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DESCRIPTION

Technical Field

[0001] The present disclosure relates to telecommunications enclosures, and more particularly, to telecommunications enclosures including cable port assemblies that seal fiber optic cables entering the enclosures.

Background

[0002] Telecommunications systems typically employ a network of telecommunications cables capable of transmitting large volumes of data and voice signals over relatively long distances. The telecommunications cables can include fiber optic cables, electrical cables, or combinations of electrical and fiber optic cables. A typical telecommunications network also includes a plurality of telecommunications enclosures integrated throughout the network of telecommunications cables. The telecommunications enclosures are adapted to house and protect telecommunications components such as splices, termination panels, power splitters, and wavelength division multiplexers.

[0003] It is often preferred for telecommunications enclosures to be re-enterable. The term "re-enterable" means that the telecommunications enclosures can be reopened to allow access to the telecommunications components housed therein without requiring the removal and destruction of the telecommunications enclosures. For example, certain telecommunications enclosures can include separate access panels that can be opened to access the interiors of the enclosures, and then closed to re-seal the enclosures. Other telecommunications enclosures take the form of elongated sleeves formed by wrap-around covers or half-shells having longitudinal edges that are joined by clamps or other retainers. Still other telecommunications enclosures include two half-pieces that are joined together through clamps, wedges or other structures. Telecommunications enclosures are typically sealed to inhibit the intrusion of moisture or other contaminants.

[0004] Cables enter the enclosures at sealed cable ports. Cables may be secured to the enclosures using clamps and/or strength members (e.g., rods or aramid yarn) to inhibit axial and/or lateral pull.

From WO 2010/047920 A2 a mechanical cable entry port with an internal seal and an external seal is known. WO 92/22114 A1 discloses a device for sealing an article, which comprises: (i) a sealing material; (ii) a resilient member that can be biased to apply compression to the sealing material to cause it to seal the article; and (iii) stop means for limiting said biasing of the resilient member at a configuration thereof in which said biasing can be increased by movement of the sealing material.

Summary

[0005] In order to simplify the construction of cable seal block assemblies as defined in the preambles of the independent claim, the gaskets and the first housing are embodied as defined in the characterising portion of the independent claim.

[0006] Further aspects are set out in the dependent claims.

Brief Description of the Drawings**[0007]**

FIG. 1 is a top, front perspective view of an example base defining cable ports at a first end at which two cable port assemblies are received;

FIG. 2 is a front perspective view of the base and seal block assemblies;

FIG. 3 is a top, rear perspective view of the first end of the base and the cable port assemblies;

FIG. 4 is a perspective view of an example round-type seal block assembly;

FIG. 5 is a perspective view of the seal block assembly of FIG. 4 shown along an axial cross-section;

FIG. 6 is a perspective view of an example oblong-type seal block assembly;

FIG. 7 is a top plan view of the seal block assembly of FIG. 6 shown along an axial cross-section;

FIG. 8 is a top, rear perspective view of the first end of the base with a side portion of the base hidden to reveal a cross-section of two cable ports;

FIG. 9 is a top, rear perspective view of the first end of the base with two seal blocks mounted at the cable ports that were shown in cross-section in FIG. 8, a side portion of the base being hidden for ease in viewing the inner ends of the ports;

FIG. 10 is a bottom perspective view of an example fixation assembly coupled to a stripped region of an optical cable where the optical fibers of the cable are hidden for clarity;

FIG. 11 is a top perspective view of the example fixation assembly of FIG. 10;

FIG. 12 is a bottom perspective view of the example fixation assembly of FIG. 10 shown along an axial cross-section;

FIG. 13 is a top, rear perspective view of the first end of the base with fixation assemblies

exploded away from the ports towards an interior of the base and seal block assemblies exploded away from the ports towards an exterior of the base;

FIG. 14 is a top, rear perspective view of the first end of the base with a side portion of the base hidden to reveal a cross-section of two cable ports and a fixation assembly mounted at one of the two cable ports;

FIG. 15 is a top, rear perspective view of a portion of the base with three cable port assemblies mounted at the first end with a side portion of the base hidden to reveal an axial cross-section of two of the cable port assemblies;

FIG. 16 is a top, front perspective view of an enclosure in the closed and sealed position with alternative seal block assemblies and cable fixation assemblies;

FIG. 17 is a bottom, front perspective of the enclosure of FIG. 16;

FIG. 18 is a view looking into the empty ports of the base of the enclosure of FIGS. 16 and 17;

FIG. 19 is a perspective view of a portion of the base of the enclosure of FIGS. 16 and 17 from an interior position;

FIG. 20 is a cross-sectional side view of the enclosure of claims 16 and 17, wherein the cross-section passes through the oblong port;

FIG. 21 is a perspective view of an example oblong-type seal block assembly in the enclosure of FIGS. 16 and 17;

FIG. 22 is a cross-sectional view of the example oblong-type seal block assembly in the enclosure of FIG. 21;

FIGS. 23-25 are exploded views of the example oblong-type seal block assembly of FIG. 22;

FIG. 26 is a perspective view of an example round-type seal block assembly in the enclosure of FIGS. 16 and 17;

FIGS. 27 and 28 are exploded views of the example round-type seal block assembly of FIG. 26;

FIG. 29 is a perspective view of the example oblong-type seal block assembly in the enclosure of FIGS. 16 and 17, showing the method of adding a new tube through the seal block;

FIG. 30 is an exploded view of the example oblong-type seal block assembly and method of FIG. 29;

FIGS. 31 and 32 show the oblong-type seal block assembly being mounted to the enclosure;

FIGS. 33 and 34 show the round-type seal block assembly being mounted to the enclosure;

FIGS. 35-52 show another embodiment of an oblong-type seal block assembly;

FIGS. 53-84 show another embodiment of a round-type seal block assembly.

Detailed Description

[0008] Reference will now be made in detail to the exemplary aspects of the present disclosure that 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 structure.

[0009] In general, optical fiber cables may be routed into an enclosure through one or more cable ports. The cables are mounted to cable port assemblies to secure the cables to the base and to seal the ports around the cables. Certain types of cable port assemblies include seal block assemblies to seal the ports. Certain types of cable port assemblies include fixation assemblies to secure (e.g., axially secure, torsionally secure, laterally secure, etc.) the optical cables. In certain implementations, the fixation assemblies axially fix the optical cables separate from the seal block assemblies. In other certain implementations, the fixation assemblies axially fix the optical cables together with the seal block assemblies.

[0010] FIG. 1 is a perspective view of an example base 100 of an example telecommunications enclosure assembly. The base 100 extends from a first end 101 to a second end 102. The base 100 also extends from a first side 103 to a second side 104. The base 100 includes a sidewall 106 extending upwardly from a base 108 to define an interior 105. The base 100 is shaped and configured to cooperate with a cover to form an enclosure that defines an interior. One or more telecommunications components may be mounted within the interior of the enclosure. For example, a splice tray assembly may be mounted within the interior.

[0011] A gasket or sealing ring may be disposed between the base 100 and the cover around the perimeter of the enclosure. The gasket inhibits dirt, water, or other contaminants from entering the enclosure when the cover is secured to the base 100 (e.g., by the latches). In some implementations, the base 100 defines a gasket channel 107 in which the gasket may seat. In certain implementations, the cover includes a tongue that extends downwardly so that the tongue compresses the gasket in the channel 107 when the cover is disposed on the base 100. In other implementations, the cover may define a second channel instead of the tongue to accommodate the gasket. In still other implementations, the cover may define the channel and the base 100 may define the tongue.

[0012] A latch arrangement may be provided to releasably secure the cover in a closed position relative to the base 100. The latch arrangements may be released to enable the cover to be removed from the base 100. Additional details regarding an example latch arrangement, an example splice tray assembly, and an example cover can be found in PCT Publication No. WO 2013/007662, filed July 6, 2012, and titled "Telecommunications Enclosure with Splice

Tray Assembly".

[0013] The base 100 defines one or more cable ports 109 at the first end 101 of the base 100. Each cable port 109 is configured to receive a cable port assembly 190 (FIG. 15) including a seal block 120, 140 and a fixation device 160. Fiber optic cables 180 are routed into and out of the enclosure through the seal blocks and are fixed to the enclosure using the fixation devices. In the example shown, the base 100 includes seven ports 109. In other implementations, however, the base 100 may include a greater or lesser number of ports 109. Input and output cables may be routed into the base 100 through the ports 109. As used herein, the terms "input" and "output" are used for convenience and are not intended to be exclusory. Optical signals carried over optical fibers may travel in either or both directions. Accordingly, optical fibers routed through any of the ports 109 may carry input and/or output signals.

[0014] In some implementations, at least one of the ports 109 has a different size and/or shape from at least one other port 109. In the example shown, one of the ports 109 defines an oval or oblong cross-sectional profile and the other six ports 109 define round cross-sectional profiles. In other implementations, each of the ports 109 may have any desired cross-sectional profile. In still other implementations, one or more of the round ports 109 may be larger or smaller than others of the round ports 109.

[0015] Ducts 110 extend through the first end 101 of the base 100 to define the cable ports 109. The ducts 110 are generally sized and shaped to fit within a respective one of the cable ports 109. In some implementations, a tear-off sealing member is disposed in one or more of the ducts 110. Each sealing member extends across the duct 110 to inhibit contaminants from entering the enclosure. The sealing members are connected to the ducts with weak webs or other frangible connections that facilitate removing the sealing members from the ducts 110. Accordingly, the sealing members temporally seal the ducts 110 until the cable port is needed.

[0016] As shown in FIGS. 2 and 3, each of the ducts 110 has a first end extending partially into the interior 105 of the base 100 and a second end extending outwardly from the first end 101 of the base 100. By disposing a portion of each duct 110 within the base interior 105, an overall length of the base 100 is reduced as compared to a base having ducts 110 extending only outside of the base 100. In the example shown, a majority of each duct 110 extends outwardly from the first end 101 of the base 100. In other implementations, however, a greater portion of each duct may extend into the interior 105.

[0017] One or more fiber optic cables 180 may be routed into the interior 105 of the base 100 through one or more of the cable ports 109. To inhibit the ingress of contaminants (e.g., dirt, water, etc.) and pests (e.g., insects, rodents, etc.) into the base 100, the cable ports 109 are sealed around the cables 180. In accordance with some aspects of the disclosure, seal block assemblies may be used to seal the cable ports 109. In general, seal blocks include a gasket that activates (e.g., performs sealing functions) upon compression. In one example implementation, the gasket includes a gel-based gasket. In other implementations, however, other types of gaskets may be utilized.

[0018] Each seal block includes a gasket disposed between a first housing portion and a second housing portion. In some implementations, each housing portion is formed from an integral piece. In other implementations, each housing portion is formed from multiple pieces. An activation assembly selectively forces the first and second housing portions together to squeeze the gasket therebetween. Axial passages are provided through the housing portions and the gasket to allow optical fiber cables 180 to be routed through the seal block.

[0019] In the example shown in FIGS. 1-3, a first seal block assembly 120 is disposed within one of the ducts 110 at one of the cable ports 109. The first seal block assembly 120 is configured to fit within one of the round cable ports 109. The first seal block assembly 120 includes a body 121 extending from a first end 122 to a second end 123. An axial passage 124 (FIG. 5) extends through the body 121 from the first end 122 to the second end 123. One or more optical fiber cables 180 may be routed through the axial passage 124. In some implementations, the axial passage 124 extends along center longitudinal axis of the body 121. In other implementations however, the axial passage 124 may be offset from the center (e.g., see FIG. 5).

[0020] One or more stop surfaces (e.g., shoulders, notches, lips, etc.) 125 are disposed at the first end 122 of the body 121. In some implementations, the stop surfaces 125 are formed by the edge of the first end 122 of the seal block assembly 120. In other implementations, the stop surfaces 125 are notched surfaces offset from the edge of the first end 122. For example, the stop surfaces may define circumferentially spaced shoulders cut into an exterior surface of the seal block body 121 at the first end 122. In certain implementations, one or more tabs 129 are disposed at the second end 123 of the body 121.

[0021] The seal block assembly body 121 also includes a latching arrangement to secure the body 121 at the cable port 109. In the example shown, the latching arrangement includes one or more flexible fingers 126 at the first end 122 of the body 121. A ramp 127 and a shoulder 128 are disposed on an external surface of each flexible finger 126. In certain implementations, the flexible fingers 126 extend axially from the first end 122 of the body 121 past the stop surface 125. In the example shown, four latching fingers 126 extend from circumferentially spaced locations at the first end 122 of the body 121. In other implementations, however, the body 121 may have a greater or lesser number of latching fingers 126.

[0022] The seal block body 121 is configured to seal a cable port 109 when plugged into the cable port 109. In the example shown, the seal block body 121 includes a gasket 130 (e.g., a gel structure, a foam structure, a rubber structure, etc.) sandwiched between a first body portion and a second body portion. In the example shown, the first body portion includes an integral body piece 131 and the second body portion includes a second integral body piece 132. An activation assembly 133 holds the body pieces 131, 132 together and selectively axially compresses the gasket 130 therebetween to activate the seal.

[0023] In the example shown in FIG. 5, the activation assembly 133 includes a screw 134 having a threaded region 135, a grip 136 having a threaded region 137, and a spring 138. The screw 134 extends axially through the gasket 130. A first end of the screw 134 is secured to the first body piece 131 and a second end of the screw 134 protrudes from the second body piece 132. The threaded region 137 of the grip 136 cooperates with the threaded region 135 of the screw 134 to telescopically mount the grip 136 to the second end of the screw 134. The spring 138 is mounted over the screw 134 so that tightening the grip 136 on the screw 134 compresses the spring 138. As the spring 138 is compressed, the spring 138 exerts a greater axial bias on the gasket 130 (see FIG. 5).

[0024] A second seal block assembly 140 is disposed within another of the ducts 110 at one of the cable ports 109. The second seal block assembly 140 is configured to fit within the oblong cable port 109. The second seal block assembly 140 includes a body 141 extending from a first end 142 to a second end 143. One or more axial passages 144 (FIG. 7) extend through the body 141 from the first end 142 to the second end 143. One or more optical fiber cables 180 may be routed through each of the axial passage 144. In the example shown, a first axial passage 144a extends along a first side of the body 141, a second axial passage 144b extends along an intermediate region of the body 141, and a third axial passage 144c extends along a second side of the body 141 opposite the first side. In other implementations however, the body 141 may include a greater or lesser number of axial passages 144 or may have a different configuration of axial passages.

[0025] The first end 142 of the body 141 defines a first stop surface 145. The seal block assembly body 141 also includes a latching arrangement to secure the body 141 at the respective cable port 109. In the example shown, the latching arrangement includes one or more flexible fingers 146 at the first end 122 of the body 121. A ramp 147 and a shoulder 148 are disposed on an external surface of each flexible finger 146. In certain implementations, the flexible fingers 146 extend axially from the first end 142 of the body 141 past the first stop surface 145. In the example shown, one latching finger 146 extends from each of the elongated sides of the body 141. In other implementations, however, the body 141 may include a greater or lesser number of latching fingers 146.

[0026] The seal block body 141 is configured to seal a cable port 109 when plugged into the respective duct 110. In the example shown, the seal block body 141 includes a gasket 150 (e.g., a gel structure, a foam structure, a rubber structure, etc.) sandwiched between a first body portion and a second body portion. In the example shown, the first body portion includes a first body assembly 151 and the second body portion includes a second body assembly 152. In certain implementations, each of the body assemblies 151, 152 include two or more sections that cooperate to define the axial passages 144. The sections of the body assemblies 151, 152 may be separated to load the fiber optic cables within the body assemblies 151, 152 (e.g., see FIG. 7).

[0027] An activation assembly 153 holds the body assemblies 151, 152 together and selectively axially compresses the gasket 150 therebetween to activate the seal. In the

example shown in FIG. 7, the activation assembly 153 includes a screw 154 having a threaded region 155, a grip 156 having a threaded region 157, and a spring 158. The screw 154 extends axially through the gasket 150. A first end of the screw 154 is secured to the first body assembly 151 and a second end of the screw 154 protrudes from the second body assembly 152. The threaded region 157 of the grip 156 cooperates with the threaded region 155 of the screw 154 to telescopically mount the grip 156 to the second end of the screw 154. The spring 158 is mounted over the screw 154 so that tightening the grip 156 on the screw 154 compresses the spring 158. As the spring 158 is compressed, the spring 158 exerts a greater axial bias on the gasket 150 (see FIG. 7).

[0028] FIG. 8 illustrates the front end 101 of the enclosure base 100 from the interior 105 of the base 100. As noted above, the first end 101 defines multiple ports 109 leading into the interior 105 of the base 100. In the example shown, the first end 101 defines a first row of round ports 109 and a second row of round and oblong ports 109. In other implementations, the ports 109 may be arranged in any desired configuration.

[0029] In the example shown, the ports 109 are defined by ducts 110 extending into and out of the base 100. Each duct 110 includes an elongated body 111 extending from an outer end 112 to an inner end 113. Each elongated body 111 defines an axial passage 114 extending from the outer end 112 to the inner end 113. The inner end 113 of the elongated body 111 defines a shoulder 116 that faces the interior 105 of the base 100. In the example shown, the shoulder 116 extends around the circumference of the inner end 113. In other implementations, however, the shoulder 116 may be broken/interrupted along the circumference.

[0030] One or more stops 115 are disposed at the inner end 113 of the elongated body 111 and extend into the passage 114. In the example shown, four circumferentially spaced stops 115 extend inwardly at the inner end 113 of each elongated body 111. In other implementations, however, a greater or lesser number of stops 115 may extend inwardly from the elongated body 111. In certain implementations, one or more of the elongated bodies 111 may define one or more slots 117 at the outer end 112 of the elongated body 111. In the example shown, the outer end 112 defines a single slot that is useful for aligning the seal block assembly 120 at the duct 110.

[0031] One or more fastener supports 118 may be disposed at the inner ends 113 of the ducts 110. Each fastener support 118 defines a fastener hole 119 accessible from the interior 105 of the base 100. The fastener supports 118 aid in securing the optical fiber cables 180 separate from the seal blocks 120, 140 as will be discussed in more detail herein.

[0032] FIG. 9 shows the example seal blocks 120, 140 secured at respective cable ports 109. Each seal block 120, 140 is inserted through the axial passage 114 defined by the elongated body 111 of the duct 110 installed at the respective cable port 109. The first end 122, 142 of each seal block body 121, 141 is inserted through the outer end 112 of each duct and pushed towards the inner end 113 until the stop surfaces 125, 145 of each seal block body 121, 141 abuts the stops 115 of the respective duct 110. The stops 115 inhibit the seal block bodies 121,

141 from being pushed too far into the base 100.

[0033] As the seal block body 121, 141 is pushed toward the inner end 113 of the duct 110, the latching fingers 126 cam inwardly to pass the inner end 113 and snap over the shoulder 116 of the duct body 111. The shoulder 128, 148 of the latching fingers 126, 146 abuts the shoulder 116 of the duct body 111 to inhibit the seal block bodies 121, 141 from being pulled out of the ducts 110. Accordingly, a user need not separately fasten (e.g., with screws) the seal blocks 120, 140 to the base 100. Merely pushing the seal blocks 120, 140 into position secures the seal blocks 120, 140 to the base 100. The latching fingers 126 are manually releasable by compressing the latching fingers 126 inwardly until the shoulders 128, 148 clear the inner shoulder 116 of the ducts 110.

[0034] In certain implementations, the duct bodies 111 include alignment structures that facilitate mounting the seal blocks in accordance with a preferred orientation. For example, the slot 117 at the outer end 112 of the round ducts 110 may be sized and shaped to receive the tab 129 disposed at the second end 123 of the first seal block body 121. In other implementations, the tab 129 also aids in inhibiting the seal block body 121 from being inserted too far into the duct 110. In still other implementations, one or more tabs may be disposed on the oblong seal block 140.

[0035] The gasket 130, 150 of each seal block 120, 140 is spaced towards the exterior of the base 100 from the point at which the seal block 120, 140 is axially fixed to the base 100. In some implementations, the stops 115 and/or tab 129 aid in maintaining the seal block 120, 140 within the ducts 110 when pressure is applied to the seal block 120, 140 from outside the base 100. External pressure applied to the seal block 120, 140 will further compress the gasket 130, 150 axially since the stops 115 and/or tab 129 maintain the seal block 120, 140 in a fixed axial position.

[0036] In accordance with some aspects, the optical fiber cables 180 may be secured to the base 100 separate from the seal blocks 120, 140 using fixation mounts 160 (FIG. 10). A fixation mount 160 is coupled to an optical fiber cable 180 at a location where one or more strength members have been terminated (e.g., trimmed). The fixation mount 160 is coupled to an interior 105 of the base 100. For example, the fixation mount 160 may be coupled to the inner surface of the first end 101 of the base 100. In certain implementations, the fixation mount 160 axially fixes the cable 180 relative to the base 100. In certain implementations, the fixation mount 160 torsionally fixes the cable 180 relative to the base 100. In certain implementations, the fixation mount 160 laterally fixes the cable 180 relative to the base 100. Accordingly, stress applied to the cables 180 is not transferred to the seal blocks 120, 140 and, hence, does not affect the seal at the respective port 109.

[0037] The fiber optic cables 180 include one or more optical fibers 181 and at least one strength member. In certain implementations, the optical fibers 181 are contained within a buffer tube. A jacket 185 is stripped or otherwise removed at a section of the cable that is to be secured to the enclosure. Stripping the jacket 185 reveals the optical fiber(s) 181 and one or

more strength members. The strength members may be terminated (e.g., trimmed) at or near the stripped region. In certain implementations, the strength members include a plurality of strength yarns (e.g., aramid yarn, such as Kevlar®) 182. In certain implementations, the strength members include a tensile strength member (e.g., a fiberglass rod) 183 in addition to the strength yarns 182. In other implementations, the strength members include a tensile strength member (e.g., a fiberglass rod) 183 instead of the strength yarns 182.

[0038] In some implementations, the seal blocks 120, 140 are loaded onto the optical cables 180 before the fixation assemblies 160 are coupled to the optical cables 180. For example, the fixation assemblies 160 may be sized so that a fixation assembly 160 does not fit easily through the axial passages 124, 144 defined by the seal blocks 120, 140. Indeed, some fixation assemblies 160 may not fit at all through the axial passages 124, 144 of the certain example types of seal blocks 120, 140.

[0039] In certain implementations, the optical cables 180 are routed through the passages 124, 144 of the seal blocks 120, 140 before being stripped (e.g., while the jacket 185 still covers the optical fibers 181 and strength members 182, 183). For example, an optical cable 180 may be routed axially through the passage 124 of the round-type seal block 120. In other implementations, however, an optical cable 180 may be routed radially into the passage 144 of the oblong-type seal block 140.

[0040] FIGS. 10-12 illustrate one example fixation mount 160. The fixation assembly 160 includes a body 161 extending from a first end 162 to a second end 163. The body 161 defines an axial channel 164 that extends at least partially between the first and second ends 162, 163. In some implementations, the axial channel 164 has a ribbed (e.g., laterally ribbed) or otherwise textured surface. A fiber optic cable 180 may be routed along the channel 164 from the first end 162 towards the second end 163. The textured surface may aid in holding the cable 180 against axial and/or torsional strain. In certain implementations, a sizing flange 169 may be positioned in the channel 164 to accommodate various sizes of optical fiber cables 180 (i.e., optical cables having various diameters). In some such implementations, the sizing flange 169 has a ribbed (e.g., laterally ribbed) or otherwise textured surface. The textured surface of the sizing flange 169 may aid in holding the cable 180 against axial and/or torsional strain.

[0041] A cover 170 is configured to selectively mount to the body 161 to close the channel 164, thereby enclosing a portion of the fiber optic cable 180 (see FIG. 12). In certain implementations, the cover 170 is pivotally coupled to the body 161 (e.g. using hinge arrangement 171). In certain implementations, the cover 170 latches to the body 161 using latch arrangement 172. In the example shown in FIG. 10, the latch arrangement 172 includes two latching fingers extending upwardly from the body 161 adjacent the channel 164. The cover 170 may be latched to the body 161 after being pivoted to the closed position. In other implementations, the cover 170 may be otherwise secured to the body 161.

[0042] The jacket 185 of the optical cable 180 terminates at an intermediate position within the fixation body 161. The optical fibers 181 and strength members extend past the jacket 185

towards the second end 163 of the body 161. The strength members may be trimmed at a location spaced from the jacket 185. In some implementations, the jacketed cable 180 extends through the axial channel 164 of the body 161. In such implementations, the cover 170 cooperates with the channel 164 (or sizing flange 169) to enclose the jacketed portion of the cable 180. In certain implementations, the cover 170 and the channel 164 (or sizing flange 169) cooperate to radially compress the jacketed portion of the cable 180.

[0043] The fixation assemblies 160 are configured to retain the strength members of the optical fiber cables 180. In some implementations, the cable fixation body 161 includes a winding arrangement 165 at which the strength yarns 182 may be wound or otherwise retained. In the example shown, the winding arrangement 165 includes four L-shaped flanges that extend upwardly from the fixation body 161 (see FIG. 10). In various implementations, the strength yarns may be wound around the flanges in a variety of configurations (e.g., an X-pattern, an L-pattern, or an O-pattern). In other implementations, the winding arrangement 165 may have a greater or lesser number of flanges or have flanges of different shapes.

[0044] In some implementations, the fixation body 161 includes an enclosing structure defining a first pocket 166 at which the tensile strength member 183 may be retained. The first pocket 166 is located at the second end 163 of the body 161. In some implementations, the first pocket 166 is axially aligned with the channel 164 of the body 161. In other implementations, the first pocket 166 is radially offset from the channel 164 (e.g., see FIG. 12) so that the tensile strength member 183 flexes radially away from the channel 164 when routed to the first pocket 166. The first pocket 166 is sized to receive the tensile strength member 183 and still allow the optical fibers 181 to extend past the first pocket 166 (see FIG. 13).

[0045] The pocket 166 is defined at least partially by a flexible flange 167 that is configured to flex selectively into the pocket 166. In certain implementations, a tightening member 168 is configured to apply a force to the flange 167 that directs the flange 167 into the first pocket 166. The force may be increased to move the flange 167 into the first pocket 166 and decreased to allow the flange 167 to move out of (or to extend flush with) the first pocket 166. In the example shown, the tightening member 168 includes a set screw 168 that is mounted at a screw hole located above the flange 167.

[0046] The flexible flange 167 radially compresses the strength member 183 to aid in retaining the strength member 183 in the first pocket 166. By applying the inward force with the flange 167 instead of the tightening member 168, itself, the radial compression is spread out along a greater surface area of the strength member 183, decreasing the chances of crushing or breaking the strength member 183.

[0047] The flexible flange 167 and tightening member 168 of the fixation device 160 cooperate to accommodate tensile strength members 183 of various sizes. To accommodate a tensile strength member 183 having a small diameter, the tightening member 168 is screwed or otherwise moved towards the flange 167 to press the flange 167 into the first pocket 166. To accommodate a tensile strength member 183 having a larger diameter, the tightening member

168 is unscrewed or otherwise moved away from the flange 167, thereby allowing the flange 167 to unflex and bend away from the first pocket 166.

[0048] The fixation mount bodies 161 also are configured to secure to the interior of the base 100. In some implementations, the fixation assemblies 160 are coupled to the fiber optic cables 180 before routing the cables 180 through the ports 109. In such implementations, the fixation bodies 161 and stripped regions of the optical cables 180 are routed through the ducts 110 from an exterior of the base 100 into the interior 105 of the base 100. In other implementations, however, the fixation assemblies 160 may be coupled to the optical cables 180 after the cables 180 are routed through the ports 109.

[0049] As shown in FIG. 13, one or more fastener supports 118 are disposed at the inner ends 113 of the ducts 110. Each fastener support 118 defines a fastener hole 119 accessible from the interior 105 of the base 100. Each fastener hole 119 is located outside of a perimeter of the axial passage 114 extending through the respective duct 110 (e.g., see FIGS. 8 and 9). A mounting member 175 is secured in each fastener hole 119 at which a fixation assembly 160 is to be secured. In the example shown, the mounting member 175 includes a screw. In some implementations, mounting members 175 may be preinstalled in one or more of the fasteners holes 119 in the factory or other manufacturing facility. In other implementations, the mounting members 175 may be added during the installation of the cables 180 to be secured.

[0050] As shown in FIG. 14, the body 161 of each fastening assembly 160 defines a second pocket 173 at the first end 162 of the body 161. To secure the fixation assembly 160 to the base 100, the fixation assembly 160 is positioned so that the mounting member 175 is disposed within the second pocket 173. For example, the fixation assembly 160 may be moved laterally relative to the ports 109 to slide the mounting member 175 into the second pocket 173. The mounting member 175 may be tightened to clamp the fixation assembly 160 between the screw head and the fastener support 118, thereby axially securing the fixation assembly 160 to the base 100.

[0051] As shown in FIG. 11, the second pocket 173 is sized to accommodate the head of the mounting screw 175. The second pocket 173 has an open face 176 that extends generally parallel to the channel 164 of the fixation body 161. The open face 176 is sized to enable the head of the mounting screw 175 to pass into the second pocket 173. The fixation body 161 also defines a slot 174 extending through a wall defining the second pocket 173. The slot 174 is sized to enable the body of the screw 175 to extend therethrough. In the example shown, the slot 174 and the open face 176 define a T-shaped profile. An inner surface of the second pocket 173 forms shoulders 177 at opposite sides of the slot 174. When the mounting member 175 is tightened, the head of the mounting member 175 axially compresses against the shoulders 177 (see FIG. 14).

[0052] When coupled to the cables 180, the seal block assemblies 120, 140 and the fixation assemblies 160 cooperate to form cable port assemblies 190 (FIG. 15). In some implementations, the seal blocks 120, 140 are slid into the ducts 110 to seal the cable ports

109 after the fixation assemblies 160 are secured to the first end 101 of the base 100. In other implementations, the seal blocks 120, 140 may be slid into the ducts 110 after the fixation assemblies 160 are routed through the ducts 110, but before the fixation assemblies 160 are secured to the base 100.

[0053] In the example shown in FIGS. 16-34, an alternative first seal block assembly 220 is disposed within one of the ducts 110 at one of the cable ports 109, and an alternative second seal block 340 is disposed within another one of the ducts 110 at the cable ports. A complete enclosure 200 is shown with a base 204, a cover 206, and latches 208. The first seal block assembly 220 is configured to fit within one of the round cable ports 109. The second seal block assembly 340 is configured to fit within one of the oblong cable ports 109. Note the oblong port 109 in FIGS. 16-20 is 90 degrees from the position shown in FIGS. 1-15. Such a rotated position assists with cable management of loop cables, such as for storage in a hinged tray. Oblong port 109 is particularly useful for loop cables.

[0054] The first seal block assembly 220 includes a body 221 extending from a first end 222 to a second end 223. Two axial passages 224 (FIG. 26) extend through the body 221 from the first end 222 to the second end 223. One or more optical fiber cables 180 may be routed through each of the axial passages 224. The axial passages 224 extend in separate halves 290 which can be used separately and accessed separately.

[0055] One or more stop surfaces (e.g., shoulders, notches, lips, etc.) 225 are disposed at the first end 222 of the body 221. In some implementations, the stop surfaces 225 are formed by the edge of the first end 222 of the seal block assembly 220.

