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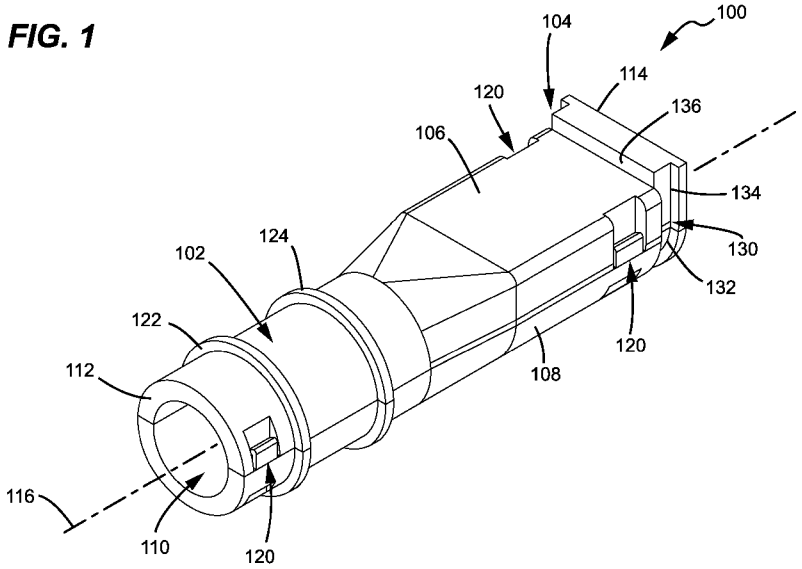
FIG. 1



(57) Abstract: A device for sealing a telecommunications cable is disclosed. The device includes a first part, and a second part having one or more attachment members that assemble onto the first part to assemble the first and second parts together. A cavity is defined between the first and second parts that extends along a central axis and between first and second ends of the device. The cavity is structured to seal the cable between the first and second parts without threading the cable through the first and second ends, and the first and second parts define at least one mounting location for a cable port in a telecommunications enclosure. The cavity may receive a resin to seal the cable between the first and second parts.

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DEVICE AND METHOD FOR SEALING CABLES IN TELECOMMUNICATIONS ENCLOSURES

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. Patent Application Serial No. 63/010,332, filed on April 15, 2020, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND

[0002] In a typical fiber optic distribution network, sealed and re-enterable enclosures are used to provide access to optical fibers from one or more fiber optic cables. For example, the optical fibers from multi-fiber distribution cables can be accessed within the enclosures.

[0003] Splice trays, patch panels, and various optical components can be provided within the enclosures. In certain examples, the enclosures include ruggedized adapter ports for allowing pre-connectorized drop cables to be connected to the optical fibers from the distribution cable. In some further examples, the optical fibers from the distribution cable are spliced inside the enclosures to optical fibers corresponding to drop cables that are routed out of the enclosure through sealed ports. Effective sealing is an important consideration relating to outdoor enclosures used in fiber optic distribution networks.

[0004] In certain examples, a distribution cable is looped through an enclosure such that the distribution cable can pass through multiple enclosures in the distribution network. It can be challenging to seal the locations where the looped distribution cable enters and exits the enclosure. For this and other reasons, improvements are desirable.

SUMMARY

[0005] Aspects of the present disclosure relate to a device and method for providing effective sealing with regard to telecommunication enclosures. In certain aspects, the device assembles around a cable to effectively seal the cable and/or the ports of an enclosure where the cable enters and/or exits the enclosure.

[0006] In one aspect, a device for sealing a telecommunications cable includes a first part; a second part having one or more attachment members that assemble onto the first part to assemble the first and second parts together; and a cavity defined between the first and second parts that extends along a central axis and between first and second ends of the device; wherein the cavity is structured to seal the cable between the first and second parts without threading the cable through the first and second ends, and the first and second parts define at least one mounting location for a cable port in a telecommunications enclosure.

[0007] In another aspect, a method of sealing a telecommunications cable includes providing first and second parts of a device; striping a portion of the outer protective jacket; assembling the first and second parts around a portion of the cable; applying a resin to seal the portion of the cable inside a cavity defined between the first and second parts of the device; and inserting the device into a cable port of a telecommunications enclosure. In some cases, the method includes positioning or wrapping an outer device around the outer protective jacket of the cable.

[0008] In another aspect, a device for sealing a telecommunications cable includes a first part; a second part having one or more attachment members that assemble onto the first part to assemble the first and second parts together; and a cavity defined between the first and second parts that extends along a central axis between first and second ends of the device; wherein the cavity is structured to receive a cable between the first and second parts without having to thread the cable through the first and second ends.

[0009] In a further aspect, the first and second parts define a first mounting location structured to mount to a port in a first type of enclosure and a second mounting location structured to mount to a port in a second type of enclosure.

[0010] A variety of additional inventive aspects will be set forth in the description that follows. The inventive aspects can relate to individual features and to combinations of features. It is to be understood that both the forgoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the broad inventive concepts upon which the examples disclosed herein are based.

DESCRIPTION OF THE FIGURES

[0011] The following drawing figures, which form a part of this application, are illustrative of described technology and are not meant to limit the scope of the disclosure in any manner.

[0012] FIG. 1 is a perspective view of a device for sealing a telecommunications cable.

[0013] FIG. 2 is another perspective view of the device.

[0014] FIG. 3 is a perspective view of the device.

[0015] FIG. 4 is another perspective view of the device.

[0016] FIG. 5 is a top view of the device.

[0017] FIG. 6 is a bottom view of the device.

[0018] FIG. 7 is a right side view of the device.

[0019] FIG. 8 is a left side view of the device.

[0020] FIG. 9 is an exploded perspective view of the device.

[0021] FIG. 10 is a bottom perspective view of a first part of the device.

[0022] FIG. 11 is a top perspective view of a second part of the device.

[0023] FIG. 12 is a front perspective view of devices in accordance with the embodiment of FIGS. 1-11 mounted inside cable ports of a first type of enclosure.

[0024] FIG. 13 is a rear perspective view of the devices mounted in the first type of enclosure, with a cover of the first type of enclosure removed.

[0025] FIG. 14 is an exploded perspective view showing an assembly of the devices and the first type of enclosure.

[0026] FIG. 15 is a top perspective view of devices in accordance with the embodiment of FIGS. 1-11 mounted inside cable ports of a second type of enclosure.

[0027] FIG. 16 is a top perspective view of the devices mounted in the second type of enclosure, with a cover of the second type of enclosure removed.

[0028] FIG. 17 is a detailed view of FIG. 16 showing an interface between the devices and the second type of enclosure.

[0029] FIG. 18 is a bottom perspective view of the devices mounted in the cable ports of the second type of enclosure.

[0030] FIG. 19 is a bottom perspective view of the device mounted relative to the cover of the second type of enclosure.

[0031] FIG. 20 is a detailed view of FIG. 19 showing an interface between the device and the cover of the second type of enclosure.

[0032] FIG. 21 illustrates a cross-sectional view of a telecommunications cable sealed inside a device in accordance with the embodiment of FIGS. 1-11.

[0033] FIG. 22 schematically illustrates a method of sealing a telecommunications cable.

DETAILED DESCRIPTION

[0034] Various embodiments will be described in detail with reference to the drawings, wherein like reference numerals represent like parts and assemblies throughout the several views. Reference to various embodiments does not limit the scope of the claims attached hereto. Additionally, any examples set forth in this specification are not intended to be limiting and merely set forth some of the many possible embodiments for the appended claims.

[0035] There are one or more reasons to seal an end of a cable used in connection with an enclosure. One reason is prevent the escape of pressuring test gas placed into the cable interior to check for cuts or breakages of the cable. Another reason may be to prevent the entry of moisture or gas into an interior of an enclosure.

[0036] In certain embodiments, an inert gas is injected into a telecommunications cable such as a multi-fiber distribution cable. The inert gas is used to pressurize the cable to detect a leakage or breakage in the cable, and to also prevent moisture from entering inside the cable.

[0037] Additionally, in certain embodiments, an inert gas is injected into a telecommunications enclosure where various telecommunications cables are routed therein. The inert gas may be used to pressurize the enclosure to ensure that there are no leaks or damage to the enclosure. As will be described in more detail, a device 100 is structured to seal a pressurized telecommunications cable, and/or to seal a cable port of one or more types of telecommunications enclosures.

[0038] FIGS. 1-4 are perspective views of the device 100. Referring now to FIGS. 1-4, the device 100 defines a cavity 110 that is structured to surround a cable such as a pressurized multi-fiber distribution cable, and that is structured to receive a resin to seal the cable inside the cavity 110. In certain embodiments, the device 100 is structured to seal a telecommunications cable such as the telecommunications cable 400 shown in FIG.

21. The resin is a flowable adhesive that cures to seal an interior of the cable, and around any extending fiber tubes that extend out of the cable and continue on into the enclosure.

[0039] The interface between the device 100 and resin also creates a fixation from axial pulls or pushes on the cable, in some embodiments. Additionally, in some embodiments, the interior and/or the exterior of the enclosure may include fixation structures which fix onto the outer jacket and/or strength members of the cable.

[0040] The device 100 further includes a first mounting location 102 for sealing a cable port in a first type of enclosure such as the enclosure 200 shown in FIGS. 12-14, and a second mounting location 104 for sealing a cable port in a second type of enclosure such as the enclosure 300 shown in FIGS. 15-20. Accordingly, in certain embodiments, the device 100 is structured to seal the cable ports of one or more types of telecommunications enclosures. Enclosures 200, 300 can include cable splices, splitters, and/or cable connectors and mating adapters, as desired.

[0041] The device 100 includes first and second parts 106, 108 that are structured for assembly in the field. As shown in FIGS. 1-4, the first and second parts 106, 108 are assembled together at one or more attachment locations 120. In certain embodiments, the first and second parts 106, 108 snap-fit together such that the device 100 can be readily assembled in the field.

[0042] When assembled together, the first and second parts 106, 108 define the cavity 110 that extends along a central axis 116 of the device 100 between a first end 112 and a second end 114 of the device 100. The cavity 110 is structured to surround a cable that enters or exits an enclosure such as a multi-fiber distribution cable or a drop cable. Additionally, the cavity 110 is also structured to receive a resin to seal the cable inside the cavity 110.

[0043] Advantageously, by providing the first and second parts 106, 108 that assemble together, the device 100 can be wrapped around the cable without having to thread the cable through the cavity 110. Thus, the device 100 can be attached to a middle portion of

the cable that is distant from the distal ends of the cable. In one example, device 100 is configured to wrap around a loop cable that is looped through the enclosure.

[0044] In some examples, an outer device can be positioned around the cable at a location where it is desired to assemble the device 100 around the cable before the first and second parts 106, 108 are assembled together. In some examples, the outer device is foam tape that can be wrapped around the cable. The outer device can be of a predetermined thickness. The outer device can help ensure that the cable is held snuggly inside the cavity 110 and prevent the cable from sliding relative to the device 100 after the first and second parts 106, 108 are assembled around the cable. The outer device, such as foam tape, can increase the sealing effect from resin. Also, the outer device can increase the cable thickness, and is appreciated to be an optional feature in some embodiments. The outer device can allow device 100 to be used with a variety of cable sizes.

[0045] In the examples depicted in the figures, the cavity 110 has a substantially circular cross-sectional shape to accommodate cables having a circular cross-section. However, it is possible for the cavity 110 have a plurality of different shapes and sizes to accommodate a variety of different cables, or multiple cables grouped together, having different shapes and sizes.

[0046] FIGS. 5-8 are top, bottom, right side, and left side views, respectively, of the device 100. Referring now to FIGS. 1-8, the first mounting location 102 is a rounded exterior surface defined between first and second projections 122, 124 that extend radially from the central axis 116. The first mounting location 102 extends around the central axis 116.

[0047] In the embodiment depicted in the figures, the first and second projections 122, 124 are circular rims that extend around the central axis 116, and the first mounting location 102 is a cylindrical exterior surface that is defined between the first and second projections 122, 124. As shown in FIGS. 5-8, a distance between the first and second

projections 122, 124 defines a length L of the cylindrical exterior surface of the first mounting location 102, and the diameter of the cavity 110 combined with the thickness of the first and second parts 106, 108 defines an outside diameter D of the cylindrical exterior surface of the first mounting location 102.

[0048] Referring back to FIGS. 1-4, the second mounting location 104 includes a groove 130 that extends at least partially around the central axis 116. The groove 130 has first and second portions 132, 134. In the embodiment depicted in the figures, the first portion 132 is substantially semi-circular, and the second portion 134 of the groove 130 is substantially linear.

[0049] Additionally, the second mounting location 104 includes a surface 136 that is orthogonal to the central axis 116. The surface 136 is structured to interface with a cover 304 of the enclosure 300 to secure the device 100 inside a cable port of the enclosure 300.

[0050] FIG. 9 is an exploded perspective view of the device 100. FIG. 10 is a bottom perspective view of the first part 106 of the device 100, and FIG. 11 is a top perspective view of the second part 108 of the device 100. Referring now to FIGS. 9-11, the rounded exterior surface of the first mounting location 102 is partially defined by the first part 106 and is also partially defined by the second part 108. Additionally, the first and second projections 122, 124 are partially defined by the first part 106 and are also partially defined by the second part 108. As also shown in these figures, the first portion 132 of the groove 130 is defined by the second part 108, and the second portion 134 and surface 136 are defined by the first part 106.

[0051] The attachment locations 120 each include an attachment member 140 of a first type, and an attachment member 142 of a second type. In certain embodiments, the attachment members 142 are latch members that snap-fit onto mating surfaces of the attachment members 140. For example, the attachment members 140 each include a flat mating surface and a sloped surface. The attachment members 142 each include a sloped surface that causes the attachment members 142 to flex when engaging the sloped surface

of the attachment member 140 such that a flat mating surface of each attachment member 142 is able to latch onto the flat mating surface of each corresponding attachment member 140.

[0052] While the embodiment depicted in the figures shows the first part 106 as having the attachment members 140 of the first type, and the second part 108 as having the attachment members 142 of the second type, in alternative embodiments the first part 106 can have the attachment members 142 of the second type, and the second part 108 can have the attachment members 140 of the first type. Also, in alternative embodiments, the first part 106 can have attachment members 140, 142 of both the first and second types, and the second part 108 can have attachment members 140, 142 of both the first and second types.

