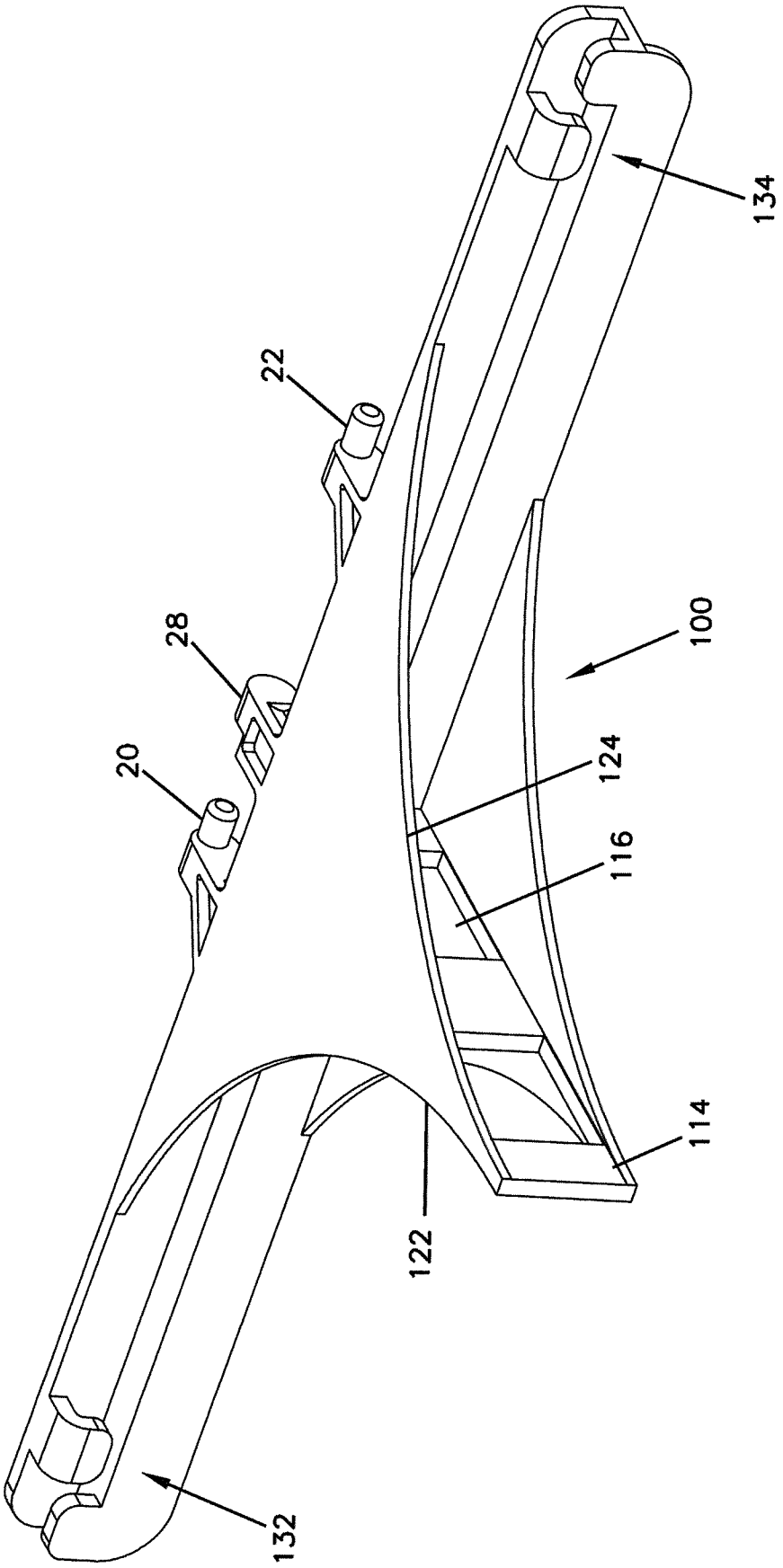


FIG. 7A

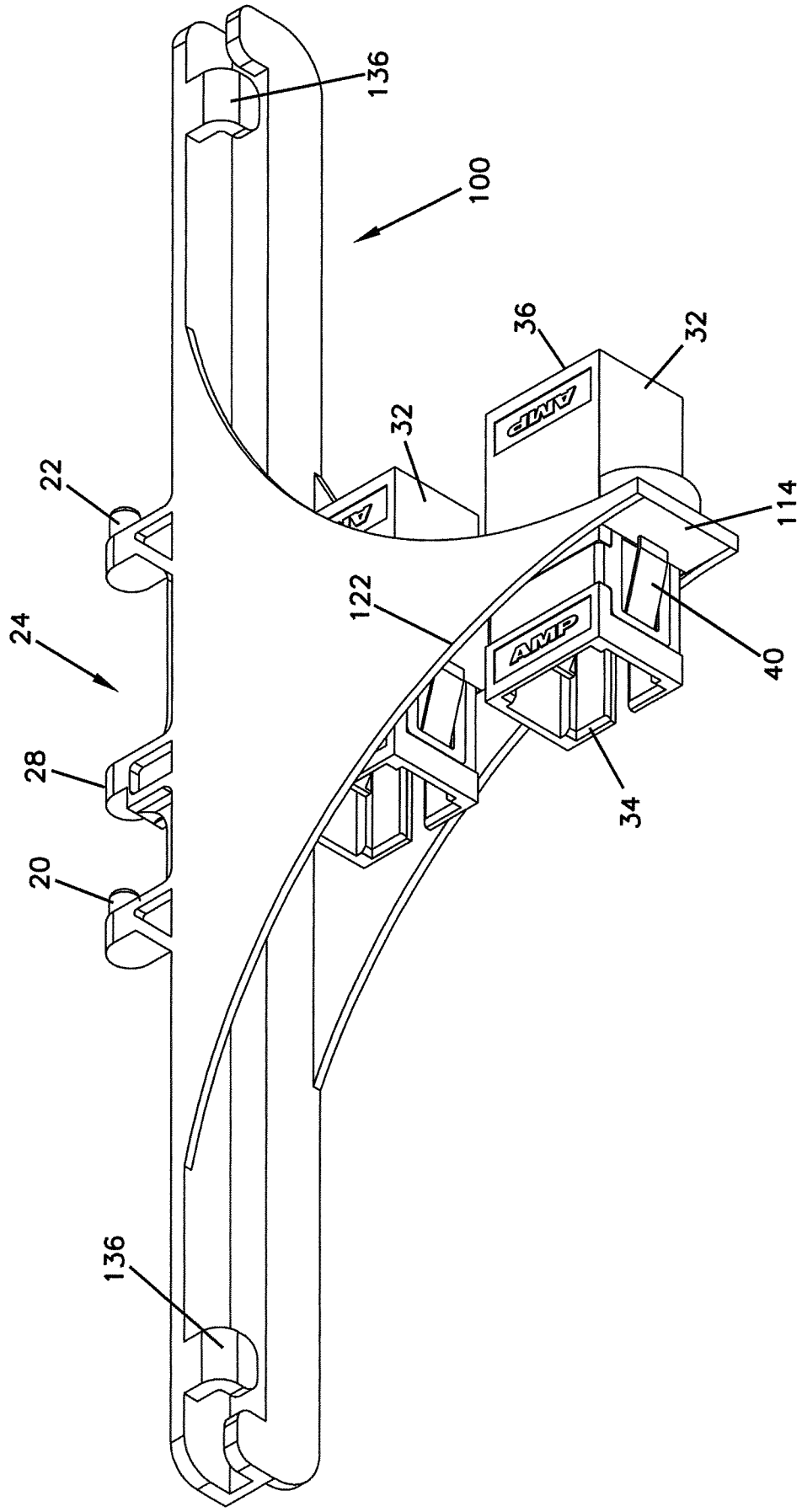


FIG. 8

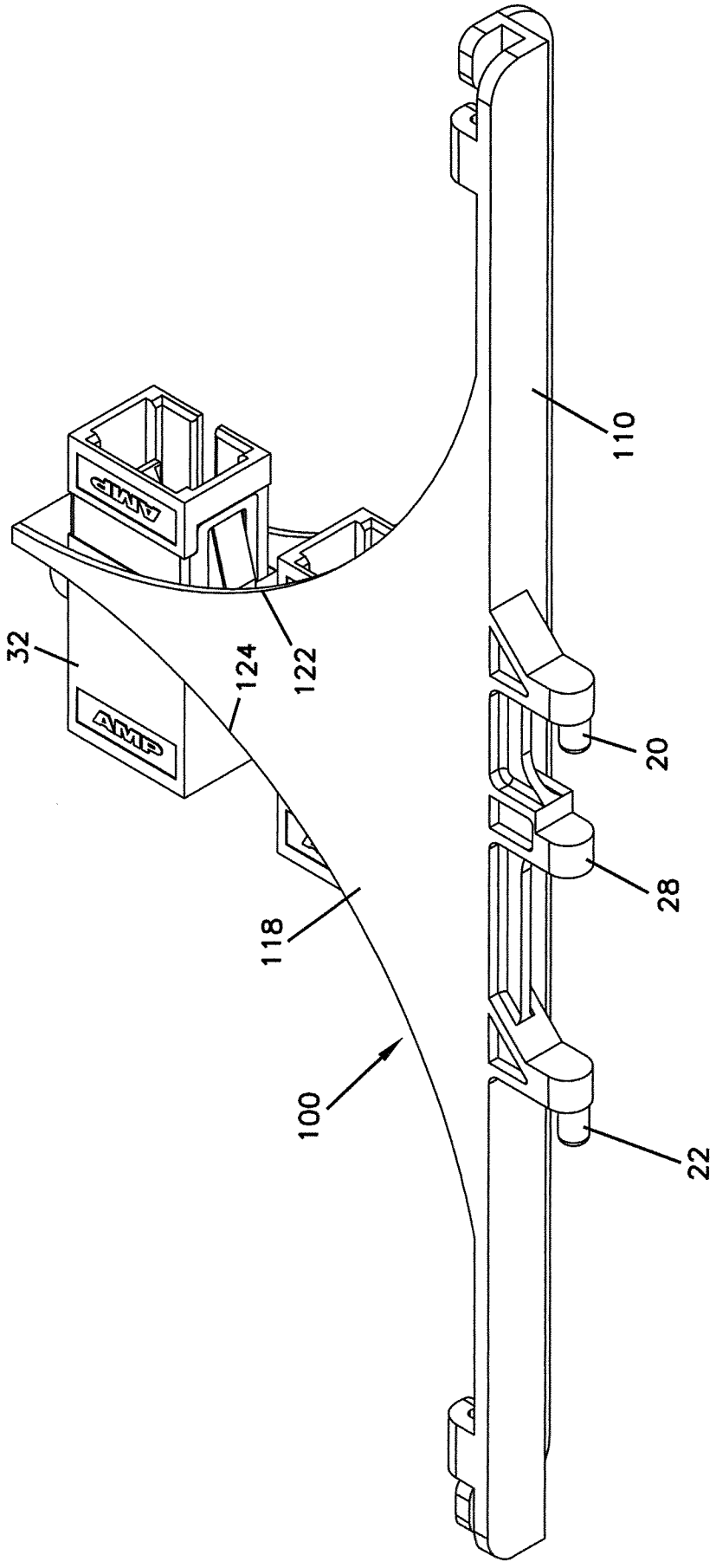


FIG. 9

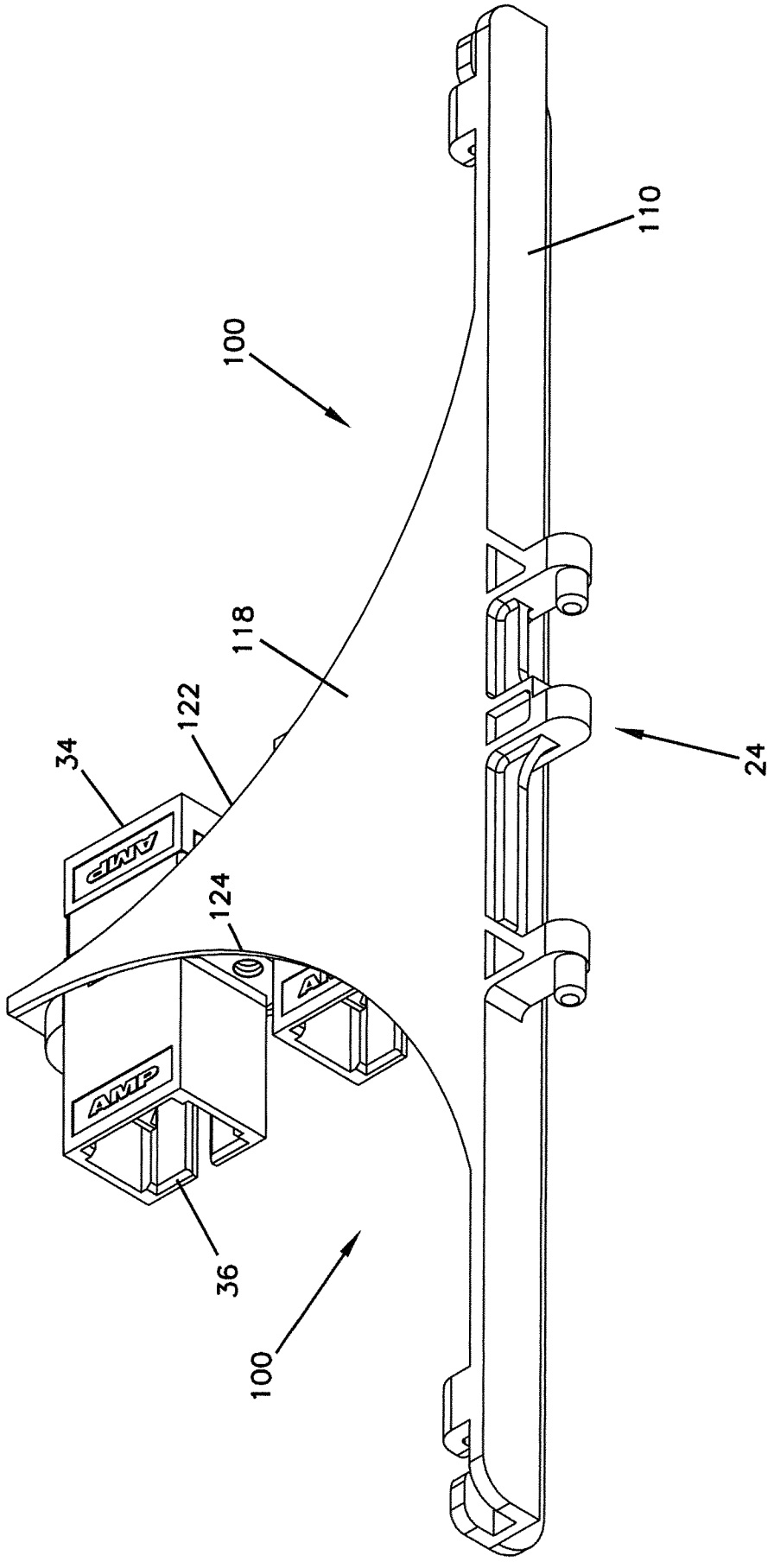


FIG. 10

FIG. 11

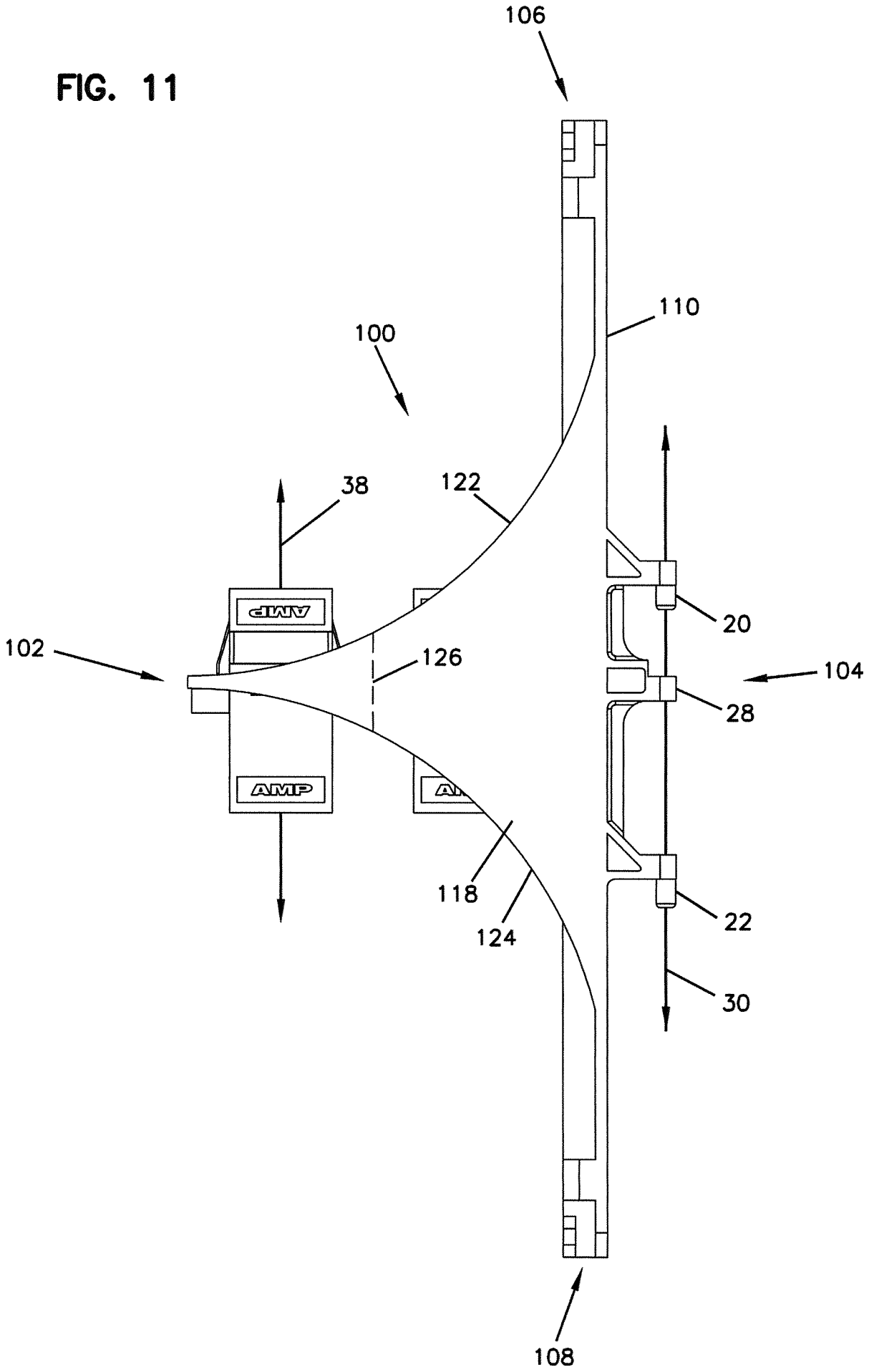