[0056] The seal block assembly body 221 also includes a latching arrangement to secure the body 221 at the cable port 109. In the example shown, the latching arrangement includes one or more flexible fingers 226 at the first end 222 of the body 221. A ramp 227 and a shoulder 228 are disposed on an external surface of each flexible finger 226. In the example shown, two latching fingers 226 extend from circumferentially spaced locations at the first end 222 of the body 221. In other implementations, however, the body 221 may have a greater or lesser number of latching fingers 226. A groove 240 and a c-clip 242 secure seal block assembly 220 to cable port 109.

[0057] The seal block body 221 is configured to seal a cable port 109 when plugged into the cable port 109. In the example shown, the seal block body 221 includes a gasket 230 (e.g., a gel structure, a foam structure, a rubber structure, etc.) sandwiched between a first body portion and a second body portion. In the example shown, the first body portion includes an integral body piece 231 and the second body portion includes a second integral body piece 232. Body piece 231 holds halves 290. An activation assembly 233 holds the body pieces 231, 232 together and selectively axially compresses the gasket 130 therebetween to activate the seal.

[0058] In the example shown in FIGS 26 and 27, the activation assembly 233 includes a screw

134 having a threaded region 135, a grip 136 having a threaded region 137, and a spring 138. The screw 134 extends axially through the gasket 130. A first end of the screw 134 is secured to the first body piece 231 and a second end of the screw 134 protrudes from the second body piece 232. The threaded region 137 of the grip 136 cooperates with the threaded region 135 of the screw 134 to telescopically mount the grip 136 to the second end of the screw 134. The spring 138 is mounted over the screw 134 so that tightening the grip 136 on the screw 134 compresses the spring 138. As the spring 138 is compressed, the spring 138 exerts a greater axial bias on the gasket 130 (see FIG. 5).

[0059] Halves 290 are held inside body piece 231 by stops 215 in port 109. Halves 290 also define cable fixture structures as will be defined in more detail below. First seal block assembly 220 allows for seal assembly on the cable 180 and fixation to the strength member or members outside of enclosure 200, and the unit can be inserted into port 109. At that point the seal can be activated. Halves 290 include tabs 260 which fit into notches 262 of body piece 231.

[0060] A second seal block assembly 340 is disposed within another of the ducts 110 at one of the cable ports 109. The second seal block assembly 340 is configured to fit within the oblong cable port 109. The second seal block assembly 340 includes a body 341 extending from a first end 342 to a second end 343. One or more axial passages 344 (FIGS. 20-22) extend through the body 341 from the first end 342 to the second end 343. One or more optical fiber cables 180 may be routed through each of the axial passage 344. In the example shown, a first axial passage 344a extends along a first side of the body 341, a second axial passage 344b extends along an intermediate region of the body 341, and a third axial passage 344c extends along a second side of the body 341 opposite the first side. In other implementations however, the body 341 may include a greater or lesser number of axial passages 344 or may have a different configuration of axial passages.

[0061] The first end 342 of the body 341 defines a first stop surface 345. The seal block assembly body 341 also includes a securing arrangement to secure the body 341 at the respective cable port 109. In the example shown, the securing arrangement includes one or more grooves 346 at the first end 342 of the body 341. A clip 347 fits into groove 346.

[0062] The seal block body 341 is configured to seal a cable port 109 when plugged into the respective duct 110. In the example shown, the seal block body 341 includes a gasket 350 (e.g., a gel structure, a foam structure, a rubber structure, etc.) sandwiched between a first body portion and a second body portion. In the example shown, the first body portion includes a first body assembly 351 and the second body portion includes a second body assembly 352. In certain implementations, each of the body assemblies 351, 352 include two or more sections that cooperate to define the axial passages 344. The sections of the body assemblies 351, 352 may be separated to load the fiber optic cables within the body assemblies 351, 352 (e.g., see FIG. 7).

[0063] An activation assembly 353 holds the body assemblies 351, 352 together and

selectively axially compresses the gasket 350 therebetween to activate the seal. In the example shown in FIG. 7, the activation assembly 353 includes a screw 154 having a threaded region 155, a grip 156 having a threaded region 157, and a spring 158. The screw 154 extends axially through the gasket 150. A first end of the screw 154 is secured to the first body assembly 351 and a second end of the screw 154 protrudes from the second body assembly 352. The threaded region 157 of the grip 156 cooperates with the threaded region 155 of the screw 154 to telescopically mount the grip 156 to the second end of the screw 154. The spring 158 is mounted over the screw 154 so that tightening the grip 156 on the screw 154 compresses the spring 158. As the spring 158 is compressed, the spring 158 exerts a greater axial bias on the gasket 350 (see FIG. 7).

[0064] FIG. 19 illustrates the front end 101 of the enclosure base 204 from the interior 105 of the base 100. As noted above, the first end 101 defines multiple ports 109 leading into the interior 105 of the base 100. First axial passage 344a is adjacent to second axial passage 344b for receipt of a loop cable. Third axial passage 344c is for later use and can be initially plugged. Third axial passage 344c can be used to later add a repair cable should to loop cable become damaged or more capacity is needed. In the example enclosure 200 shown, the first end 101 defines a first row of round ports 109 and a second row of round and oblong ports 109. In other implementations, the ports 109 may be arranged in any desired configuration.

[0065] In the example enclosure shown, the ports 109 are defined by ducts 110 extending into and out of the base 100. Each duct 110 includes an elongated body 111 extending from an outer end 112 to an inner end 113. Each elongated body 111 defines an axial passage 114 extending from the outer end 112 to the inner end 113. The inner end 113 of the elongated body 111 defines a shoulder 116 that faces the interior 105 of the base 100. In the example shown, the shoulder 116 extends around the circumference of the inner end 113. In other implementations, however, the shoulder 116 may be broken/interrupted along the circumference.

[0066] One or more stops 215 are disposed at the inner end 113 of the elongated body 111 and extend into the passage 114. In the example shown, two circumferentially spaced stops 215 extend inwardly at the inner end 113 of each round elongated body 111. In other implementations, however, a greater or lesser number of stops 215 may extend inwardly from the elongated body 111. Three stops 215 are provided for the oblong elongated body. In certain implementations, one or more of the elongated bodies 111 may define one or more slots 117 at the outer end 112 of the elongated body 111. In the example shown, the outer end 112 defines a single slot that is useful for aligning the seal block assembly 120 at the duct 110.

[0067] FIGS. 16 and 17 show the example seal blocks 220, 340 secured at respective cable ports 109. Each seal block 220, 340 is inserted through the axial passage 114 defined by the elongated body 111 of the duct 110 installed at the respective cable port 109. The first end 222, 342 of each seal block body 221, 341 is inserted through the outer end 112 of each duct and pushed towards the inner end 113 until the stop surfaces 225, 345 of each seal block body 221, 341 abuts the stops 215 of the respective duct 110. The stops 215 inhibit the seal block

bodies 221, 341 from being pushed too far into the base 100.

[0068] As the seal block body 221, is pushed toward the inner end 113 of the duct 110, the latching fingers 126 cam inwardly to pass the inner end 113 and snap over the shoulder 116 of the duct body 111. The shoulder 228 of the latching fingers 226 abuts the shoulder 116 of the duct body 111 to inhibit the seal block bodies 221, from being pulled out of the ducts 110. If desired, each half 290 can be removed separately to add or adjust a cable. Clip 242 is added to secure seal block body 221 to duct body 111. For seal block body 341, after insertion into duct body 111, clip 347 is added.

[0069] In certain implementations, the duct bodies 111 include alignment structures that facilitate mounting the seal blocks in accordance with a preferred orientation. For example, the slot 117 at the outer end 112 of the round ducts 110 may be sized and shaped to receive the tab 129 disposed at the second end 223 of the first seal block body 221. In other implementations, the tab 129 also aids in inhibiting the seal block body 221 from being inserted too far into the duct 110. In still other implementations, one or more tabs may be disposed on the oblong seal block 340.

[0070] The gasket 230, 350 of each seal block 220, 340 is spaced towards the exterior of the base 100 from the point at which the seal block 220, 340 is axially fixed to the base 100. In some implementations, the stops 215 and/or tabs 129 aid in maintaining the seal block 220, 340 within the ducts 110 when pressure is applied to the seal block 220, 340 from outside the base 100. External pressure applied to the seal block 220, 340 will further compress the gasket 230, 350 axially since the stops 215 and/or tab 129 maintain the seal block 220, 340 in a fixed axial position.

[0071] In accordance with some aspects, the optical fiber cables 180 may be secured to the seal blocks 220, 340 using fixation mounts 460 (FIGS. 20, 21, 26). A fixation mount 460 is coupled to an optical fiber cable 180 at a location where one or more strength members have been terminated (e.g., trimmed). The fixation mount 460 is coupled to pieces 231, 351. For example, the fixation mount 460 may be coupled to the seal block assembly body 221, 341 for fixation before the seal is inserted into the port 109. In certain implementations, the fixation mount 460 axially fixes the cable 180 and torsionally fixes the cable 180. In certain implementations, the fixation mount 460 laterally fixes the cable 180. The fixation mount 460 can be integrally formed with seal block bodies 221, 341.

[0072] The fiber optic cables 180 include one or more optical fibers 181 and at least one strength member. In certain implementations, the optical fibers 181 are contained within a buffer tube. A jacket 185 is stripped or otherwise removed at a section of the cable that is to be secured to the enclosure. Stripping the jacket 185 reveals the optical fiber(s) 181 and one or more strength members. The strength members may be terminated (e.g., trimmed) at or near the stripped region. In certain implementations, the strength members include a plurality of strength yarns (e.g., aramid yarn, such as Kevlar®) 182. In certain implementations, the strength members include a tensile strength member (e.g., a fiberglass rod) 183 in addition to

the strength yarns 182. In other implementations, the strength members include a tensile strength member (e.g., a fiberglass rod) 183 instead of the strength yarns 182. In some implementations, the yarns 182 are not present or not used (e.g., cut-off).

[0073] The seal blocks 220, 340 are loaded onto the optical cables 180 before or after the fixation assemblies 460 are coupled to the optical cables 180.

[0074] In certain implementations, the optical cables 180 are routed through the passages 224, 344 of the seal blocks 220, 340 before being stripped (e.g., while the jacket 185 still covers the optical fibers 181 and strength members 182, 183). For example, an optical cable 180 may be routed axially through the passage 224 of the round-type seal block 220. In other implementations, however, an optical cable 180 may be routed radially into the passage 144 of the oblong-type seal block 140. Such would be the case for loop cables.

[0075] FIGS. 21-25 illustrate one example fixation mount 460. The fixation assembly 460 includes a body 461 extending from a first end 462 to a second end 463. The body 461 defines an axial channel 464 that extends at least partially between the first and second ends 462, 463. In some implementations, the axial channel 464 has a ribbed (e.g., laterally ribbed) or otherwise textured surface. A fiber optic cable 180 may be routed along the channel 464 from the first end 462 towards the second end 463. The textured surface may aid in holding the cable 180 against axial and/or torsional strain. In certain implementations, a cover 469 may be positioned over the channel 464 to clamp or press against the exterior of the cable jacket. Different sized covers 469 can accommodate various sizes of optical fiber cables 180 (i.e., optical cables having various diameters). In some such implementations, the cover 469 has a friction promoting surface. One example is the use of a rubber sheet or something with a textured surface. The cover 469 aids in holding the cable 180 against axial and/or torsional strain. In certain implementations, the cover 469 is fastened to body 461 with a fastener 470. Alternatively, a latch to the body 461 can be used.

[0076] The jacket 185 of the optical cable 180 terminates at an intermediate position within the fixation body 461. The optical fibers 181 and strength members extend past the jacket 185 towards the second end 463 of the body 461. The strength members may be trimmed at a location spaced from the jacket 185. In some implementations, the jacketed cable 180 extends through the axial channel 464 of the body 461. In such implementations, the cover 469 cooperates with the channel 464 to enclose the jacketed portion of the cable 180. In certain implementations, the cover 469 and the channel 464 cooperate to radially compress the jacketed portion of the cable 180.

[0077] The fixation assemblies 460 are configured to retain the strength members of the optical fiber cables 180. In some implementations, the cable fixation body 461 includes a pad area 465 at which the tensile strength member 183 may be retained. The pad area 465 is located at the second end 463 of the body 461. In some implementations, the pad area 465 is axially aligned with the channel 464 of the body 461. The pad area 465 is sized to receive the tensile strength member 183 and still allow the optical fibers 181 to extend past the first pocket

166. Cover 480 presses against tensile strength member 183, and is held in place with a fastener 482. The pad area 465 is textured to facilitate improved fixation.

[0078] When coupled to the cables 180, the seal block assemblies 220, 340 and the fixation assemblies 460 cooperate to form cable port assemblies 490 (FIGS. 21 and 26). In this implementation, the seal blocks 220, 340 are slid into the ducts 110 after the fixation assemblies 460 are routed through the ducts 110.

[0079] A filler rod removal system 500 and method is provided. If a filler rod 502 is positioned in a seal block assembly, the filler rod 502 is provided with an attachment device 504 to attach to a new tube 510 which can be pushed and/or pulled through the seal block assembly into position during connection of the filler rod 502 and the new tube 510. Typically, the new tube 510 is added when the seal block assembly is deactivated.

[0080] One attachment device 504 for the filler rod 502 is one or more barbed projections 514 which fit into the new tube 510, such as a corrugated tube. Generally, the filler rod 502 and the new tube 510 have the same outer diameter.

[0081] Once the new tube 510 is located in position in the seal block assembly, the filler rod 502 can be separated from the new tube and discarded, and cables and/or blown tubes can be inserted through the new tube. The seal block assembly can also be reactivated to seal the new tube. Such a system is particularly useful for seal block assemblies 140, 340, but may be used on the other disclosed seal block assemblies.

[0082] A tube clip 520 is shown mounted to second seal block assembly for storage. Once new tube 510 is added, clip 520 is inserted into first body assembly 351 to retain tube 510 with first body assembly 351.

[0083] Referring now to FIGS. 35-52, an embodiment of a seal block assembly 600 is shown. Seal block assembly 600 is of the oblong-type for holding loop cables, and for a repair cable or a third cable option. Seal block assembly 600 includes a seal 601 between first body assembly 602 and second body assembly 603. A c-clip 604 mounts seal block assembly to an enclosure at an oval port. Clip 604 includes latches 606 which catch on structure inside the enclosure for additional fixation. An alignment tab 608 fits in a slot also on the enclosure. Clip 604 works in a similar manner as the clips described above for retaining seal block assembly 600 within the enclosure.

[0084] A cable fixation mount 610 is slidably mounted to second body assembly 603 with a slide mechanism including a first slide 614 which mounts to a rail 616 on second body assembly 603 to provide for vertical adjustment of the fixation mount 610 to adjust for different sized cables. A stop 618 prevents the fixation mount 610 from falling off of second body assembly 603. The direction of movement is transverse to the cable direction.

[0085] Fixation mount 610 includes two cable chambers 620, 622 for receiving the two cables

associated with the loop cable. Chambers 620, 622 are curved. A cover 626 having a mating shape mounts outside of the cable chambers 620, 622. Cover 626 receives a section of cable jacket for fixation of the cables to the fixation mount 610. The cable jacket fixation is part of an end of the jacket bent backwards toward second body assembly 603. The bent backwards portion is between the cable chambers 620, 622 and the cover 626 held by a fastener. Pad area 632 receives any strength members of the cables that are held in position between a cover 636 and the pad area 632.

[0086] Referring now to FIGS. 53-84, a seal block assembly 700 is shown of the round-type for use in a round port. Seal block assembly 700 receives one or two cables, as desired. Seal block assembly 700 includes a body piece 704. A c-clip 706 mounts to body piece 704 for securing seal block assembly 700 in a round port. Seal block assembly also includes latches 702 for latching to the round port once inserted. Clip 706 includes an alignment tab 707 for receipt in a mating slot on the enclosure.

[0087] Seal block assembly 700 includes halves 708 for cable fixation. Halves 708 are similar in construction, but are not identical. First half 710 and second half 712 are different in construction in the areas of staggering, so as to reduce the overall size of the seal block assembly. Various parts of seal block assembly 700 do not overlap, due to the staggering. Each half 710, 712 is retained by body piece 704 by flexible clips 716. To release either of the halves 710, 712, clips 716 are rotated outwardly. Each half 710, 712 includes a fixation device 720 for use in fixing the cable to the seal block assembly. A clamp 722 with a curved portion 724 can be used to apply pressure to an exterior of the cable. Alternatively, or in addition to, a jacket fixation device 726 can be provided to clamp a portion of the jacket folded over and backwards relative to the insertion direction. The fixation device 720 is held in place with a loop 730 and a fastener.

[0088] For cable fixation and clamping, various combinations are possible. A single clamp 800 can be used to push against an exterior of the cable. A second clamp 802 can be used to clamp the exterior of the cable, and a first plate 804 can be used to clamp to a bent back portion of the jacket. Two plates 804, 806 can be used to clamp to a bent back portion of the jacket. Both halves use similar fixation and clamping options.

[0089] Halves 710, 712 also include a tube holder 736 which can hold internal tubes of the enclosure. Tube holder 736 is also a cable segregation device. Tube holder includes first and second portions 737, 738 which snap together. Tube holder 736 mounts to pegs 740 on halves 710, 712. Tube holder 736 is an optional device. Pad area 750 receives any strength member of the cable, held in position by a cover 752. Pegs 740 can be used to wrap flexible aramid yarns if desired.

[0090] Halves 710, 712 are useable only by inserting first half 710 into body piece 704 first. Second half 712 can then be inserted with a cable, or with a filler rod. If used with a filler rod, a second cable can be added later to seal block assembly 700 by only removing second half 712 (after the seal is deactivated). First half 710 remains in place during the changeover process.

For convenience, the halves 710, 712 can be labeled "1" and "2". Clips 716 are used to hold one or both of halves 710, 712 in place during use and cable installation. Latches 702 are also used to hold seal block assembly 700 in place during the addition of the second cable.

Parts List

[0091]

100	base
101	first end
102	second end
103	first side
104	second side
105	interior
106	sidewall
107	gasket channel
108	base
109	ports
110	ducts
111	elongated body
112	outer end
113	inner end
114	passage
115	stops
116	inner shoulder
117	

	outer slot
118	
	fastener support
119	
	fastener hole
120	
	first example seal block
121	
	body
122	
	first end
123	
	second end
124	
	axial passage
125	
	stop surface
126	
	flexible finger
127	
	ramp
128	
	shoulder
129	
	rear tab
130	
	gasket
131	
	first piece
132	
	second piece
133	
	activation assembly
134	
	screw
135	
	threaded surface
136	
	grip
137	
	threaded surface
138	
	spring
140	

	second example seal block
141	body
142	first end
143	second end
144	axial passages
144a	first axial passage
144b	second axial passage
144c	third axial passage
145	front stop surface
146	flexible finger
147	ramp
148	shoulder
150	gasket
151	first body assembly
152	second body assembly
153	activation assembly
154	screw
155	threaded surface
156	grip
157	threaded surface
158	spring
160	cable fixation assembly
161	

	body
162	first end
163	second end
164	channel
165	winding arrangement
166	first pocket
167	flexible flange
168	set screw
169	sizing flange
170	cover
171	hinge member
172	latching arrangement
173	second pocket
174	slot
175	mounting screw
176	open front
177	shoulders
180	fiber optic cables
181	optical fibers
182	yarn
183	strength member
185	jacket
190	

	cable port assembly
200	
	enclosure
204	
	base
206	
	cover
208	
	latches
220	
	first seal block assembly
221	
	body
222	
	first end
223	
	second end
224	
	two axial passages
225	
	halves
226	
	flexible fingers
227	
	ramp
228	
	shoulder
230	
	gasket
231	
	integral body piece
232	
	second integral body piece
233	
	activation assembly
240	
	groove
242	
	c-clip
245	
	first stop surface
260	
	tabs
262	

	notches
290	
	halves
340	
	second seal block assembly
341	
	body
342	
	first end
343	
	second end
344	
	axial passages
344a	
	first axial passage
344b	
	second axial passage
344c	
	third axial passage
345	
	stop surfaces
346	
	grooves
347	
	clip
350	
	gasket
351	
	first body assembly
352	
	second body assembly
353	
	activation assembly
460	
	fixation mount
461	
	body
462	
	first end
463	
	second end
464	
	axial channel
465	

469 pad area
cover
480 cover
482 fastener
490 cable port assemblies
500 filler rod removal system
502 filler rod
504 attachment device
510 new tube
514 barbed projections
520 clip
600 seal block assembly
601 seal
602 first body assembly
603 second body assembly
604 clip
606 latches
608 tab
610 fixation mount
614 slide
616 rail
618 stop
620

	cable chamber
622	
	cable chamber
626	
	cover
632	
	pad area
636	
	cover
700	
	seal block assembly
702	
	latches
704	
	body piece
706	
	clip
707	
	tab
708	
	halves
710	
	first half
712	
	second half
716	
	clips
720	
	fixation device
722	
	clamp
724	
	curved portion
726	
	plate
730	
	loop
736	
	tube holder/segregation device
737	
	first portion
738	
	second portion
740	

750 pegs
752 pad area
800 cover
802 single clamp
804 second clamp
806 first plate
 second plate

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- [WO2010047920A2 \[0004\]](#)
- [WO9222114A1 \[0004\]](#)
- [WO2013007662A \[0012\]](#)

Patentkrav

1. Kabeltætningsblokanordning (220, 340, 600, 700) strækkende sig fra en første ende til en anden ende omfattende:

- 5 et første modtageafsnit (231, 351) som strækker sig fra en første ende (222, 342) til en anden ende (223, 343) og definerer mindst en aksial passage strækkende sig derimellem, idet det første modtageafsnit (231, 351) danner den første ende af kabeltætningsblokanordningen (220, 340), idet den første ende (222, 342) af det første modtageafsnit (231, 351) definerer en stopflade (245, 345);
- 10 et andet modtageafsnit (232, 352) som definerer mindst en aksial passage; en pakning (230, 350) anbragt mellem det første modtageafsnit (231, 351) og det andet modtageafsnit (232, 352), idet pakningen (230, 350) definerer mindst en aksial passage, som retter ind efter den mindst ene aksiale passage af det første modtageafsnit (231, 351) og den mindst ene
- 15 aksiale passage af det andet modtageafsnit (232, 352); og en aktiveringsanordning (233, 353) som aksialt komprimerer pakningen (230, 350), når den aktiveres, hvor den mindst ene aksiale passage af pakningen (230, 350) definerer en indvendig tætningsflade til tætning mod et kabel, og hvor pakningen (230, 350) definerer en modsat udvendig tætningsflade
- 20 til tætning mod en port på et telekommunikationshus;
- kendetegnet ved, at** det første modtageafsnit (23, 351) inkluderer mindst en kappeklemme (626, 720) og mindst en trækstangklemme (460) forbundet med det første modtageafsnit;
- hvor den mindst ene kappeklemme (626, 720) er egnet til at komprimere
- 25 en kappe på kablet;
- hvor den mindst ene trækstangklemme (460) er egnet til at komprimere en trækstang på kablet; og
- at** kappeklemmen (626, 720) inkluderer to elementer til at holde et kappeafsnit, som er bøjet 180 grader væk fra den aksiale retning af kablet.

30

2. Anordningen ifølge krav 1, hvor pakningen (230, 350) inkluderer en gelpakning (230, 350).

3. Anordningen ifølge et hvilket som helst af kravene 1 og 2, hvor aktiveringsanordningen (233, 353) inkluderer en skrue (134, 154), et greb (136, 156) og en fjeder (138, 158), idet skruen (134, 154) strækker sig gennem pakningen (230, 350) og fastgøres til det første modtageafsnit (231, 351), idet 5 grebet (136, 156) har en første ende, som skrues på skruen (134, 154), og en anden ende, som rager frem fra det andet modtageafsnit (232, 352), idet fjederen (138, 158) er positioneret mellem pakningen (230, 350) og grebet (136, 156), idet fjederen (138, 158) komprimeres, når skruen (134, 154) og grebet (136, 156) spændes sammen, idet fjederen (138, 158) påfører en aksial forspænding på 10 pakningen (230, 350), når fjederen (138, 158) komprimeres.

4. Anordningen ifølge et hvilket som helst af kravene 1 til 3, hvor det første modtageafsnit (231, 531) omfatter en lås (702) til låsning på en port.

15 5. Anordningen ifølge et hvilket som helst af kravene 1 til 3, hvor det første modtageafsnit (231, 531) omfatter en fastgørelsesindretning til at fastgøre det første modtageafsnit til en port, idet fastgørelsesindretningen inkluderer en fordybning og en C-clips (604, 706), som passer ind i fordybningen.

20 6. Anordningen ifølge et hvilket som helst af kravene 1-5, hvor det første og det andet modtageafsnit (231, 232, 704) har en overvejende rund lateral tværsnitsprofil eller en overvejende aflang lateral tværsnitsprofil.

7. Anordningen ifølge krav 1, hvor:

25 det første modtageafsnit (351) definerer mindst tre aksiale passager strækkende sig derimellem;
idet det andet modtageafsnit (352) definerer mindst tre aksiale passager;
idet pakningen (350) definerer mindst tre aksiale passager, som retter ind efter de mindst tre aksiale passager af det første modtageafsnit (351) og
30 de mindst tre aksiale passager af det andet modtageafsnit (352); og
hvor et løkkekabel er positioneret i to tilstødende aksiale passager (344) af de mindst tre aksiale passager;
hvor en fyldstang (502) er positioneret i en tredje af de mindst tre aksiale passager (344) anbragt med afstand til de to tilstødende aksiale passager;
35 hvor en ydre profil af tætningsblokanordningen er aflang.

8. Anordningen ifølge krav 1, hvor:

- 5 det første modtageafsnit (231) inkluderer to kappeklemmer (720) og to
trækstangklemmer (460) monteret på separate halvdele (290) i et
cylindrisk legeme;
hvor en ydre profil af tætningsblokanordningen er rund.

9. Anordningen ifølge krav 1, hvor den mindst ene kappeklemme (626) er buet og
holder to kapper, en kappe fra hvert af to kabler.

10

10. Anordningen ifølge krav 1, hvor kappeklemmen (626) er bevægelig på en
skinne (614, 616) i forhold til det første modtageafsnit (351) i en retning på tværs
af den aksiale retning af kablet.