[0053] Still referring now to FIGS. 9-11, the first part 106 includes an interior surface 150 that partially defines the cavity 110. For example, the interior surface 150 is a concave surface. Similarly, the second part 108 also includes an interior surface 152 that partially defines the cavity 110. The interior surface 152 is also a concave surface. Accordingly, when the first and second parts 106, 108 are assembled by snap fitting the attachment members 140, 142 together, the cavity 110 is formed by the interior surfaces 150, 152 of the first and second parts.

[0054] As shown in FIG. 10, the first part 106 includes at least one alignment rib 154. In some examples, the at least one alignment rib 154 extends parallel to the central axis 116. In some examples, the first part 106 includes a pair of alignment ribs 154 on opposite sides of the interior surface 150, such as in the example depicted in FIG. 10.

[0055] As shown in FIGS. 9 and 11, the second part 108 includes at least one alignment groove 156. In some examples, the at least one alignment groove 156 extends parallel to the central axis 116. In some examples, the second part 108 includes a pair of alignment grooves 156 on opposite sides of the interior surface 152, such as in the example depicted in FIGS. 9 and 11. The alignment grooves 156 are structured to receive the alignment ribs

154 on the first part 106 to align the first and second parts 106, 108 together during their assembly.

[0056] While the embodiment depicted in the figures shows the first part 106 as having the alignment ribs 154, and the second part 108 as having the alignment grooves 156, in alternative embodiments the first part 106 can have the alignment grooves 156, and the second part 108 can have the alignment ribs 154. Also, in alternative embodiments, the first part 106 can have an alignment rib 154 and an alignment groove 156, and the second part 108 can have a corresponding alignment groove 156 and a corresponding alignment rib 154.

[0057] FIG. 12 is a front perspective view of devices 100a, 100b mounted in the first type of enclosure 200. FIG. 13 is a rear perspective view of the devices 100a, 100b mounted in the enclosure 200, with the cover of the enclosure removed. FIG. 14 is an exploded perspective view showing an assembly of the devices 100a, 100b. Referring now to FIGS. 12-14, the enclosure 200 includes a base 202 and a cover 204. The base 202 defines a cable seal opening 206 where one or more cable seals 208 are mounted. The cable seals 208 define cable ports 210a, 210b for cables such as multi-fiber distribution cables to enter and exit the enclosure 200. In certain embodiments, the enclosure 200 is pressurized with an inert gas and the devices 100a, 100b seal the cable ports 210a, 210b to prevent the gas from escaping out of the pressurized enclosure.

[0058] The first mounting location 102 of the devices 100a, 100b is configured to mount inside the cable ports 210a, 210b. For example, the first projection 122 is structured to engage an exterior surface of the cable seals 208, and the second projection 124 is structured to engage an interior surface of the cable seals 208 to secure the rounded exterior surface of the first mounting location 102 between the exterior and interior surfaces of the cable seals 208.

[0059] The cable seals 208 are stacked inside the cable seal opening 206 of the base 202. In the configuration illustrated in the figures, three cable seals 208a-208c are stacked

inside each cable seal opening 206. For example, a first cable seal 208a is stacked inside each cable seal opening 206 followed by a second cable seal 208b. The cable seals 208a, 208b define a first cable port 210a. A third cable seal 208c is thereafter stacked in each cable seal opening 206, and the cable seals 208b, 208c define a second cable port 210b in each cable seal opening 206.

[0060] The devices 100a, 100b are inserted into the first and second cable ports 210a, 210b by mounting the first cable seal 208a in the cable seal opening 206, mounting the first mounting location 102 of the device 100a onto the first cable seal 208a, and thereafter mounting the second cable seal 208b over the first cable seal 208a and the device 100a, and thereby capturing the device 100a inside the first cable port 210a. Next, the device 100b is mounted over the second cable seal 208b, and the third cable seal 208c is mounted over the second cable seal 208b and the device 100b, and thereby capturing the device 100b inside the second cable port 210b.

[0061] In some embodiments, a rubber gasket, a resin, or other type of sealant can be positioned around the first mounting location 102 of the device 100a to provide an improved seal between the device 100a and the first and second cable seals 208, 208b in the first cable port 210a. Likewise, a sealant such as a rubber gasket, a resin, or other type of sealant can be positioned around the first mounting location 102 of the device 100b to provide an improved seal between the device 100b and the second and third cable seals 208b, 208c in the second cable port 210b.

[0062] FIGS. 15 and 16 are top perspective views of devices 100a, 100b mounted in the second type of enclosure 300. FIG. 17 is a detailed view of FIG. 16 showing an interface between the devices 100a, 100b and the enclosure 300. Referring now to FIGS. 15-17, the enclosure 300 includes a base 302 and a cover 304. The base 302 defines cable ports 310a-310d for cables such as multi-fiber distribution cables to enter and exit the enclosure 300. The second mounting location 104 of the devices 100a, 100b is mounted inside the cable ports 310c, 310d. In certain embodiments, the enclosure 300 is

pressurized with an inert gas and the devices 100a, 100b seal the cable ports 310c, 310d to prevent the gas from escaping out of the pressurized enclosure.

[0063] In some examples, the cable ports 310a-310d can be initially blocked by temporary covers 306 that can be removed to open the cable ports 310a-310d. As an illustrative example, the temporary covers 306 can be punched out or cut out to open the cable ports 310a-310d.

[0064] Referring now to FIGS. 1-4 and 15-17, the groove 130 in the second mounting location 104 of the devices 100a, 100b can be slotted onto the base 302 where the cable ports 310a-310d are located such that the groove 130 is engaged between interior and exterior surfaces of the base 302 of the enclosure 300. As shown in FIGS. 16 and 17, the surface 136 of the second mounting location 104 is substantially flush with the exterior surface of the base 302.

[0065] FIG. 18 is a bottom perspective view of the devices 100a, 100b mounted in the cable ports 310c, 310d of the enclosure 300. FIG. 19 is a bottom perspective view of the devices 100a, 100b mounted relative to the cover 304 of the enclosure 300. FIG. 20 is a detailed view of FIG. 19 showing an interface between the devices 100a, 100b and the cover 304 of the enclosure 300. Referring now to FIGS. 16-20, the cover 304 has a ridge surface 308 that extends across the width of the cover 304. When the cover 304 is attached to the base 302 of the enclosure 300, the ridge surface 308 interfaces with the surface 136 of the second mounting location 104 of the devices 100a, 100b such that the second mounting location 104 is captured between the base 302 and the cover 304 to secure the devices 100a, 100b in the cable ports 310c, 310d.

[0066] A rubber padding, resin, or other type of sealant can be inserted into the grooves 130 of the devices 100a, 100b to provide a gas-tight seal between the grooves 130 and the cable ports 310c, 310d. Similarly, a sealant such as a rubber pad or resin can also be mounted to the surface 136 to provide a gas-tight seal between the surface 136 and the ridge surface 308 of the cover.

[0067] FIG. 21 illustrates a cross-sectional view of a telecommunications cable 400 sealed inside the device 100. The telecommunications cable 400 can be a multi-fiber distribution cable that includes an outer protective jacket 402 that surrounds a bundle of tubes 404. Each tube 404 can contain one or more optical fibers. In some examples, an outer device 406 is positioned or wrapped around a portion of the outer protective jacket 402. In some examples, the outer device 406 is a foam tape that is wrapped around the outer protective jacket 402.

[0068] A portion of the outer protective jacket 402 is stripped to expose the tubes 404. The first and second parts 106, 108 are assembled around the portion of the telecommunications cable 400 where the outer protective jacket 402 is stripped. In some further examples, the first and second parts 106, 108 are assembled around where the outer device 406 is positioned.

[0069] The outer device 406 (e.g., foam tape) can help to ensure that the telecommunications cable 400 is held snuggly inside the cavity 110 such that the cable does not slide relative to the device 100 after the first and second parts 106, 108 are assembled around the cable. The outer device 406 can also help to retain the poured resin in place until cured.

[0070] A resin 408 is applied into the cavity 110 to seal the telecommunications cable 400 inside the device 100. The resin 408 can seal around an exterior of the outer protective jacket 402. The resin 408 can also seal around an area where the outer protective jacket 402 is stripped, and around the tubes 404 that contain the optical fibers.

[0071] In certain examples, the telecommunications cable 400 is pressurized with an inert gas, and the resin 408 inside the cavity 110 seals the inert gas inside the cable. In some embodiments, the resin 408 has a certain viscosity such that it does not overflow or run out before curing.

[0072] FIG. 22 schematically illustrates a method 500 of sealing a telecommunications cable such as the telecommunications cable 400. Referring now to FIGS. 21 and 22, the

method 500 includes an operation 502 of providing the first and second parts 106, 108 of the device 100.

[0073] Next, the method 500 includes an operation 504 of stripping a portion of the outer protective jacket 402. In some examples, operation 504 is optional.

[0074] Next, the method 500 has an operation 506 of wrapping an outer device 406 such as foam tape around a remaining portion of the outer protective jacket 402 of the telecommunications cable 400. In some examples, operation 506 is optional.

[0075] In FIG. 22, operations 504, 506 are shown as being performed after completion of operation 502. Alternatively, the operations 504, 506 can be performed before operation 502. Also, in FIG. 22, operation 506 is shown as being performed after completion of operation 504. In some alternative examples, operation 506 can be performed before operation 504.

[0076] Next, the method 500 includes an operation 508 of assembling the first and second parts 106, 108 around the telecommunications cable 400 where the outer protective jacket 402 is stripped. In some examples, operation 508 can also include assembling the first and second parts 106, 108 around the portion where the outer device 406 is positioned. The attachment members 140, 142 can be used to snap-fit the first and second parts 106, 108 together to provide a simple and easy assembly around the telecommunications cable 400.

[0077] Next, the method 500 includes an operation 510 of applying the resin 408 to seal the telecommunications cable 400 inside the cavity 110. In some examples, operation 510 includes applying the resin 408 first to the interior surface 150 of the first part 106 and to the interior surface 152 of the second part 108 before the first and second parts 106, 108 are assembled around the telecommunications cable. In some examples, operation 510 includes filling the cavity 110 with the resin 408 after the first and second parts 106, 108 are assembled around the telecommunications cable 400. Additional examples are contemplated.

[0078] In certain embodiments, the telecommunications cable 400 is pressurized with an inert gas and the resin 408 seals the cable to prevent the inert gas from escaping out of the cable at the location where the outer protective jacket 402 is stripped.

[0079] Next, the method 500 includes an operation 512 of inserting the device 100 into a cable port of a telecommunications enclosure.

[0080] In one embodiment, operation 512 includes inserting the device 100 into a cable port of the enclosure 200 by mounting a first cable seal 208a in a cable seal opening 206, mounting the first mounting location 102 of the device 100 onto a cable port 210a partially defined by the first cable seal 208a, and mounting a second cable seal 208b over the first cable seal 208a and the first mounting location 102 of the device 100a to capture the device 100a inside the cable port 210a between the first and second cable seals 208a, 208b.

[0081] In some further embodiments, the first mounting location 102 of a second device, such as the device 100b of FIGS. 12-14, is mounted onto a cable port 210b partially defined by the second cable seal 208b, and a third cable seal 208c is then mounted over the second cable seal 208b and the first mounting location 102 of the device 100b to capture the device 100b inside the cable port 210b defined between the second and third cable seals 208b, 208c.

[0082] In some further embodiments, the enclosure 200 is pressurized with an inert gas after the device 100b is mounted onto the cable port 210b, and the cover 204 is attached to the base 202 of the enclosure 200. In such examples, the devices 100a, 100b seal the cables ports 210a, 210b, and prevent the inert gas from escaping out of the enclosure 200.

[0083] In another embodiment, operation 512 includes inserting the device 100 into a cable port of the enclosure 300 by removing a temporary cover 306 to open a cable port 310, slotting the groove 130 in the second mounting location 104 of the device 100 onto the cable port 310 such that the groove 130 is engaged between interior and exterior surfaces of the base 302 of the enclosure 300, and then attaching the cover 304 to the

base 302 such that the surface 136 of the second mounting location 104 interfaces with the cover 304 to capture the second mounting location 104 between the base 302 and the cover 304 of the enclosure 300.

[0084] In certain embodiments, the enclosure 300 is pressurized with an inert gas. The device 100 seals the cable port 310 to prevent the inert gas from escaping out of the enclosure 300.

[0085] The various embodiments described above are provided by way of illustration only and should not be construed to limit the claims attached hereto. Those skilled in the art will readily recognize various modifications and changes that may be made without following the example embodiments and application illustrated and described herein, and without departing from the true spirit and scope of the following claims.

What is claimed is:

1. A device for sealing a telecommunications cable, the device comprising:

a first part;

a second part having one or more attachment members that assemble onto the first part to assemble the first and second parts together; and

a cavity defined between the first and second parts that extends along a central axis and between first and second ends of the device;

wherein the cavity is structured to seal the cable between the first and second parts without threading the cable through the first and second ends, and the first and second parts define at least one mounting location for a cable port of a telecommunications enclosure.

2. The device of claim 1, wherein the cavity is structured to receive a resin to seal the cable between the first and second parts.

3. The device of claim 1, wherein the attachment members are snap-fit connectors.

4. The device of claim 1, wherein one of the first and second parts has at least one alignment rib extending parallel to the central axis, and the other of the first and second parts has at least one alignment groove extending parallel to the central axis, the alignment groove structured to receive the alignment rib to align the first and second parts along the central axis.

5. The device of claim 1, wherein the first and second parts define a first mounting location structured to seal a port in a first type of enclosure and a second mounting location structured to seal a port in a second type of enclosure.

6. The device of claim 5, wherein the first mounting location is a rounded exterior surface that extends around the central axis.

7. The device of claim 6, wherein the rounded exterior surface is partially defined by the first part and is partially defined by the second part.

8. The device of claims 6 or 7, wherein the rounded exterior surface is cylindrical.

9. The device of claims 6 or 7, wherein the rounded exterior surface is defined between first and section projections that extend radially from the central axis.