FIG. 12

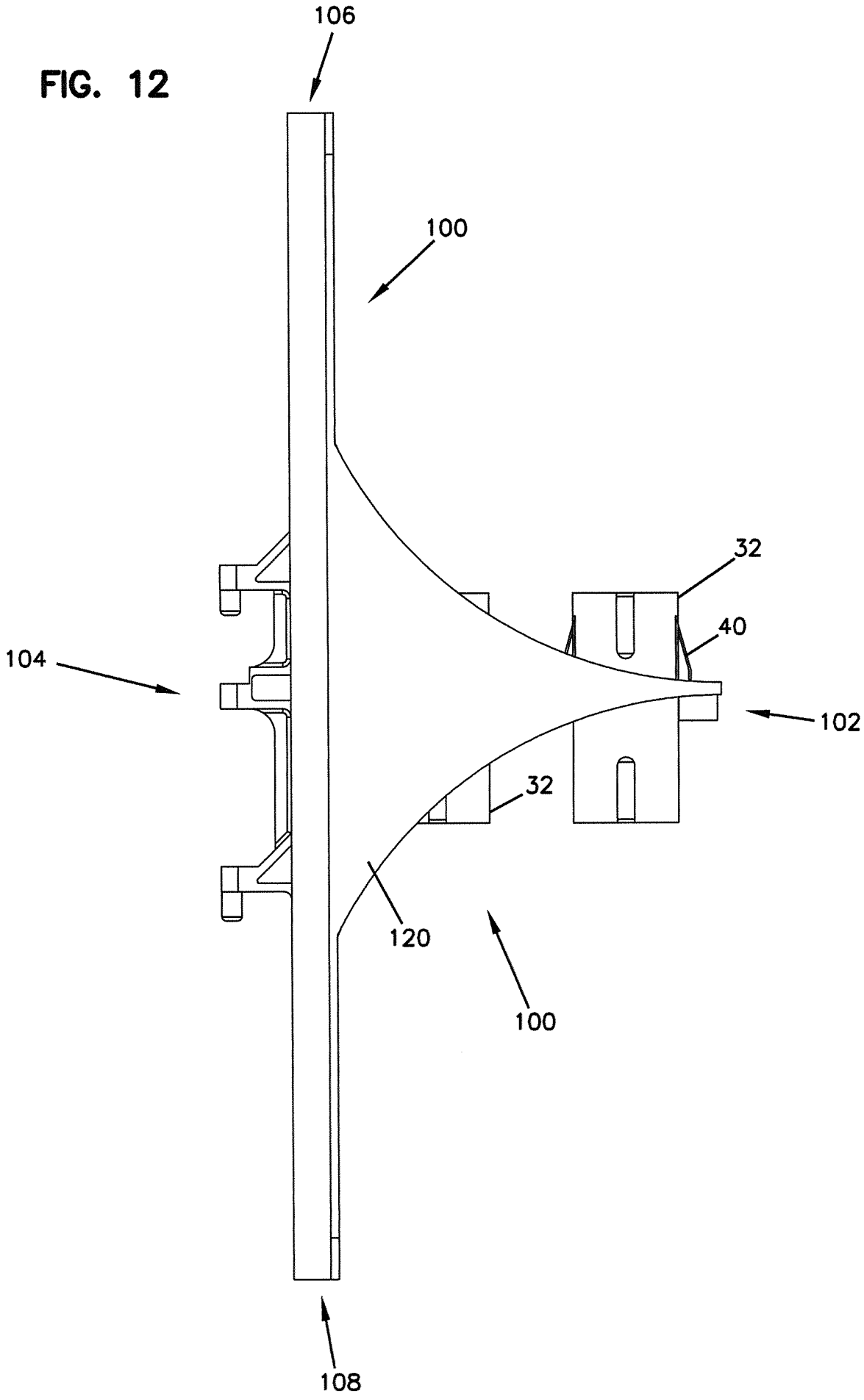


FIG. 13

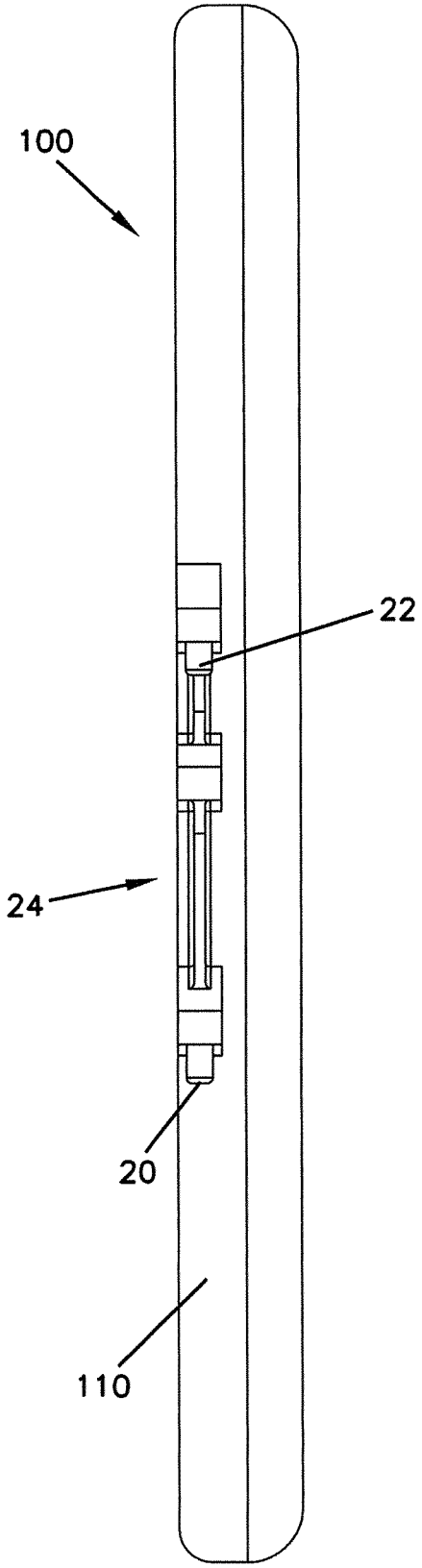


FIG. 14

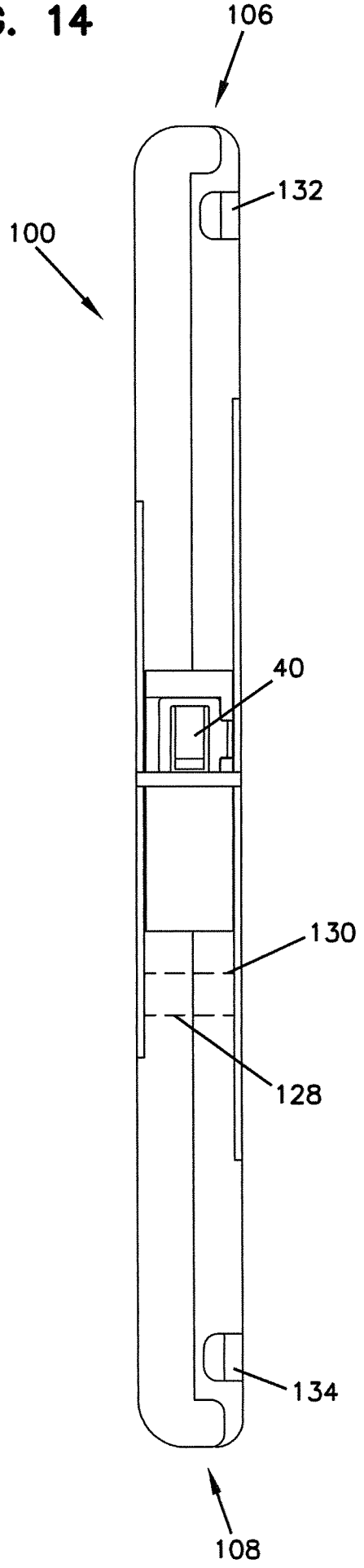


FIG. 15

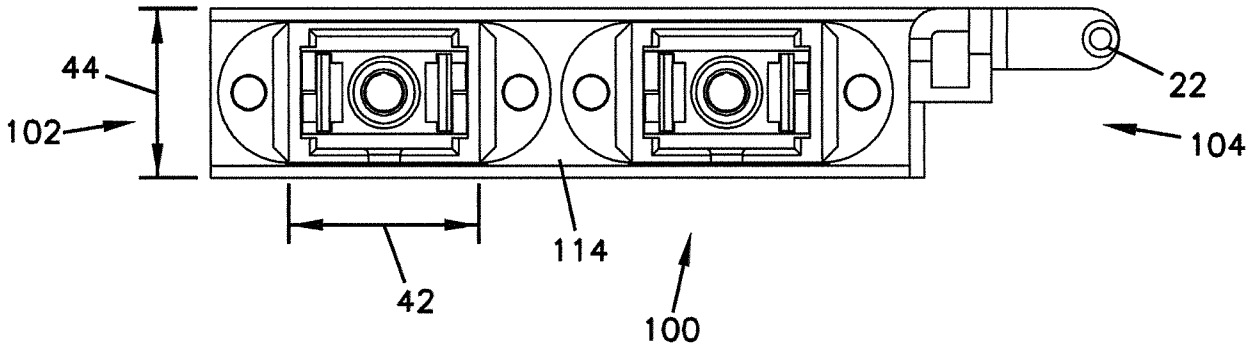
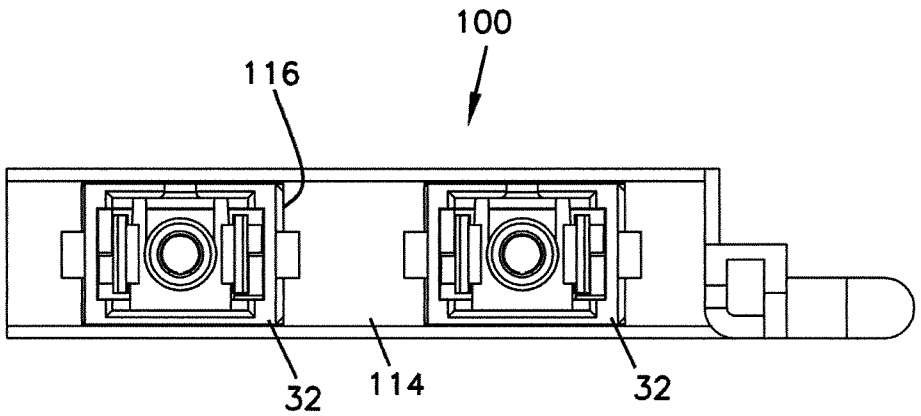