DRAWINGS

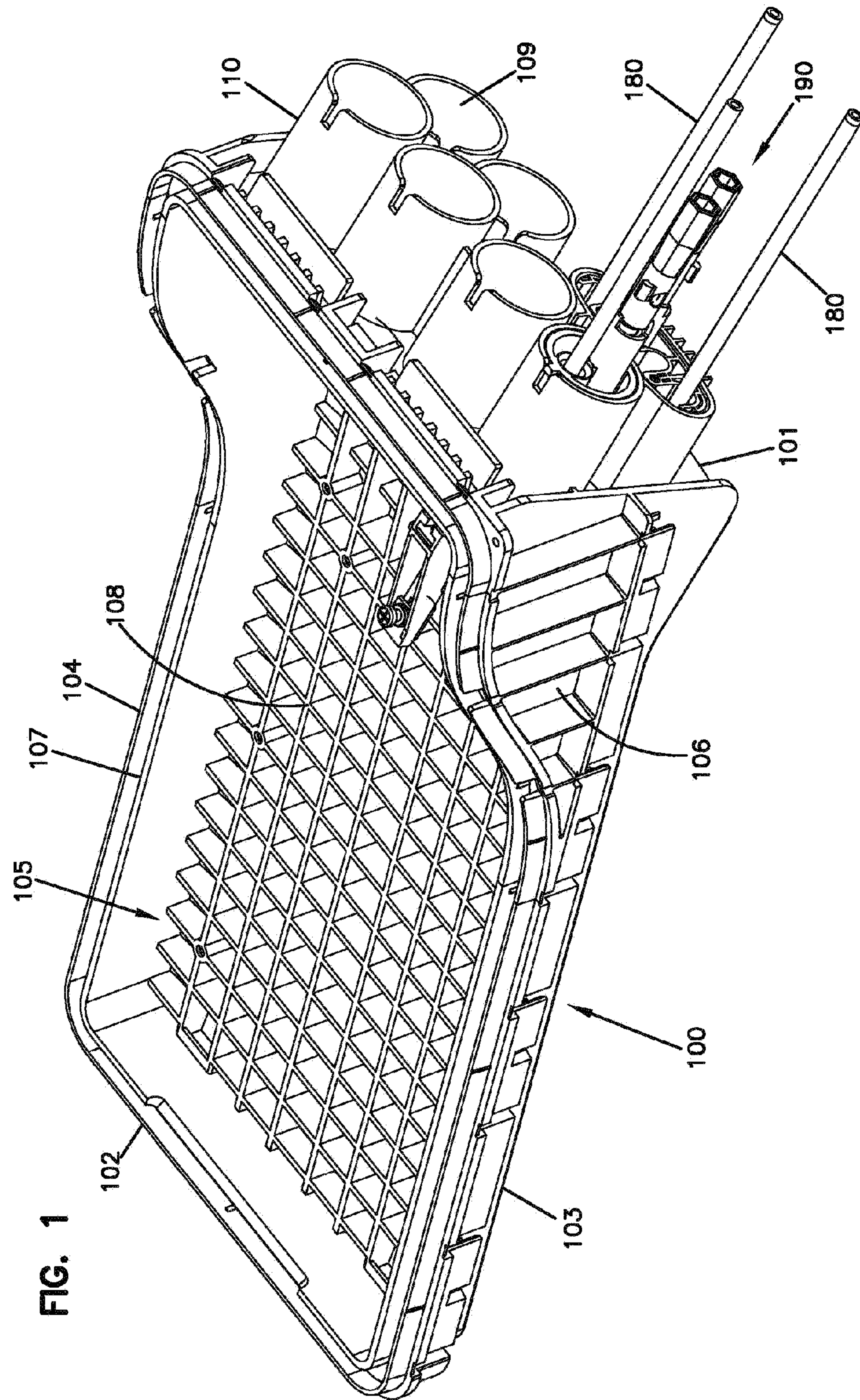


FIG. 2

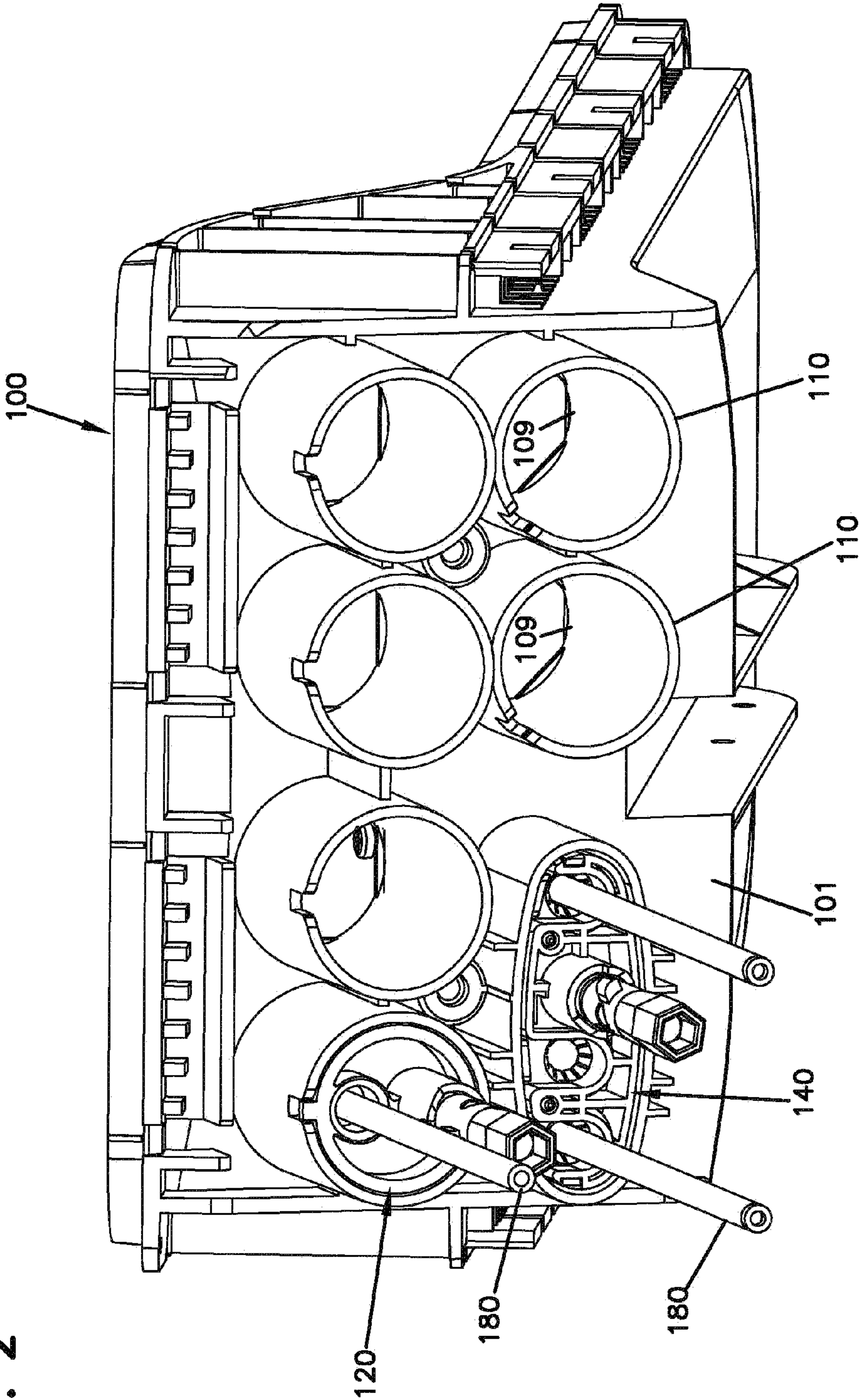


FIG. 3

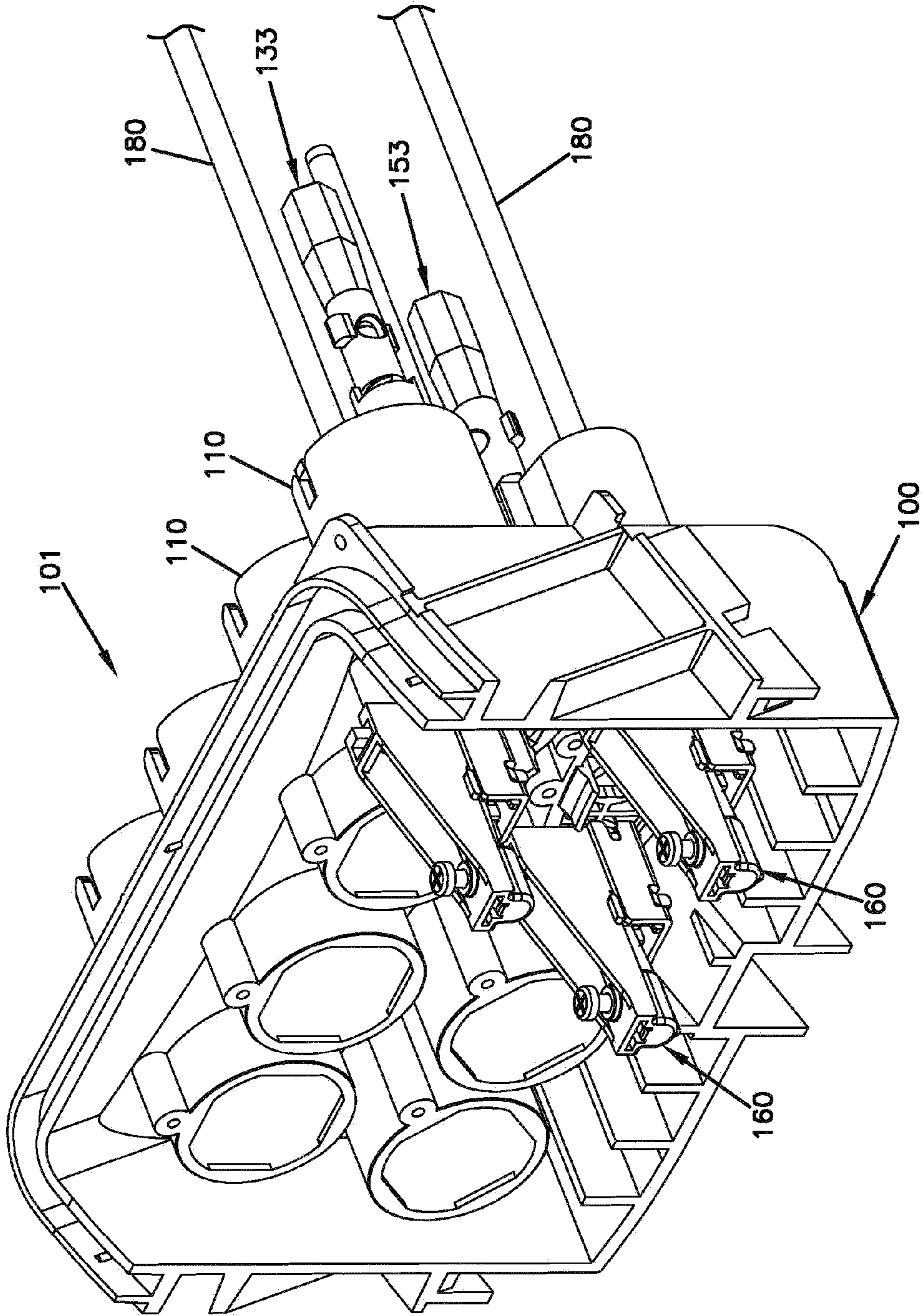


FIG. 4

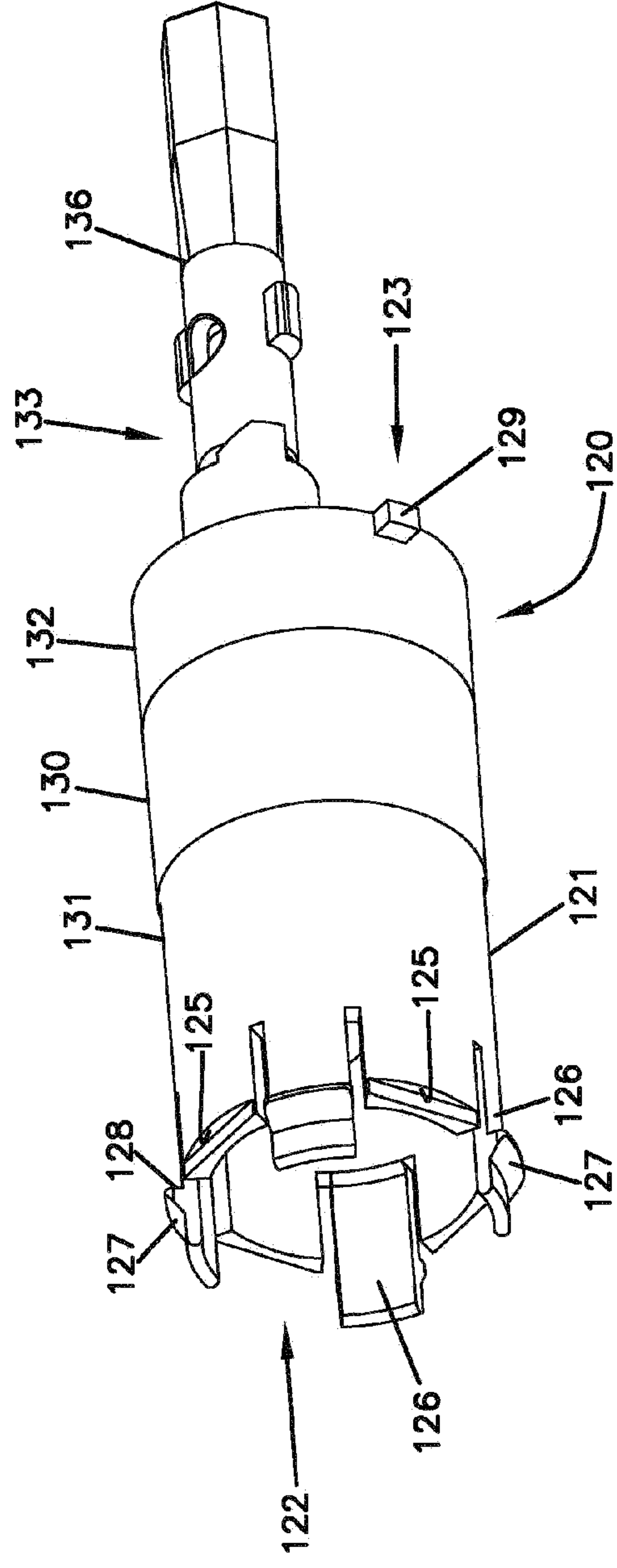


FIG. 5

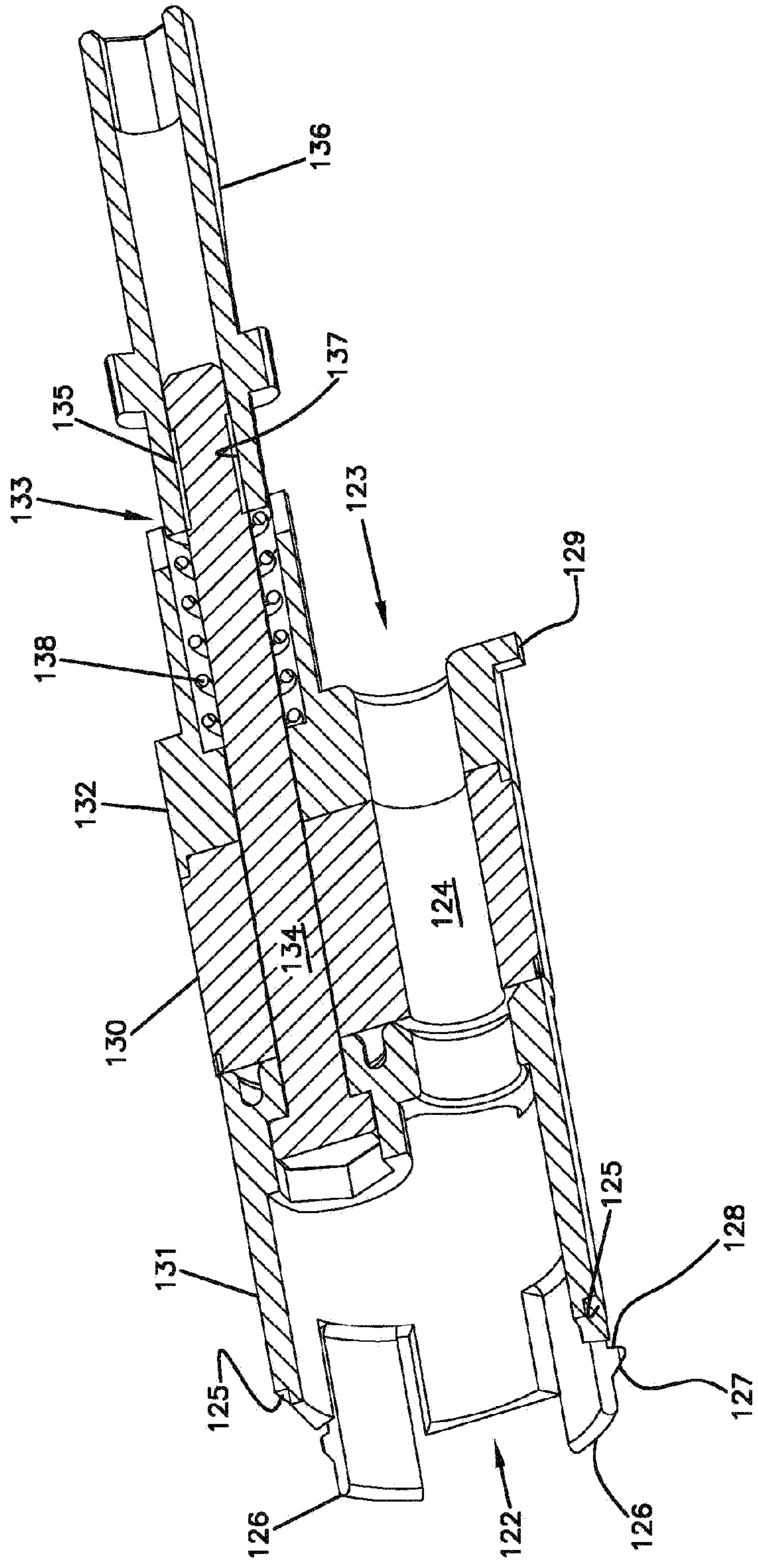


FIG. 6

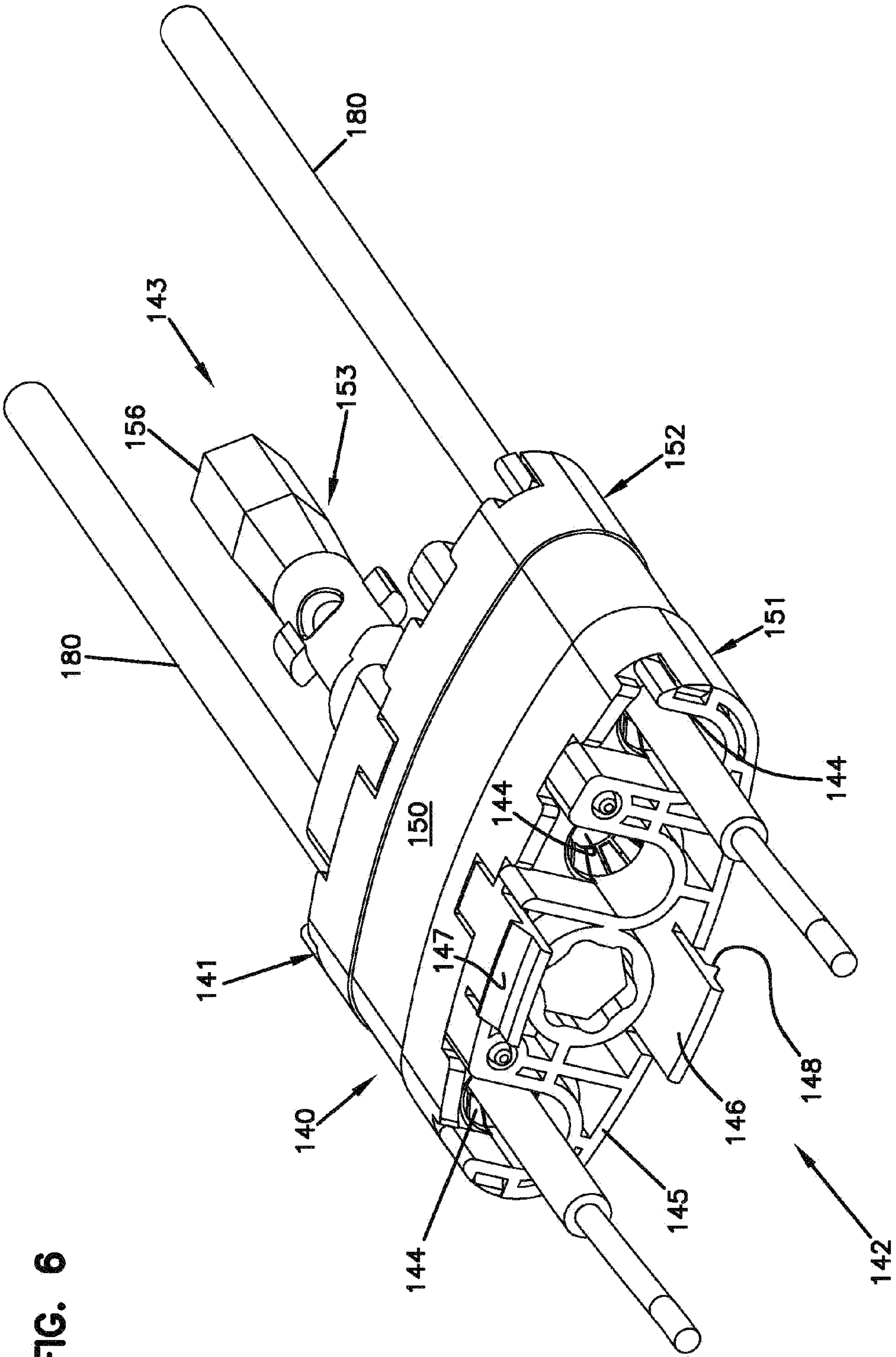


FIG. 7

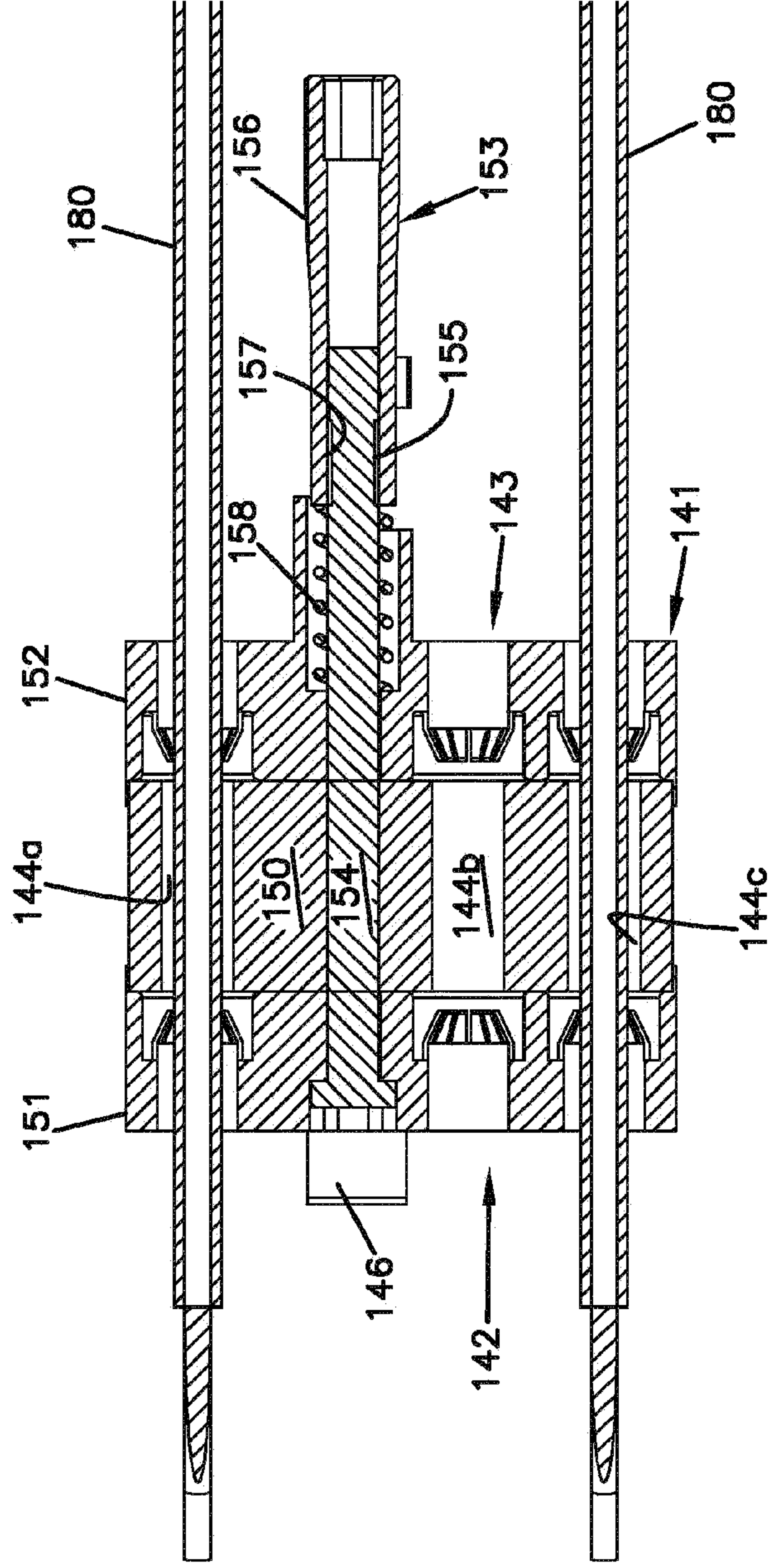
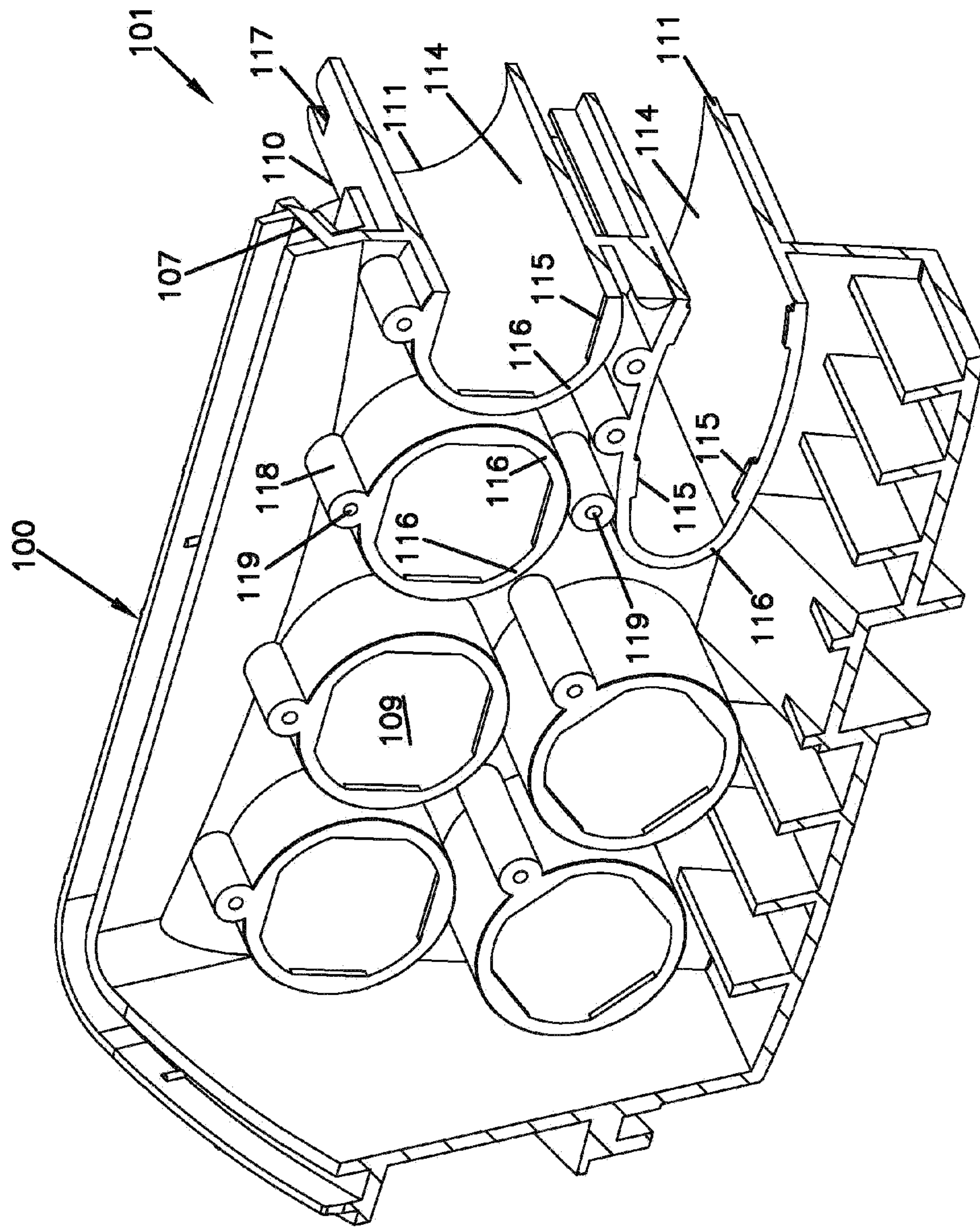
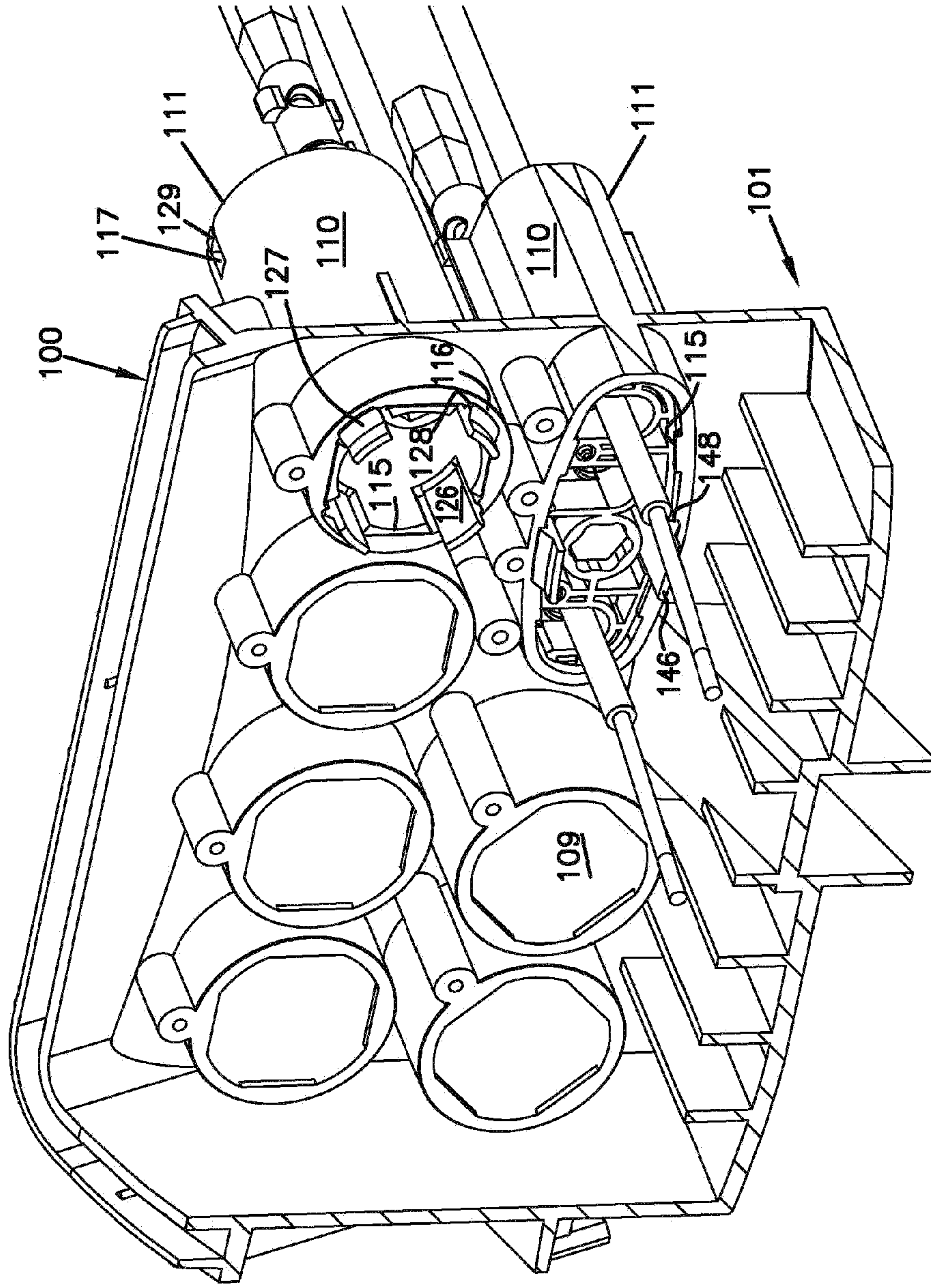


FIG. 8



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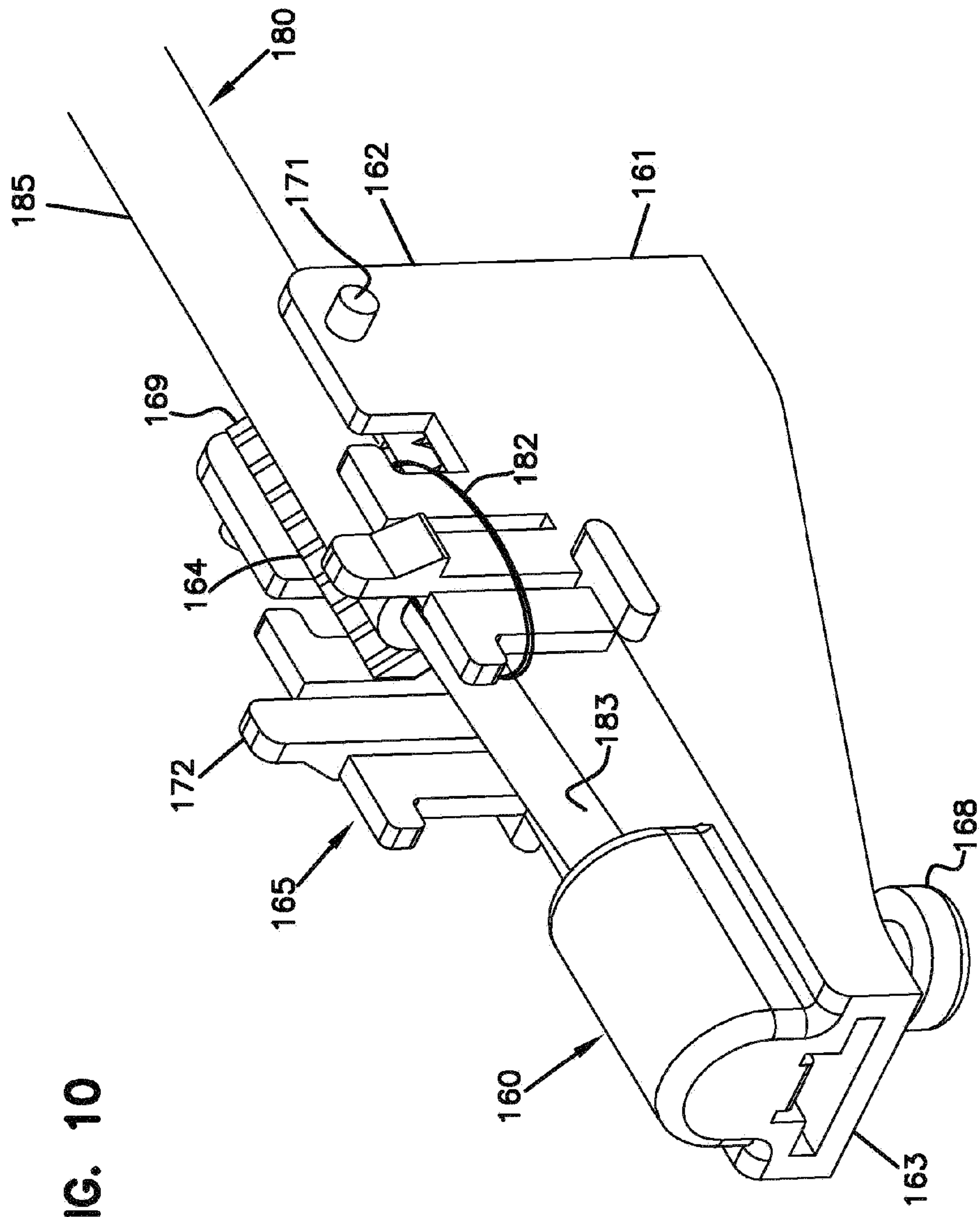