10. The device of claim 9, wherein the first and second projections are partially defined by the first part and are partially defined by the second part.

11. The device of claim 9, wherein the first projection is structured to engage an exterior surface of the first type of enclosure, and the second projection is structured to engage an interior surface of the first type of enclosure to secure the rounded exterior surface of the first mounting location between the exterior and interior surfaces of the first type of enclosure.

12. The device of claims 10 or 11, wherein the first and second projections are circular rims that extend around the central axis.

13. The device of claim 5, wherein the second mounting location includes a groove that extends at least partially around the central axis.

14. The device of claim 13, wherein a first portion of the groove is semi-circular, and a second portion of the groove is linear.

15. The device of claim 14, wherein the first portion of the groove is defined by the second part, and the second portion of the groove is defined by the first part.

16. The device of any of claims 13-15, wherein the groove is structured to be engaged between interior and exterior surfaces of a base of the second type of enclosure.

17. The device of any of claims 13-16, wherein the second mounting location further includes a surface that is orthogonal to the central axis, and that is structured to interface with a cover of the second type of enclosure.

18. The device of claim 17, wherein the second mounting location is configured to secure the device to a port defined between the base and the cover of the second type of enclosure.

19. A method of sealing a telecommunications cable, the method comprising:

providing first and second parts of a device;

striping a portion of the outer protective jacket;

assembling the first and second parts around a portion of the cable;

applying a resin to seal the portion of the cable inside a cavity defined between the first and second parts of the device; and

inserting the device into a cable port of a telecommunications enclosure.

20. The method of claim 19, wherein the portion of the cable is not a distal end of the cable.

21. The method of claim 19, wherein the portion of the cable is an area between opposing distal ends of the cable.

22. The method of claim 19, wherein inserting the device into the cable port of the telecommunications enclosure includes mounting a first cable seal in a cable seal opening, mounting a first mounting location of the device onto the cable port partially defined by the first cable seal, and mounting a second cable seal over the first cable seal

and the first mounting location to capture the device inside the cable port between the first and second cable seals.

23. The method of claim 19, wherein inserting the device into the cable port of the telecommunications enclosure includes removing a temporary cover to open a cable port, slotting a groove in a second mounting location of the device onto the opened cable port such that the groove is engaged between interior and exterior surfaces of a base of the enclosure, and attaching a cover to the base such that a surface of the second mounting location engages the cover to capture the second mounting location between the base and the cover of the enclosure.

24. A device for sealing a telecommunications cable, the device comprising:

a first part;

a second part having one or more attachment members that assemble onto the first part to assemble the first and second parts together; and

a cavity defined between the first and second parts that extends along a central axis between first and second ends of the device;

wherein the cavity is structured to receive a cable between the first and second parts without having to thread the cable through the first and second ends, and the first and second parts define a first mounting location structured to seal a port in a first type of enclosure and a second mounting location structured to seal a port in a second type of enclosure.

25. The device of claim 24, wherein the first mounting location is a rounded exterior surface that extends around the central axis.

26. The device of claim 25, wherein the rounded exterior surface is partially defined by the first part and is partially defined by the second part.

27. The device of claims 25 or 26, wherein the rounded exterior surface is defined between first and section projections that extend radially from the central axis.

28. The device of claim 27, wherein the first and second projections are partially defined by the first part and are partially defined by the second part.

29. The device of claim 27, wherein the first projection is structured to engage an exterior surface of the first type of enclosure, and the second projection is structured to engage an interior surface of the first type of enclosure to secure the rounded exterior surface of the first mounting location between the exterior and interior surfaces of the first type of enclosure.

30. The device of claim 27, wherein the rounded exterior surface is cylindrical.

31. The device of claim 27, wherein the first and second projections are circular rims that extend around the central axis.

32. The device of claim 24, wherein the second mounting location includes a groove that extends at least partially around the central axis.

33. The device of claim 32, wherein the groove includes a first portion that is semi-circular, and a second portion that is linear.

34. The device of claim 33, wherein the first portion of the groove is defined by the second part, and the second portion of the groove is defined by the first part.

35. The device of any of claims 32-34, wherein the groove is structured to be engaged between interior and exterior surfaces of a base of the second type of enclosure.

36. The device of claim 35, wherein the second mounting location secures the device to a port defined between the base and a cover of the second type of enclosure.

37. A device for sealing a telecommunications cable, the device comprising:

a first part;

a second part having one or more attachment members that assemble onto the first part to assemble the first and second parts together; and

a cavity defined between the first and second parts that extends along a central axis and between first and second ends of the device;

wherein the cavity is structured to seal the cable between the first and second parts without threading the cable through the first and second ends, and the first and second parts define at least one mounting location for a cable port of a telecommunications enclosure;

wherein the cavity is structured to receive a resin to seal the cable between the first and second parts;

wherein the attachment members are snap-fit connectors;

wherein the first and second parts completely surround an end of the jacket of the cable;

wherein a plurality of tubes inside of the cable extend from an end of the jacket past an end of the device;

wherein the resin is only located in the cavity.

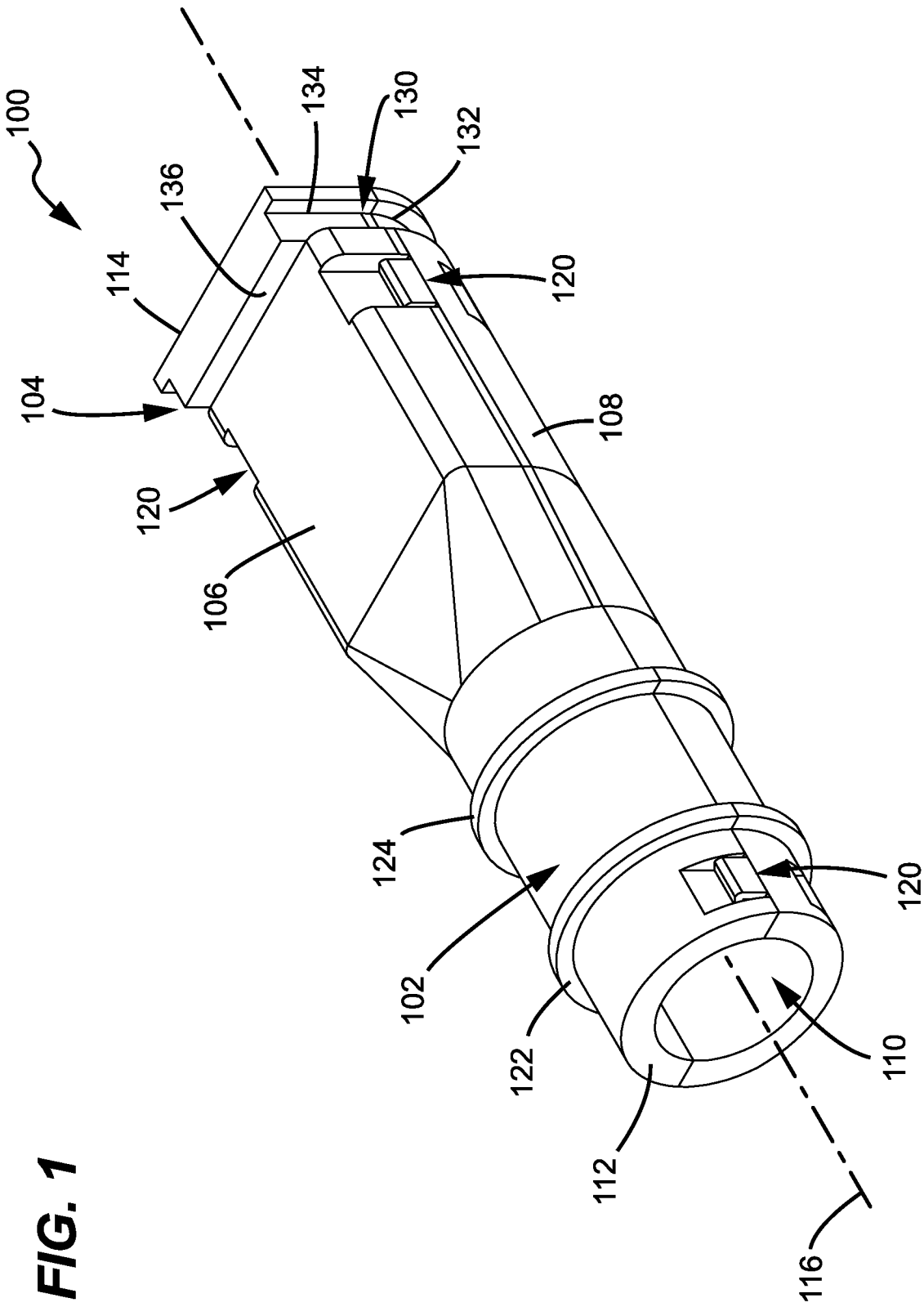
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FIG. 1