FIG. 16



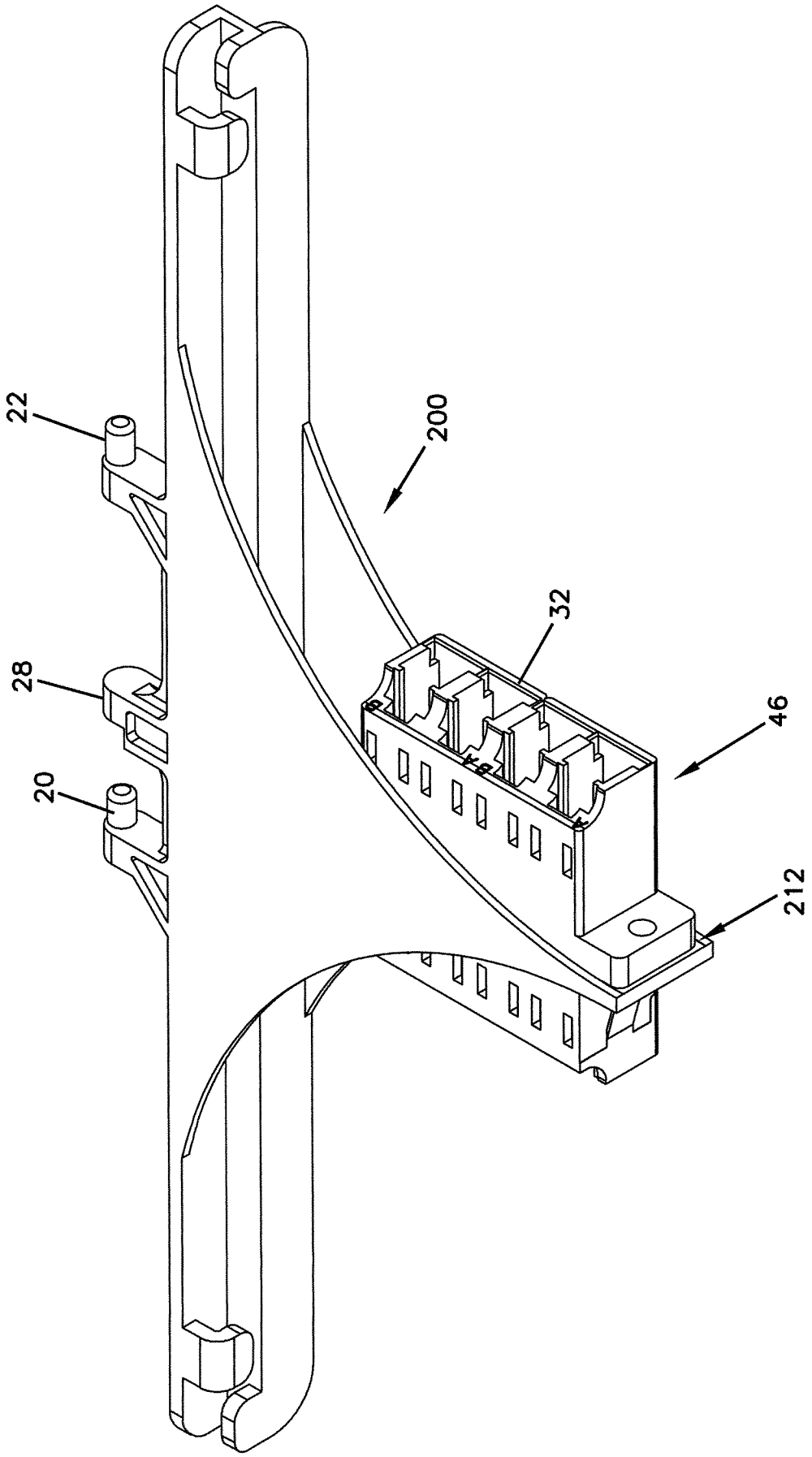


FIG. 17

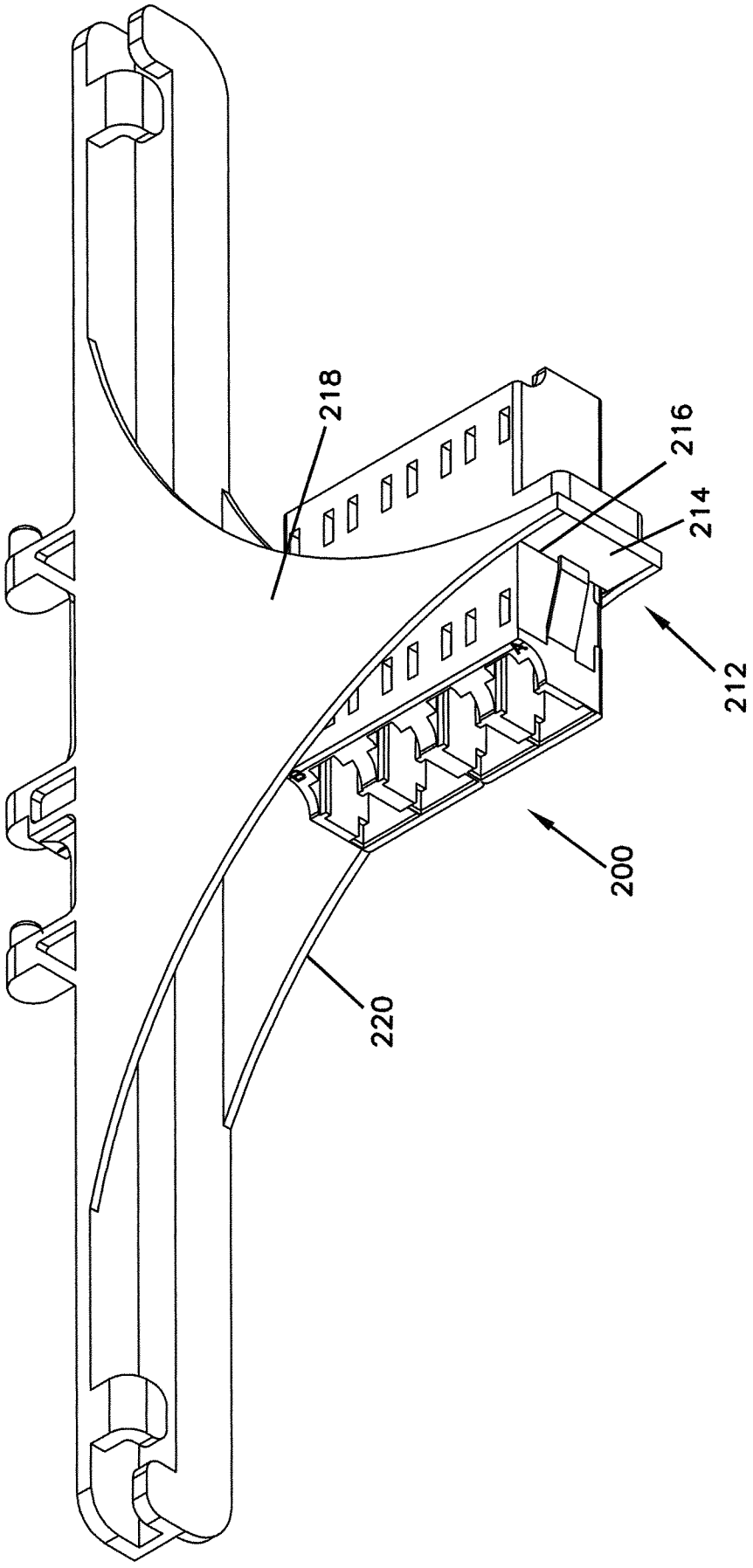


FIG. 18

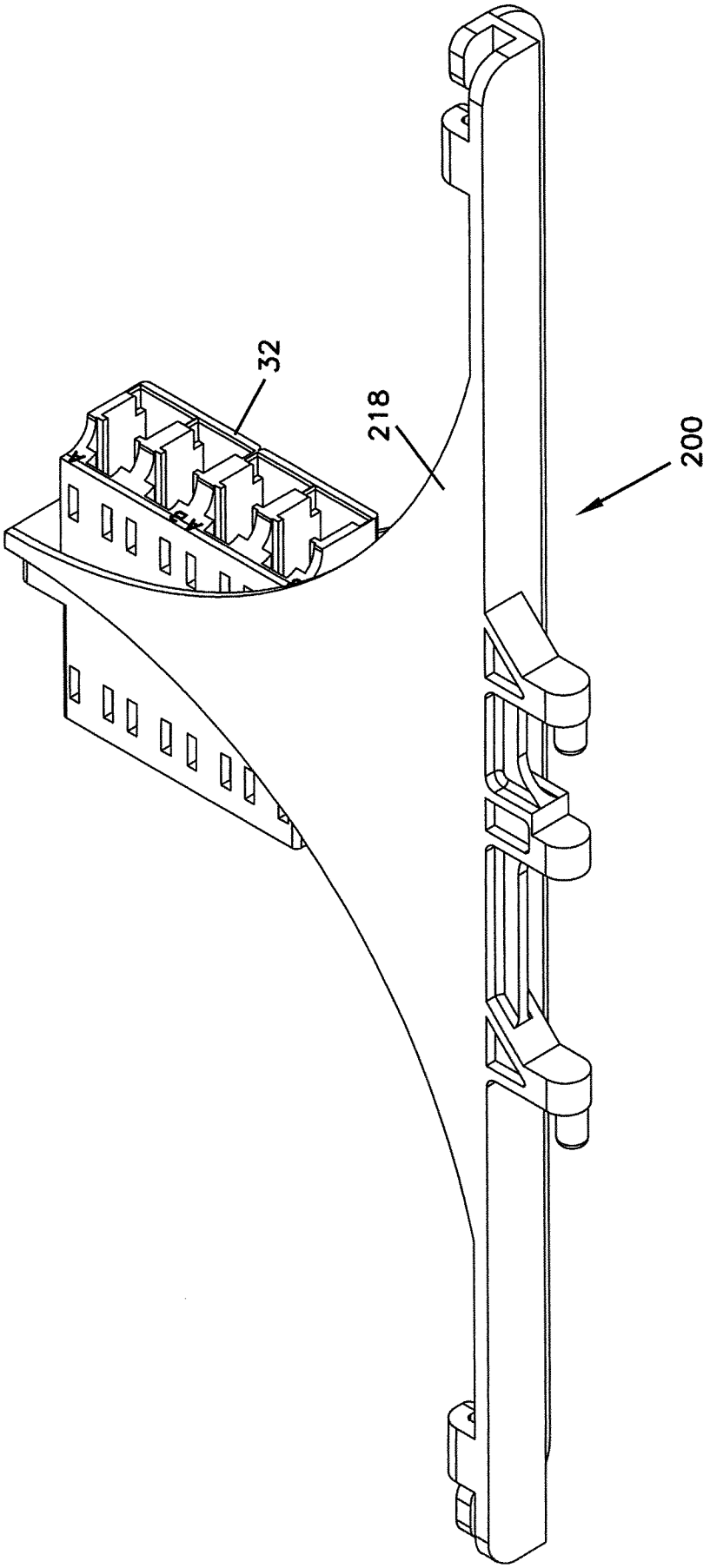


FIG. 19

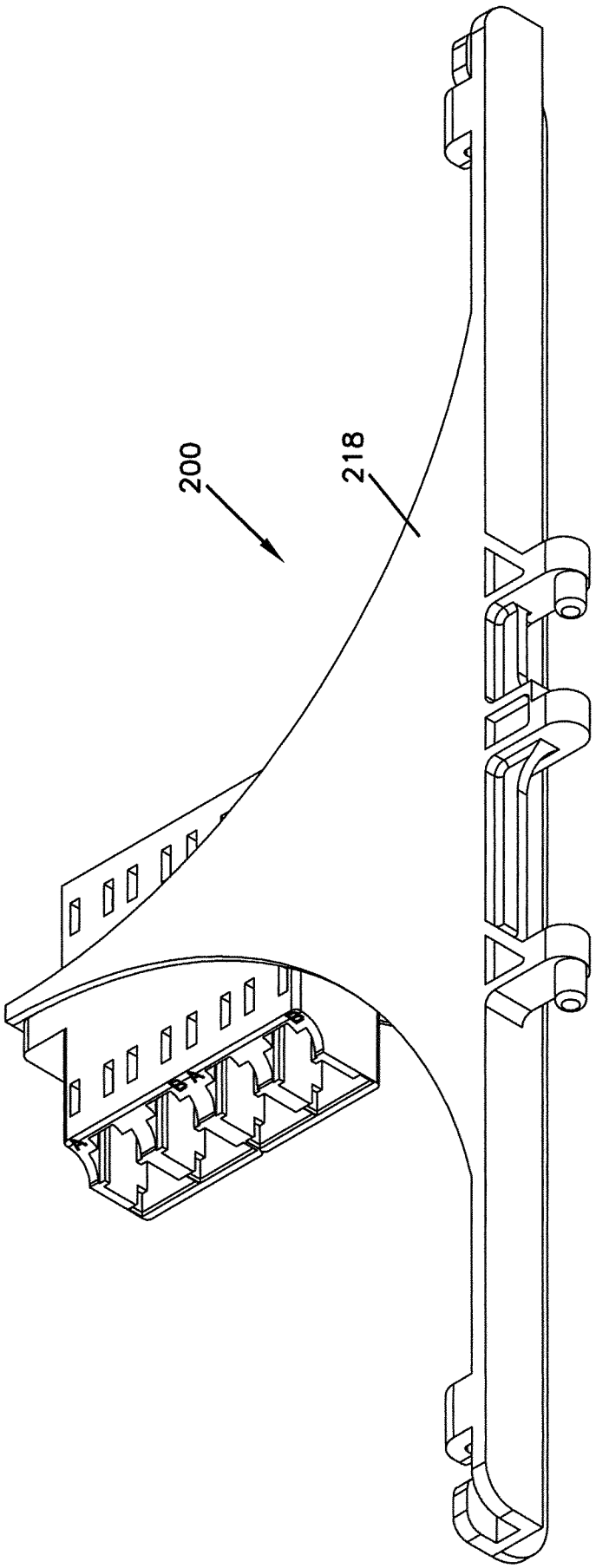


FIG. 20