FIG. 10

FIG. 11

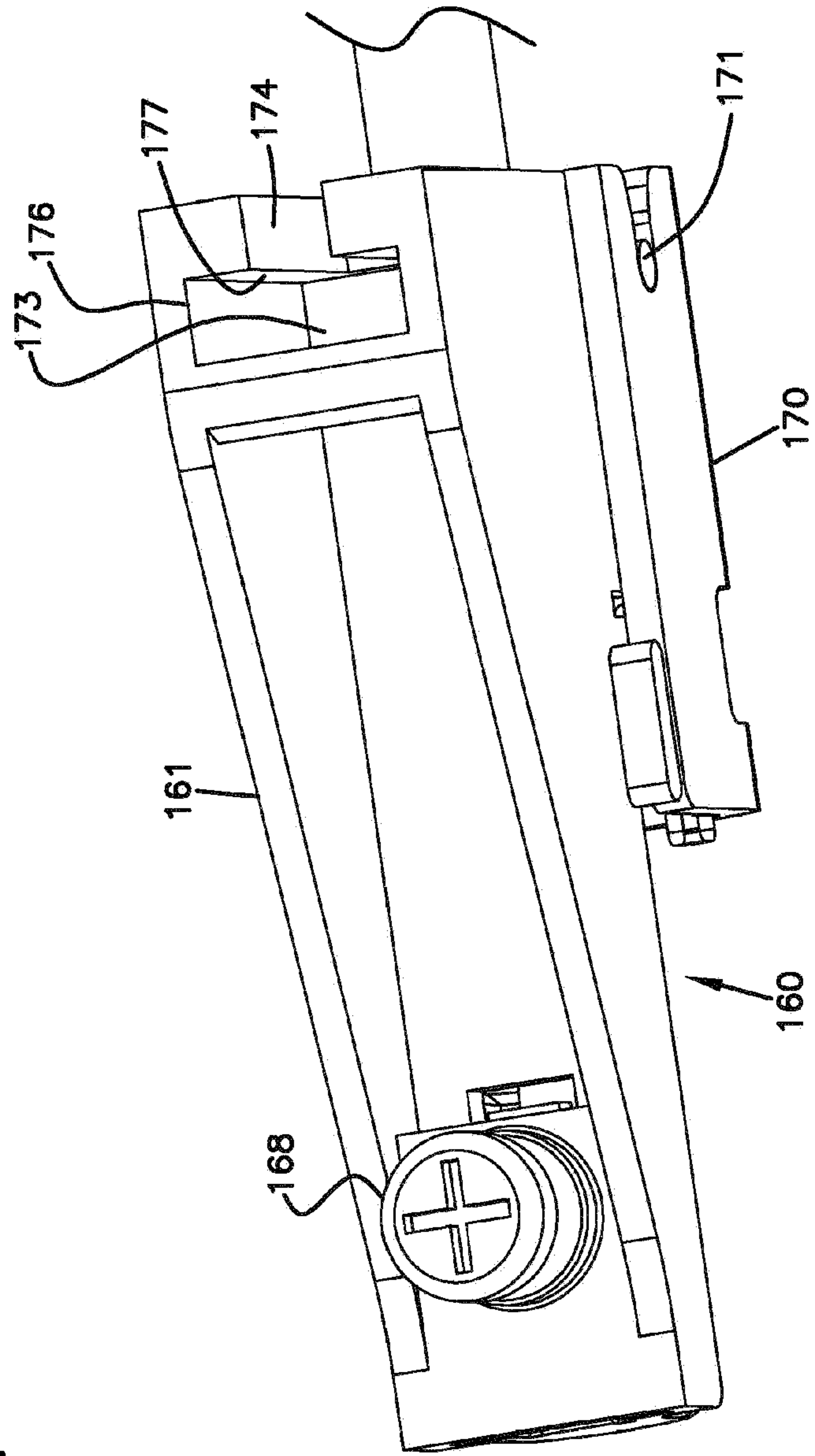


FIG. 12

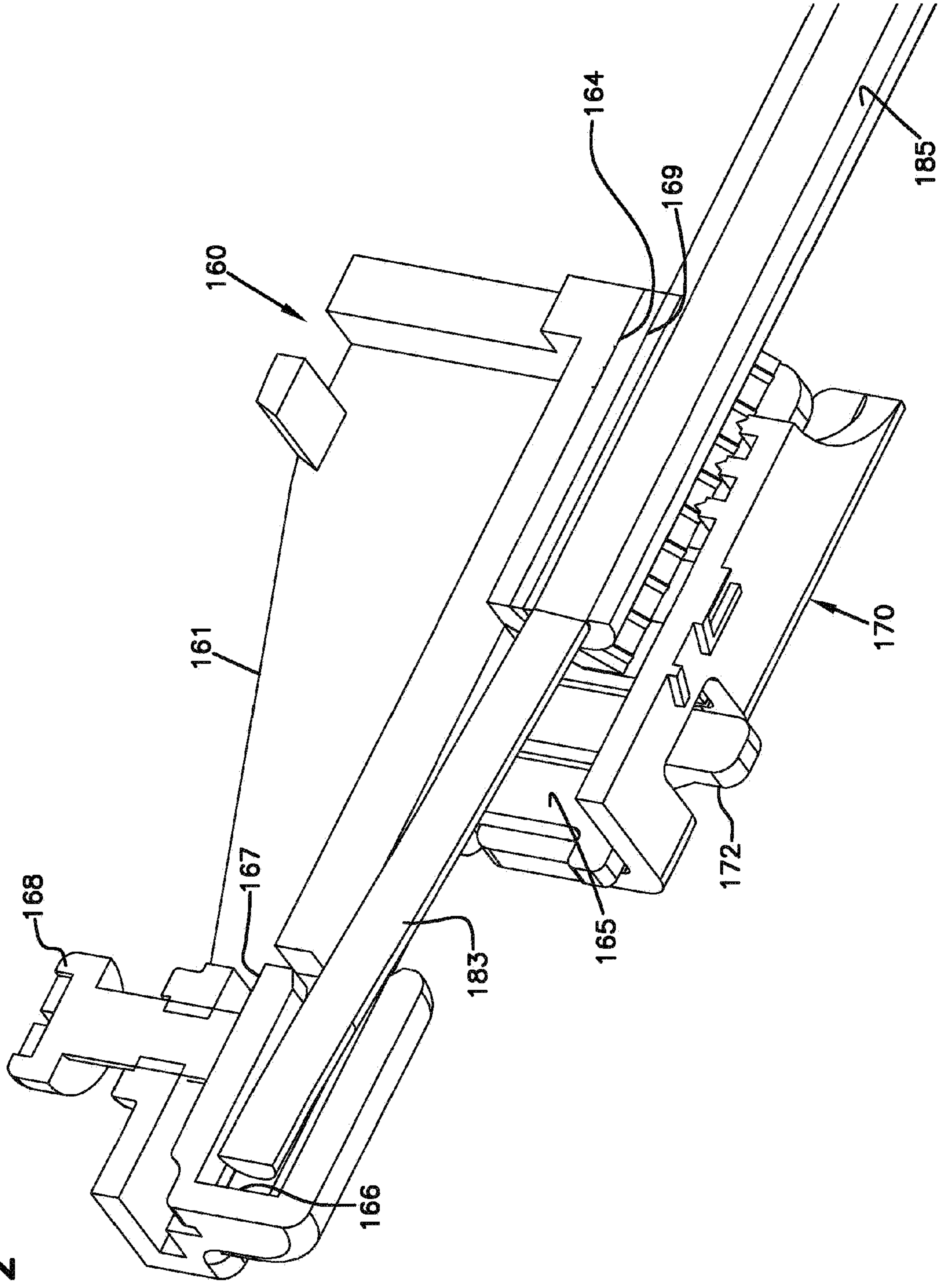


FIG. 13

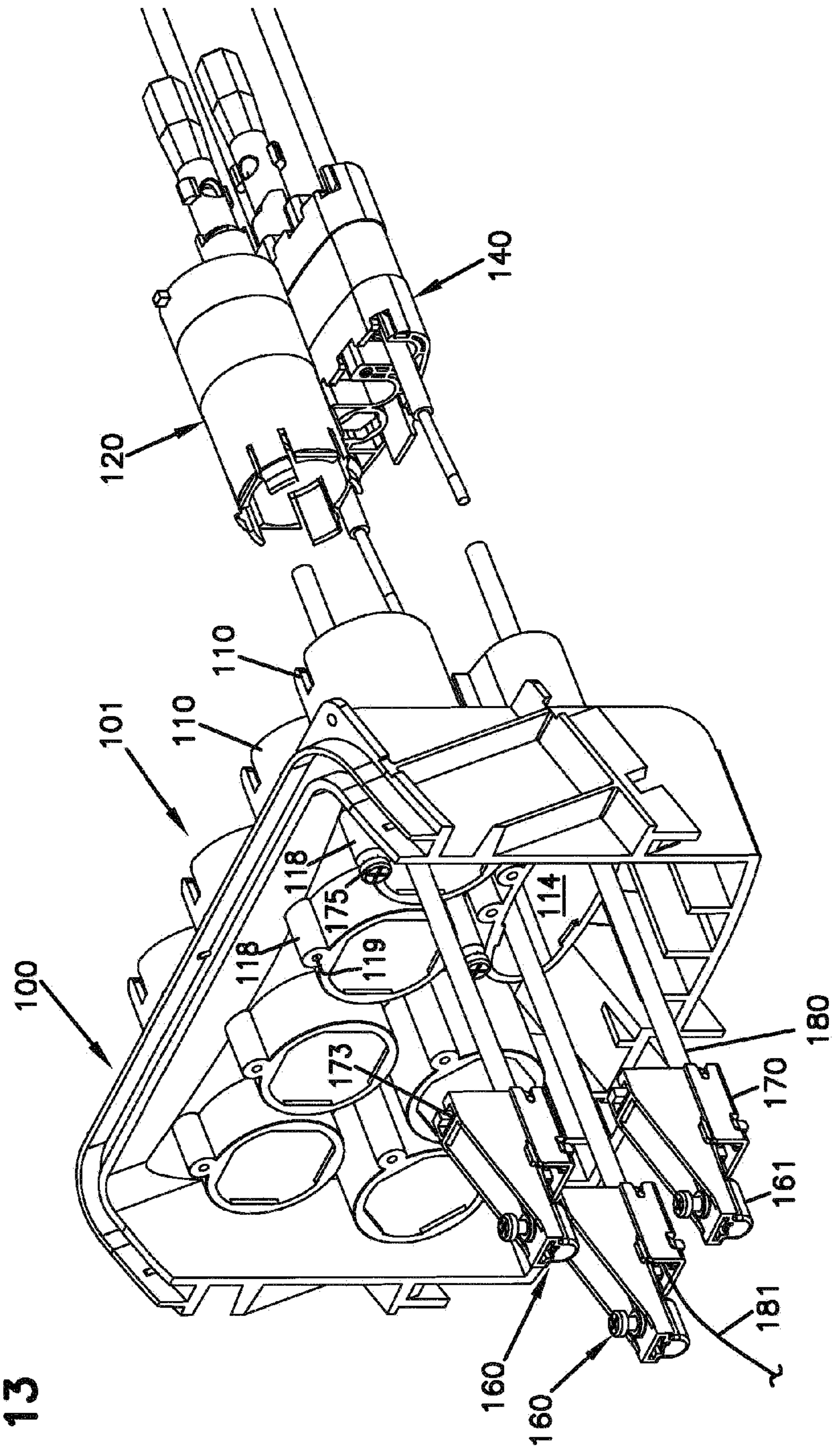


FIG. 14

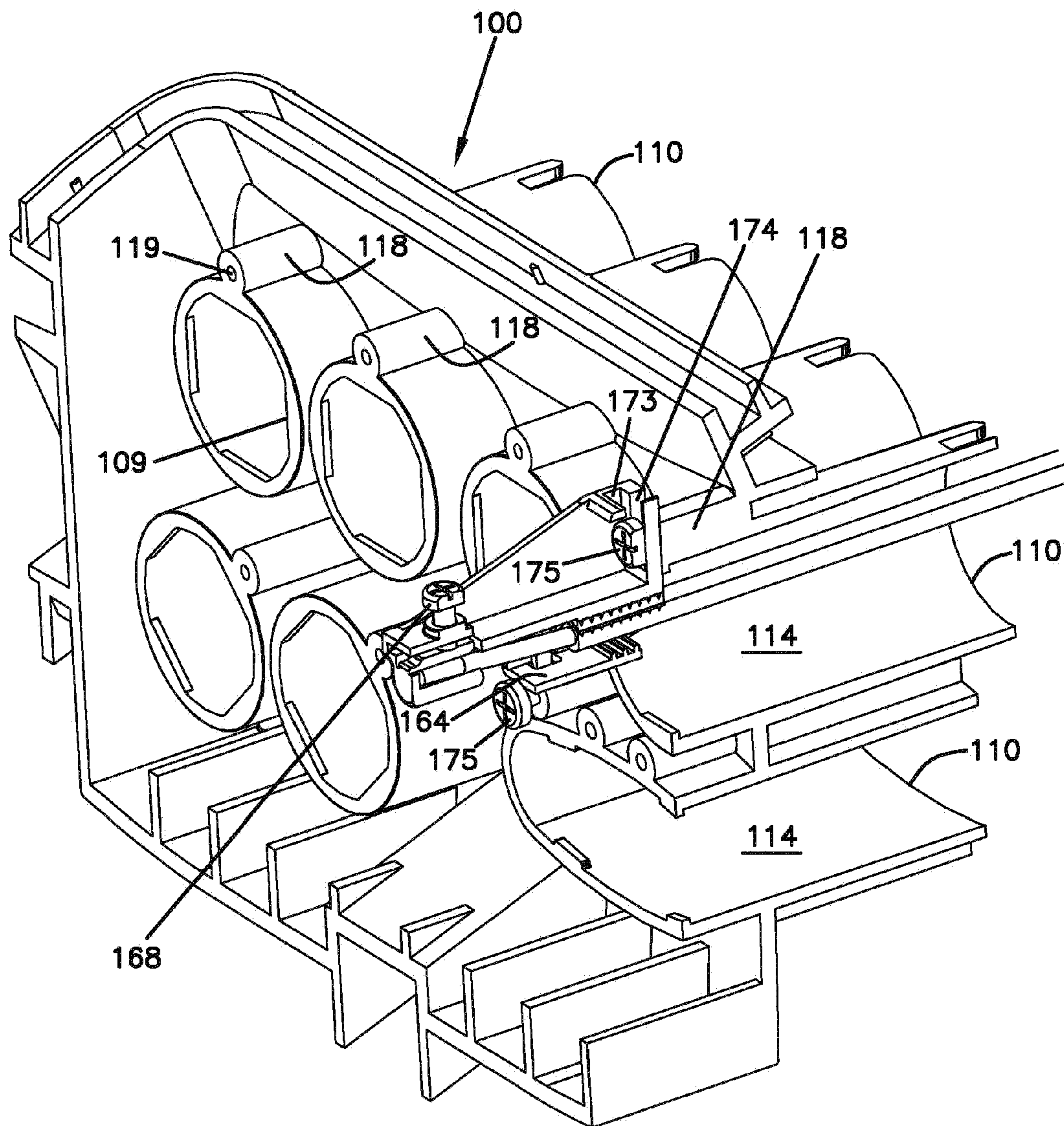
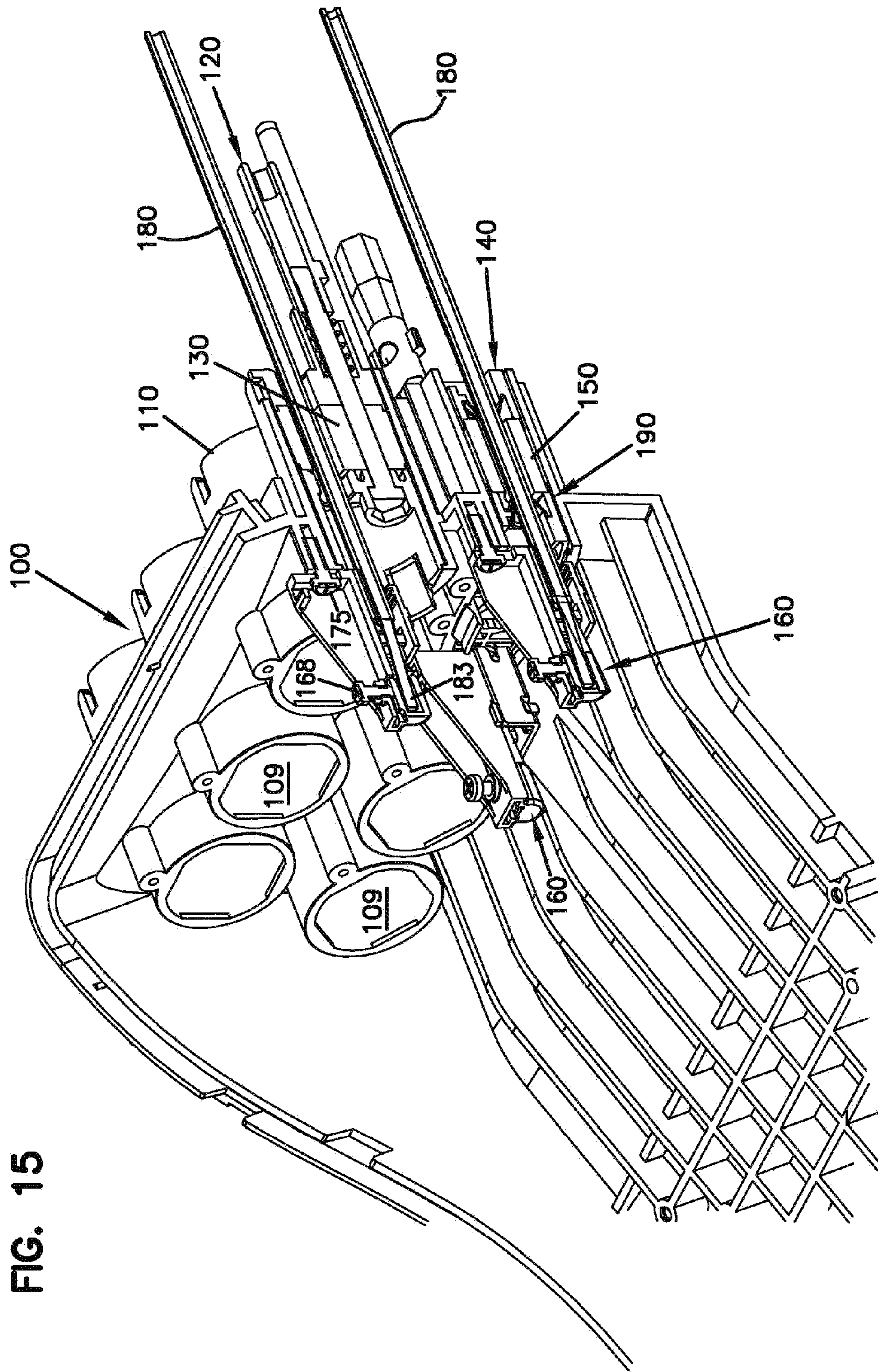
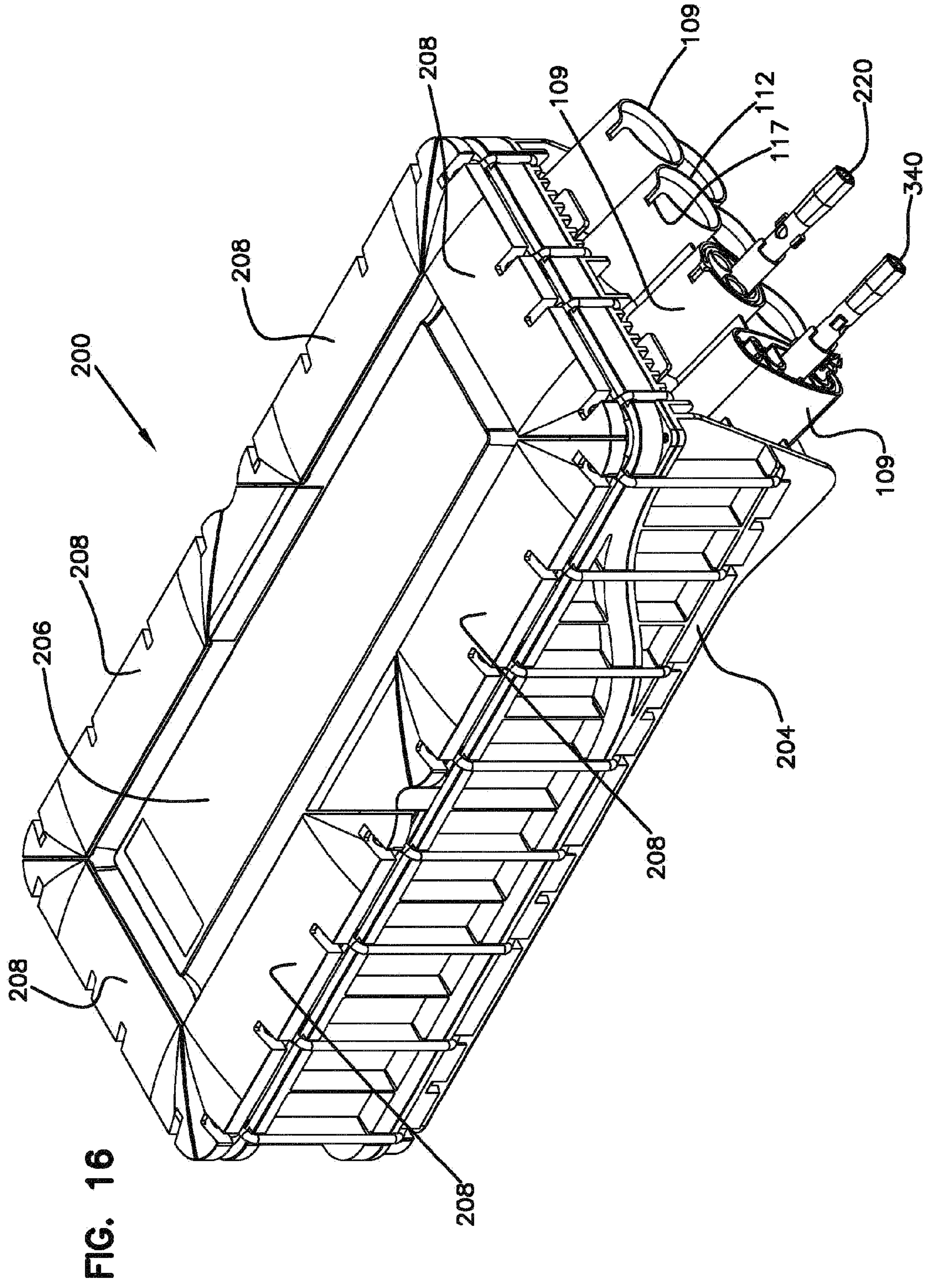


FIG. 15





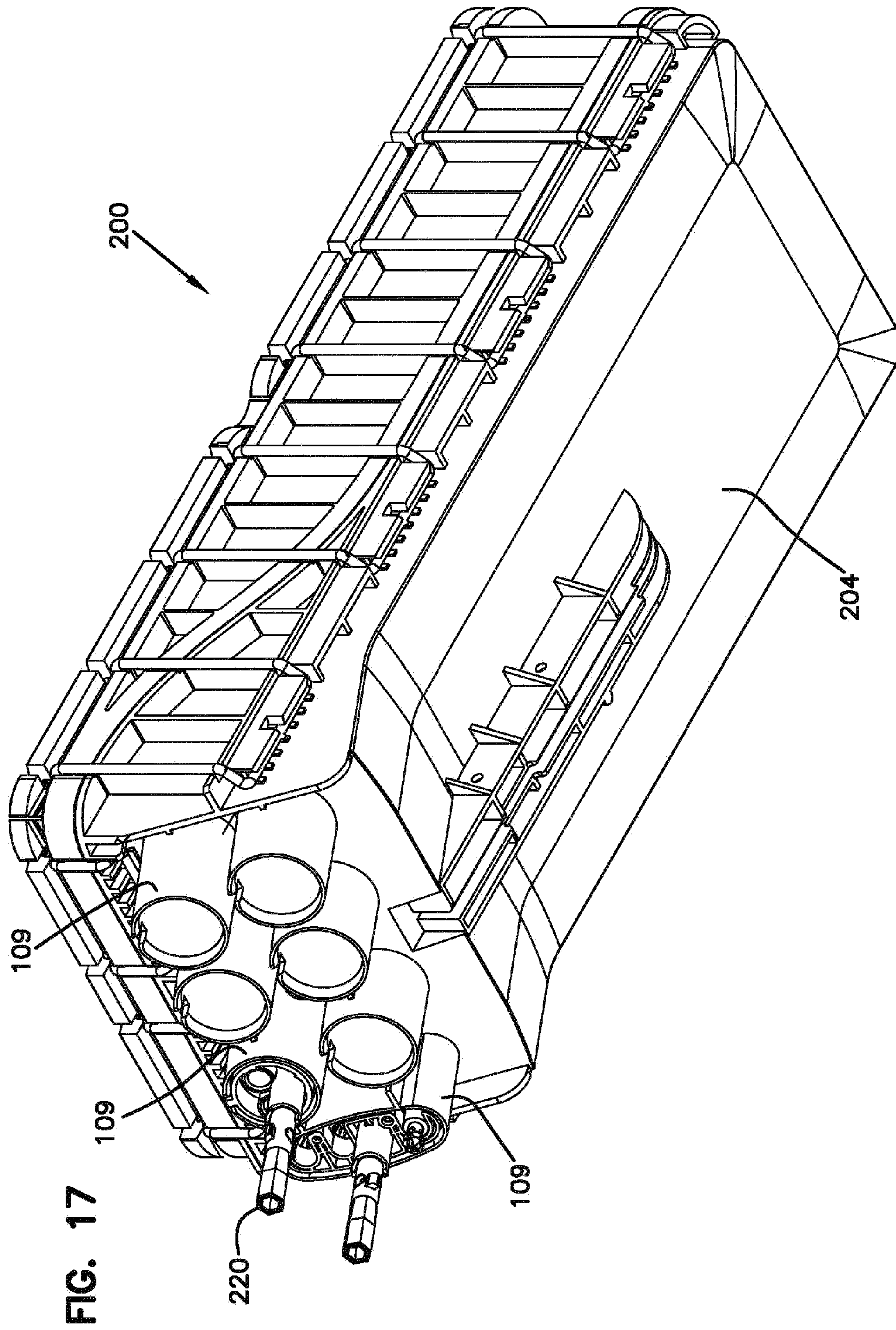
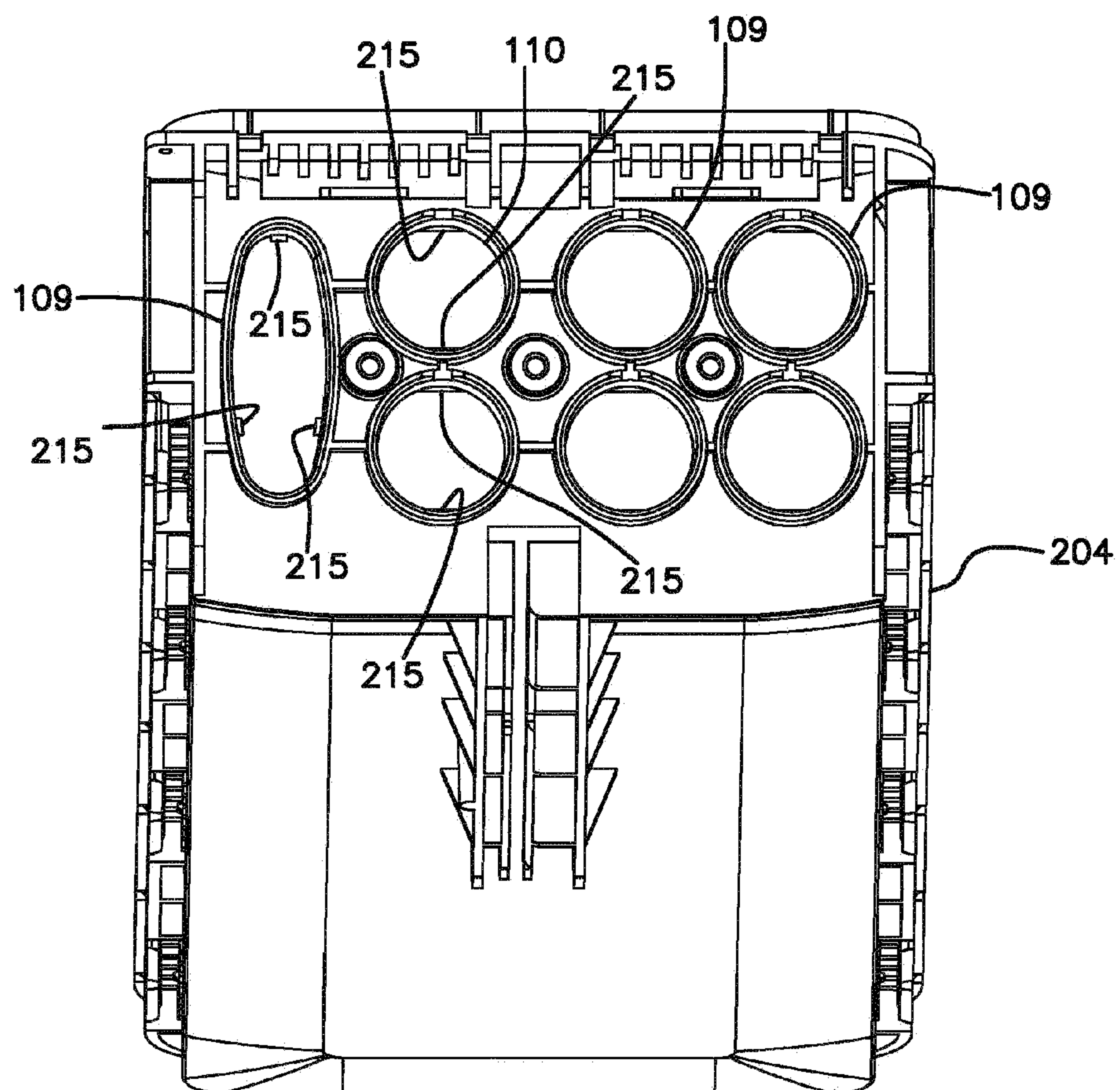
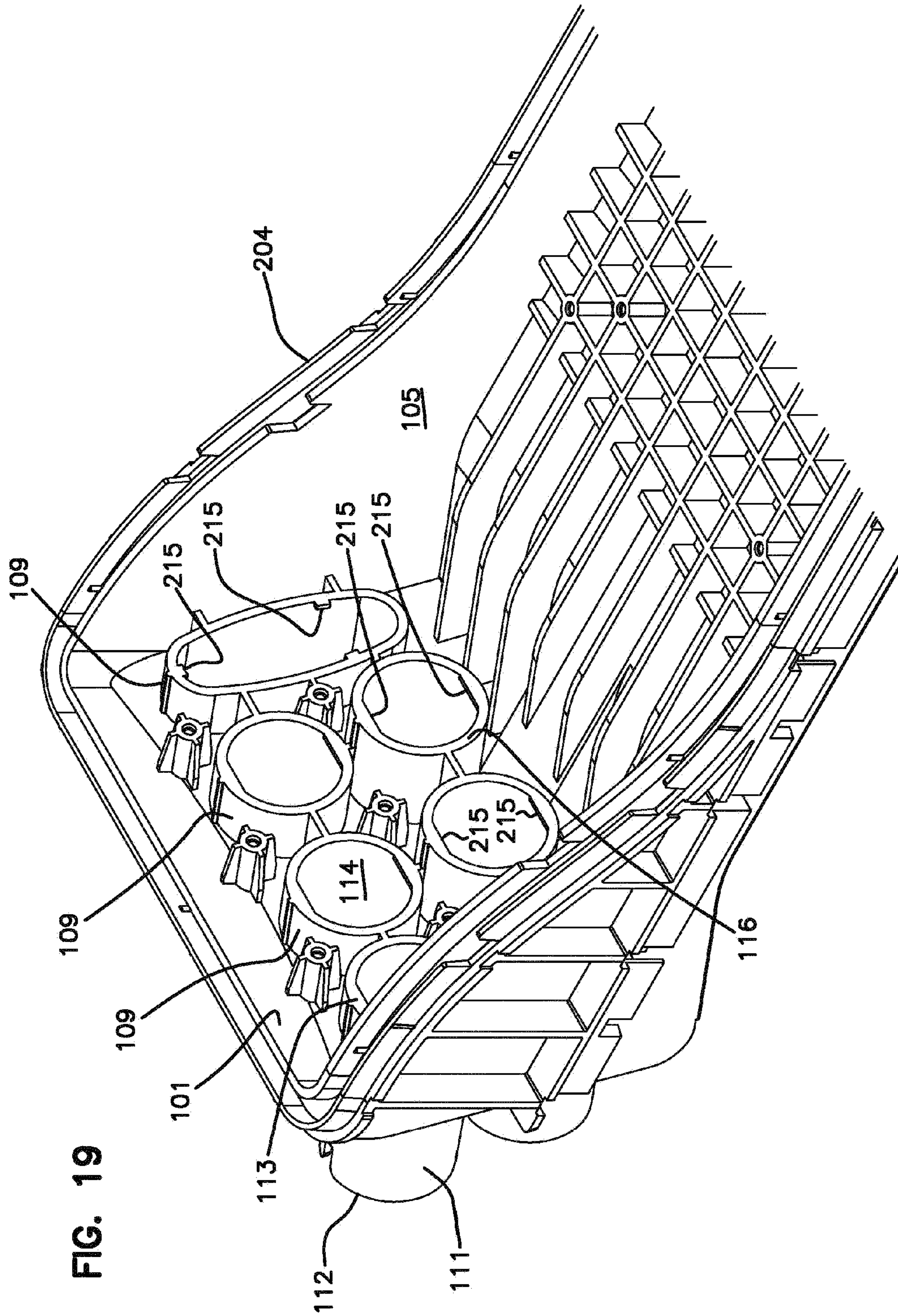