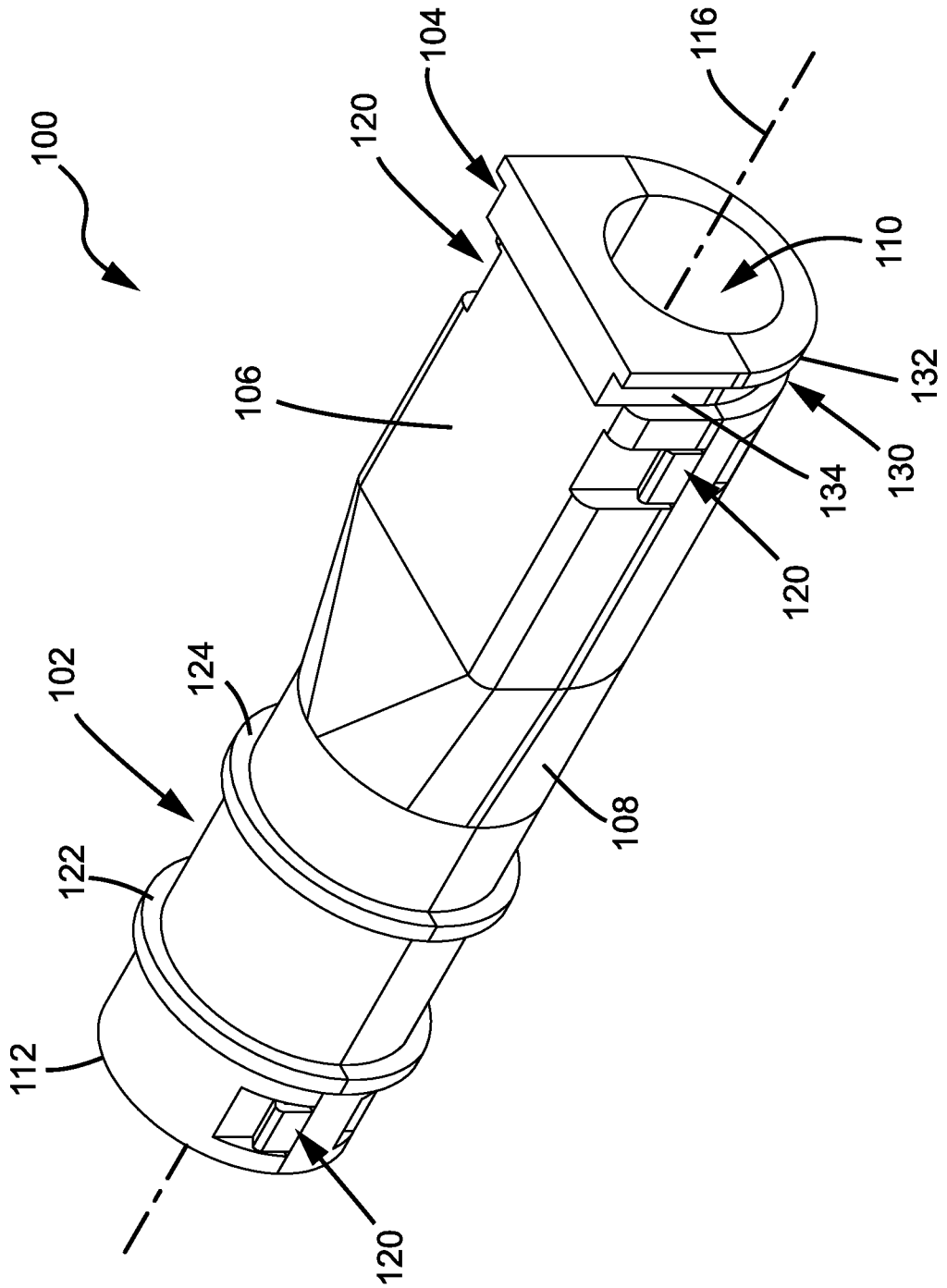

FIG. 2

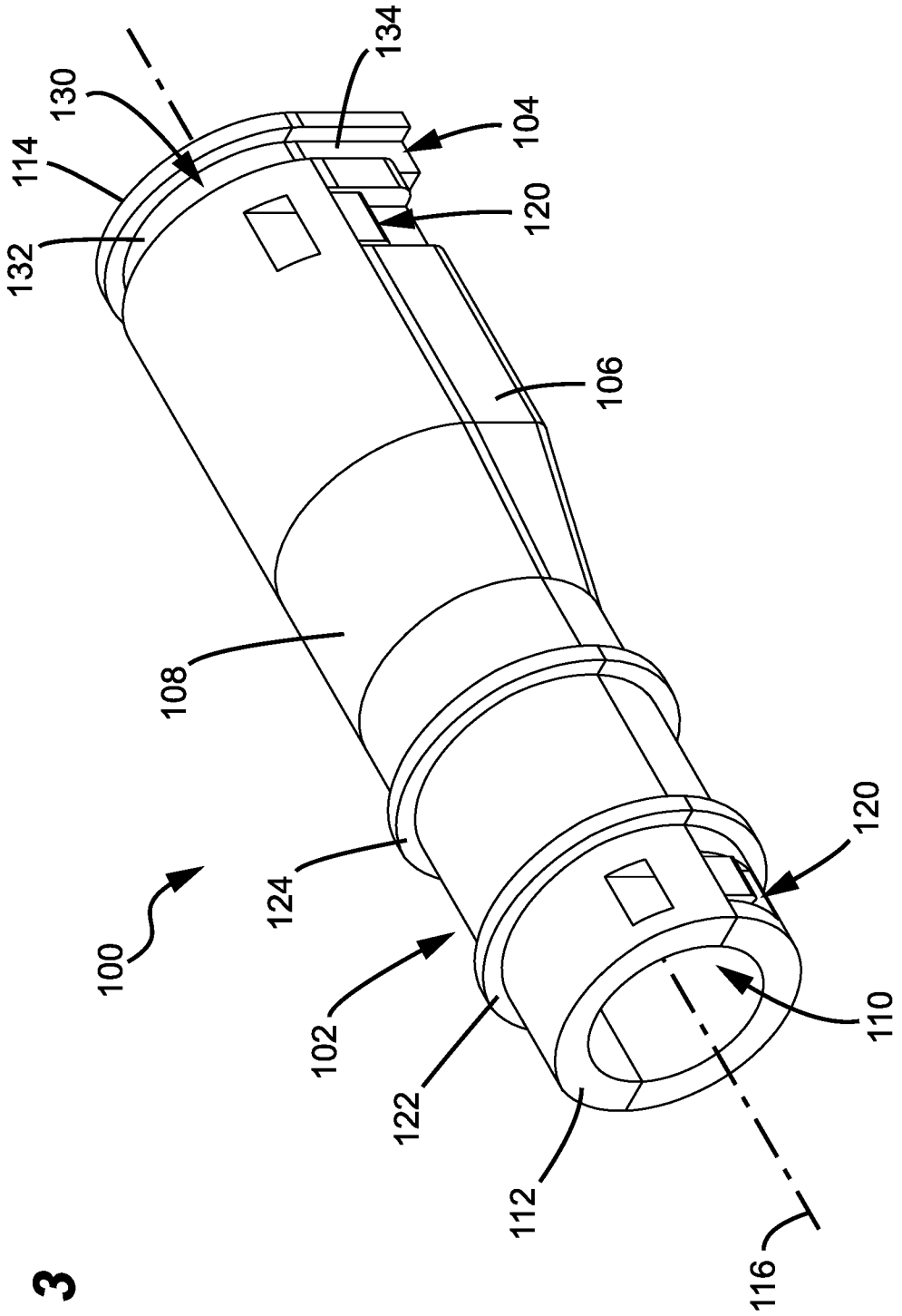

FIG. 3

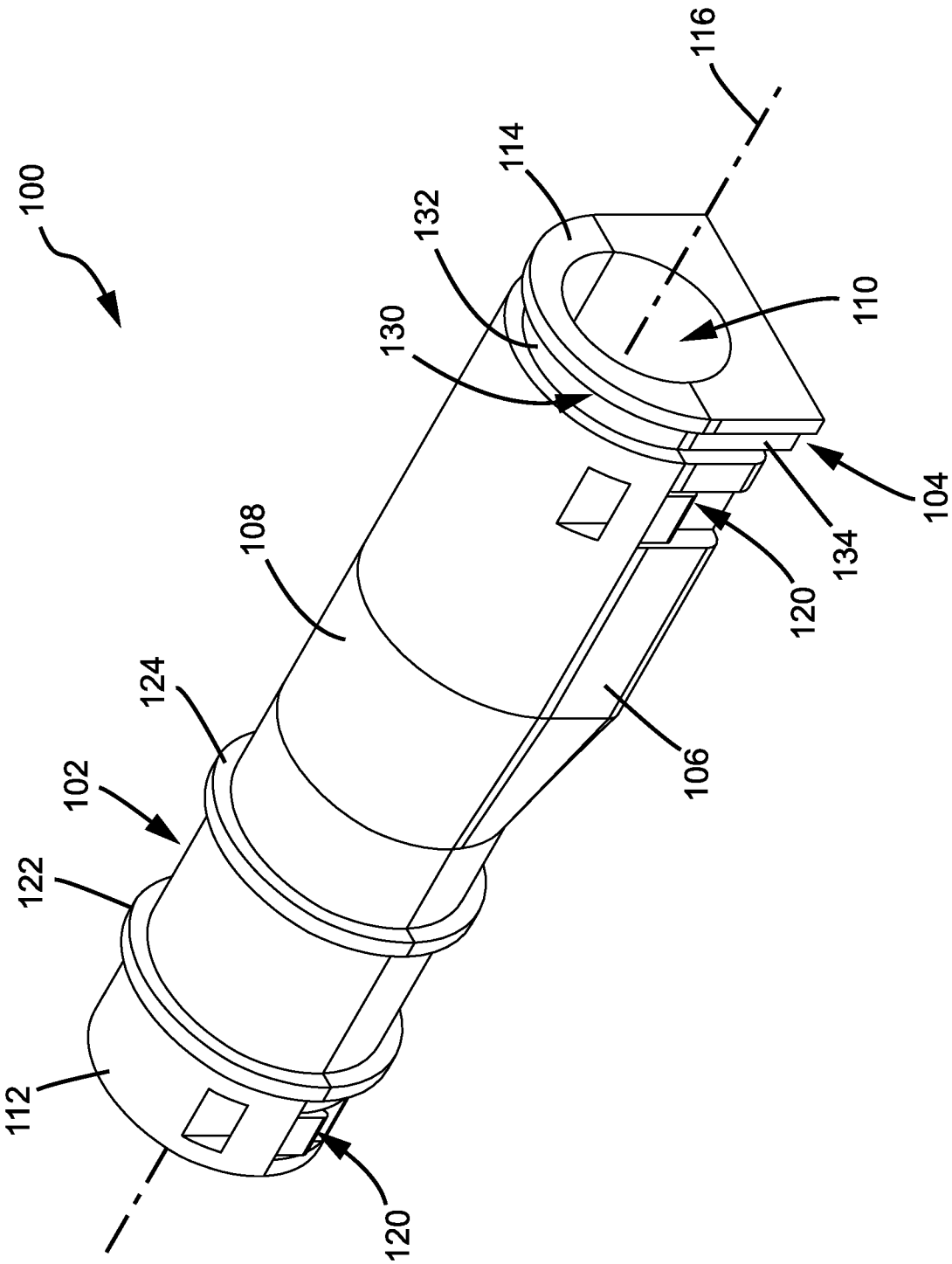

FIG. 4

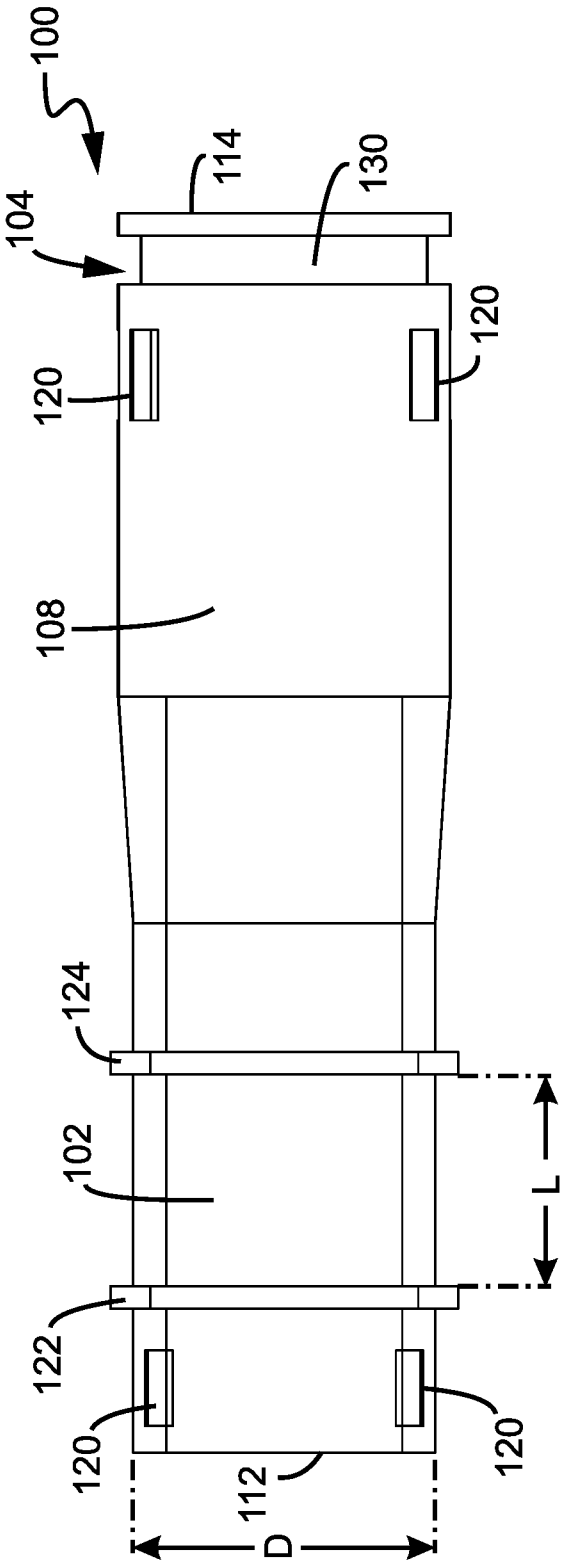
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FIG. 5

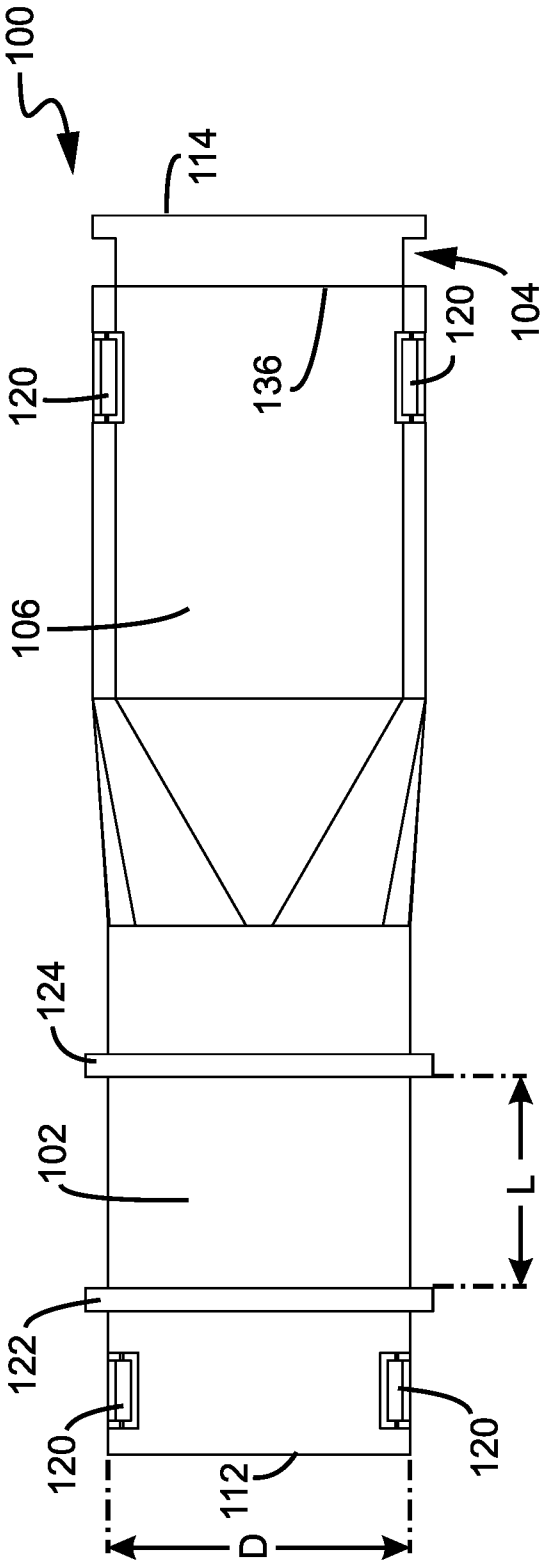
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FIG. 6

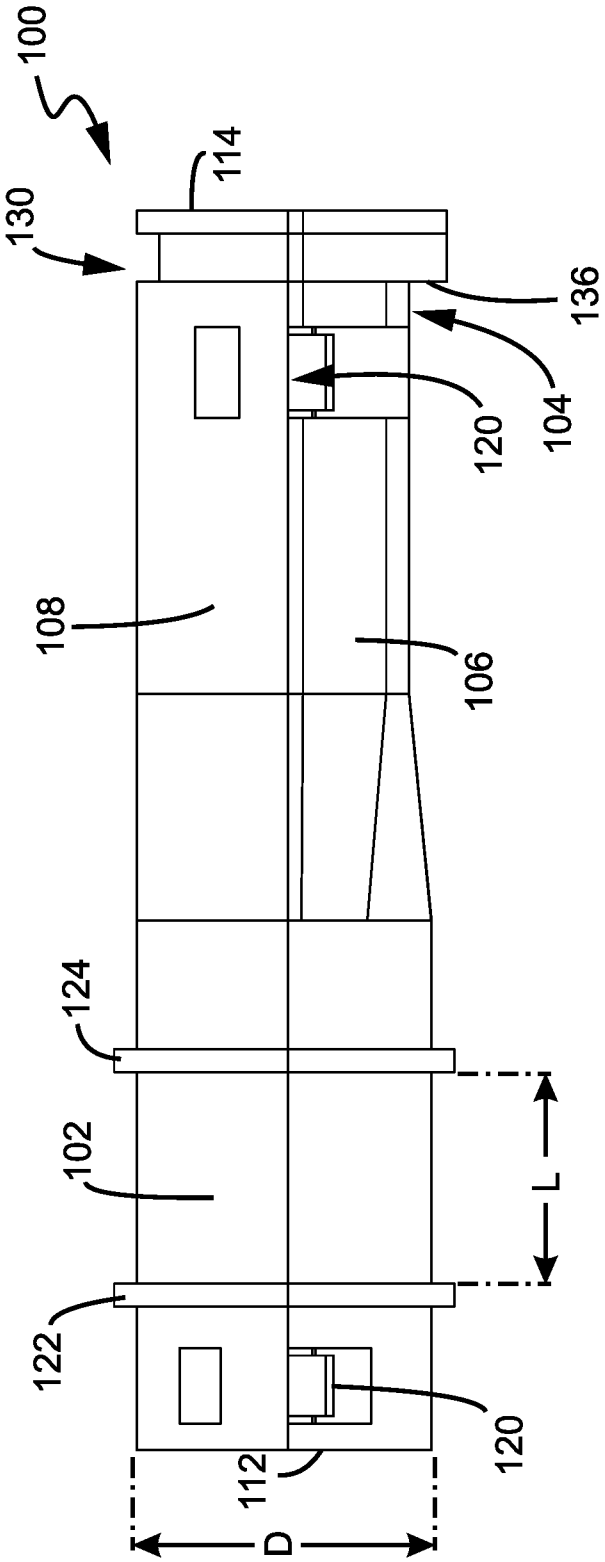
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FIG. 7