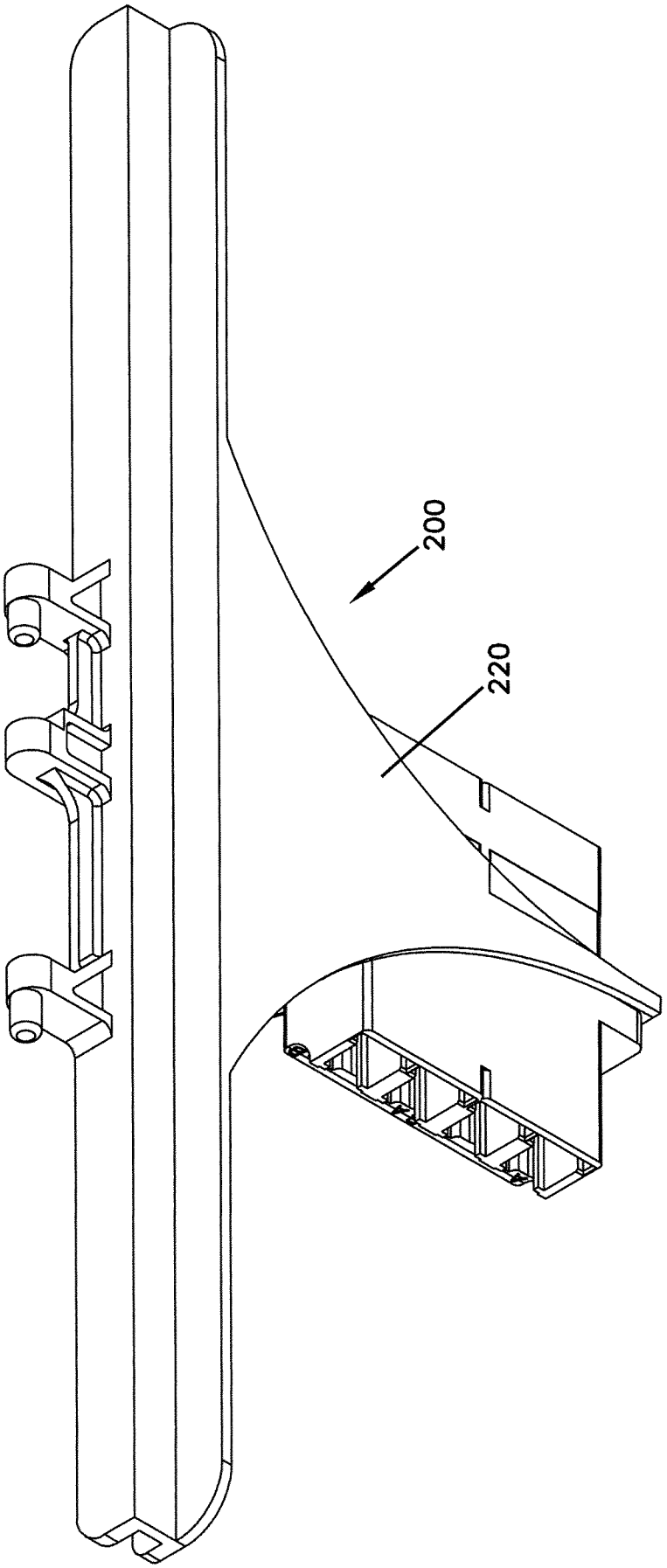


FIG. 21

FIG. 22

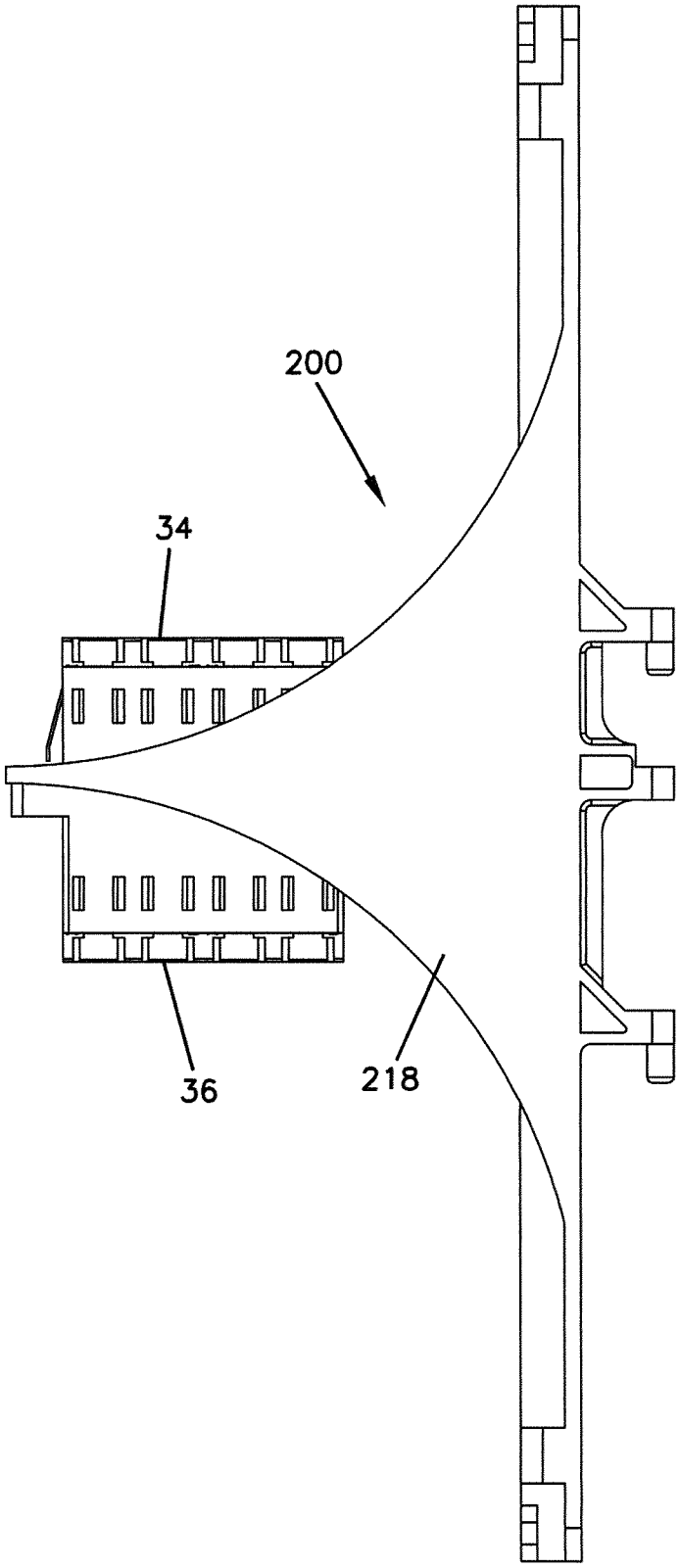


FIG. 23

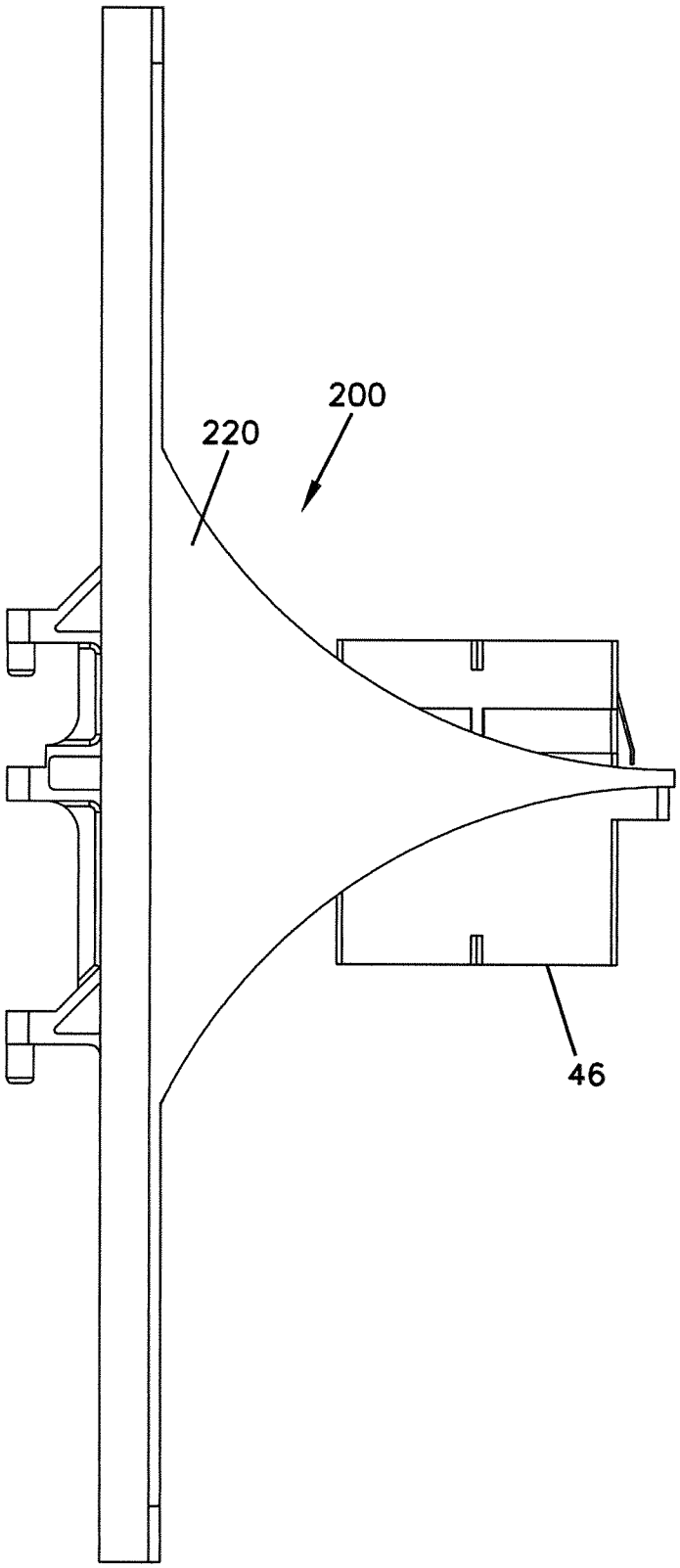


FIG. 24

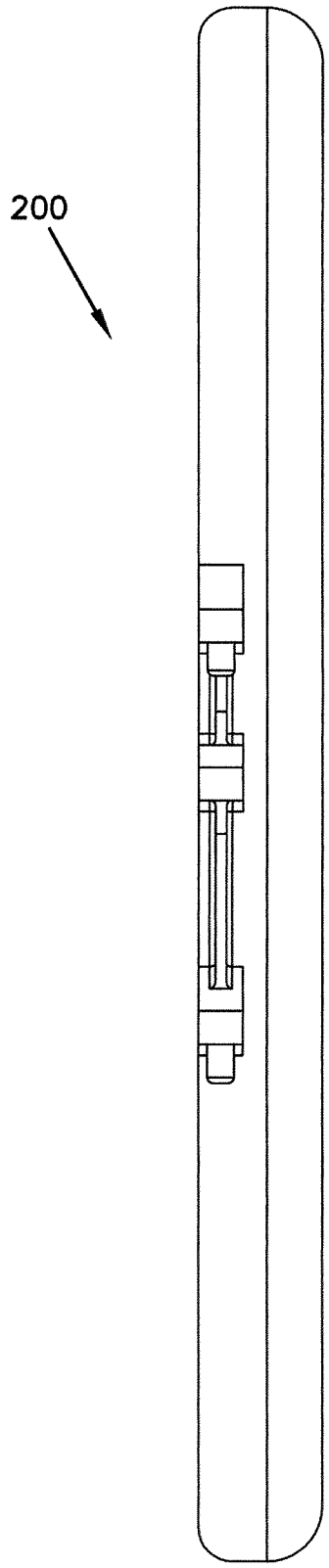
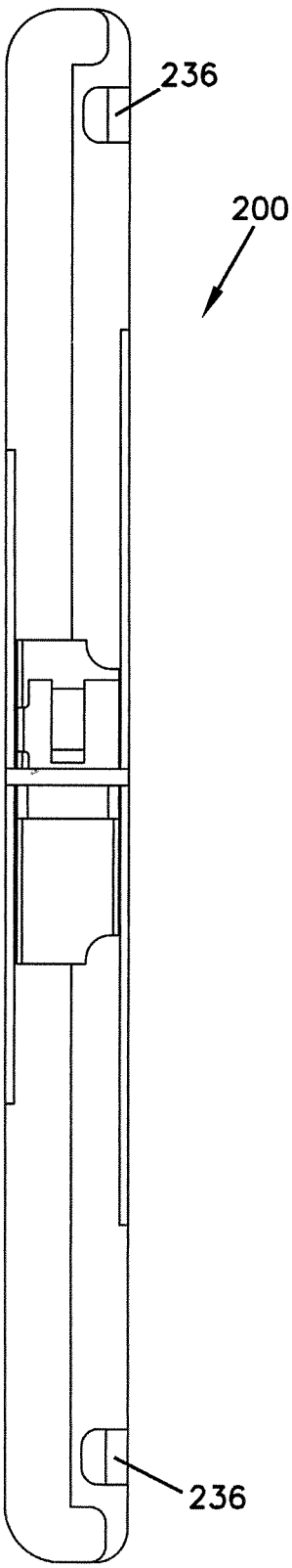