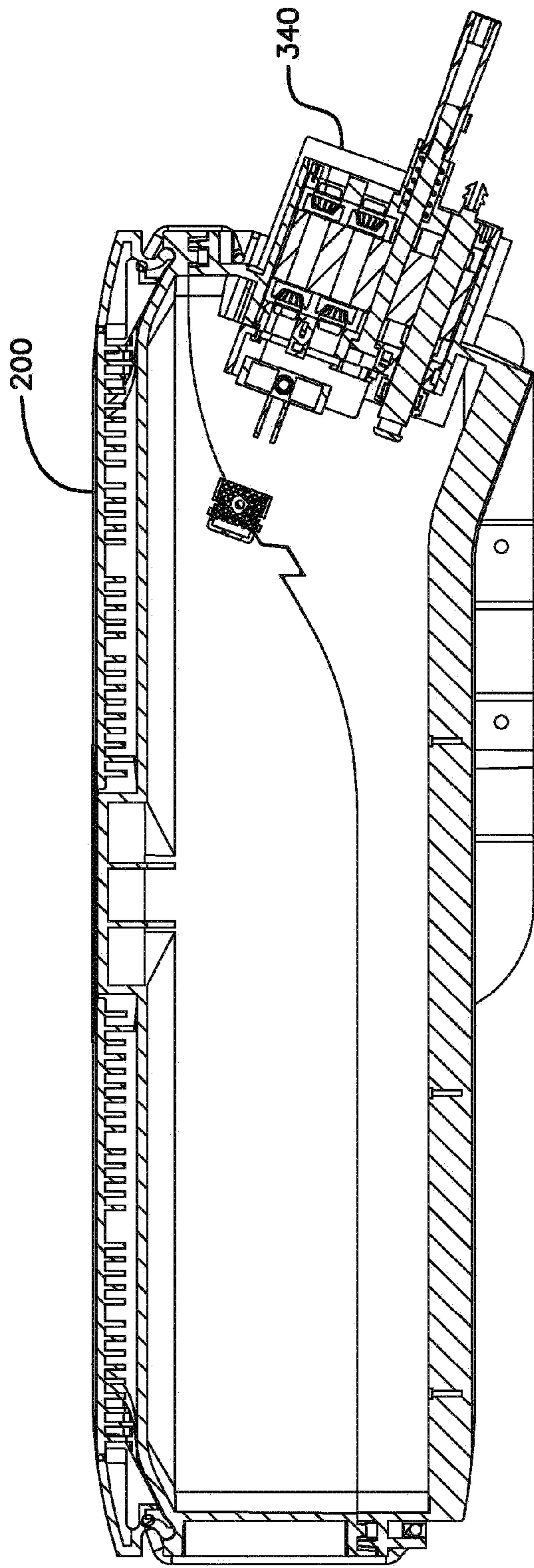
FIG. 18





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FIG. 20



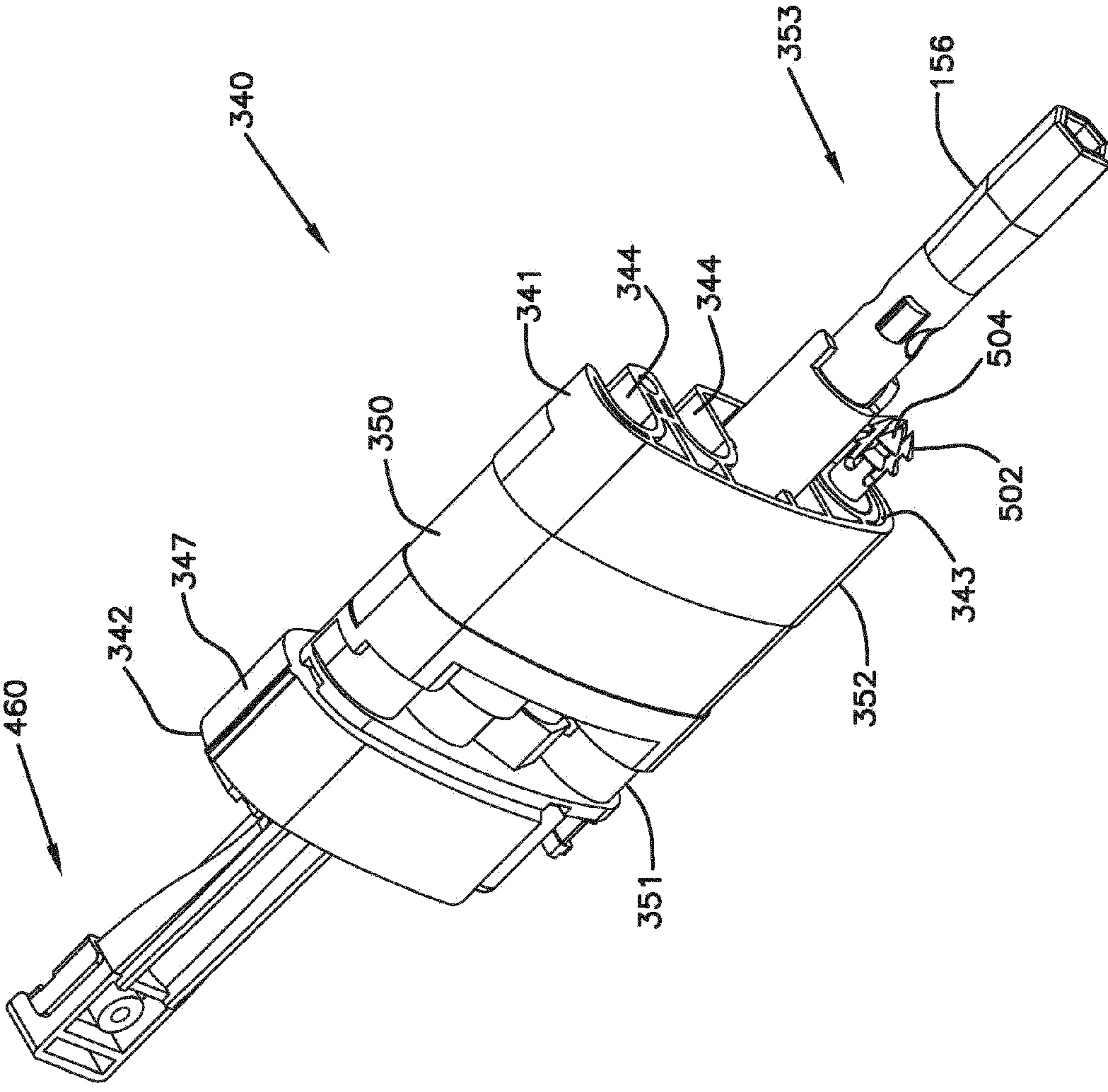
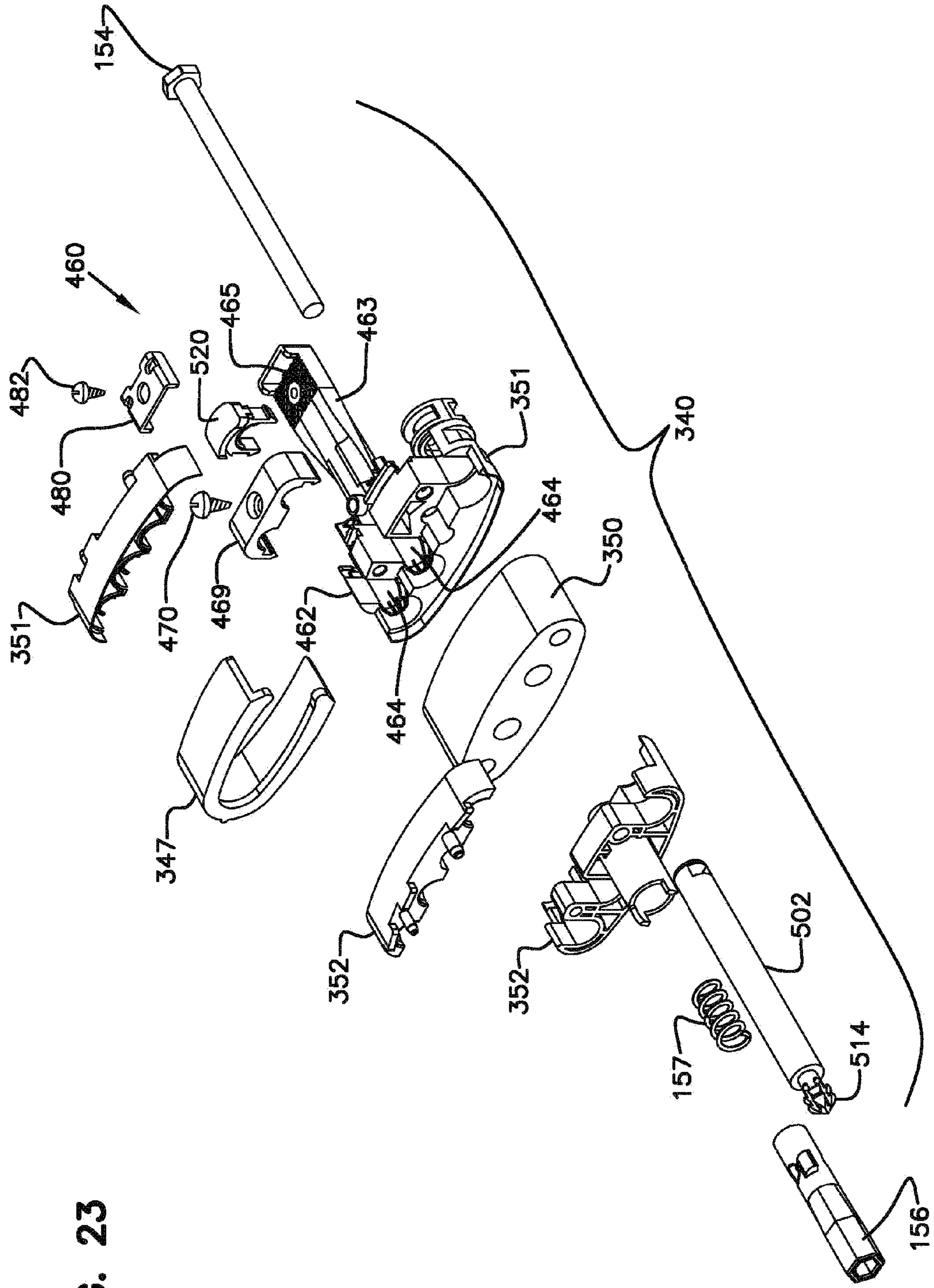


FIG. 21

FIG. 23



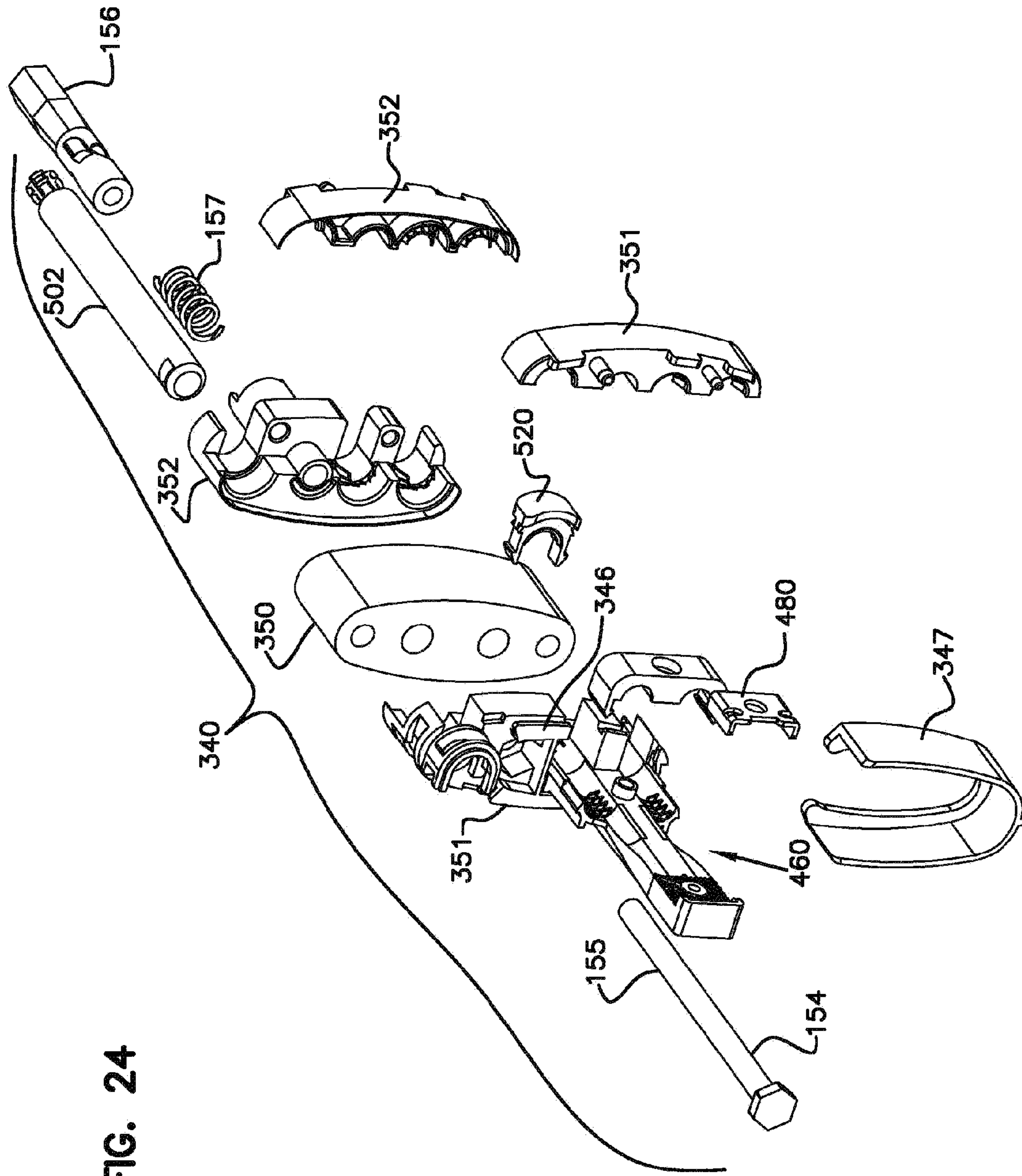


FIG. 24

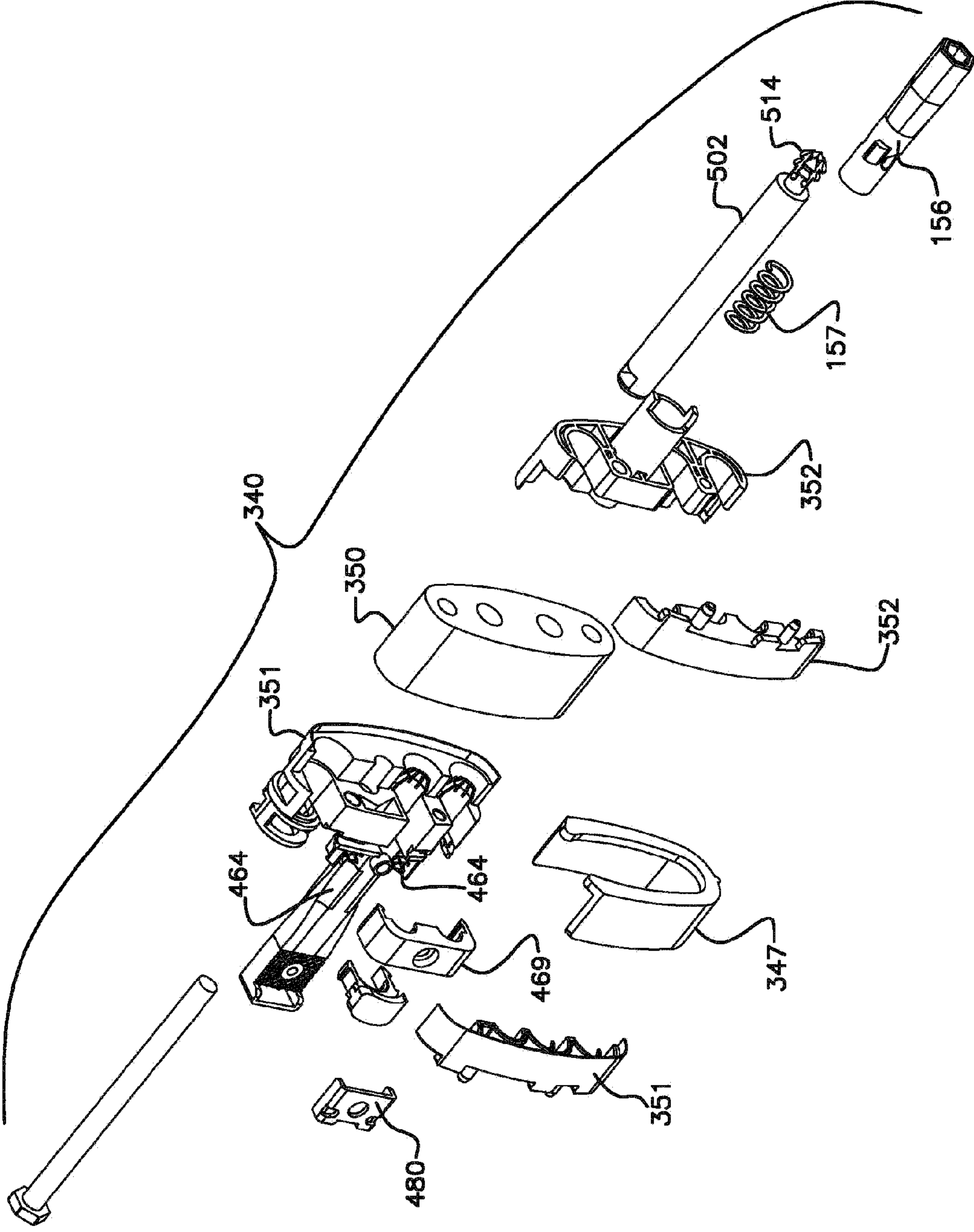
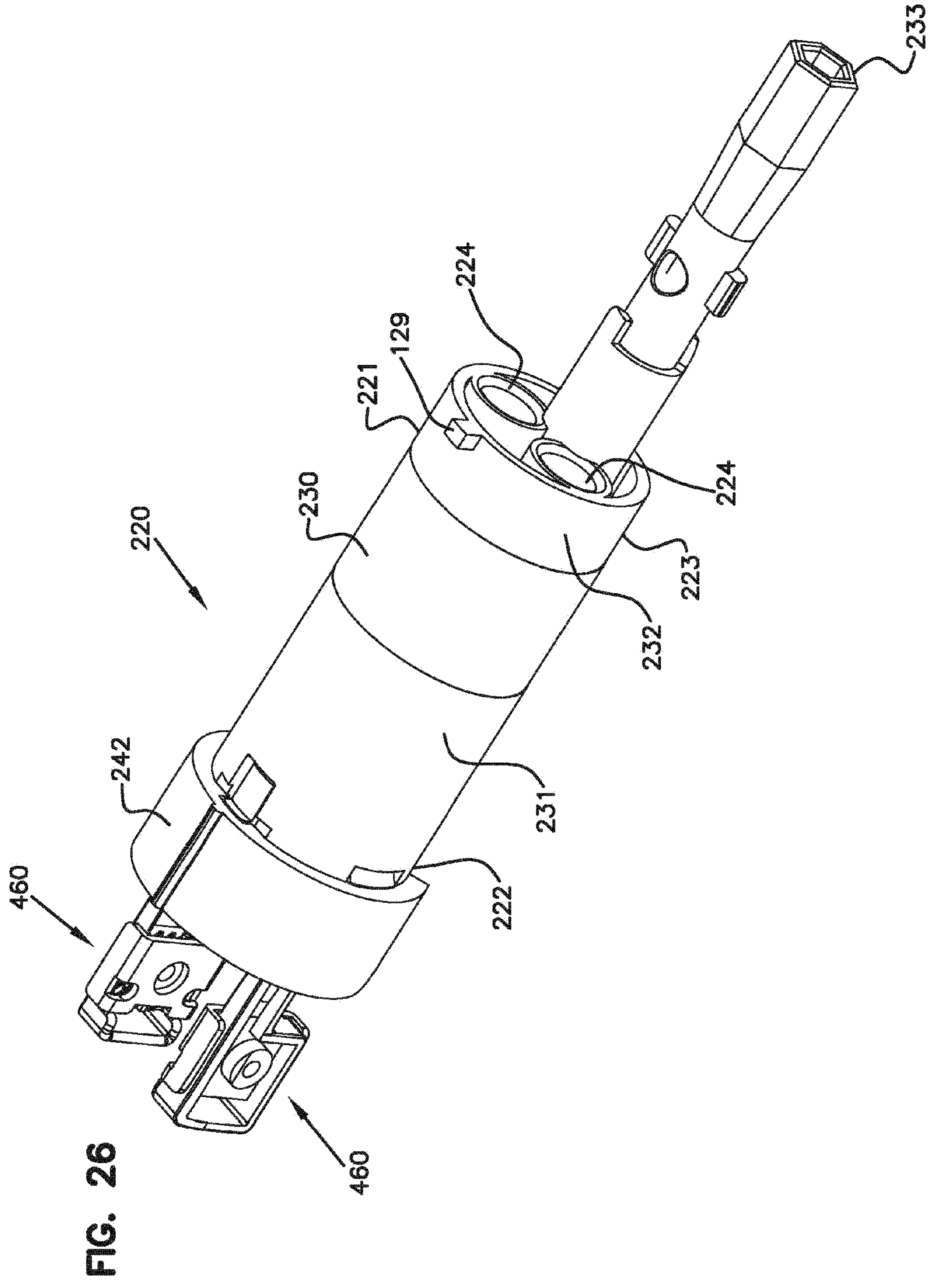
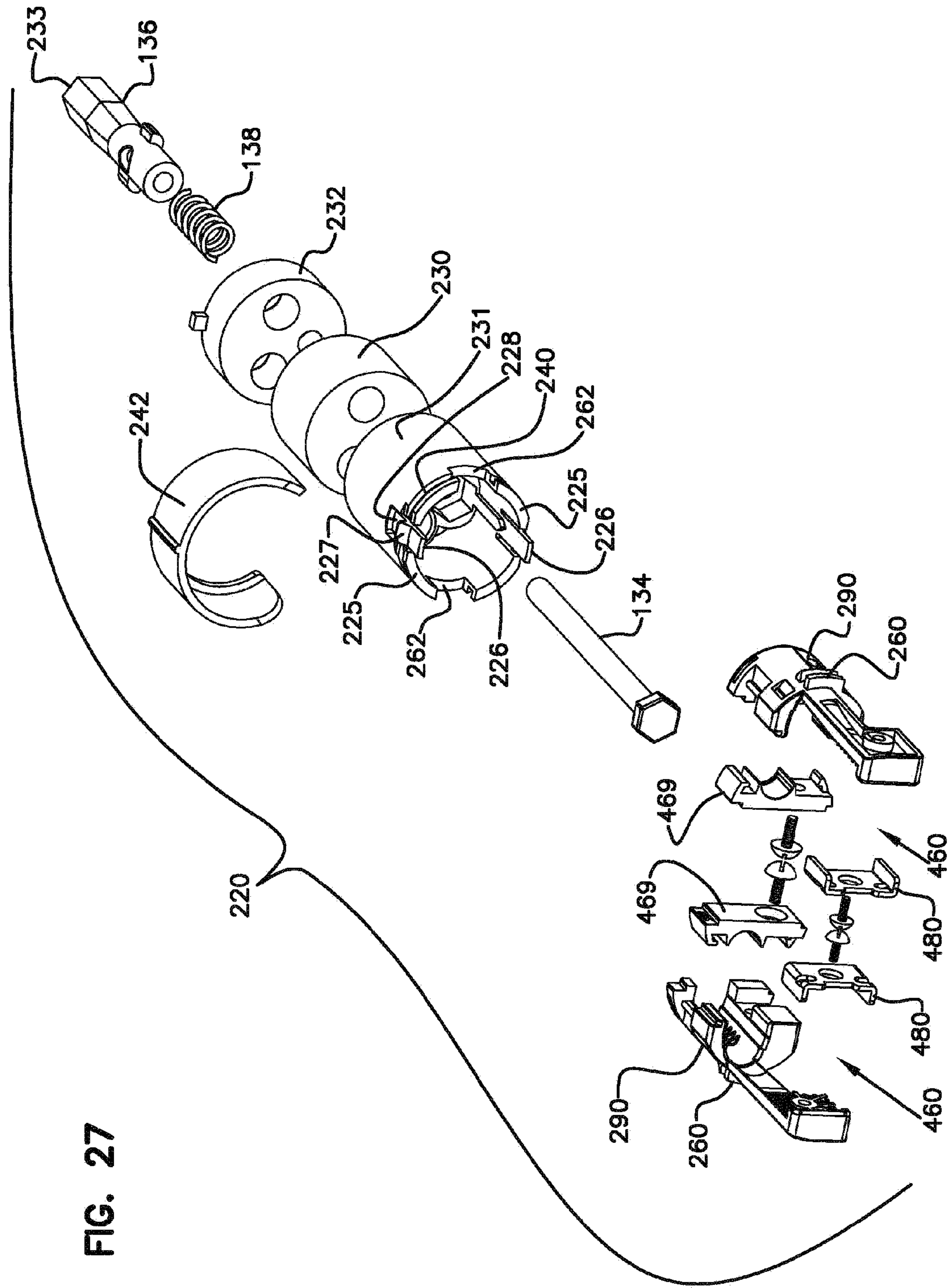