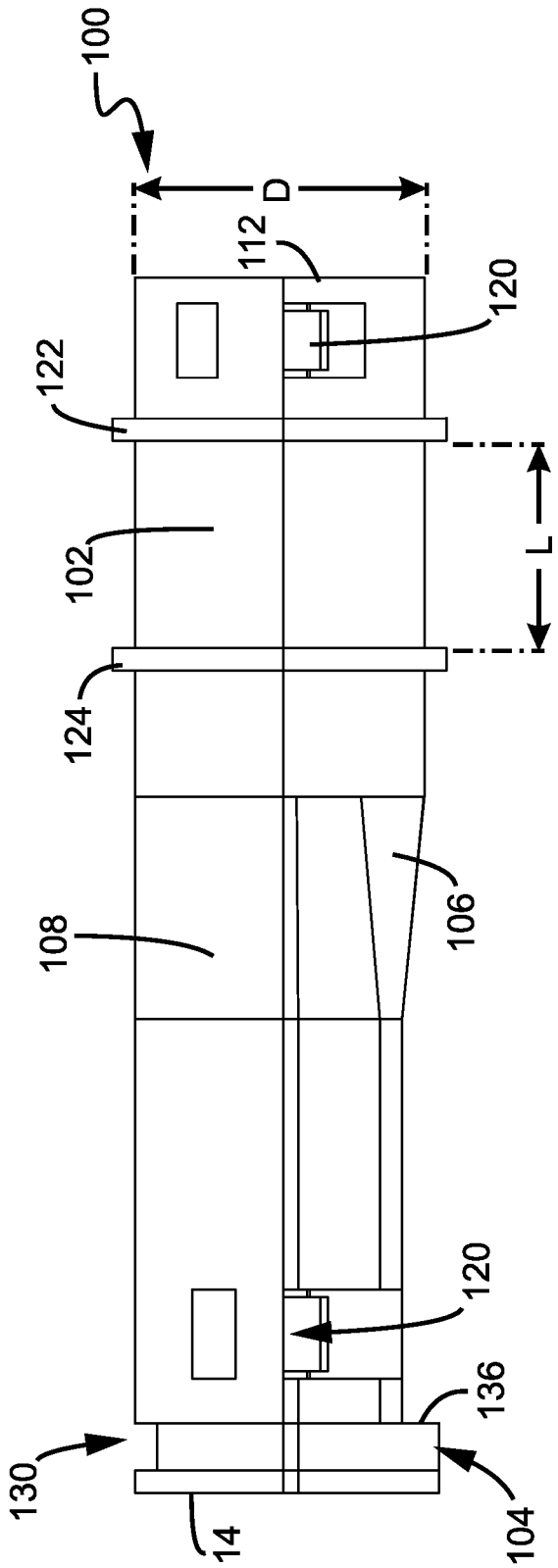
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FIG. 8

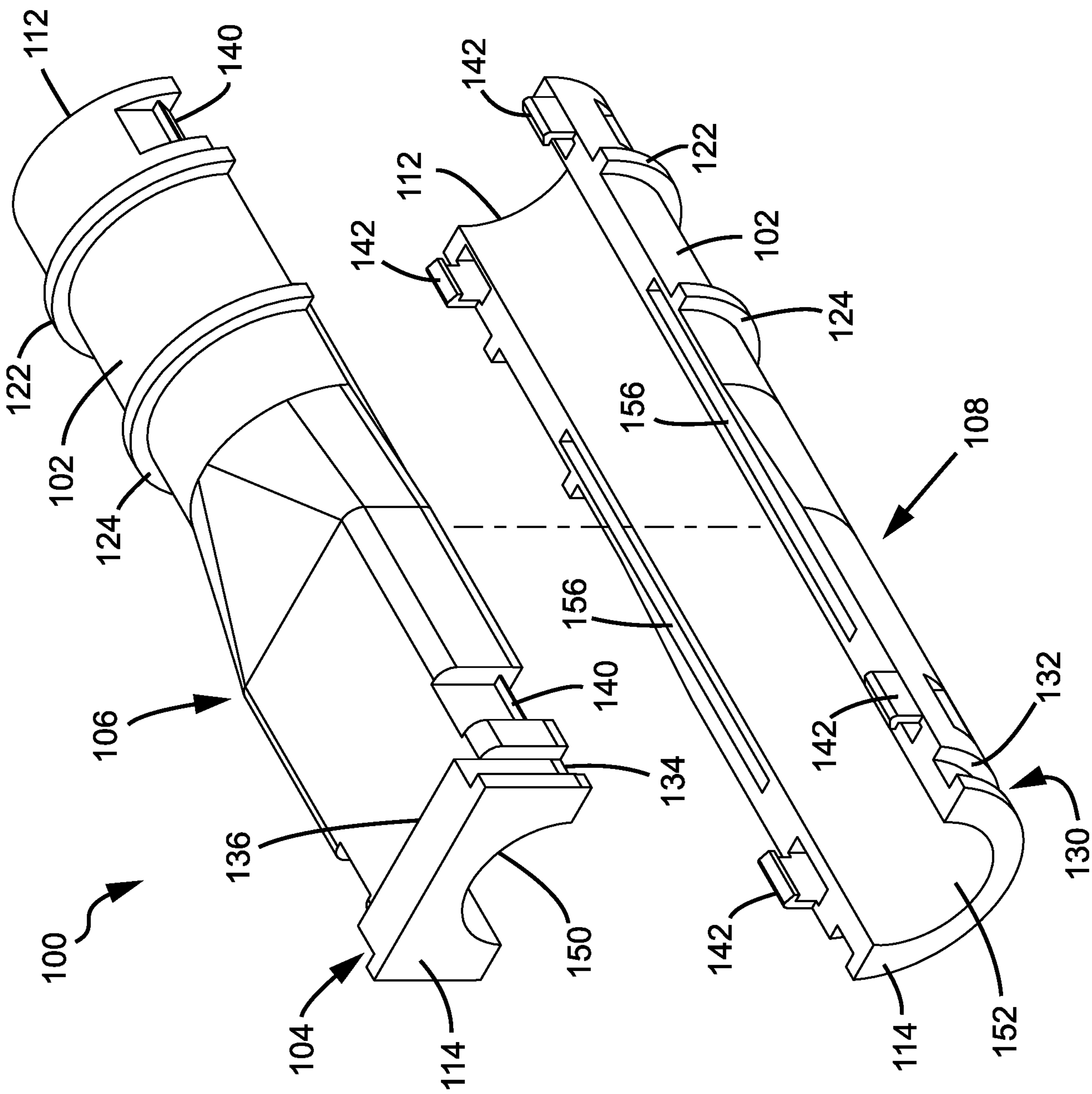
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FIG. 9