FIG. 25



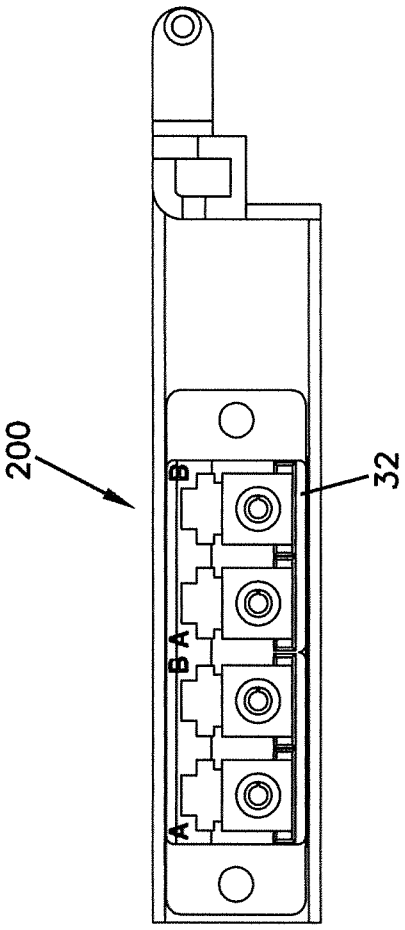


FIG. 26

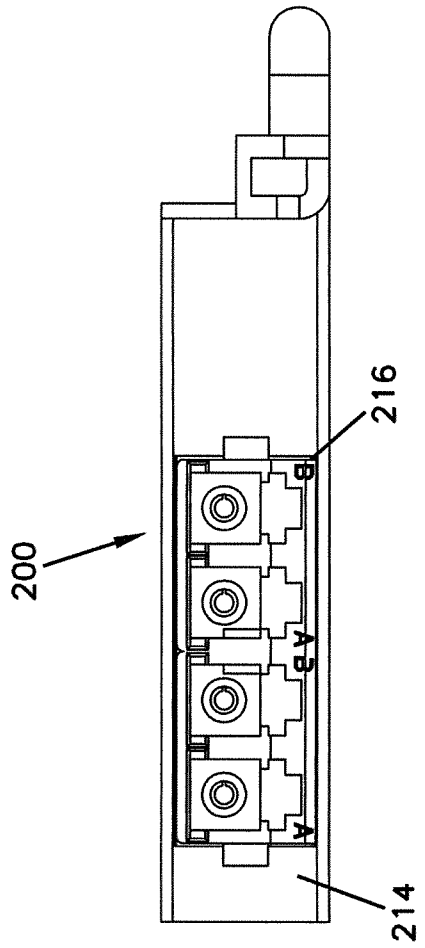


FIG. 27

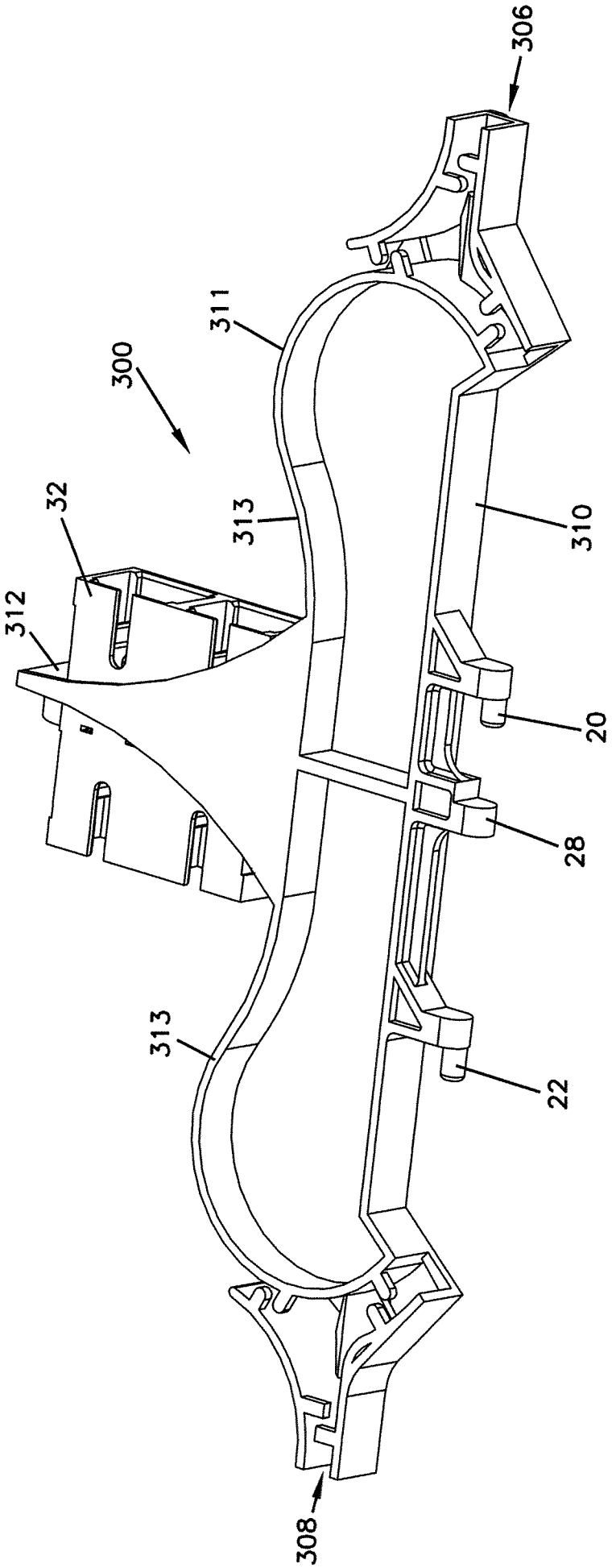


FIG. 28

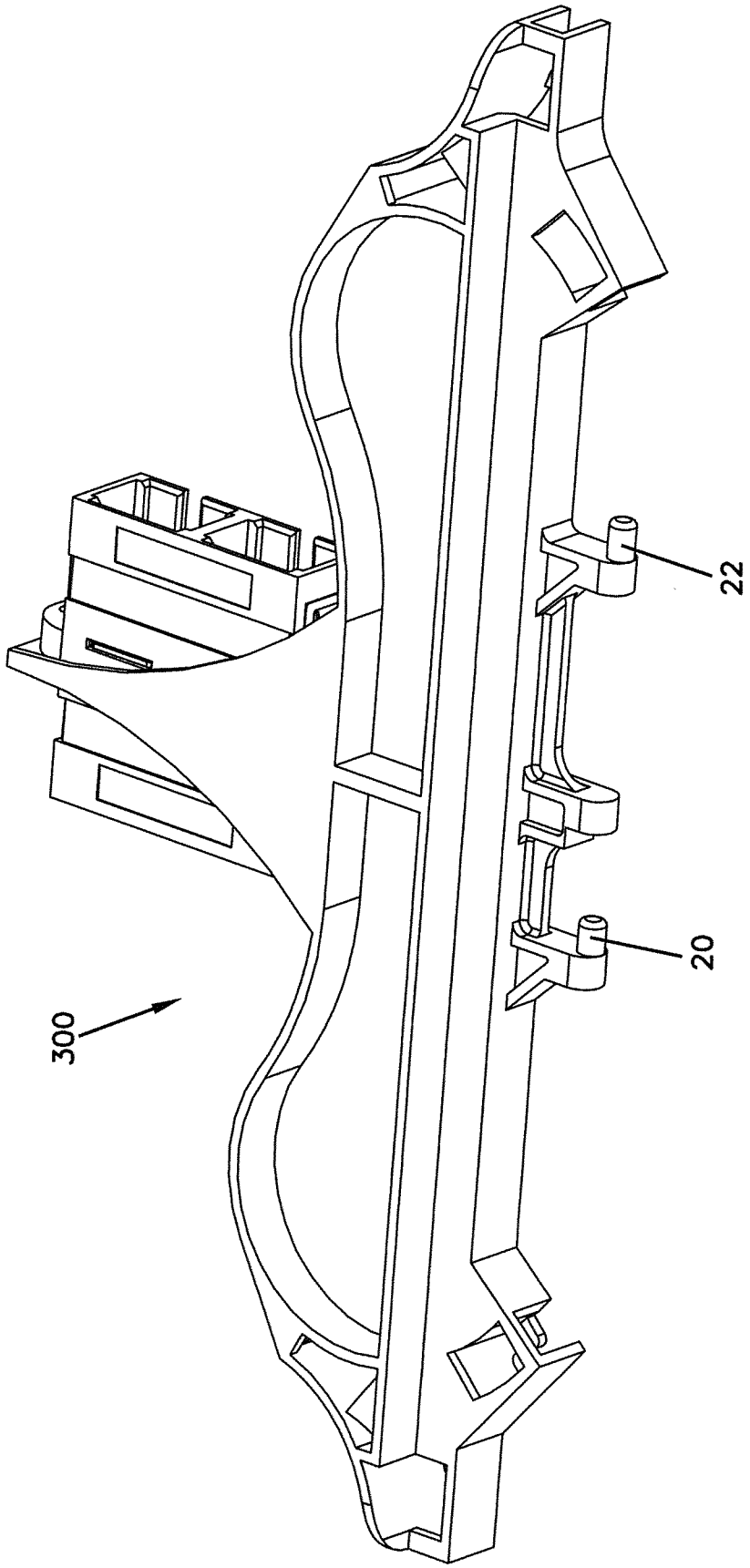