FIG. 25





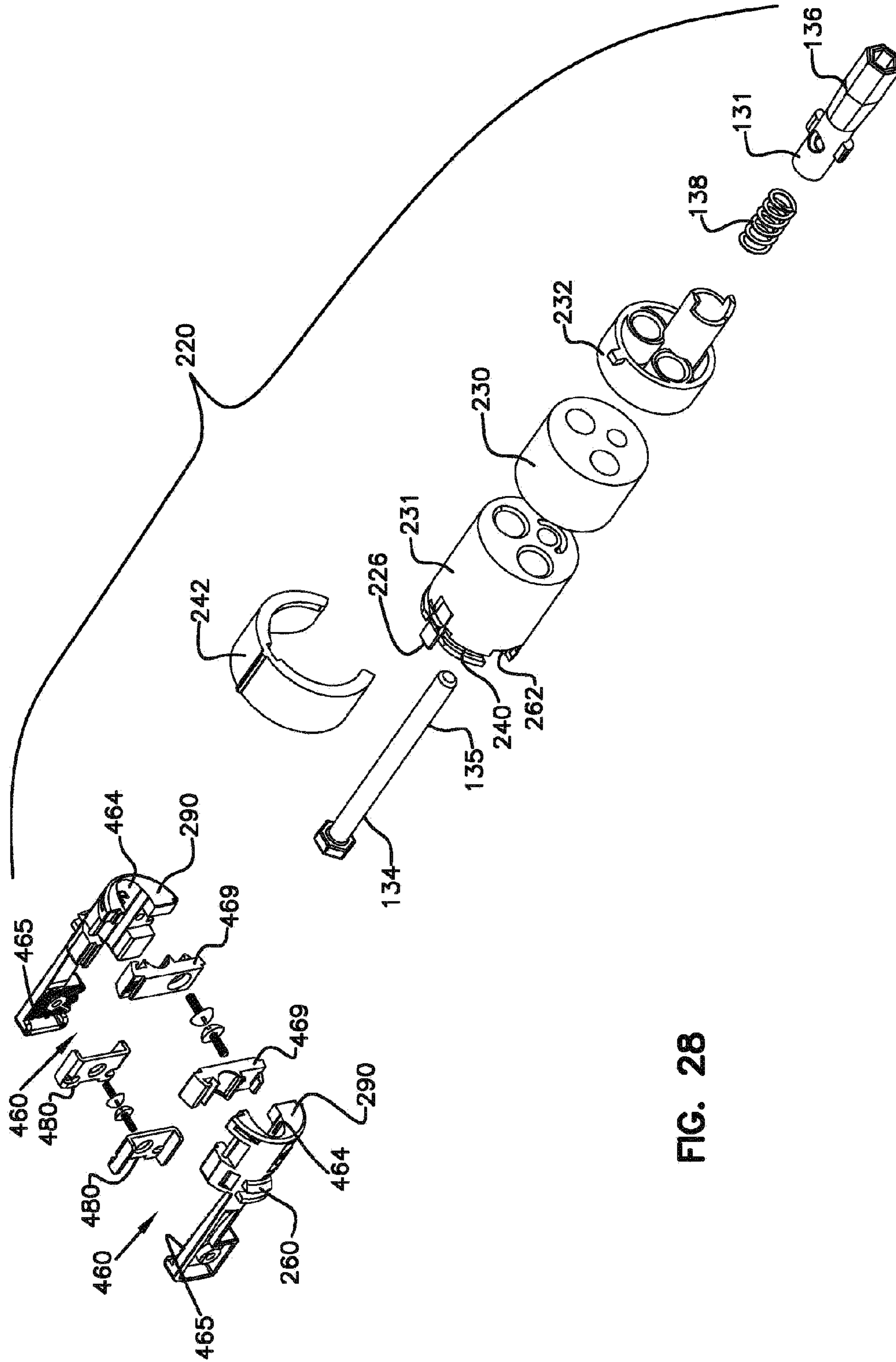


FIG. 28

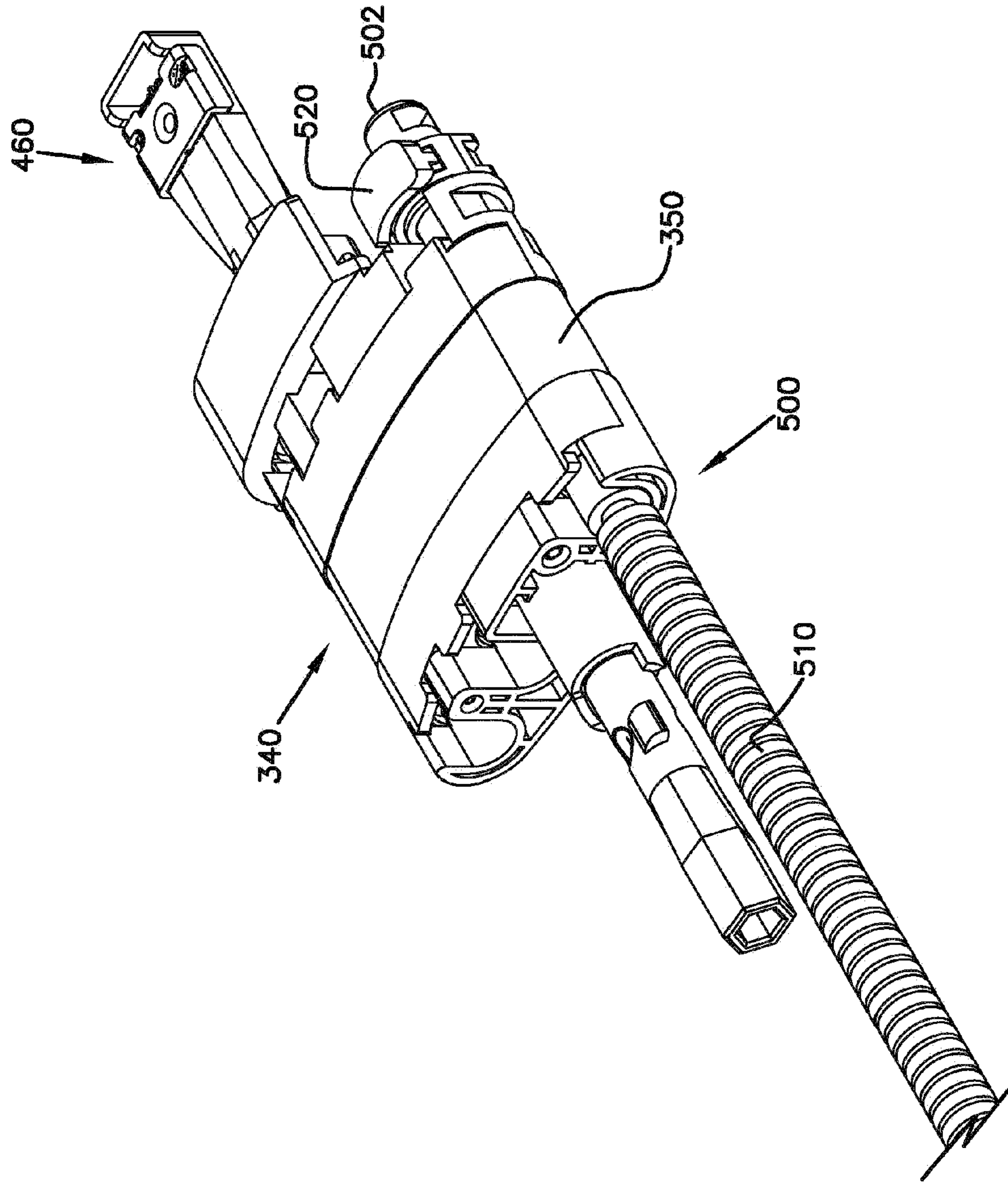
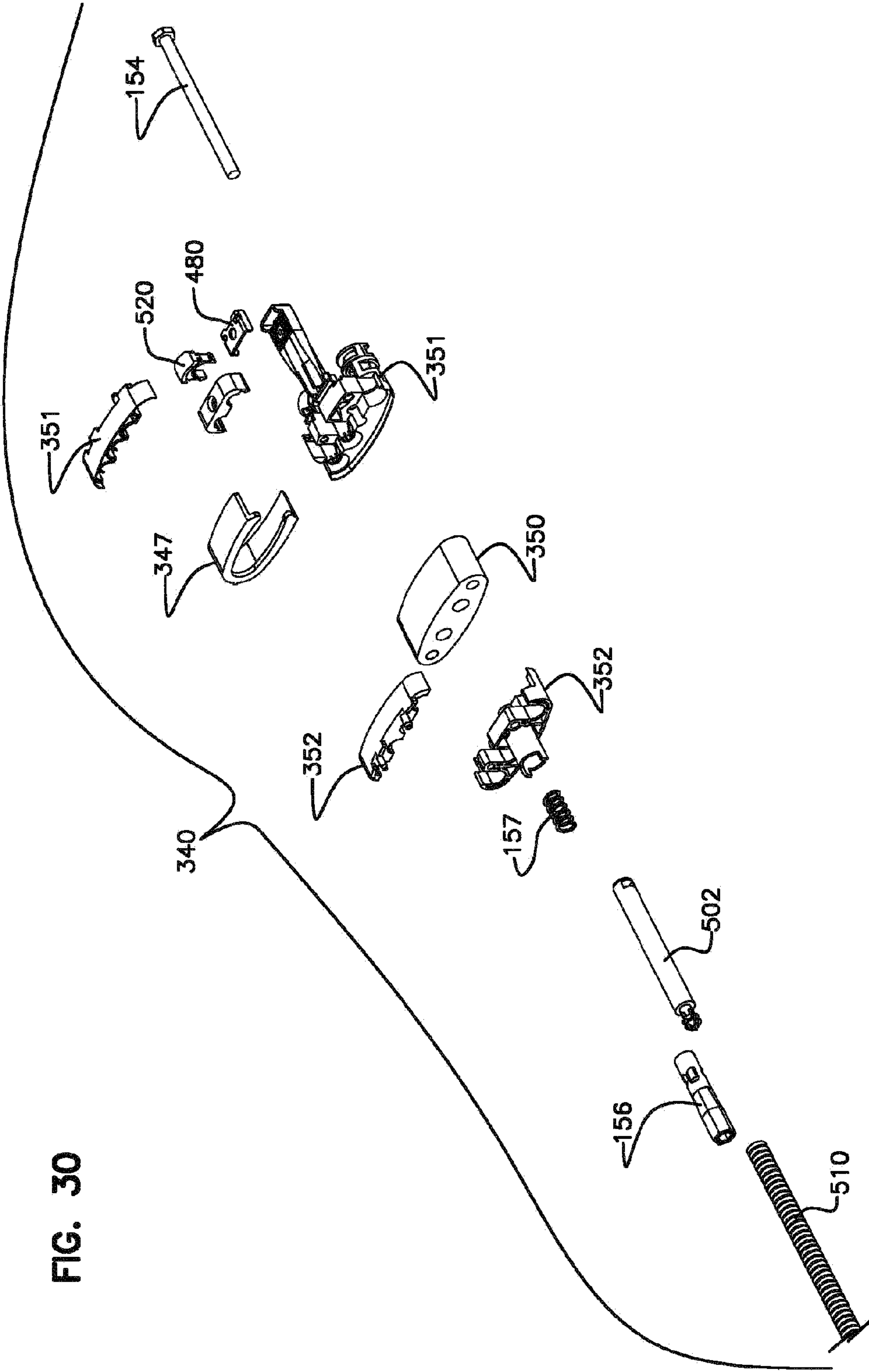


FIG. 29

FIG. 30



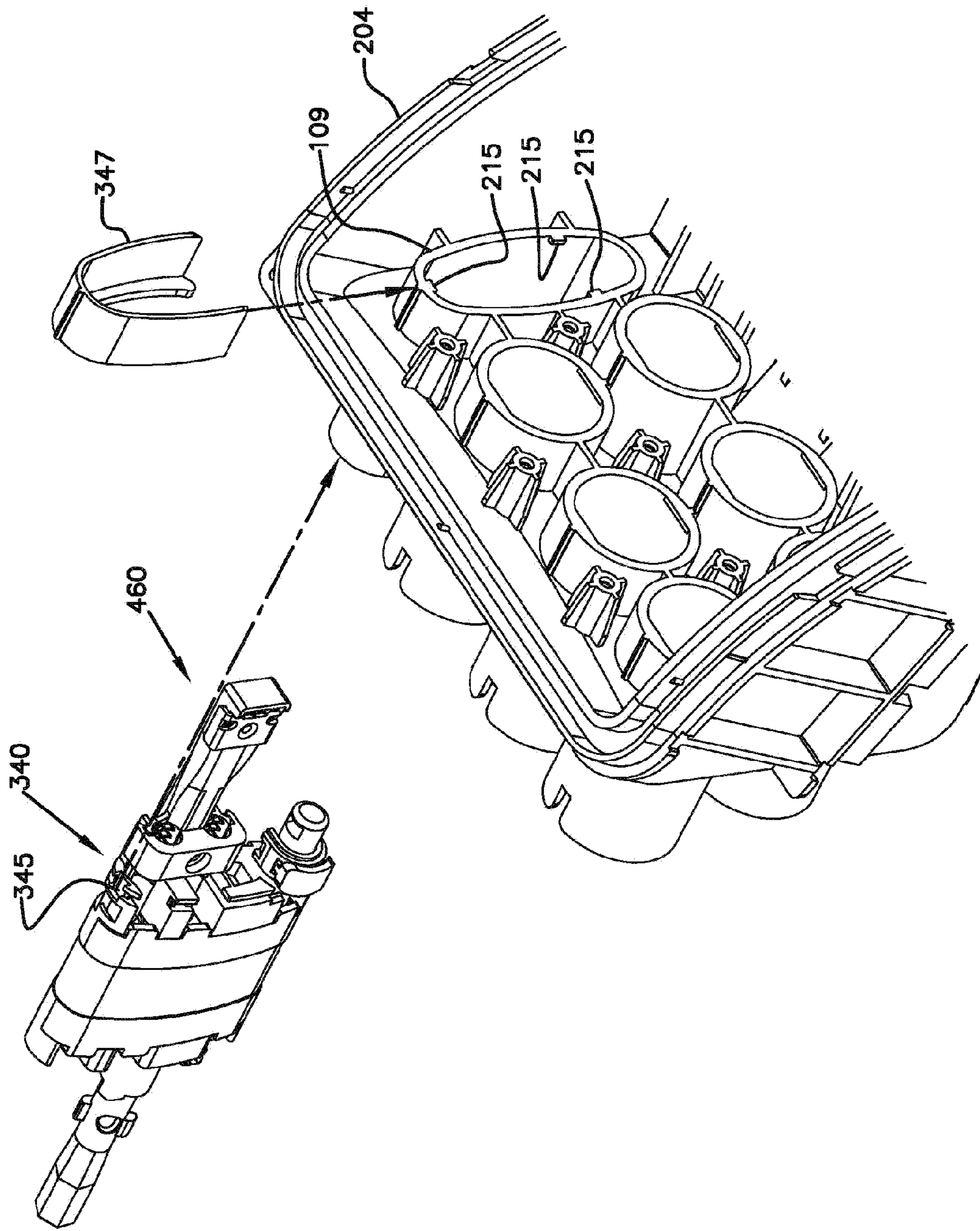
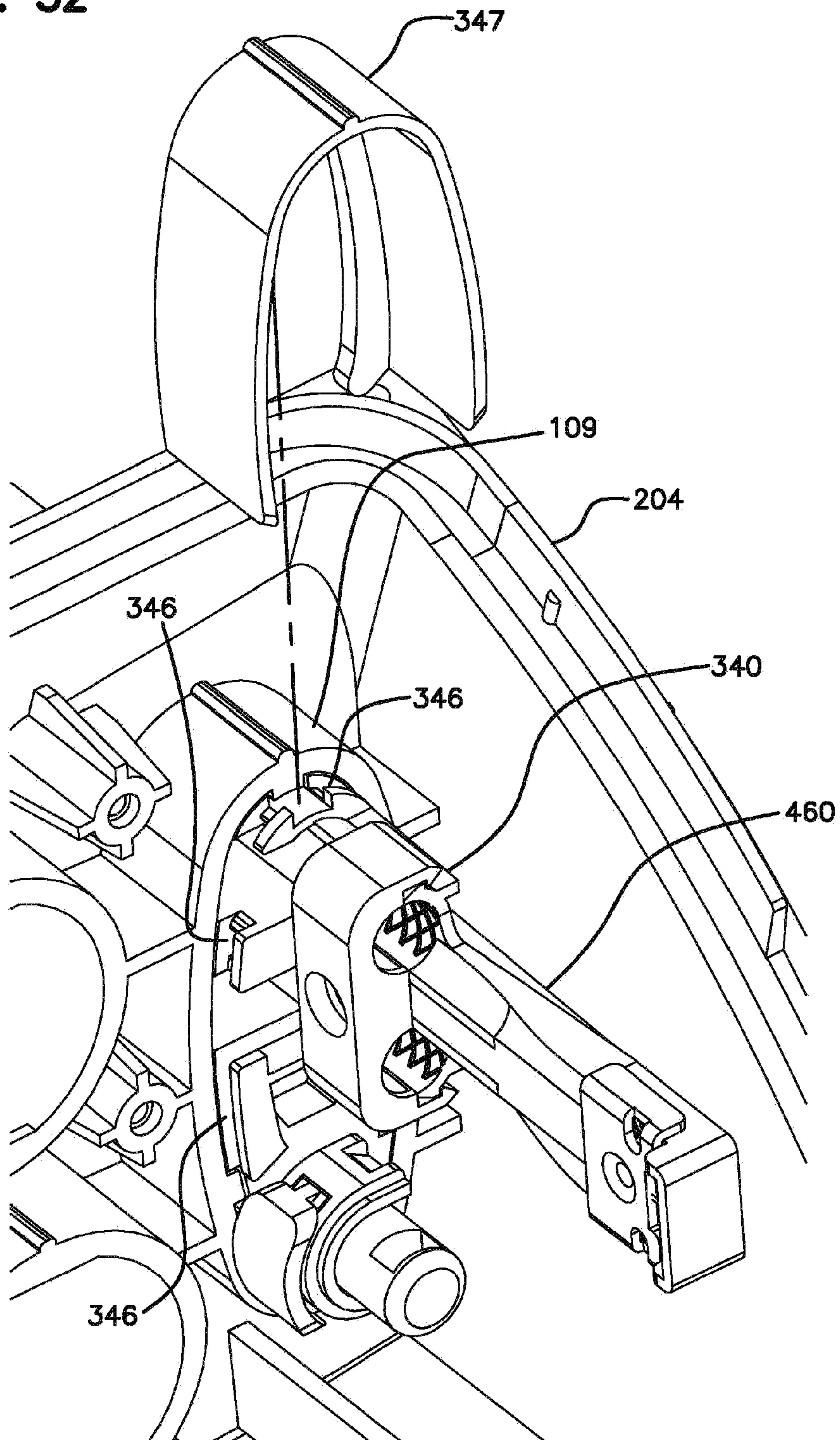


FIG. 31

FIG. 32



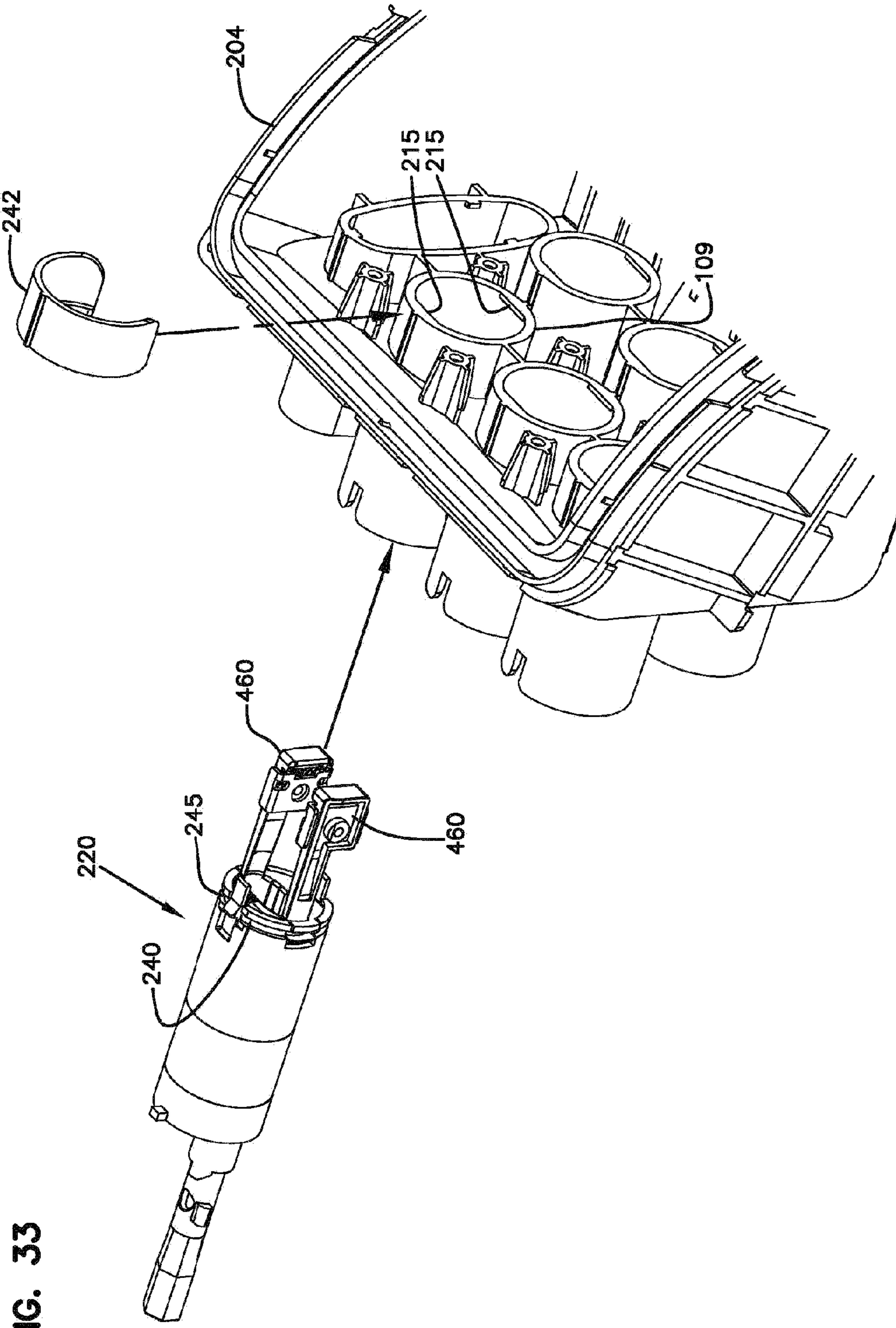


FIG. 33

FIG. 34

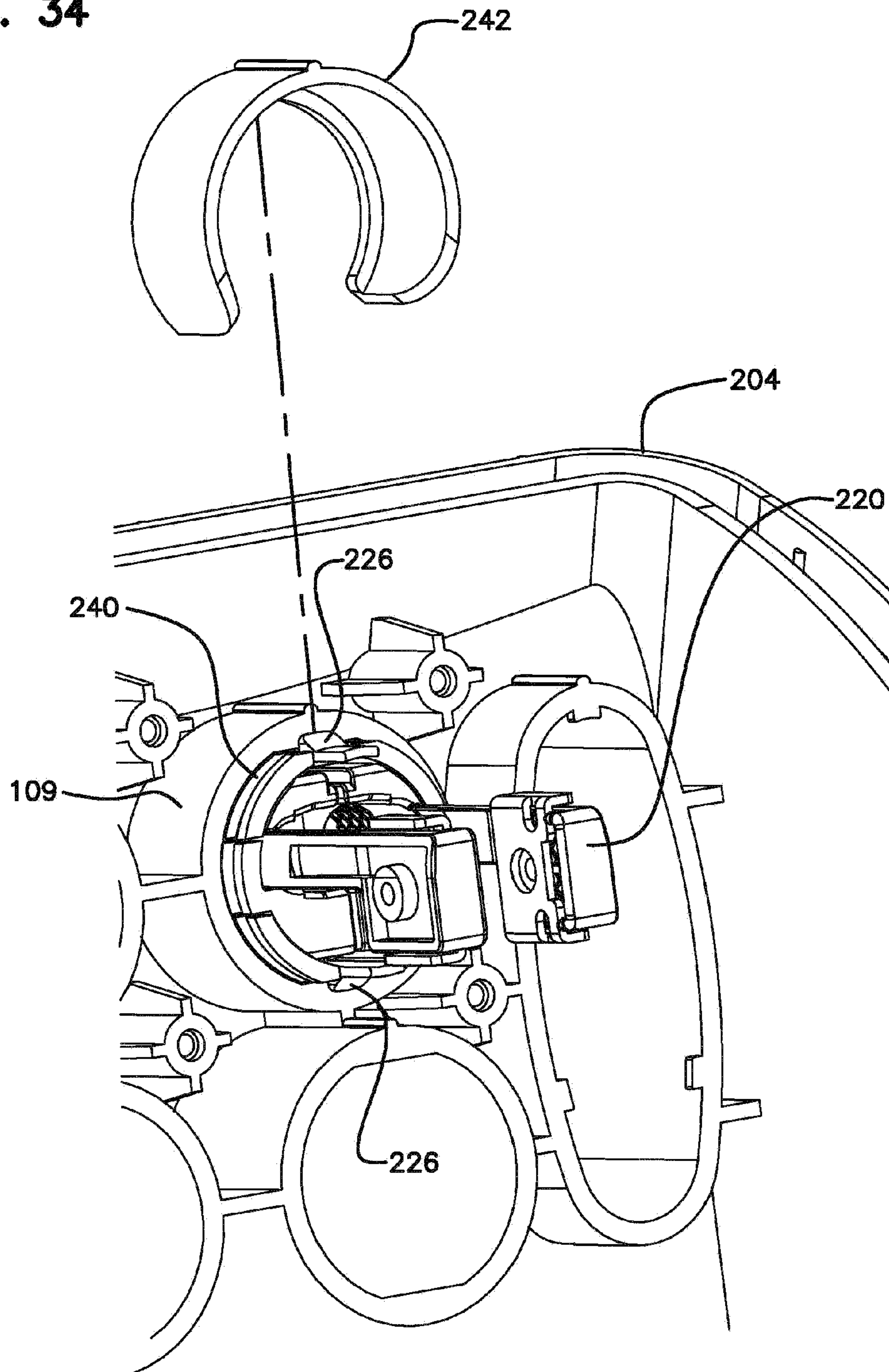
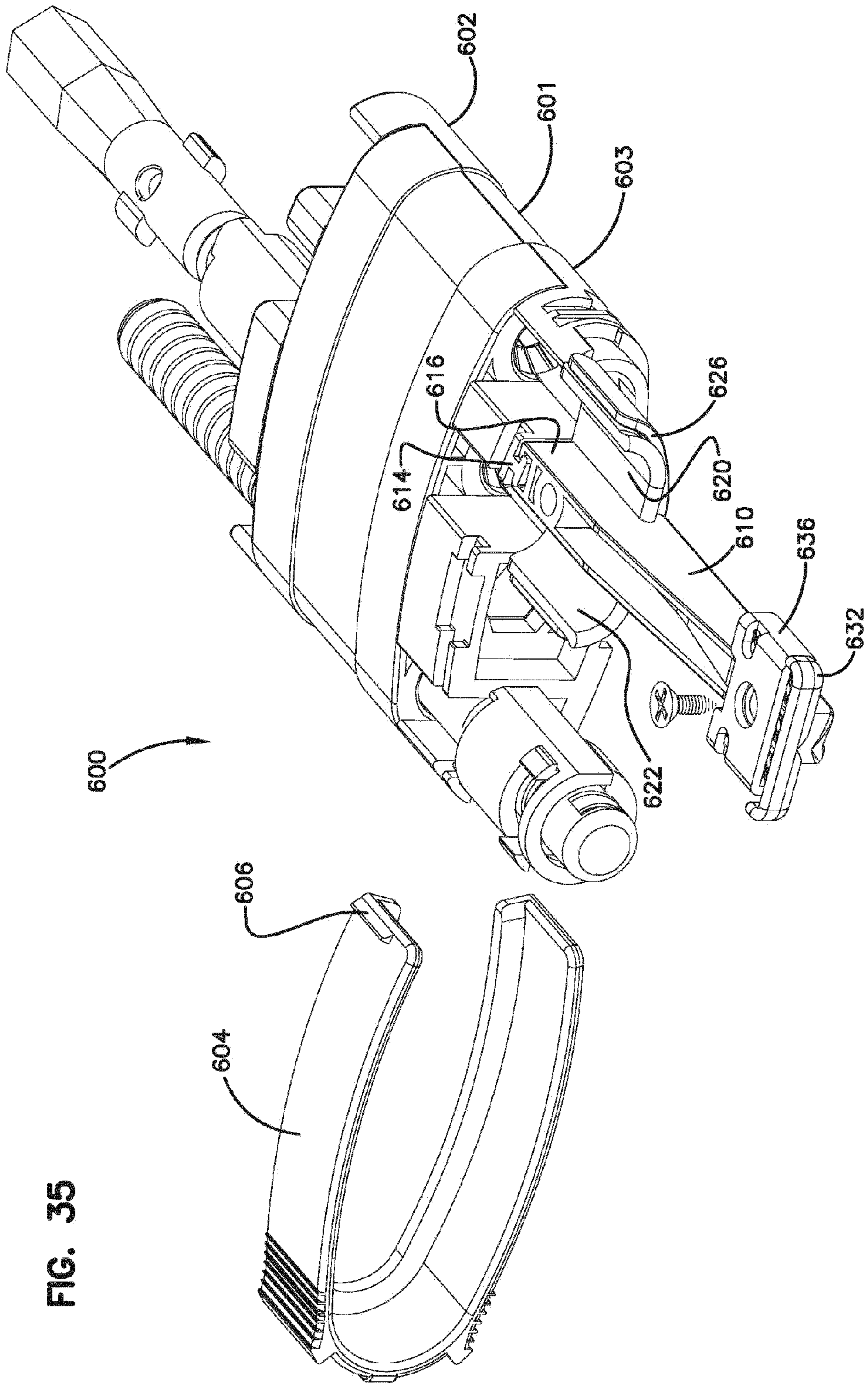
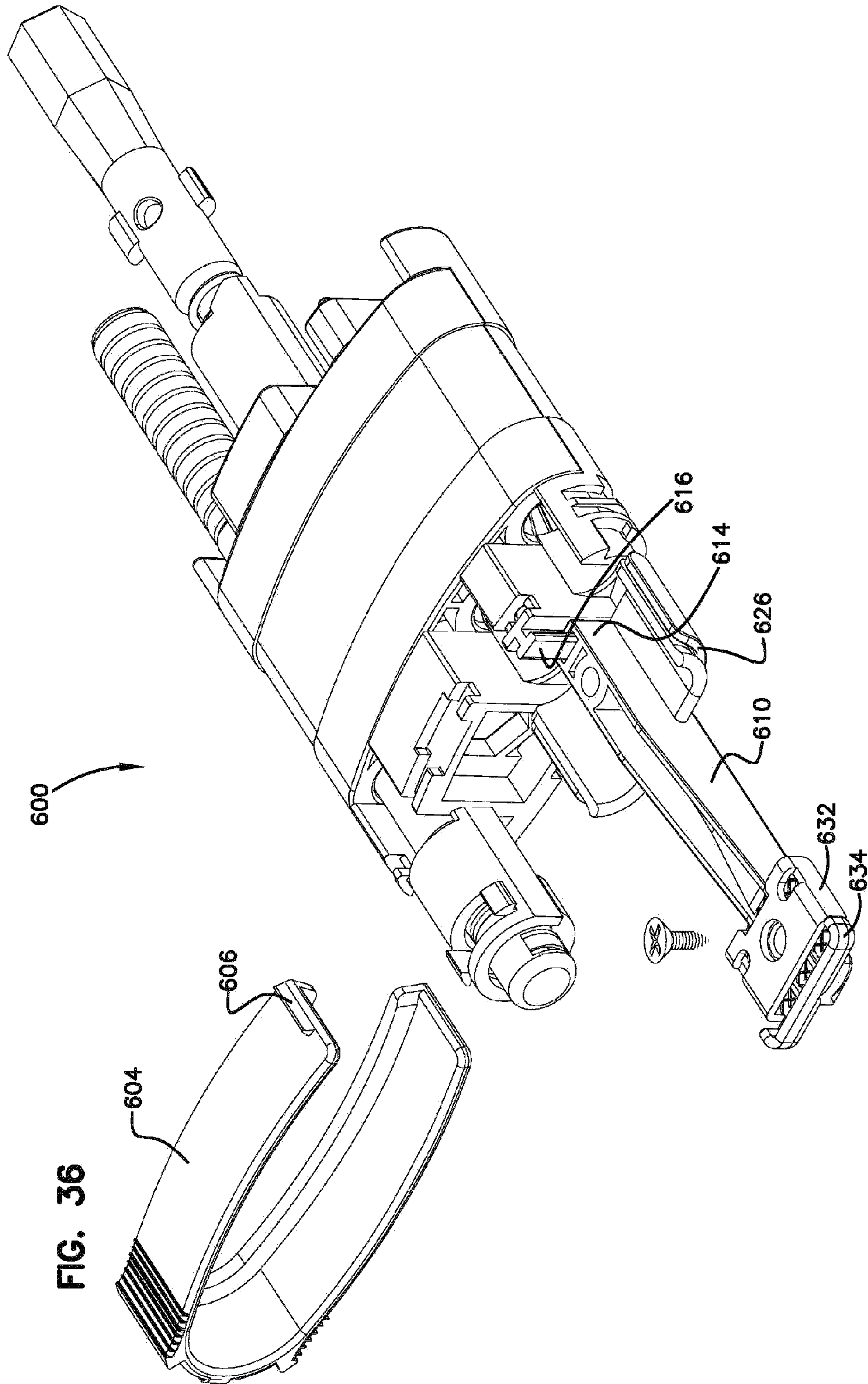