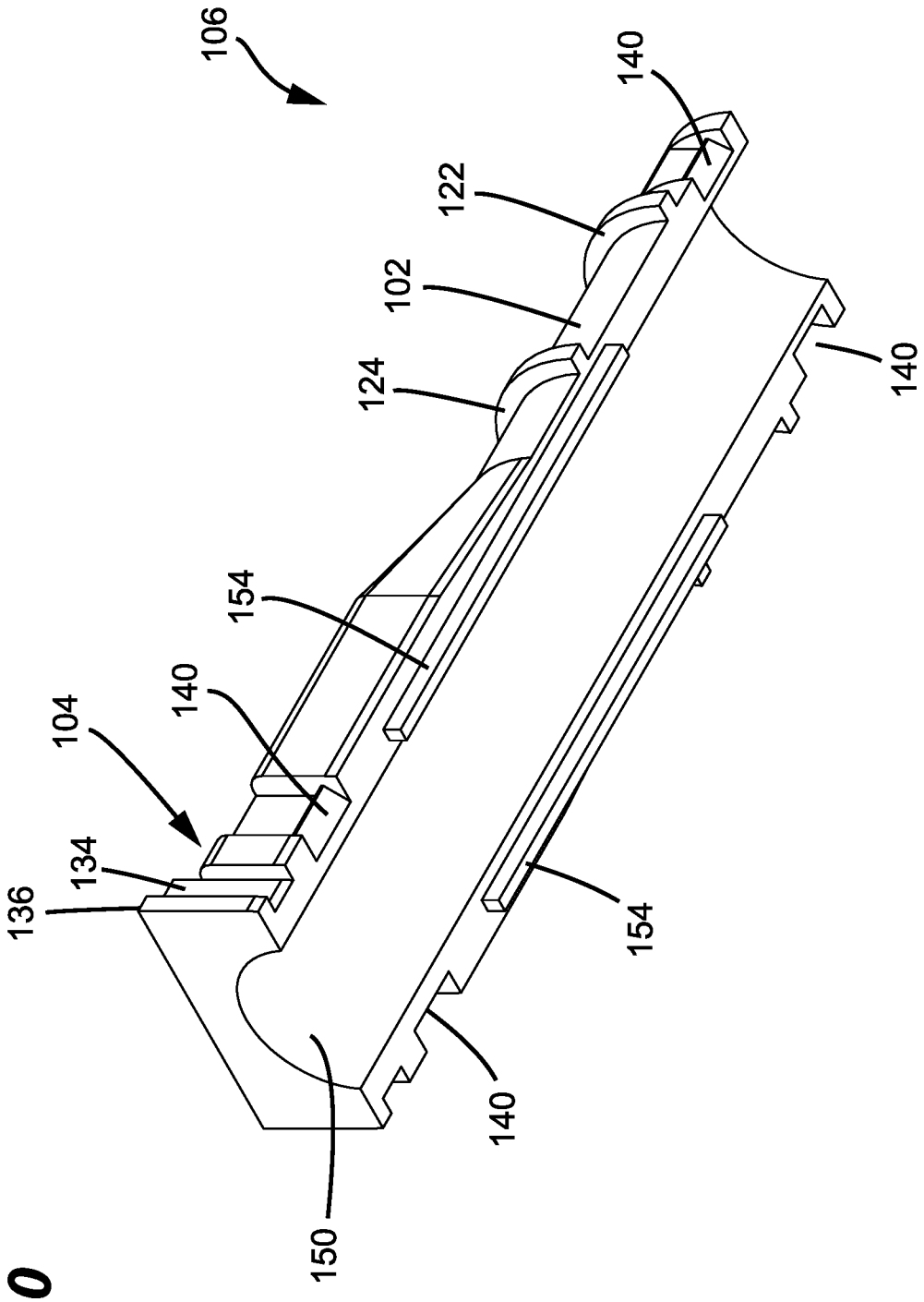

FIG. 10

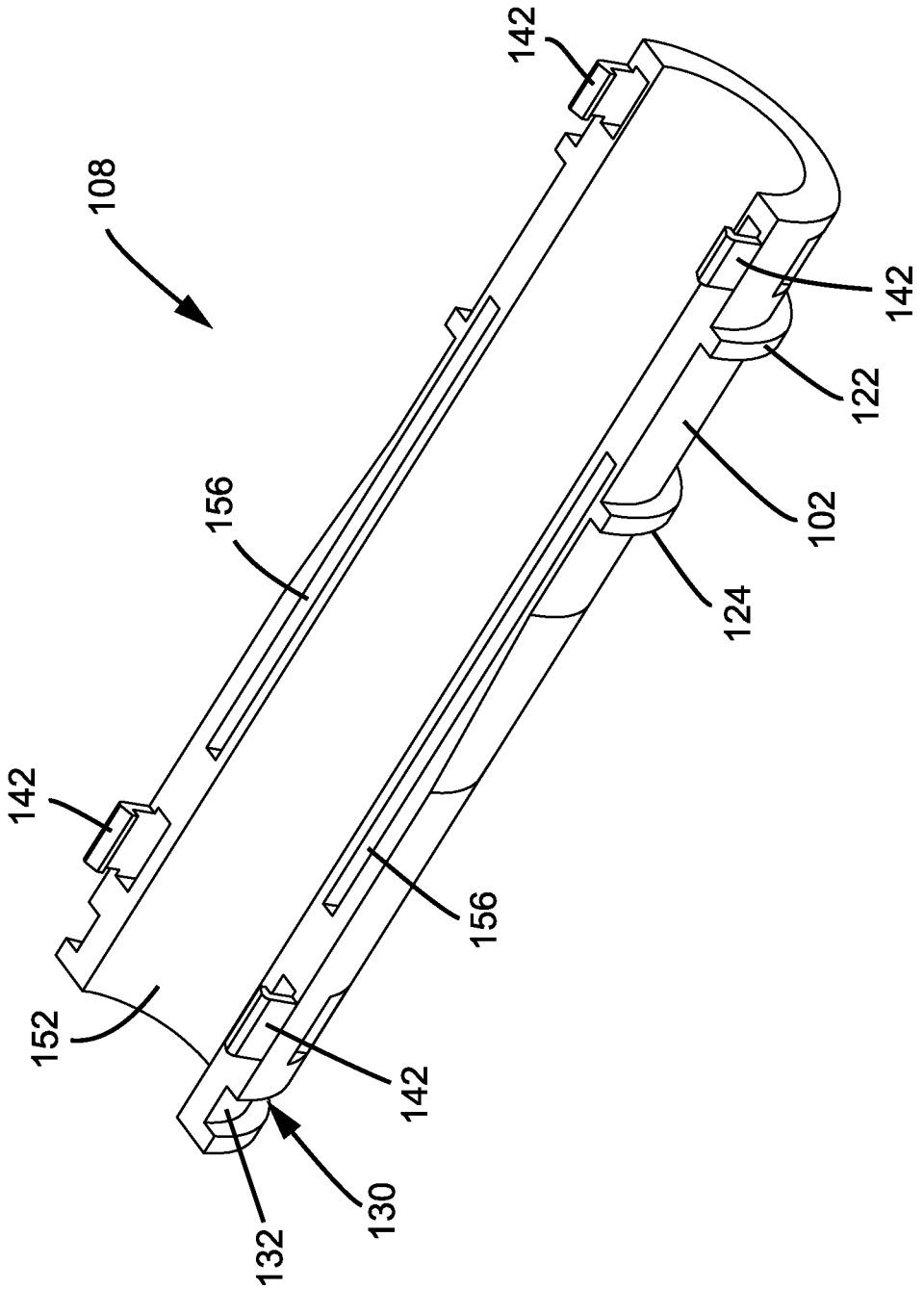

FIG. 11

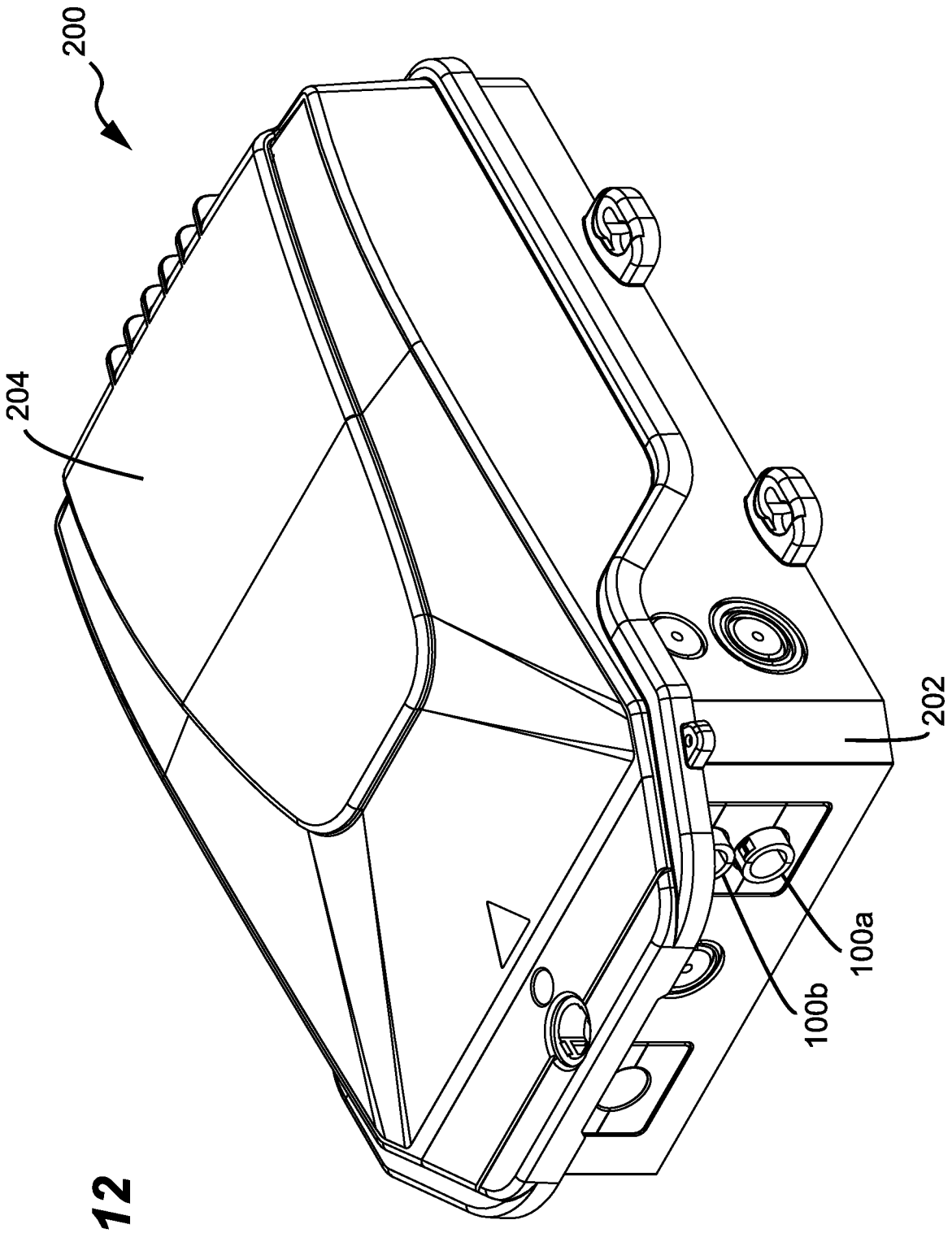

FIG. 12

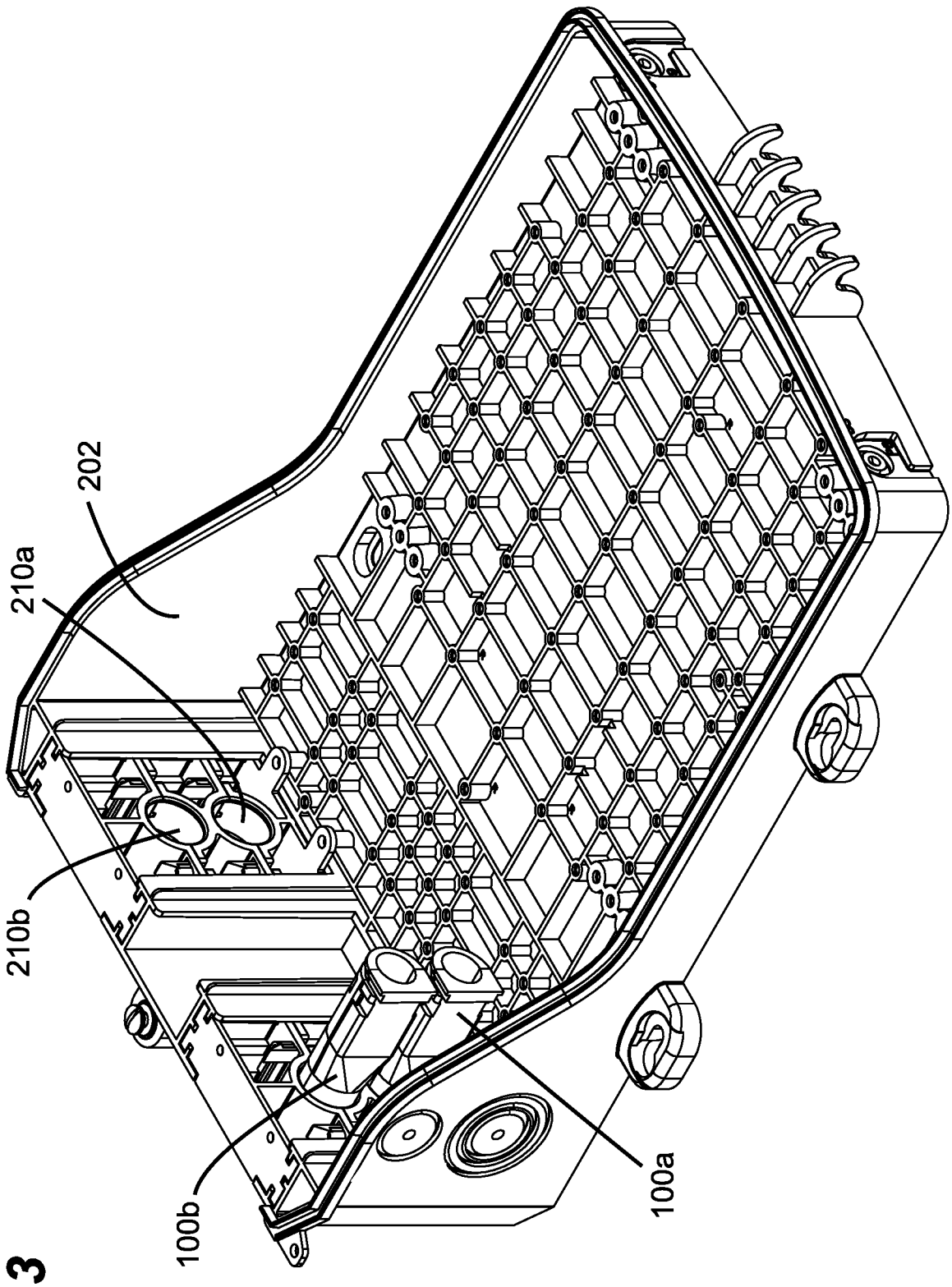

FIG. 13

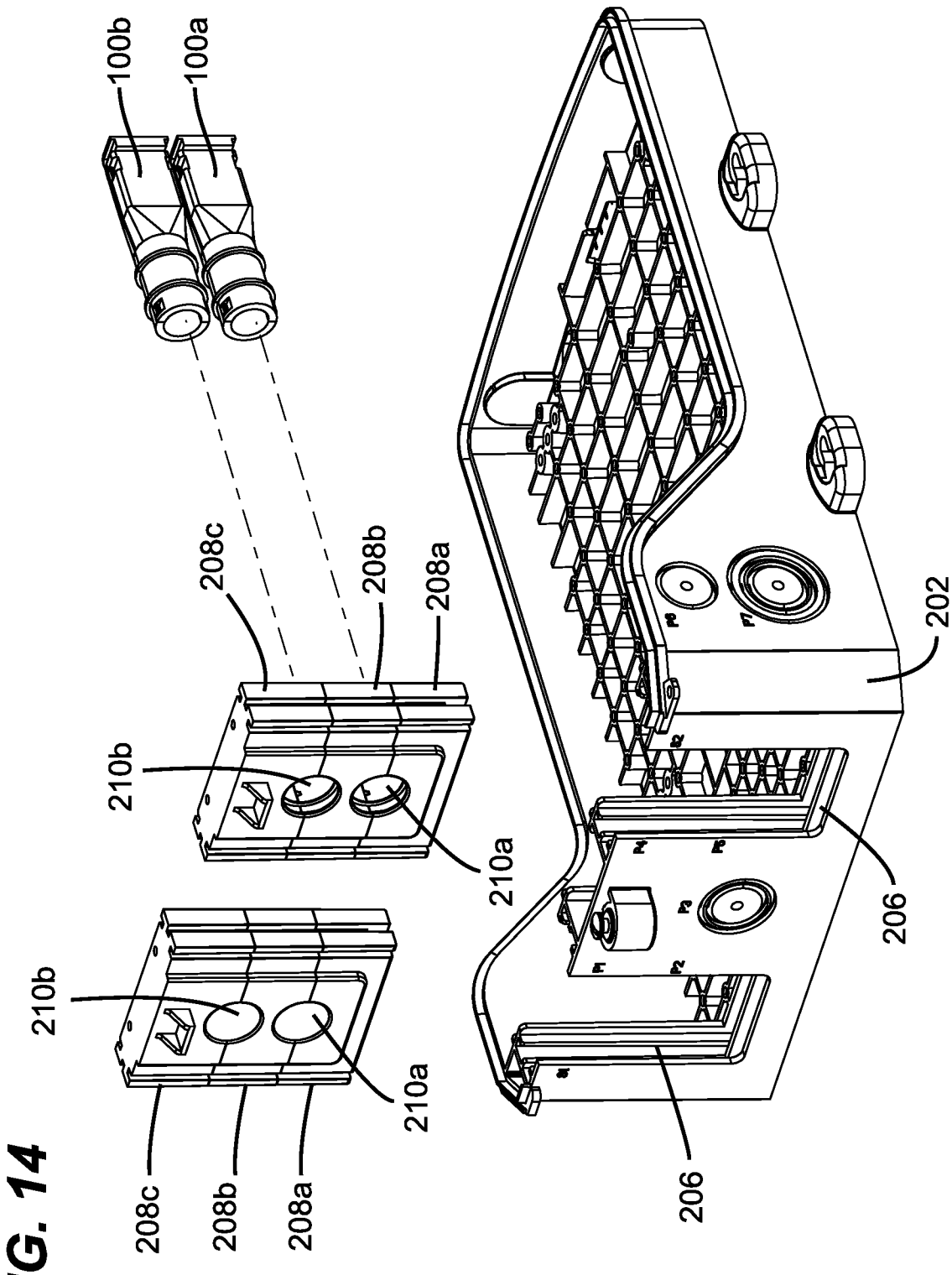
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FIG. 14