FIG. 29

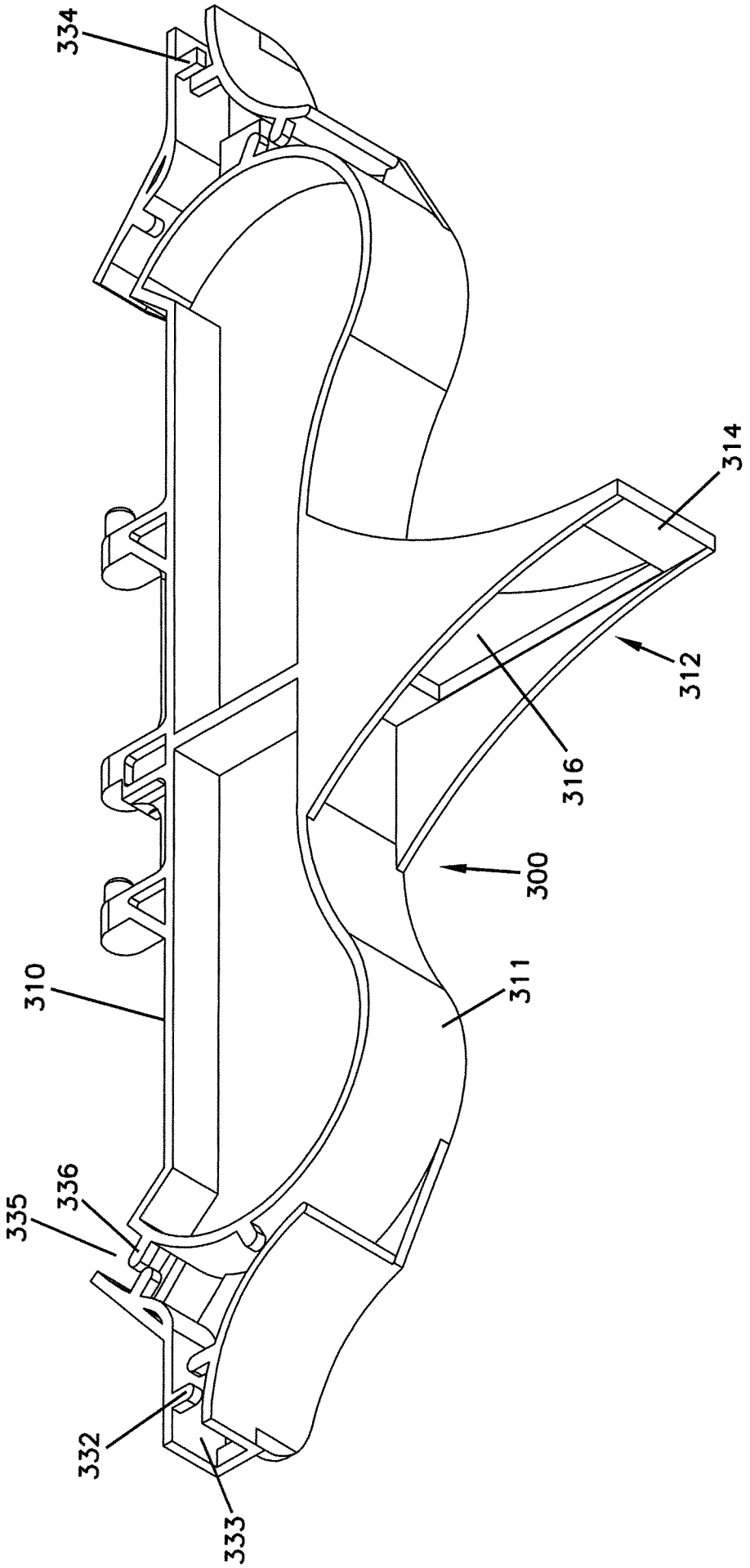


FIG. 30

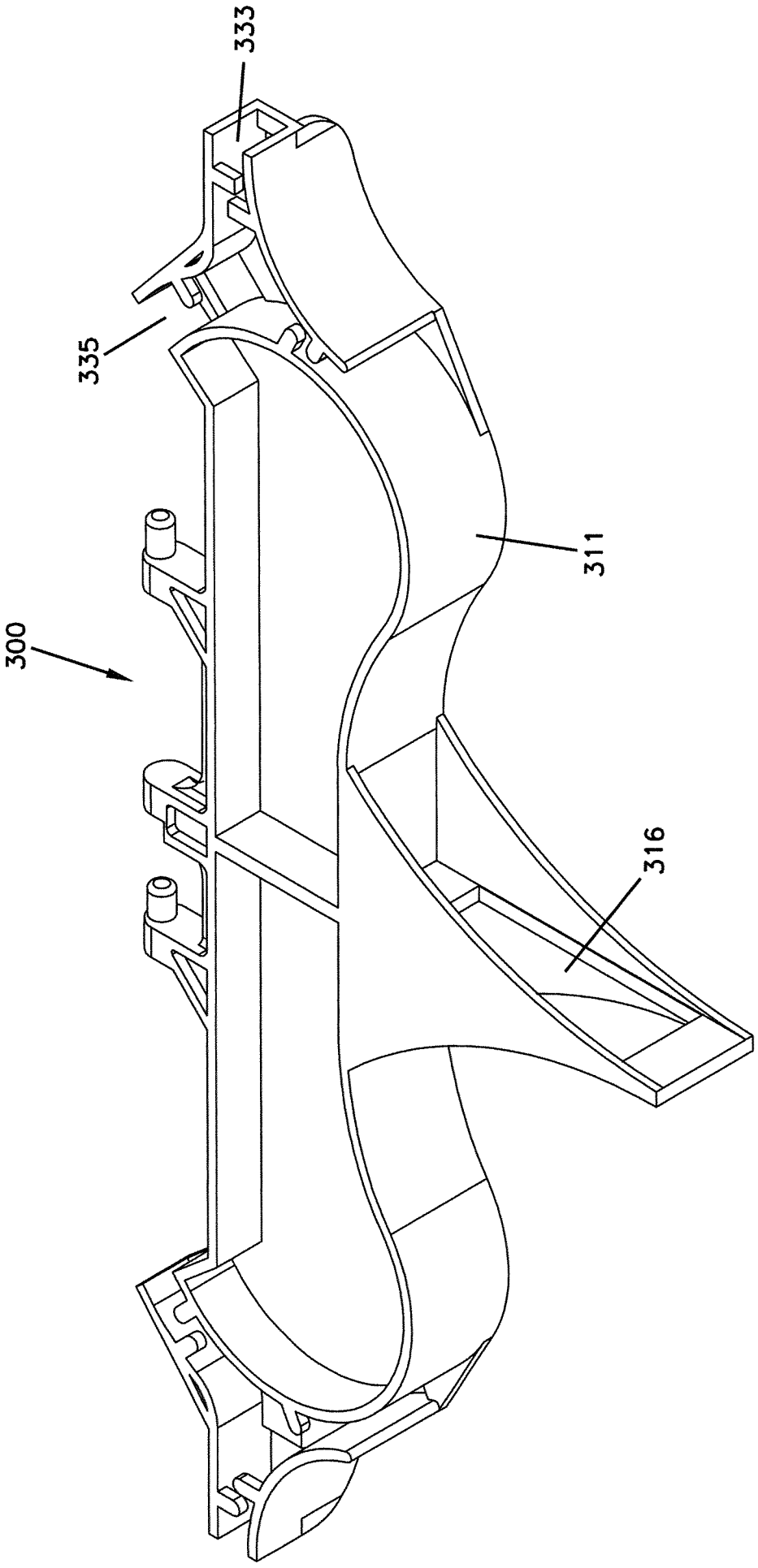


FIG. 31

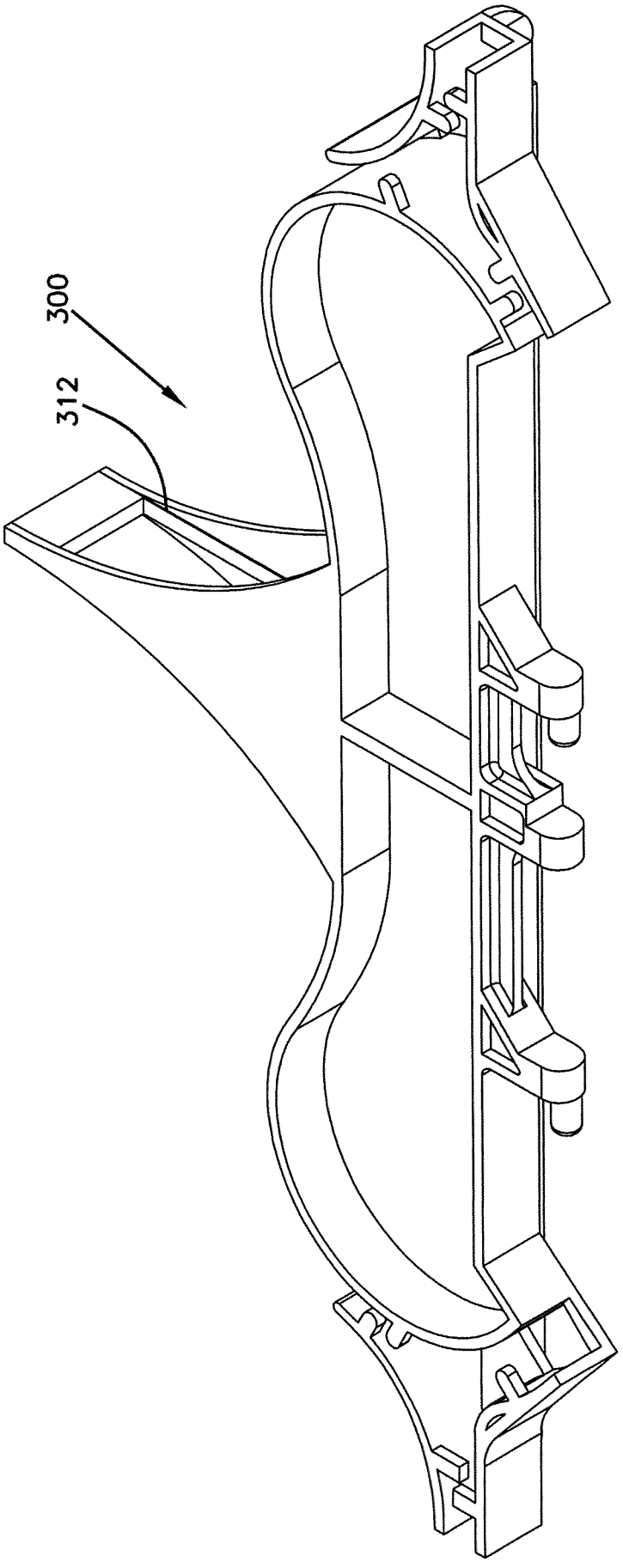


FIG. 32

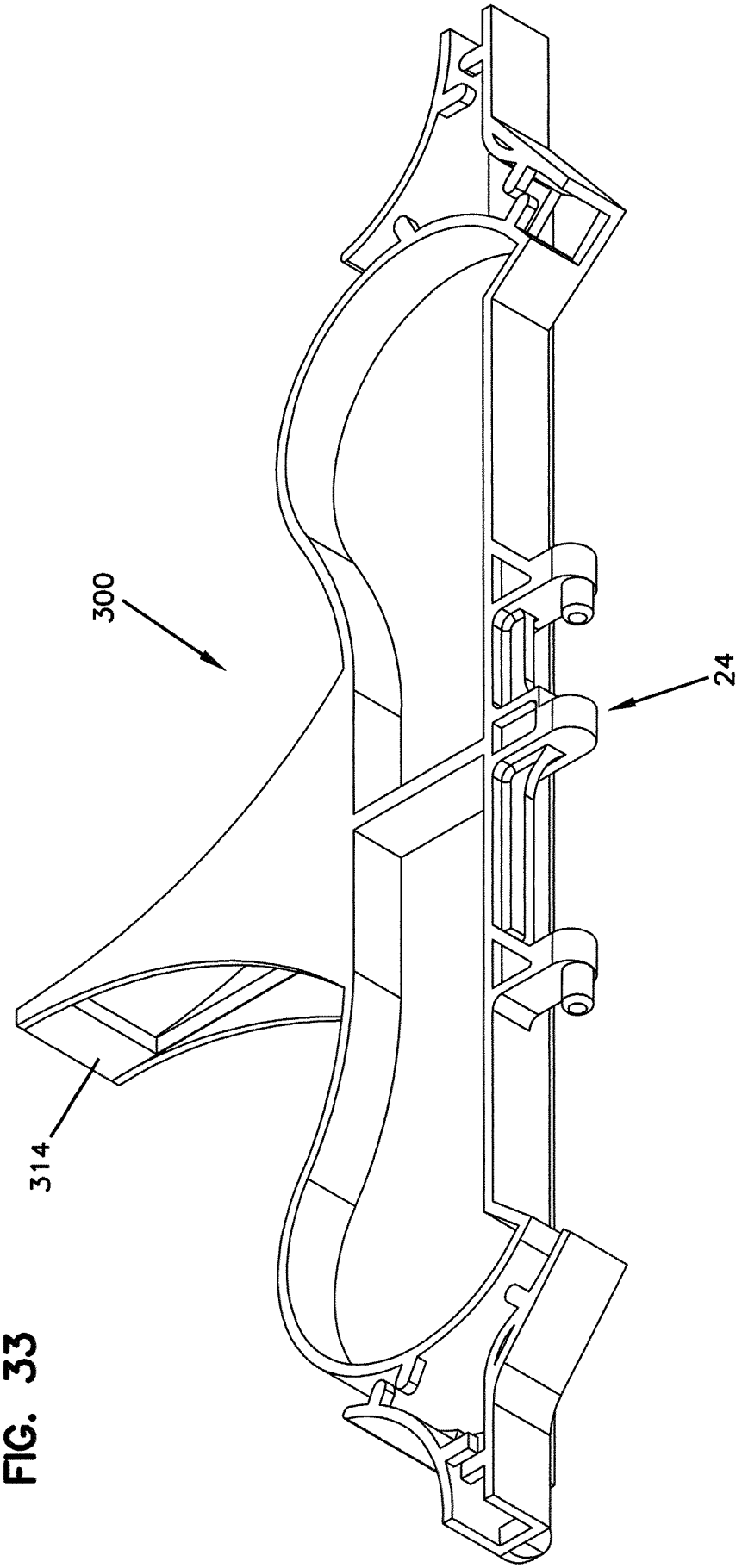