FIG. 35





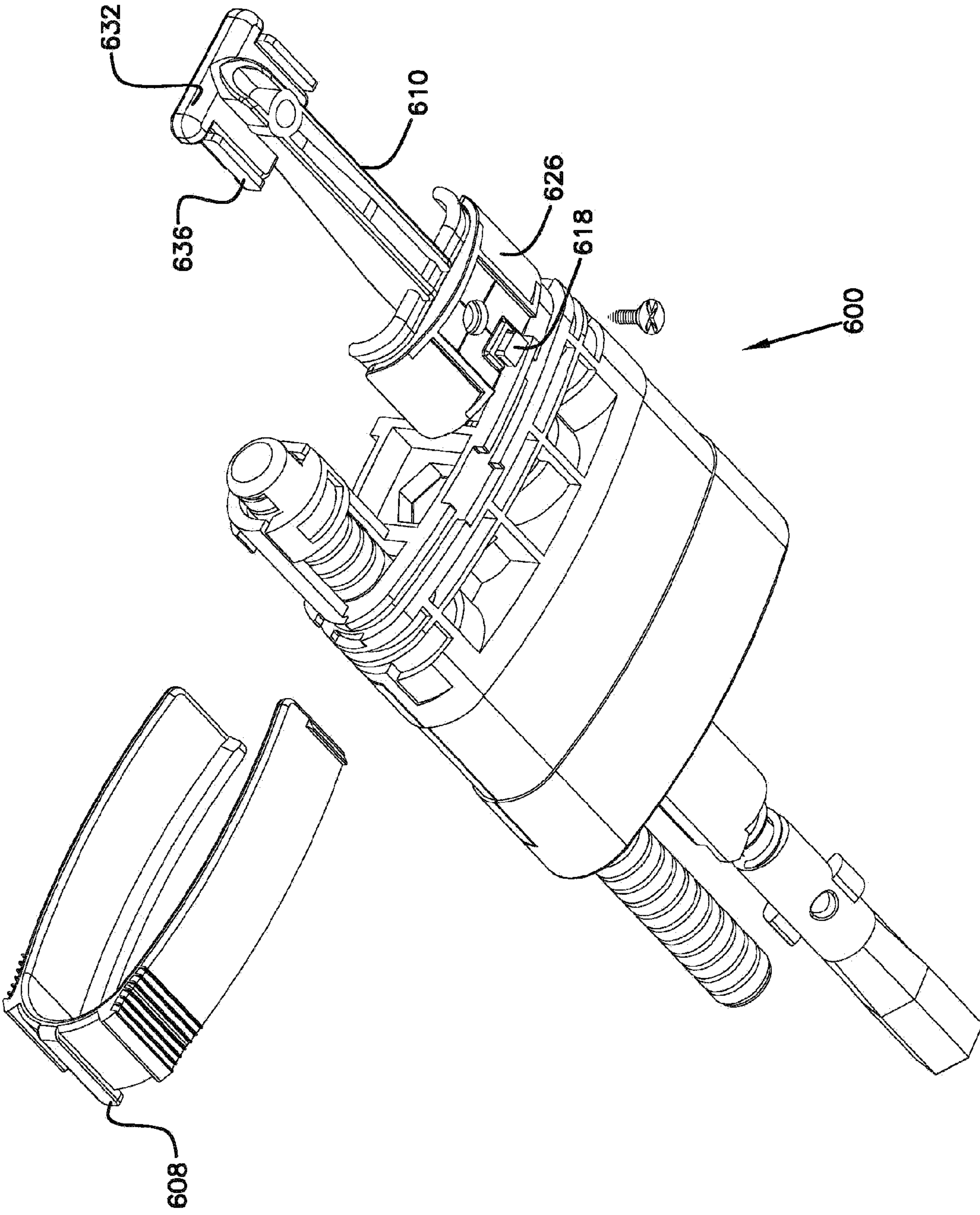


FIG. 37

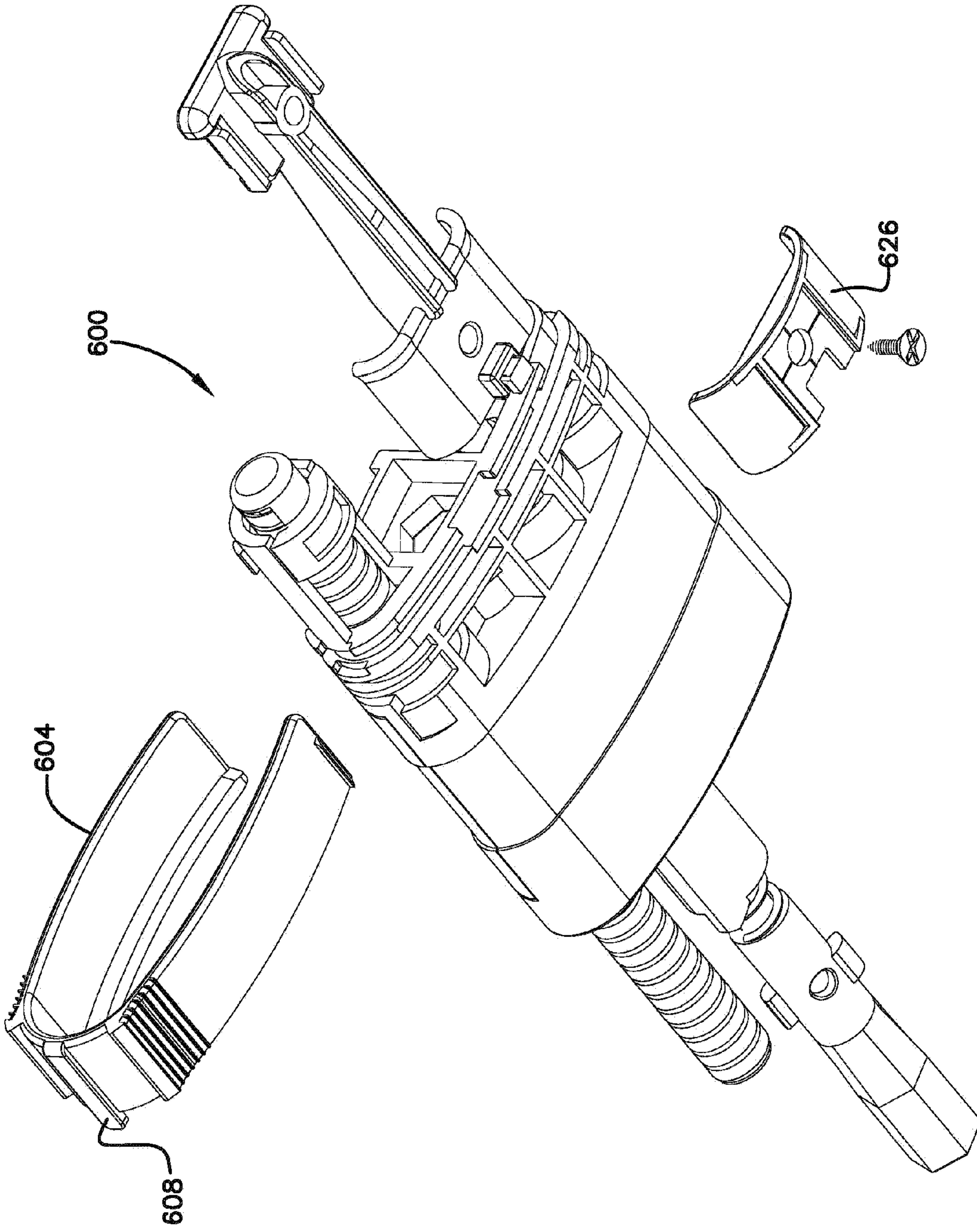


FIG. 38

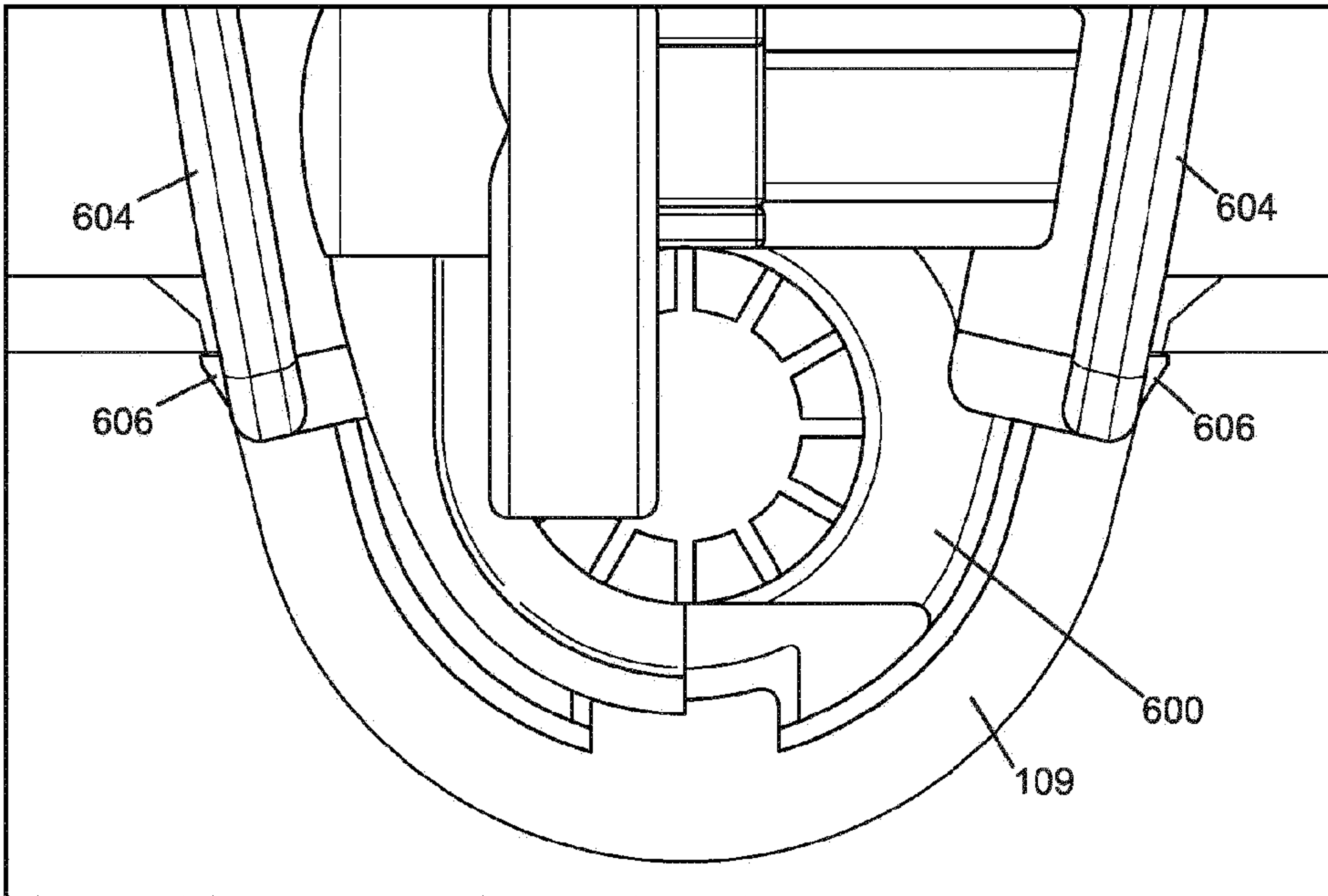


FIG. 39

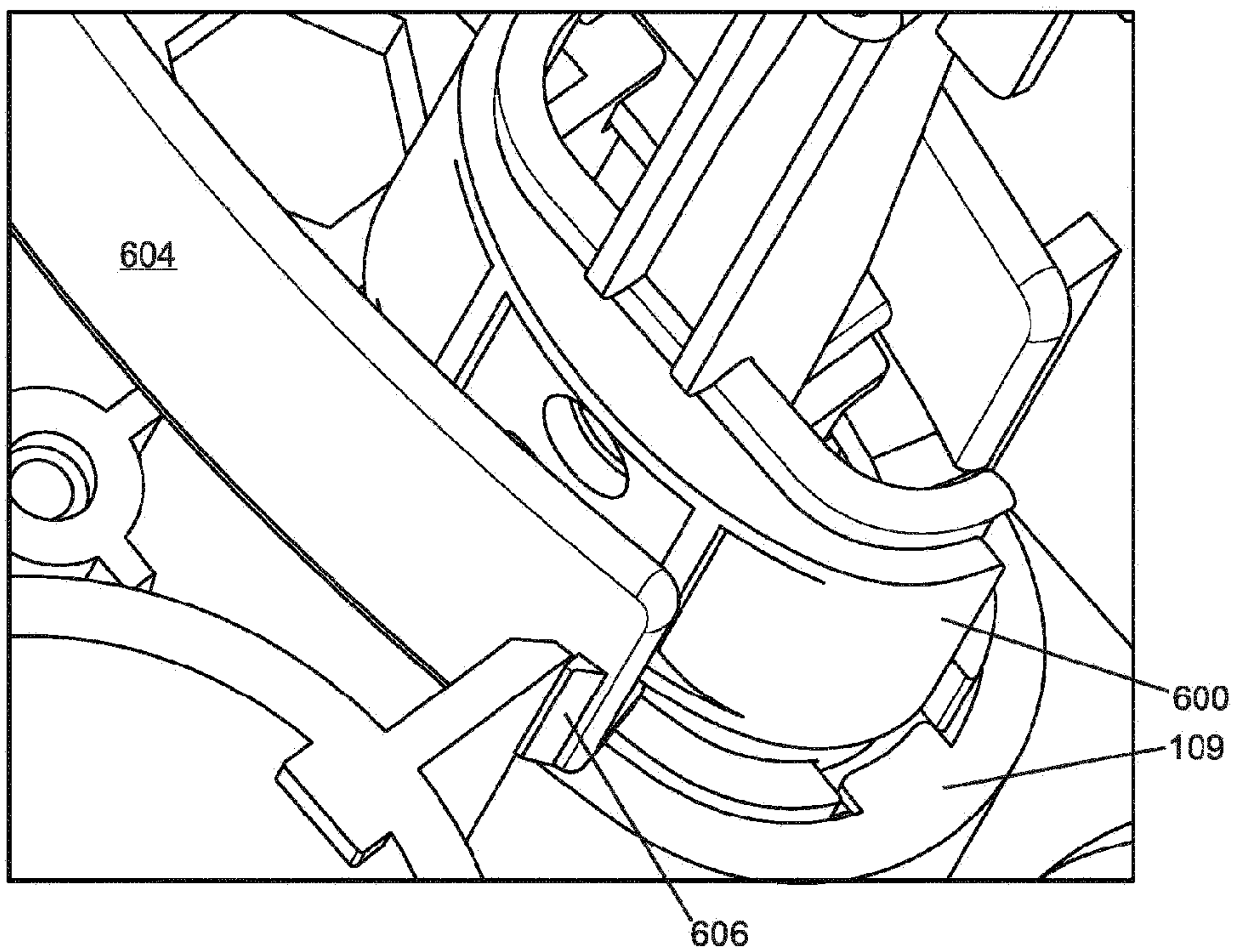


FIG. 40

600

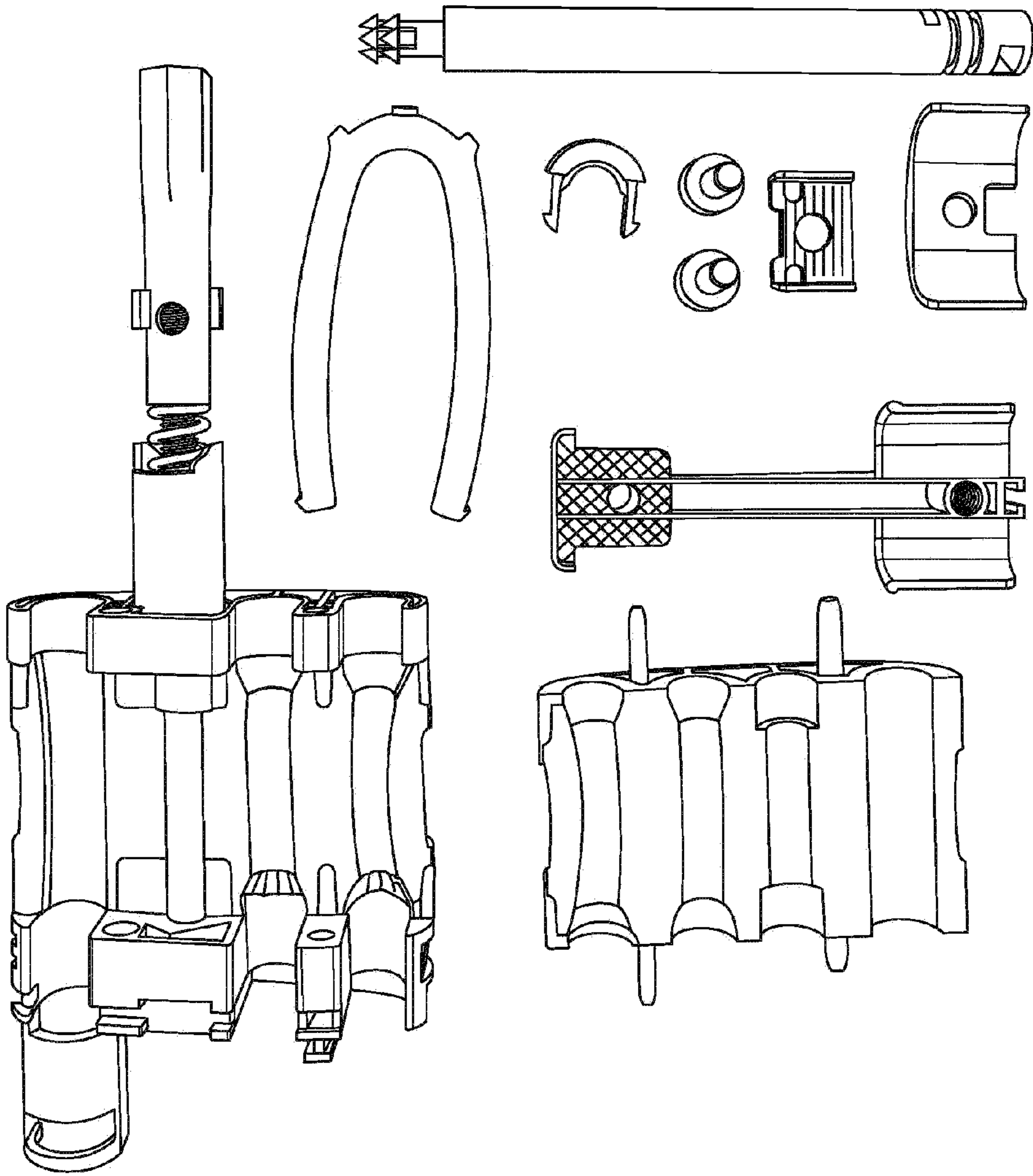


FIG. 41

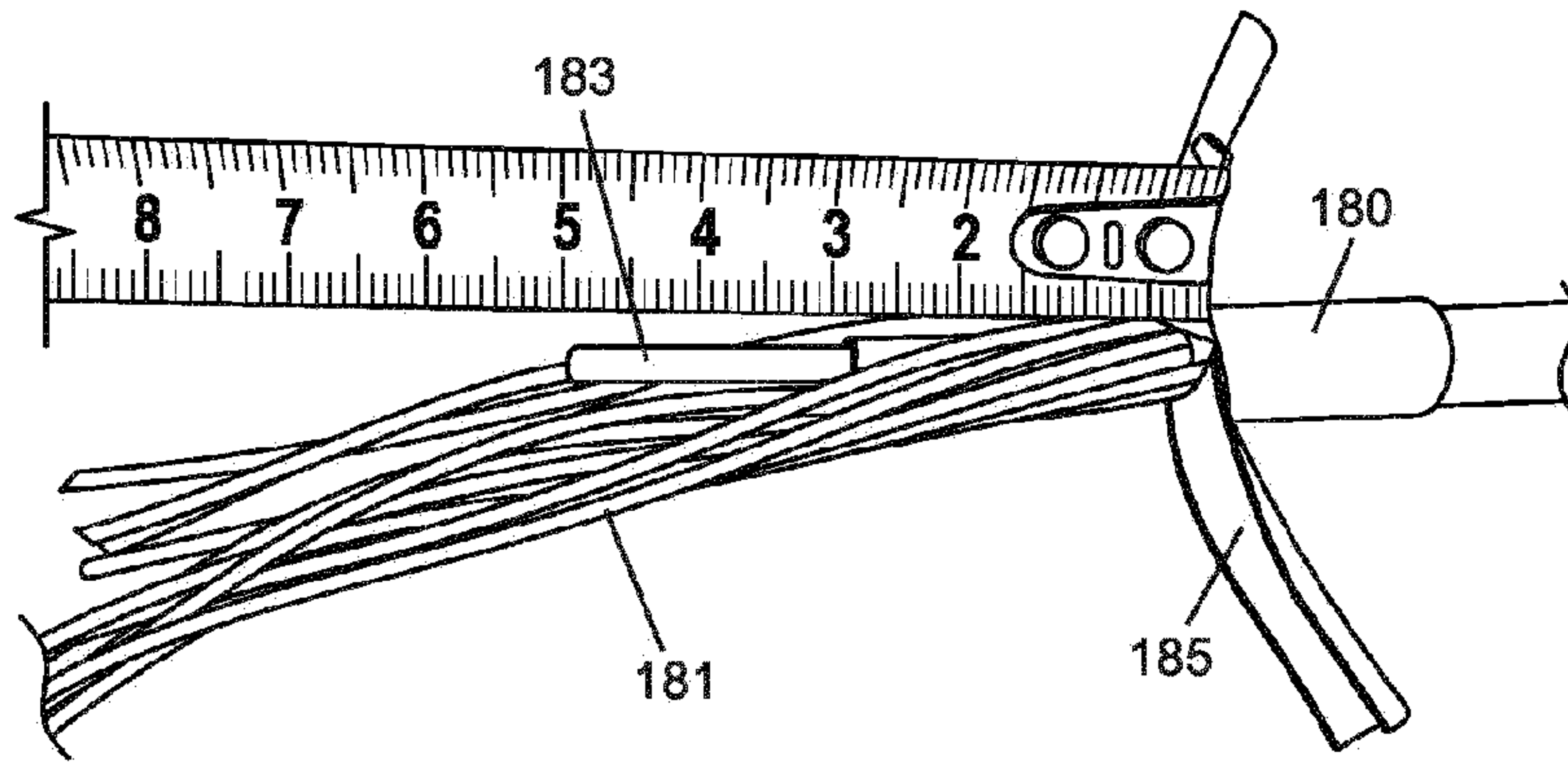


FIG. 42

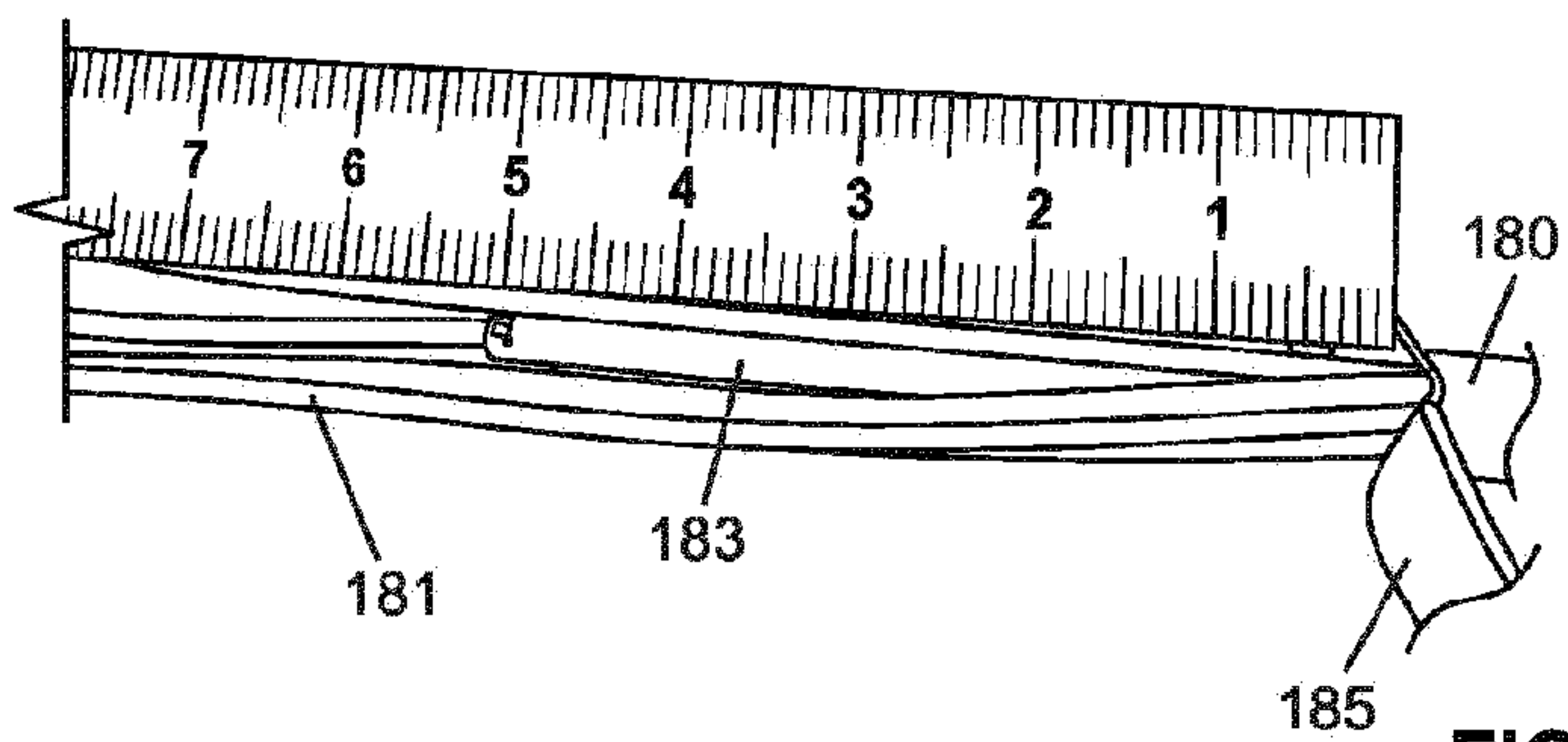


FIG. 43

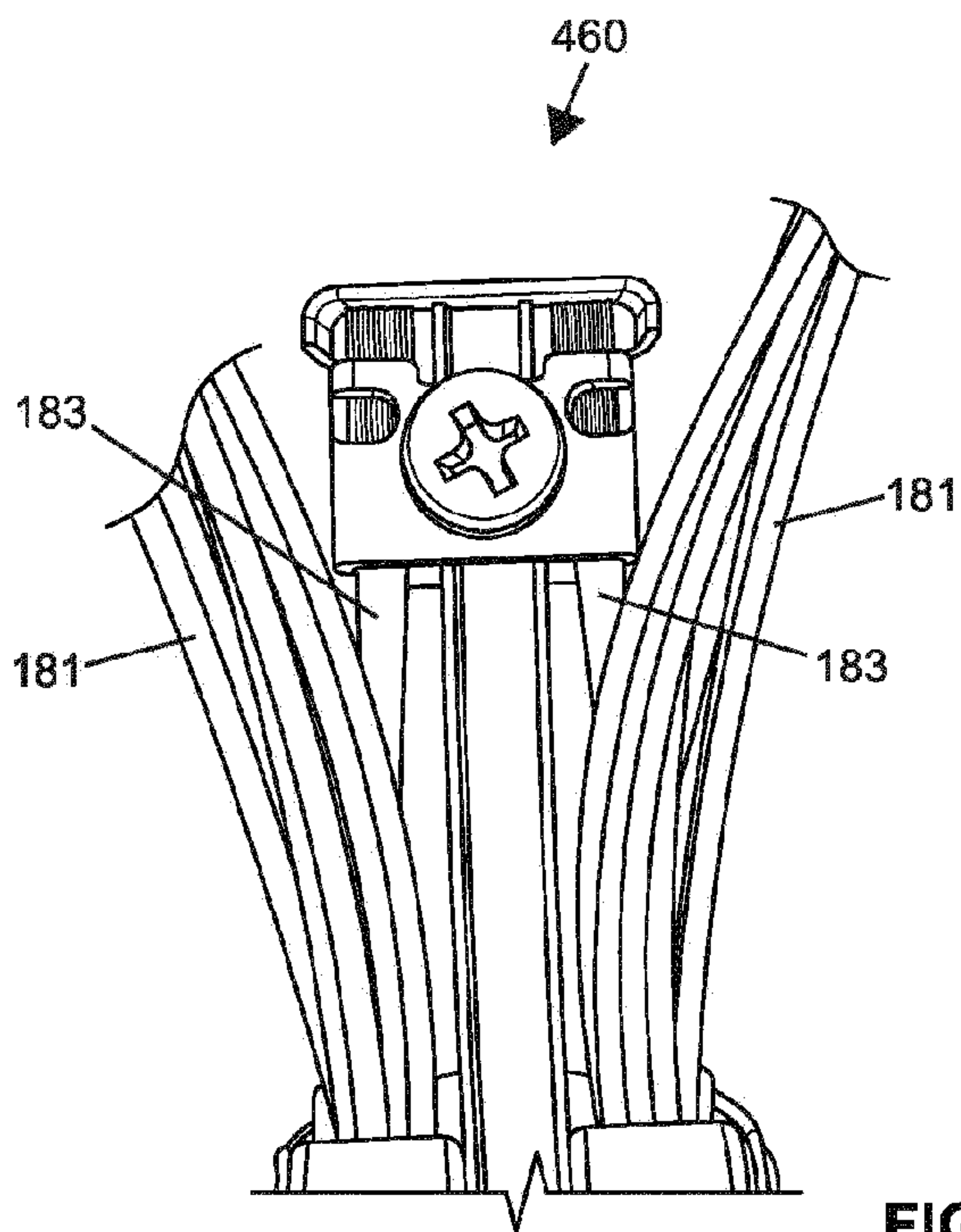


FIG. 44