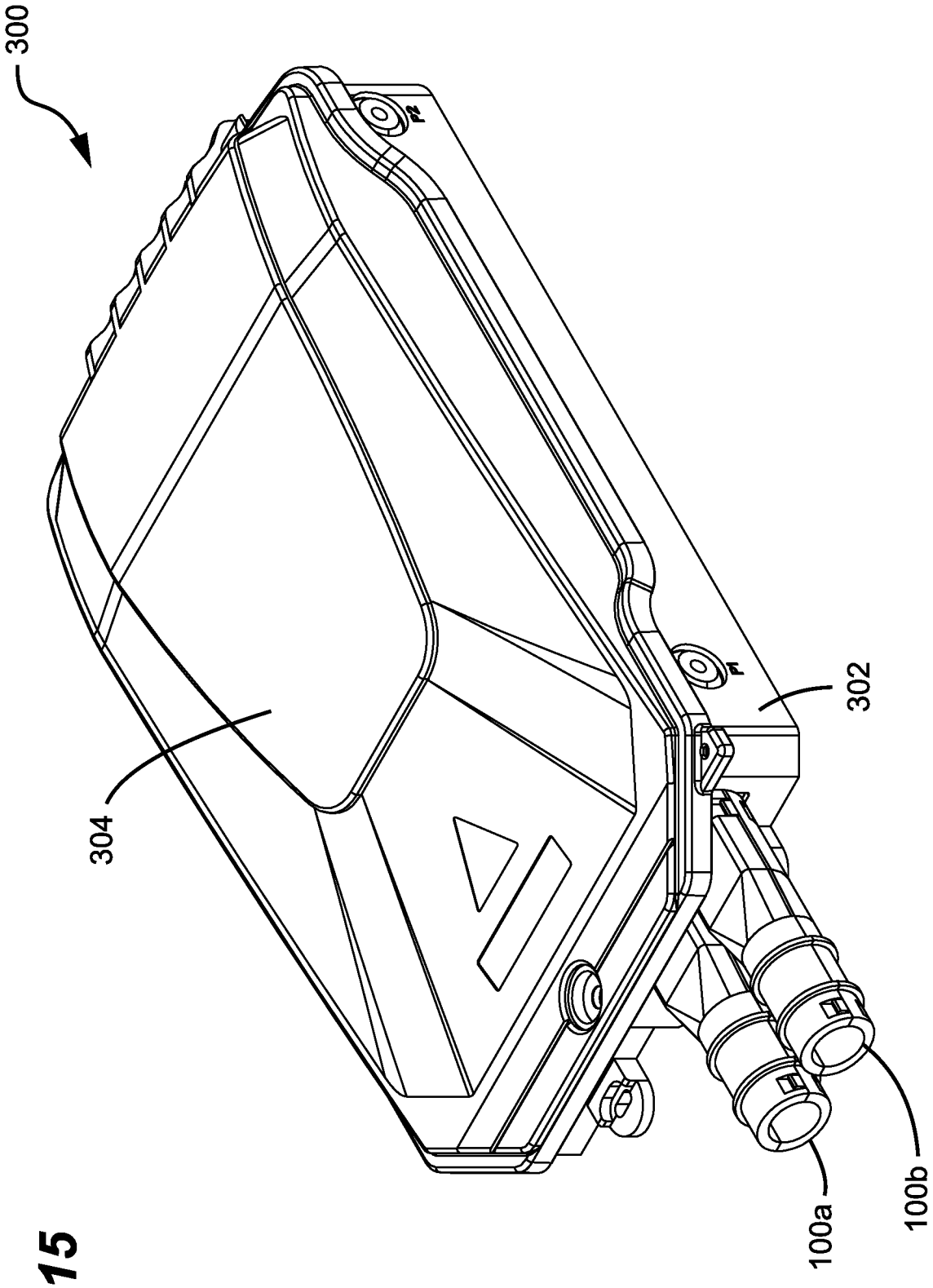


FIG. 15

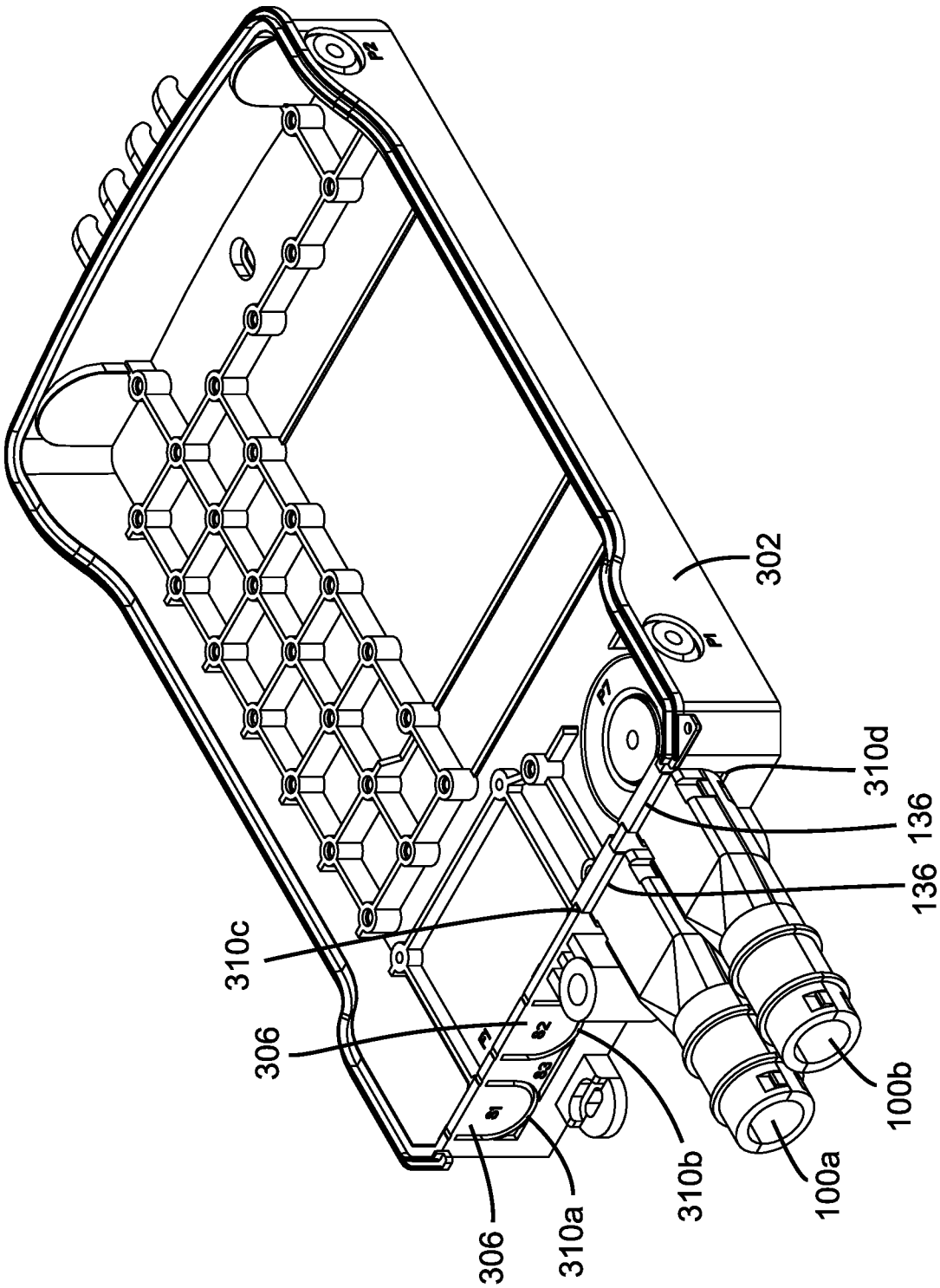


FIG. 16

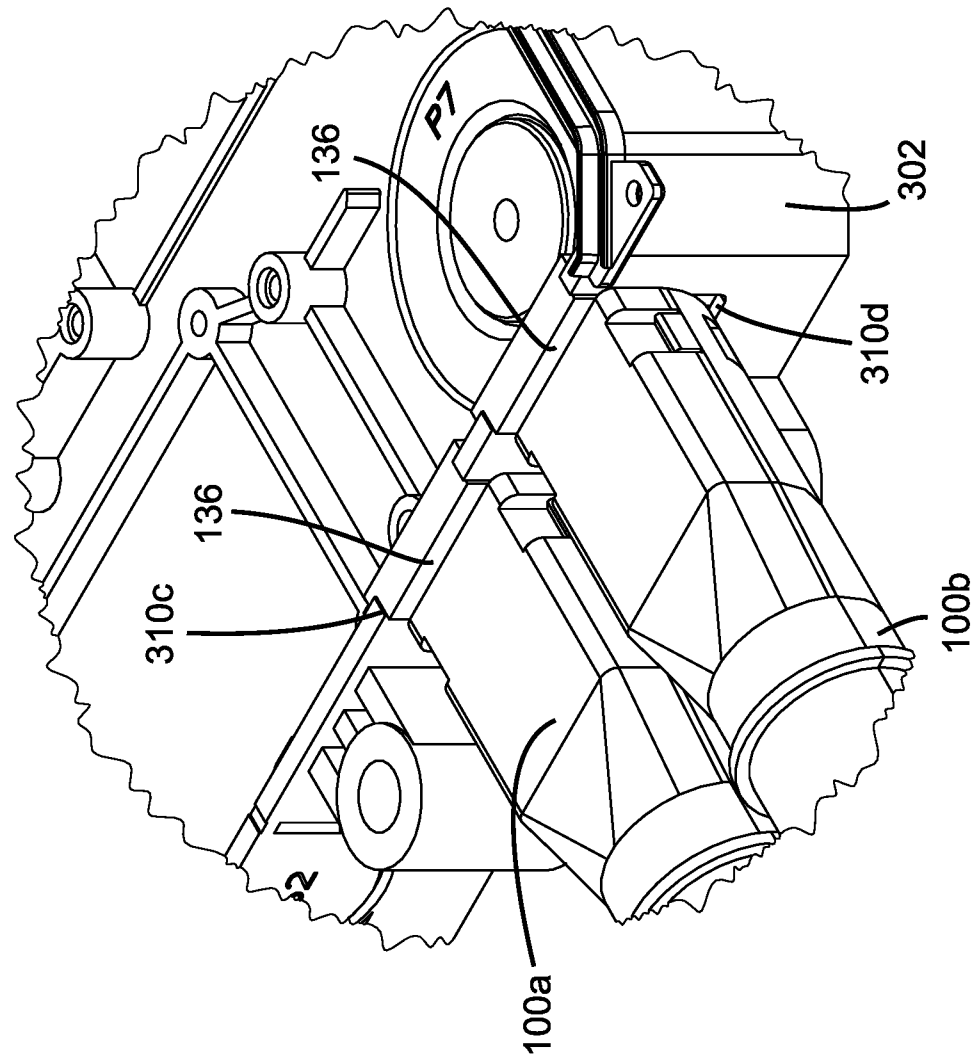


FIG. 17

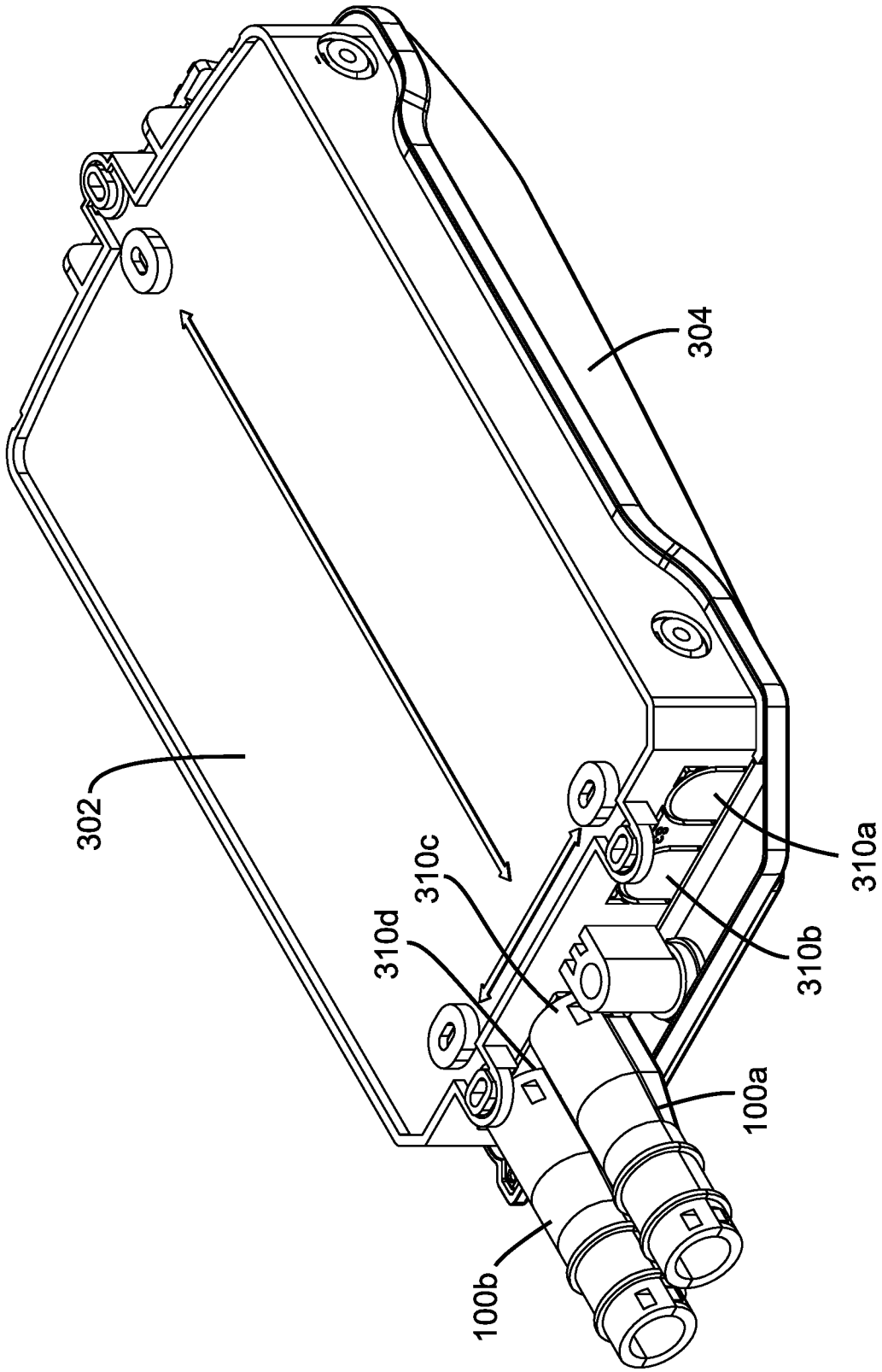


FIG. 18

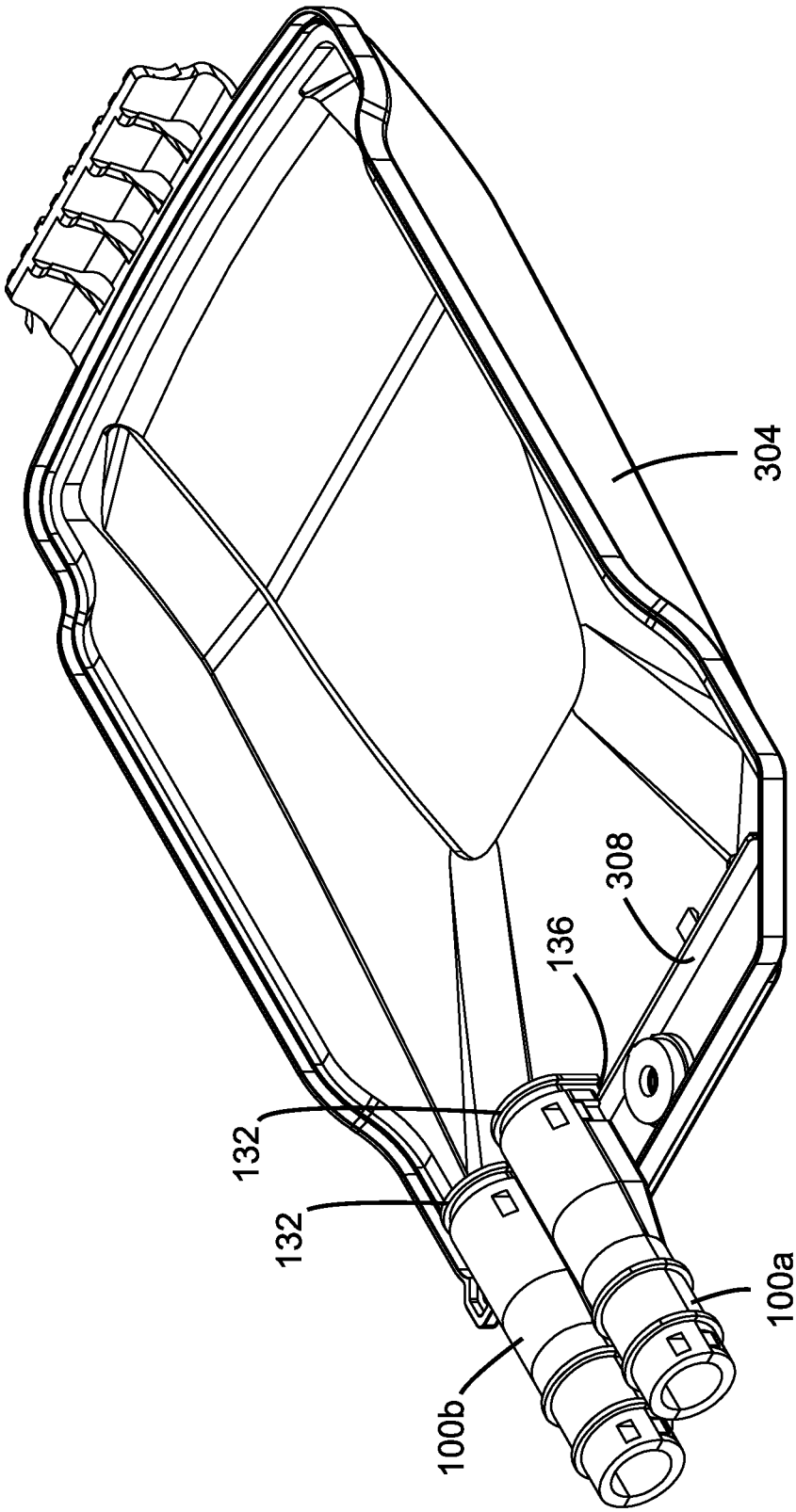


FIG. 19

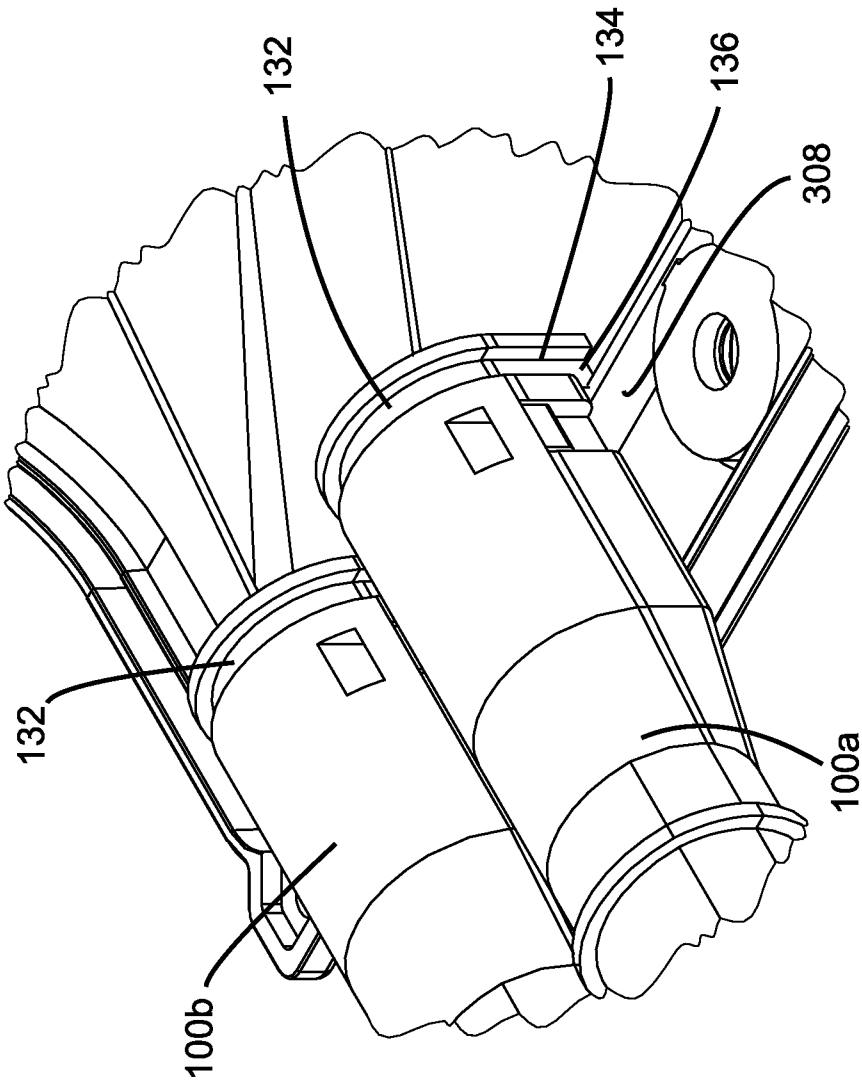


FIG. 20

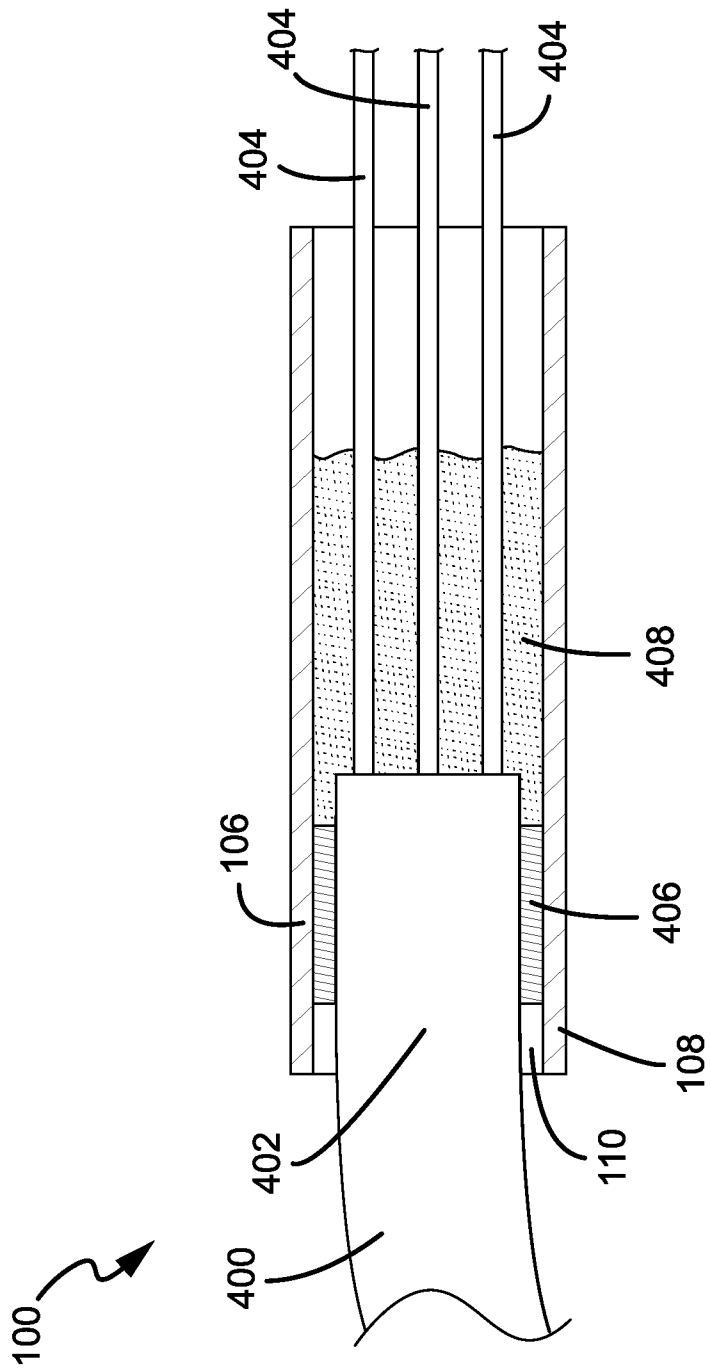
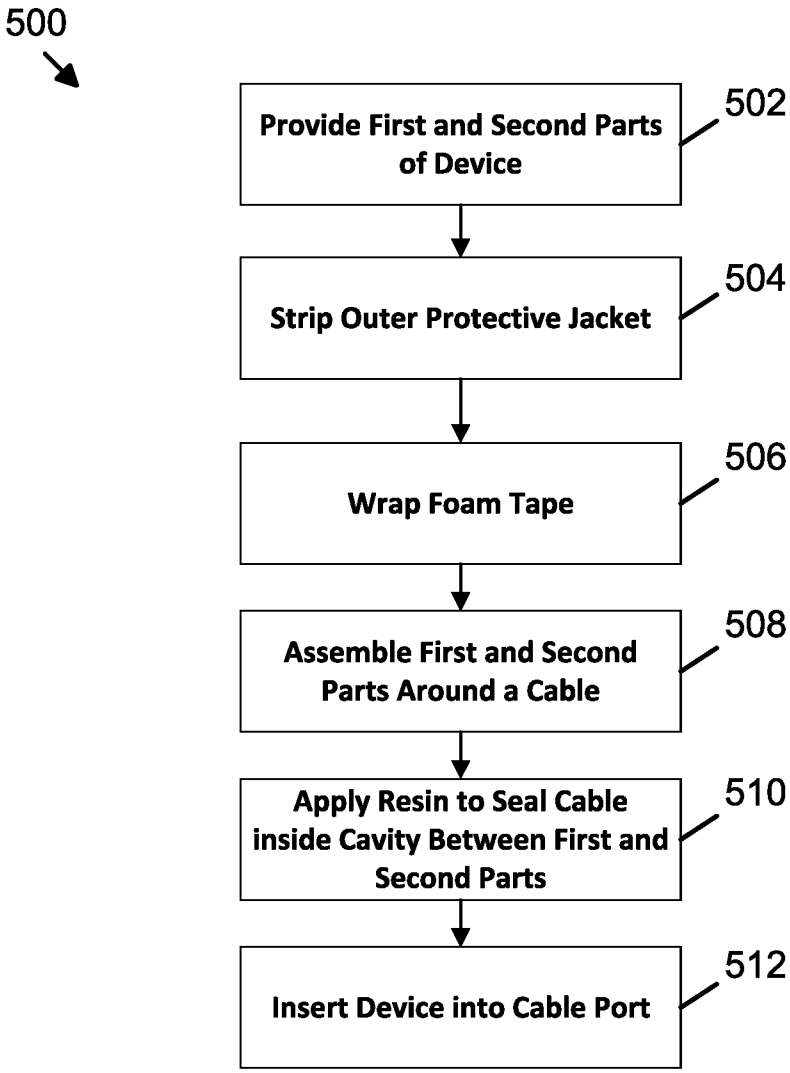


FIG. 21

FIG. 22


500
Provide First and Second Parts of Device
502
Strip Outer Protective Jacket
504
Wrap Foam Tape
506
Assemble First and Second Parts Around a Cable
508
Apply Resin to Seal Cable inside Cavity Between First and Second Parts
510
Insert Device into Cable Port
512

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2021/059642

A. CLASSIFICATION OF SUBJECT MATTER
INV. G02B6/44 H02G15/013
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 H02G

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2014/005918 A2 (TYCO ELECTRONICS RAYCHEM BVBA [BE]) 9 January 2014 (2014-01-09) page 4, line 8 - page 10, line 28; figures 1-11	1-18, 24-37
X	WO 2012/168292 A2 (TYCO ELECTRONICS RAYCHEM BVBA [BE]; KEMPENEERS DIRK [BE] ET AL.) 13 December 2012 (2012-12-13) page 8, line 7 - page 9, line 2; figures 1, 2	19-23
X	EP 3 396 798 A1 (CORNING RES & DEV CORP [US]) 31 October 2018 (2018-10-31) paragraph [0090] - paragraph [0100]; figures 4, 5	1,24,37

-/--

[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
30 July 2021	10/08/2021

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	A. Jacobs

3

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

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2018/252887 A1 (COENEGRACHT PHILIPPE [BE] ET AL) 6 September 2018 (2018-09-06) paragraph [0078] - paragraph [0107]; figures 12-18	1,19,24, 37

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2021/059642

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

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

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

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

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

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

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

see additional sheet

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

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

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

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

Remark on Protest

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

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

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-37

   Sealing of a telecommunications cable

1.1. claims: 1-18, 24-37

   Device for sealing a telecommunications cable avoiding having to thread the cable through the device

1.2. claims: 19-23

   Method of sealing a telecommunications cable including applying a resin

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2021/059642

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2014005918 A2	09-01-2014	EP 2867963 A2	06-05-2015
		US 2015168664 A1	18-06-2015
		US 2017010431 A1	12-01-2017
		WO 2014005918 A2	09-01-2014
WO 2012168292 A2	13-12-2012	NONE	
EP 3396798 A1	31-10-2018	EP 3396798 A1	31-10-2018
		US 2020057221 A1	20-02-2020
		WO 2018197980 A1	01-11-2018
US 2018252887 A1	06-09-2018	EP 3350639 A2	25-07-2018
		US 2018252887 A1	06-09-2018
		WO 2017046185 A2	23-03-2017