FIG. 33

FIG. 34

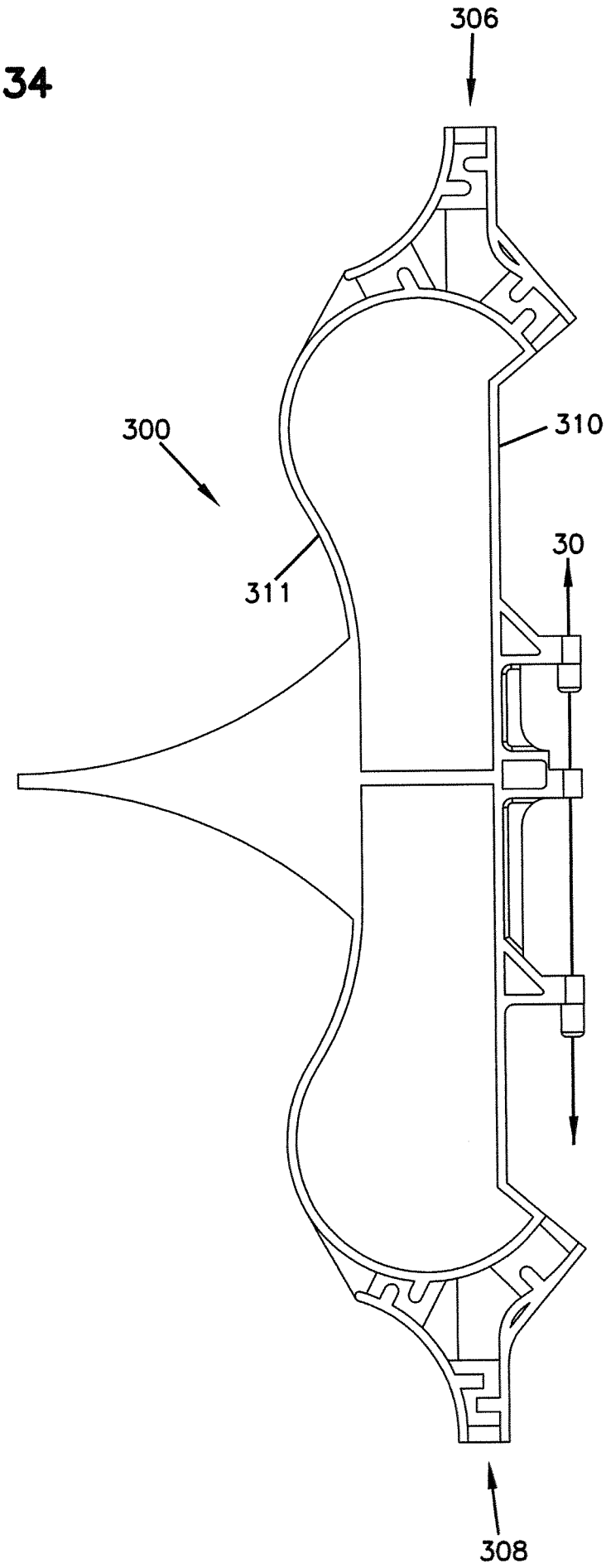


FIG. 35

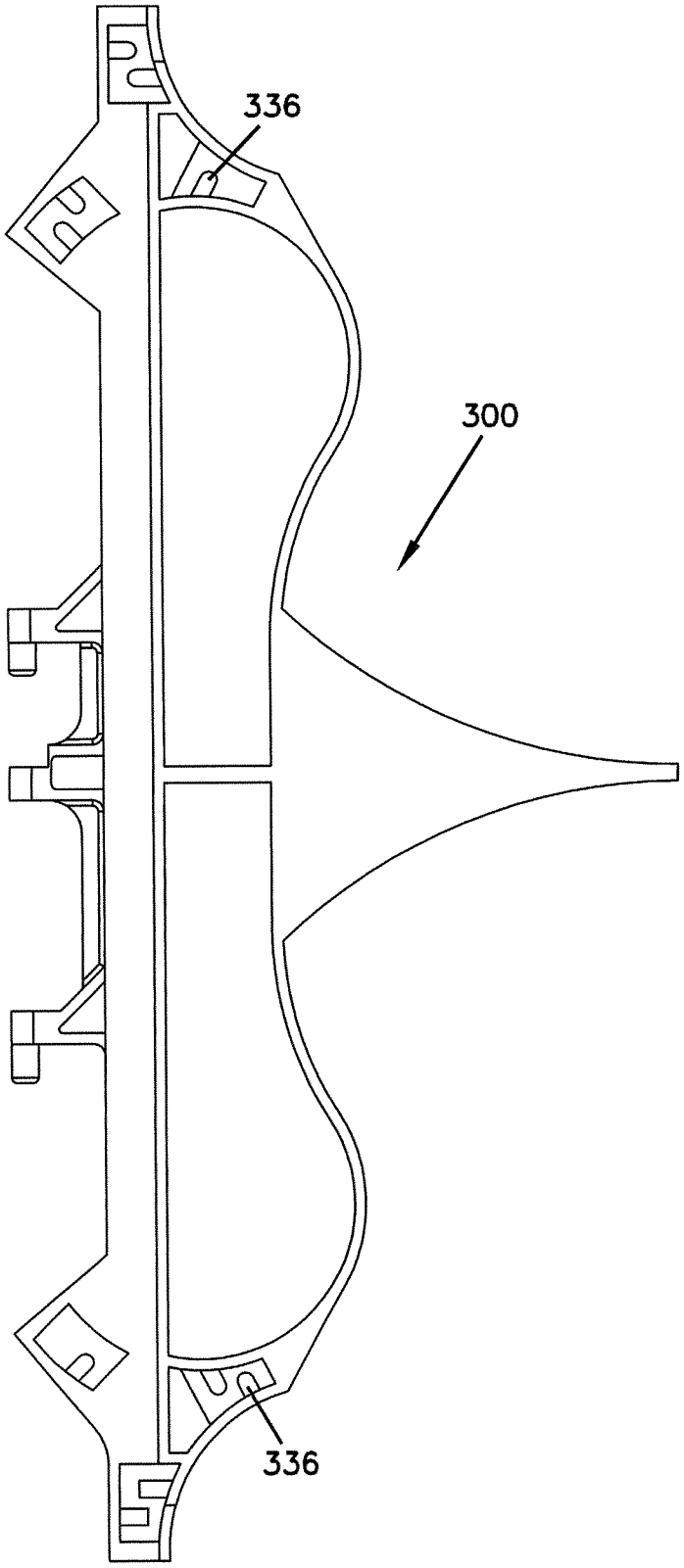


FIG. 36

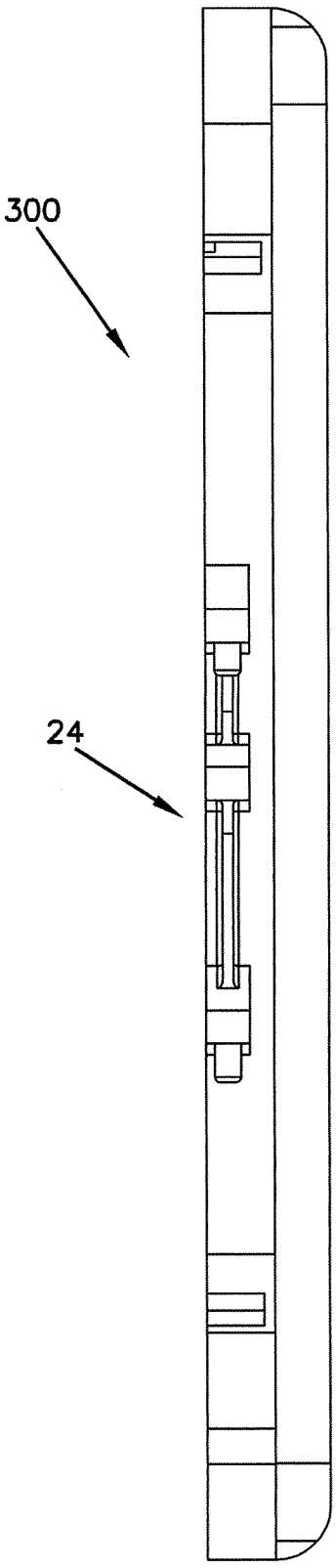
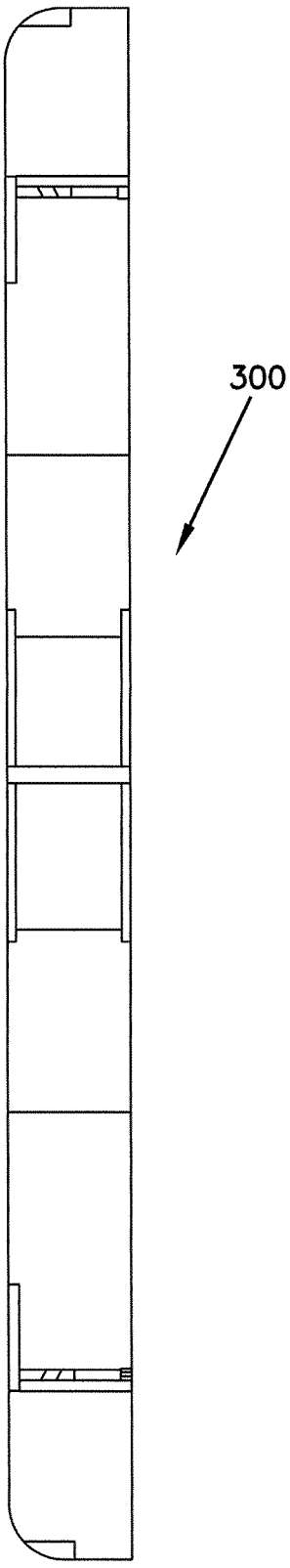


FIG. 37



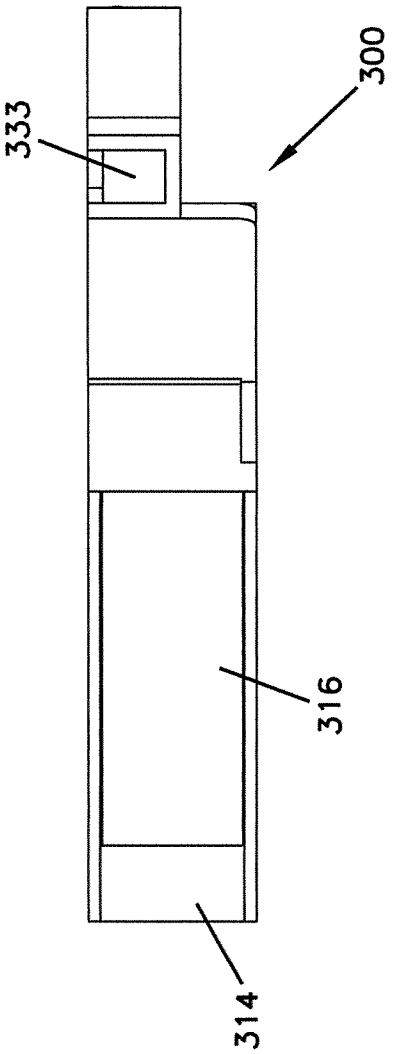


FIG. 38

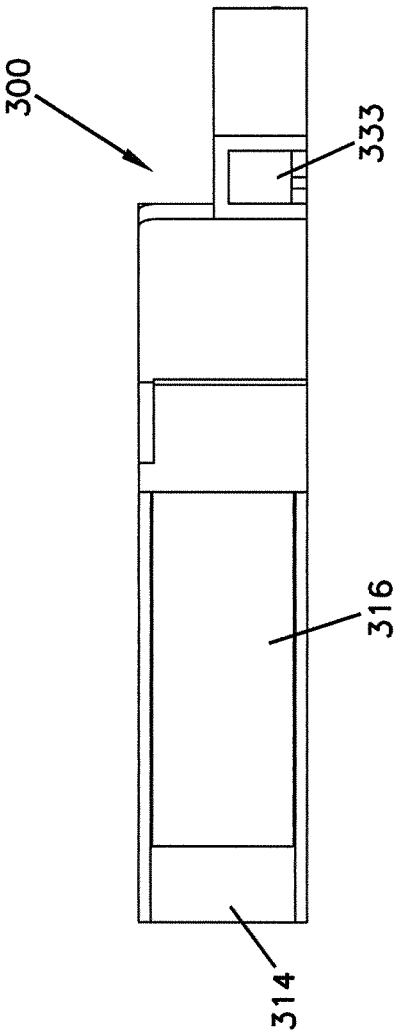


FIG. 39

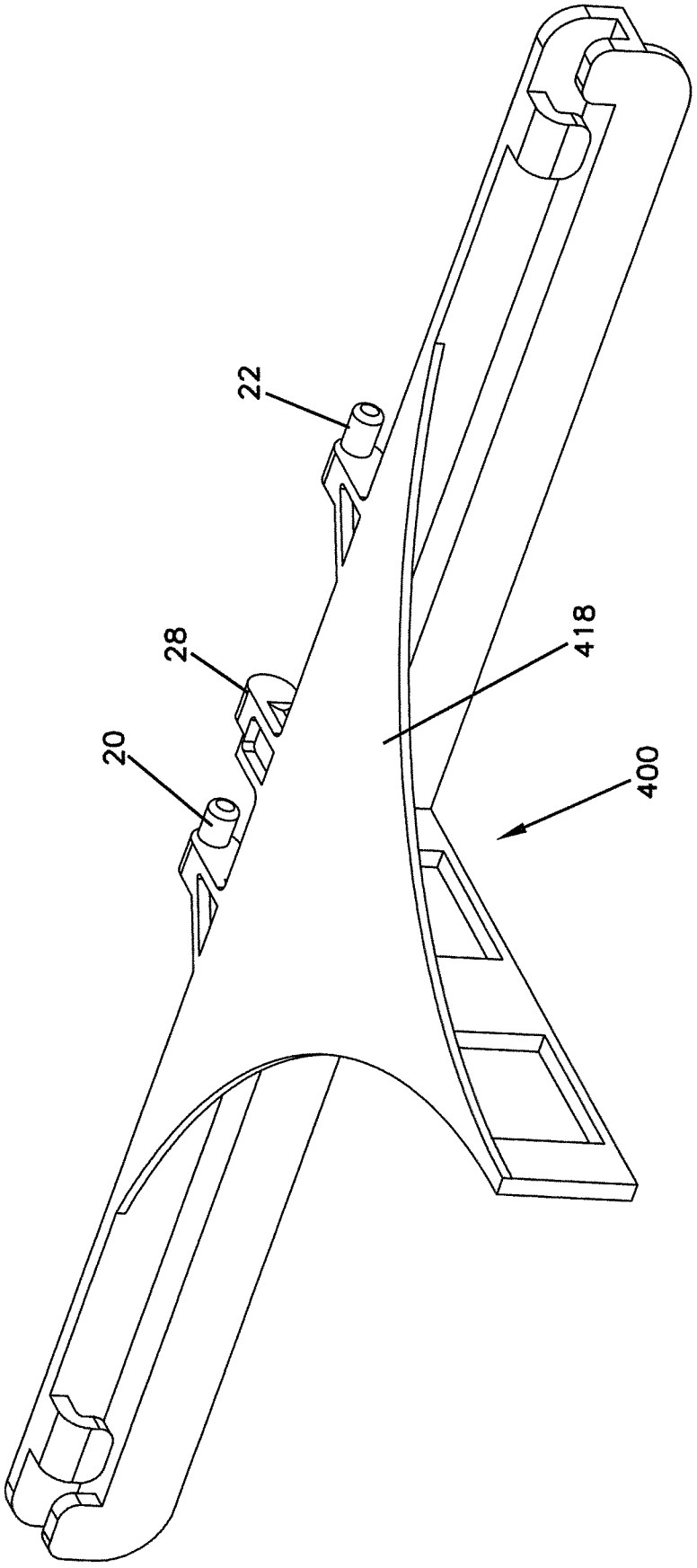


FIG. 40

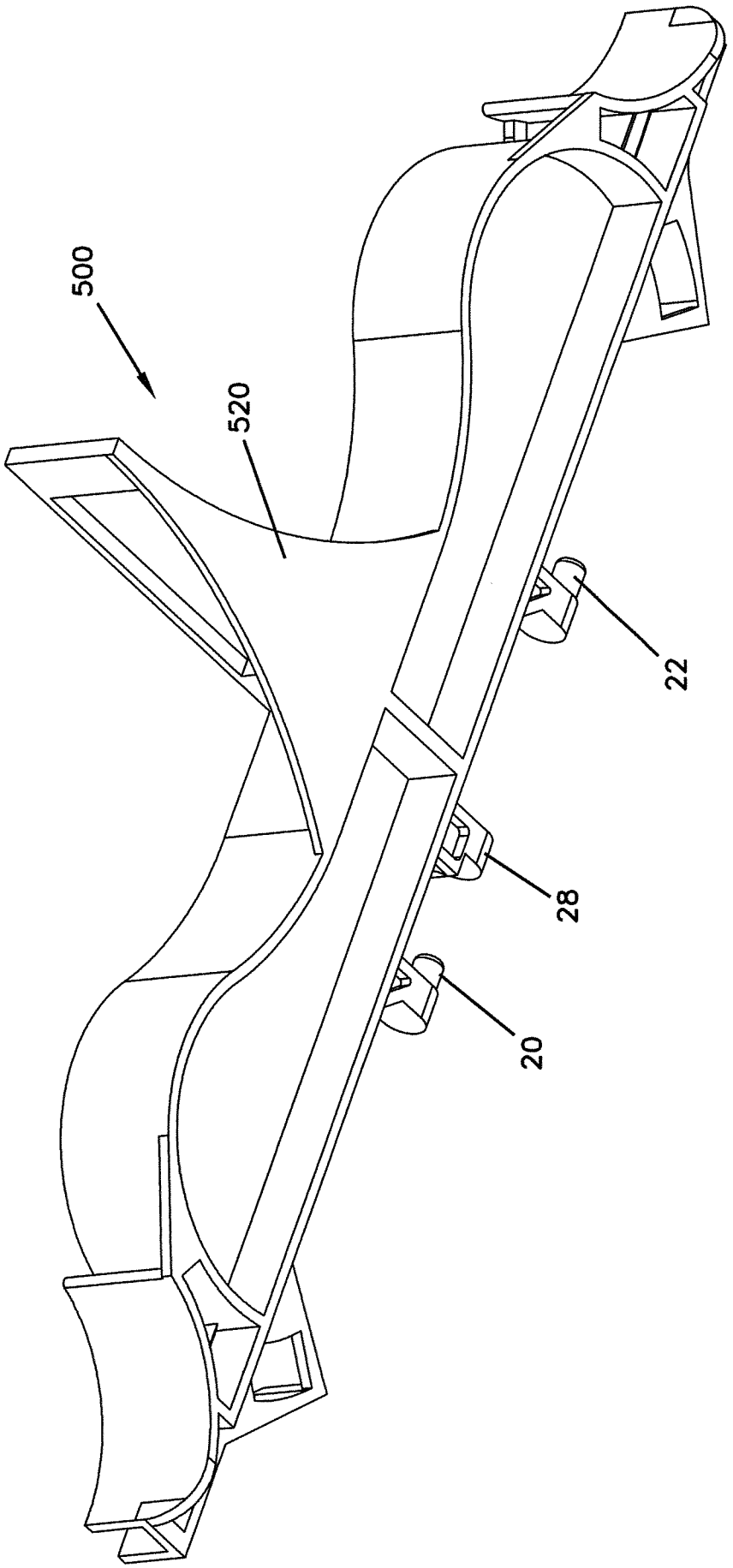


FIG. 41

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/054717

A. CLASSIFICATION OF SUBJECT MATTER
INV. G02B6/44
ADD.

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)
G02B

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)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2008/253730 A1 (COX TERRY DEAN [US] ET AL) 16 October 2008 (2008-10-16) figures 2-12 paragraph [0041] - paragraph [0049] -----	1-7, 10-18, 20,21, 25-31
X	US 6 556 763 B1 (PUETZ CURTIS LEE [US] ET AL) 29 April 2003 (2003-04-29) figures 1-8 column 5 - column 9 -----	1,4,7-19
X	US 2010/271472 A1 (HUBBARD PAUL [AU] ET AL) 28 October 2010 (2010-10-28) figures 1-6 paragraph [0038] - paragraph [0062] -----	1,4-7, 10, 14-17,19
	-/--	

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

X See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 June 2013	20/06/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Beutter, Matthias

1

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

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/054717

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 969 294 A (EBERLE STEINER A [US] ET AL) 19 October 1999 (1999-10-19) the whole document	1,20,25, 32
A	US 2010/158465 A1 (SMRHA MARK [US]) 24 June 2010 (2010-06-24) the whole document	1,20,25, 32
A	US 2011/103750 A1 (CLAESSENS BART MATTIE [BE] ET AL) 5 May 2011 (2011-05-05) the whole document	1,20,25, 32

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2013/054717

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2008253730 A1	16-10-2008	US 2008253730 A1	16-10-2008
		WO 2008127566 A1	23-10-2008
US 6556763 B1	29-04-2003	AT 348345 T	15-01-2007
		AU 774215 B2	17-06-2004
		AU 2004212589 A1	14-10-2004
		BR 0011254 A	09-04-2002
		CA 2375705 A1	14-12-2000
		CN 1364240 A	14-08-2002
		CN 101271183 A	24-09-2008
		CN 101866038 A	20-10-2010
		DE 60032360 T2	31-10-2007
		EP 1185897 A2	13-03-2002
		EP 1777563 A1	25-04-2007
		EP 2241915 A1	20-10-2010
		ES 2278632 T3	16-08-2007
		HK 1044379 A1	27-04-2007
		MX PA01012429 A	30-07-2002
		PT 1185897 E	30-03-2007
		US 6556763 B1	29-04-2003
		WO 0075706 A2	14-12-2000
US 2010271472 A1	28-10-2010	AR 068737 A1	02-12-2009
		AU 2007360000 A1	16-04-2009
		CA 2701964 A1	16-04-2009
		EP 2198329 A1	23-06-2010
		US 2010271472 A1	28-10-2010
		WO 2009046479 A1	16-04-2009
US 5969294 A	19-10-1999	NONE	
US 2010158465 A1	24-06-2010	CN 102272650 A	07-12-2011
		EP 2370843 A1	05-10-2011
		US 2010158465 A1	24-06-2010
		WO 2010077577 A1	08-07-2010
US 2011103750 A1	05-05-2011	AT 527567 T	15-10-2011
		AU 2009265341 A1	07-01-2010
		CN 102099721 A	15-06-2011
		DK 2300863 T3	23-01-2012
		EP 2300863 A1	30-03-2011
		ES 2372913 T3	27-01-2012
		KR 20110027840 A	16-03-2011
		PL 2300863 T3	29-02-2012
		RU 2011103954 A	10-08-2012
		US 2011103750 A1	05-05-2011
		WO 2010001148 A1	07-01-2010