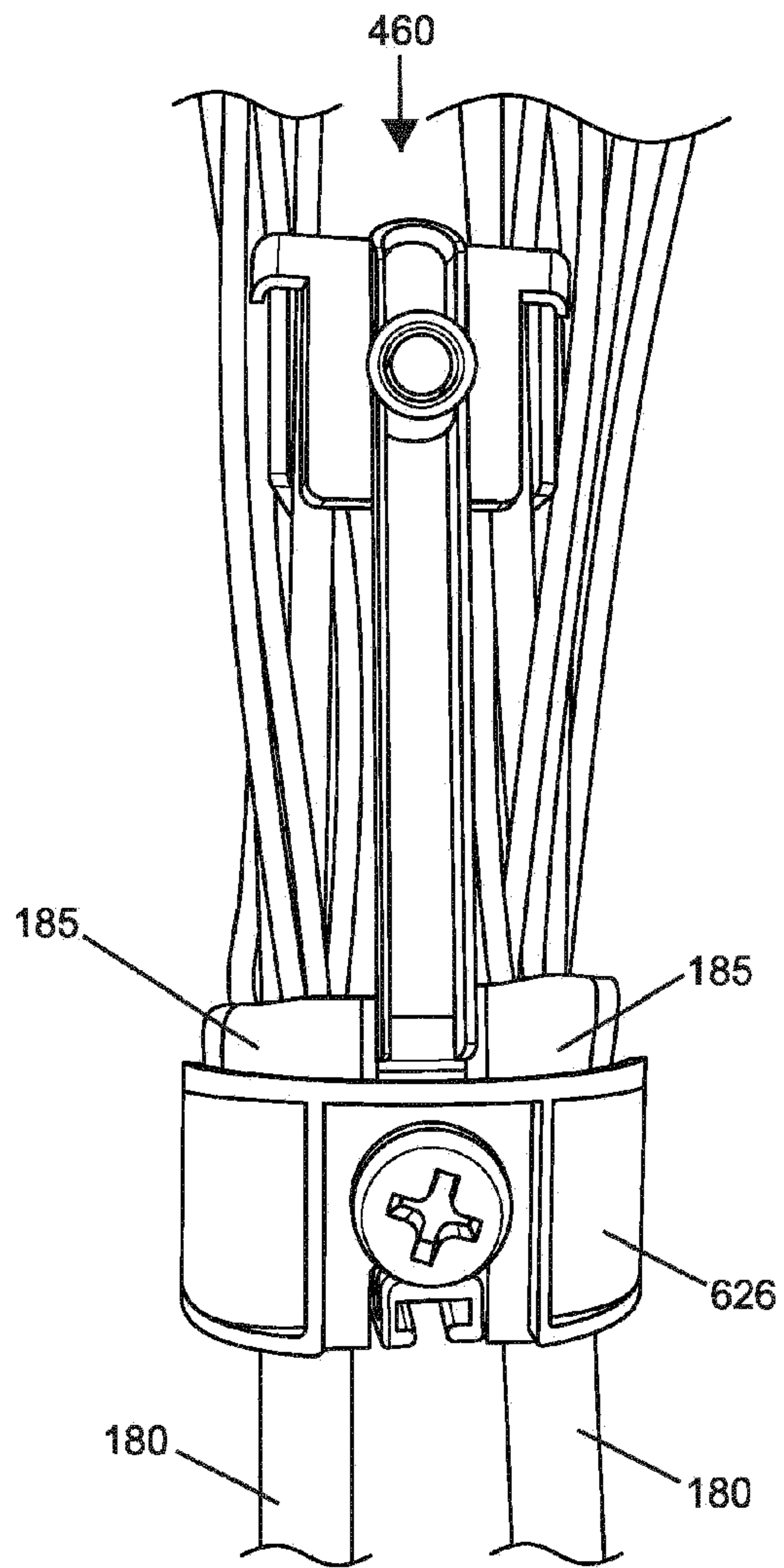


FIG. 45

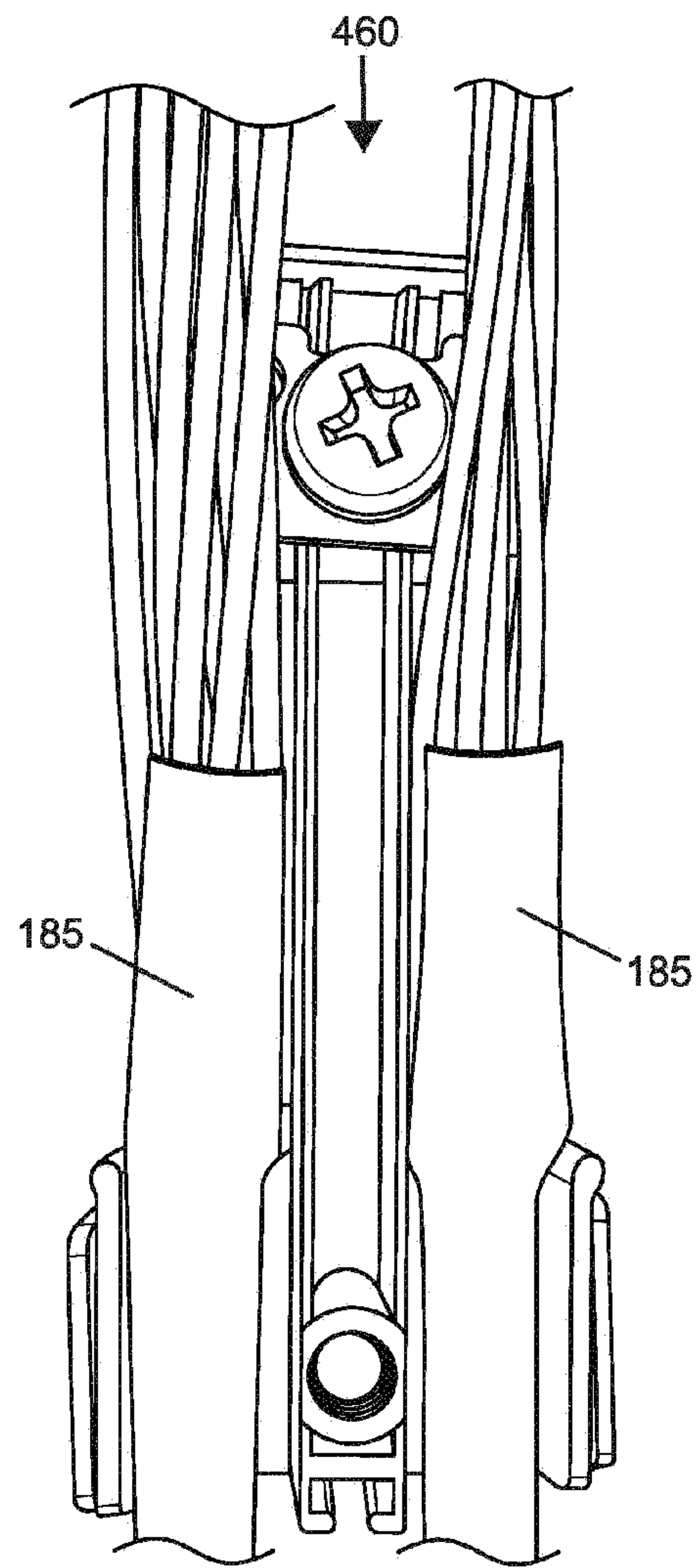
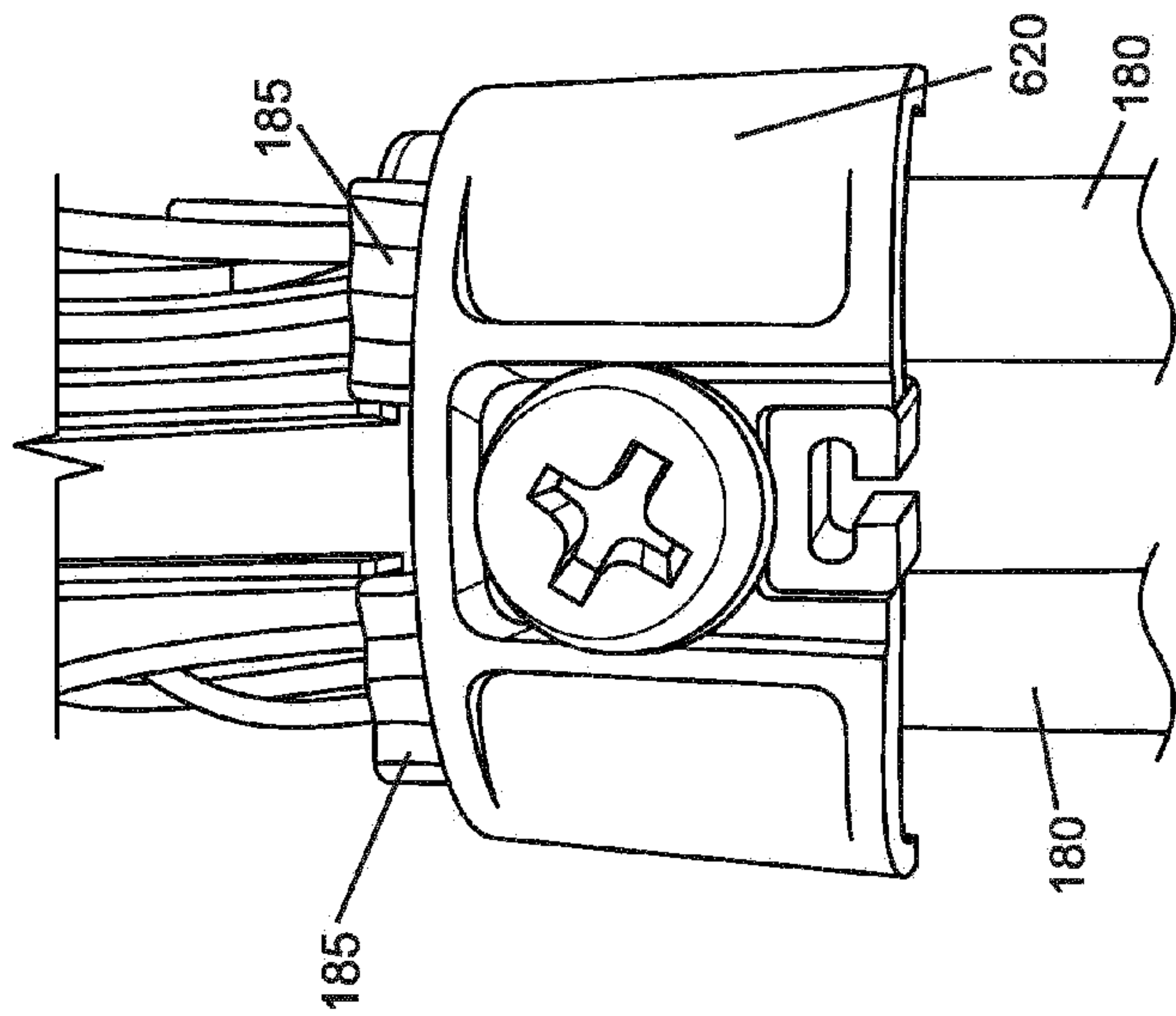
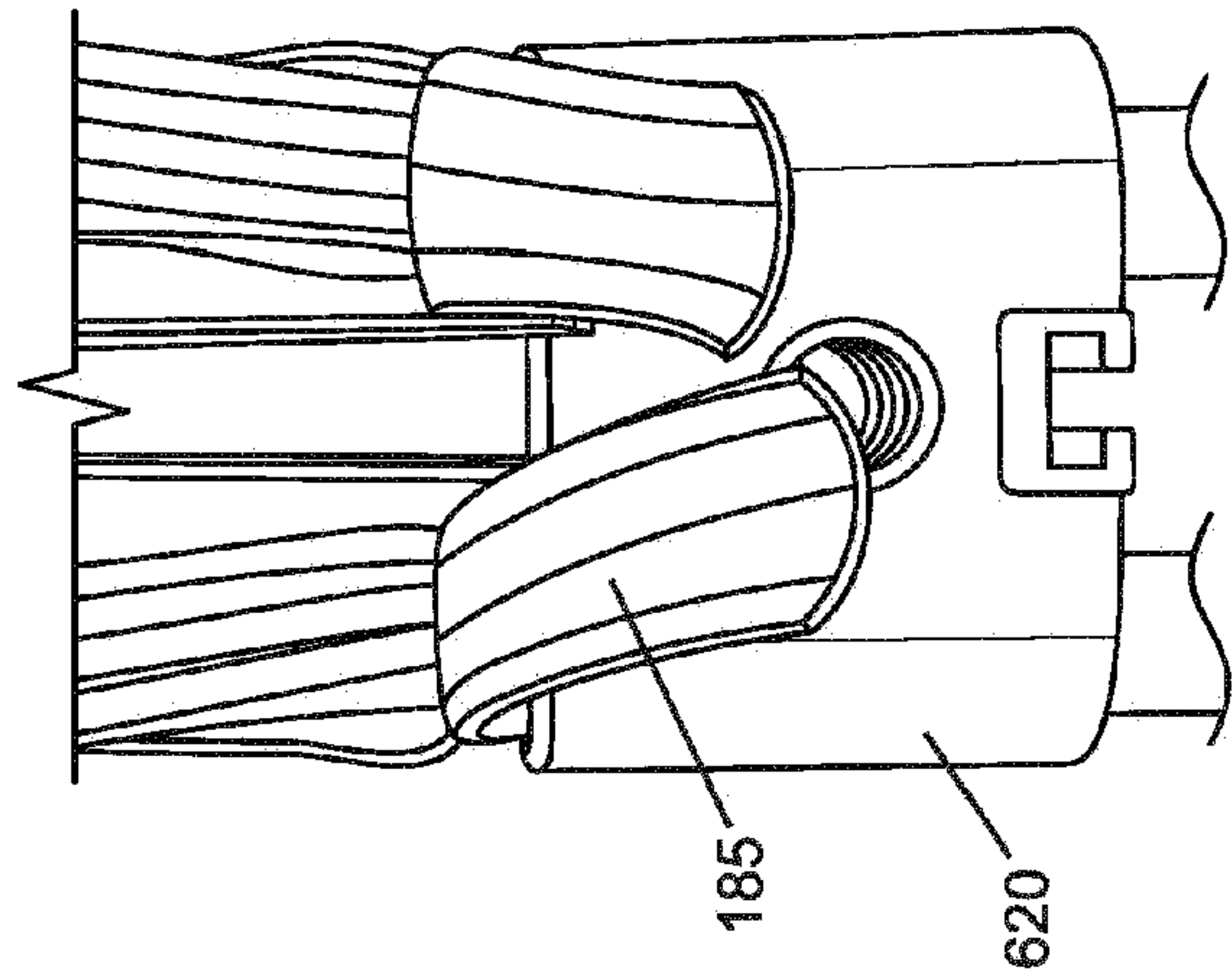
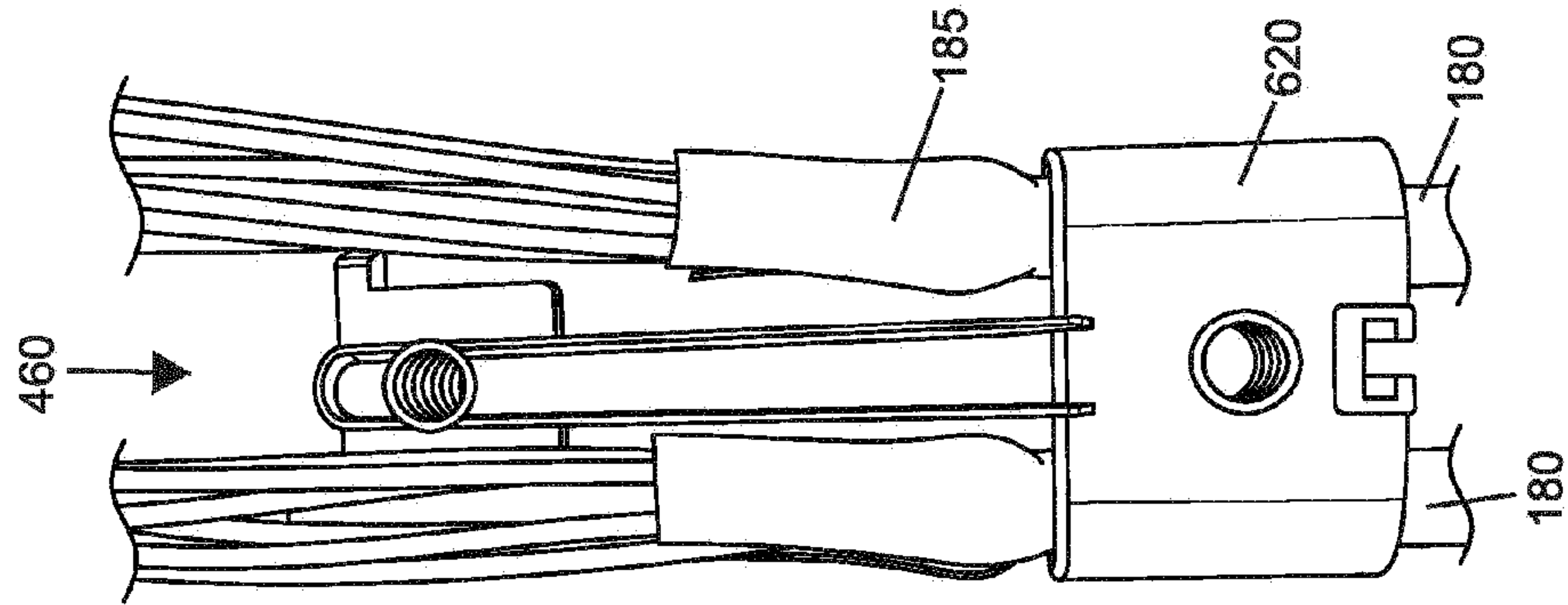


FIG. 46



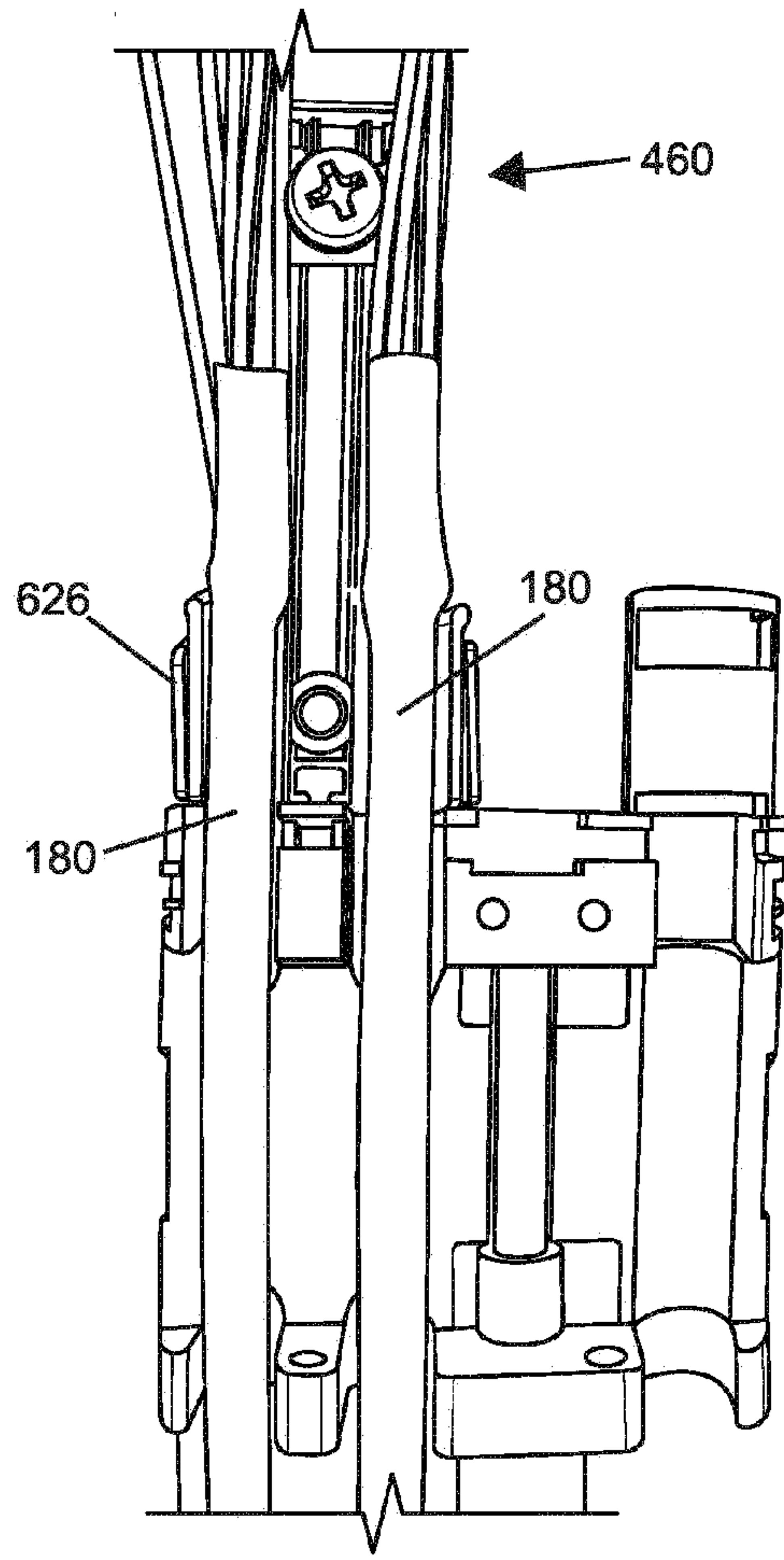


FIG. 50A

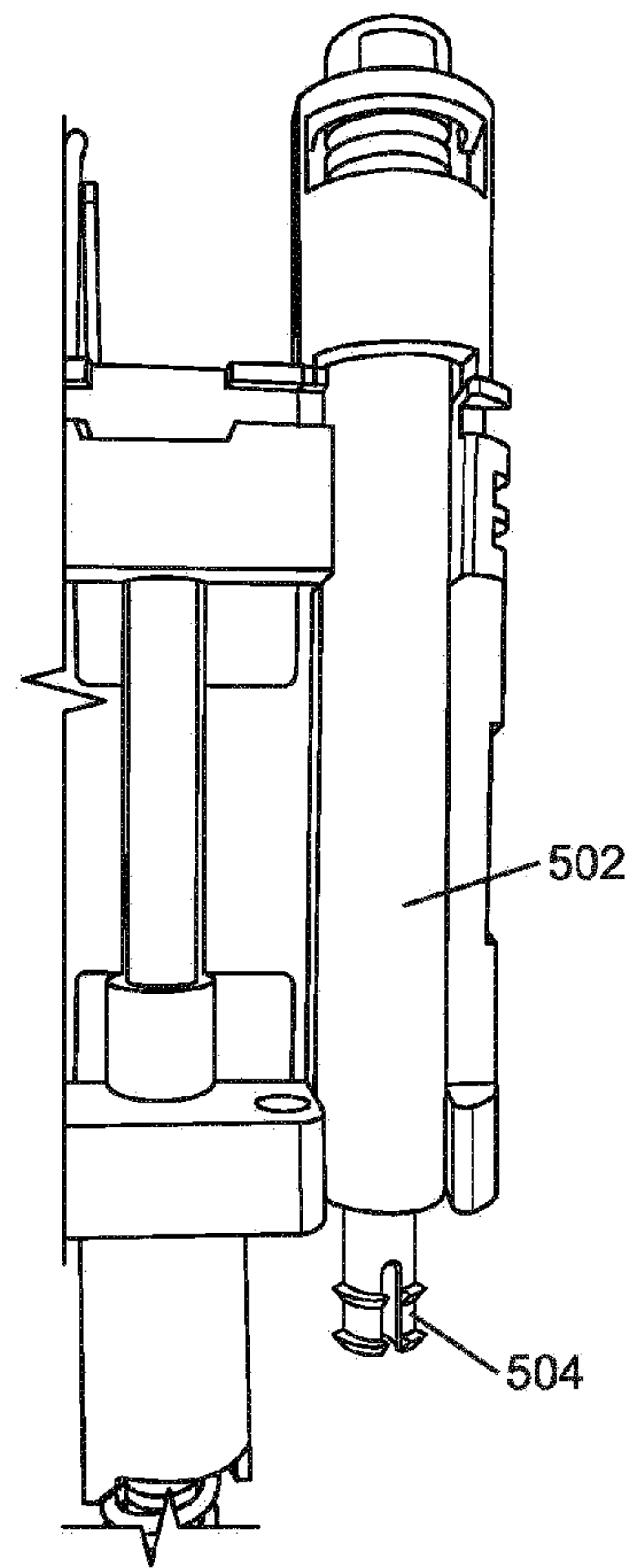


FIG. 50B

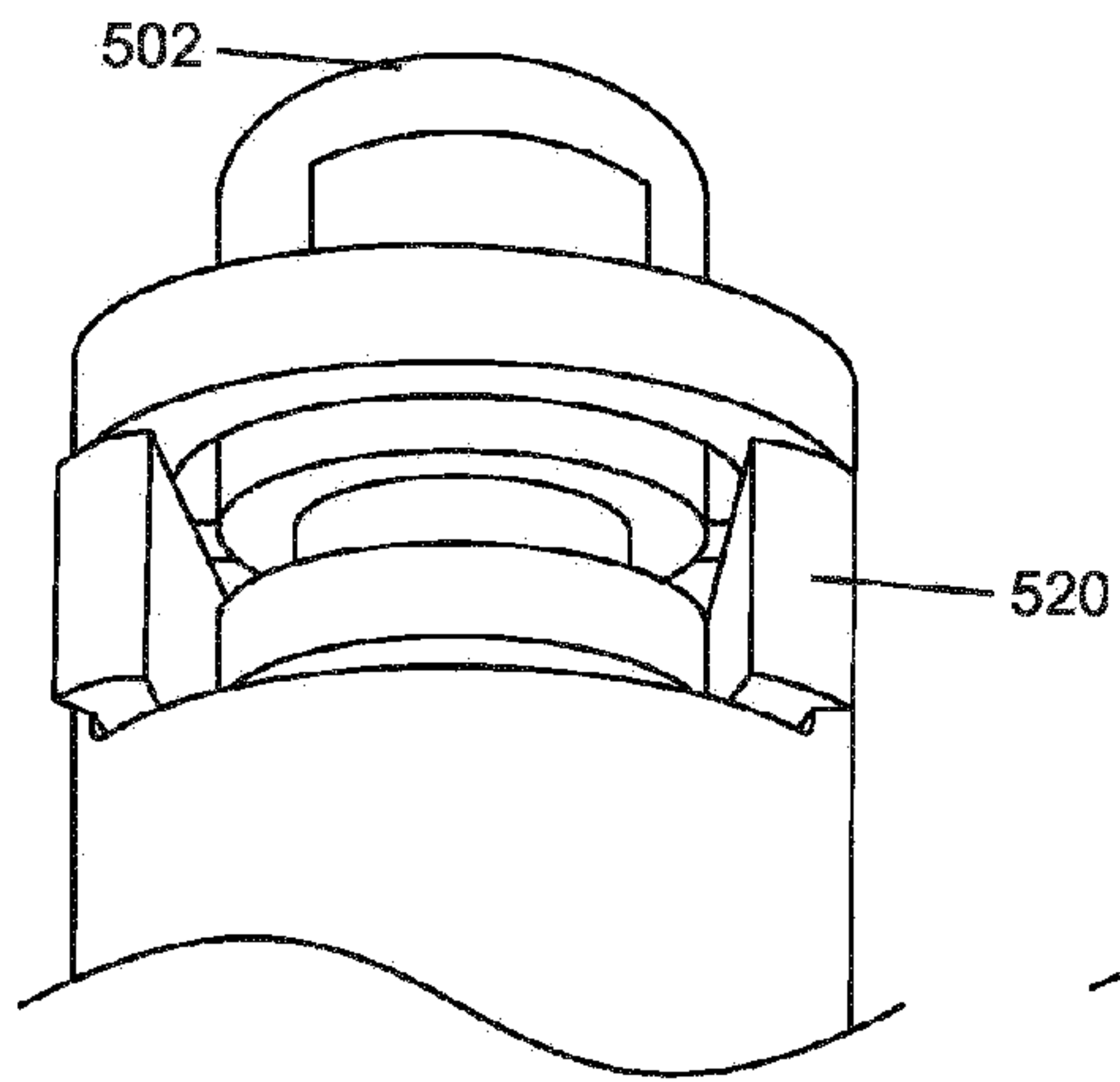


FIG. 51

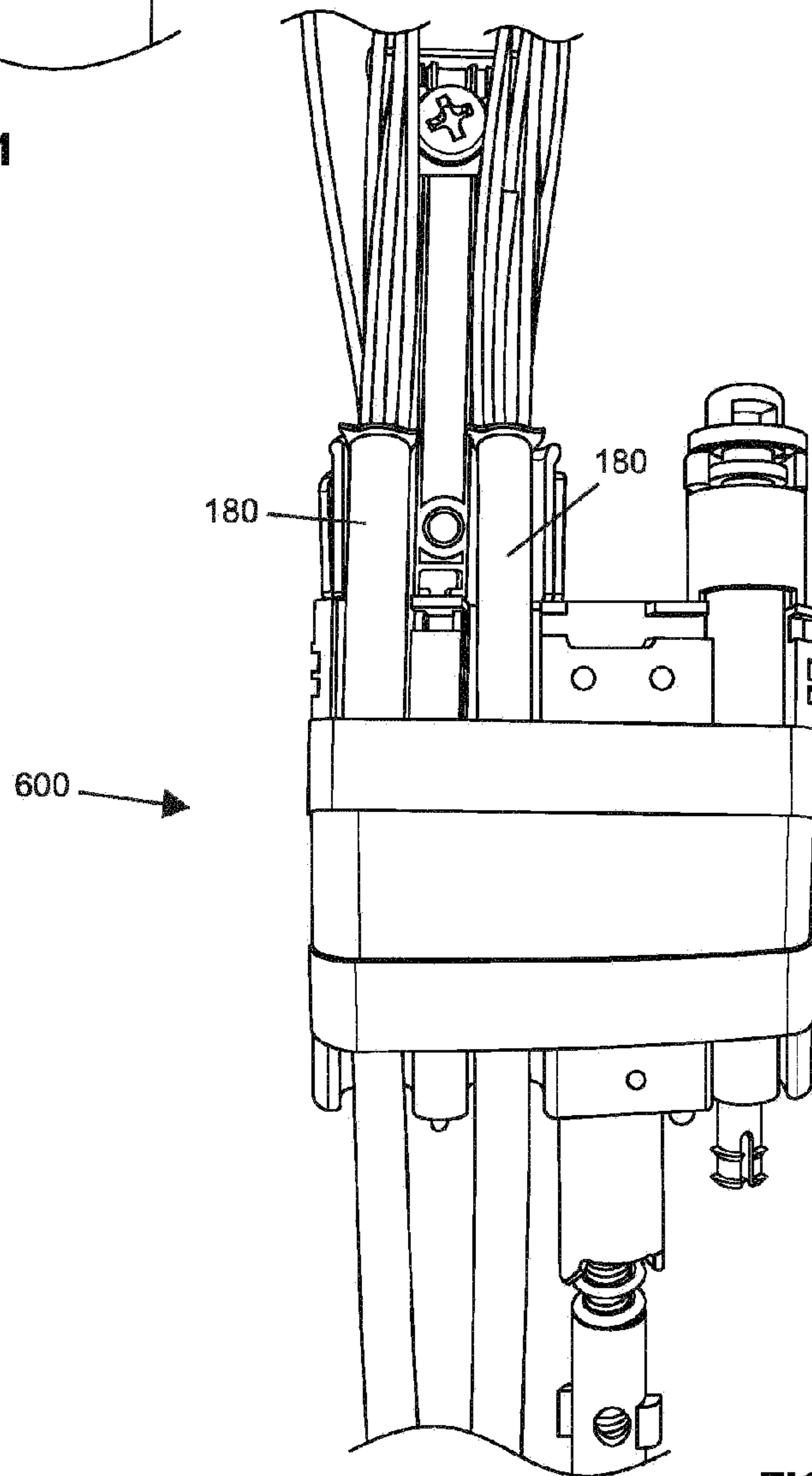


FIG. 52

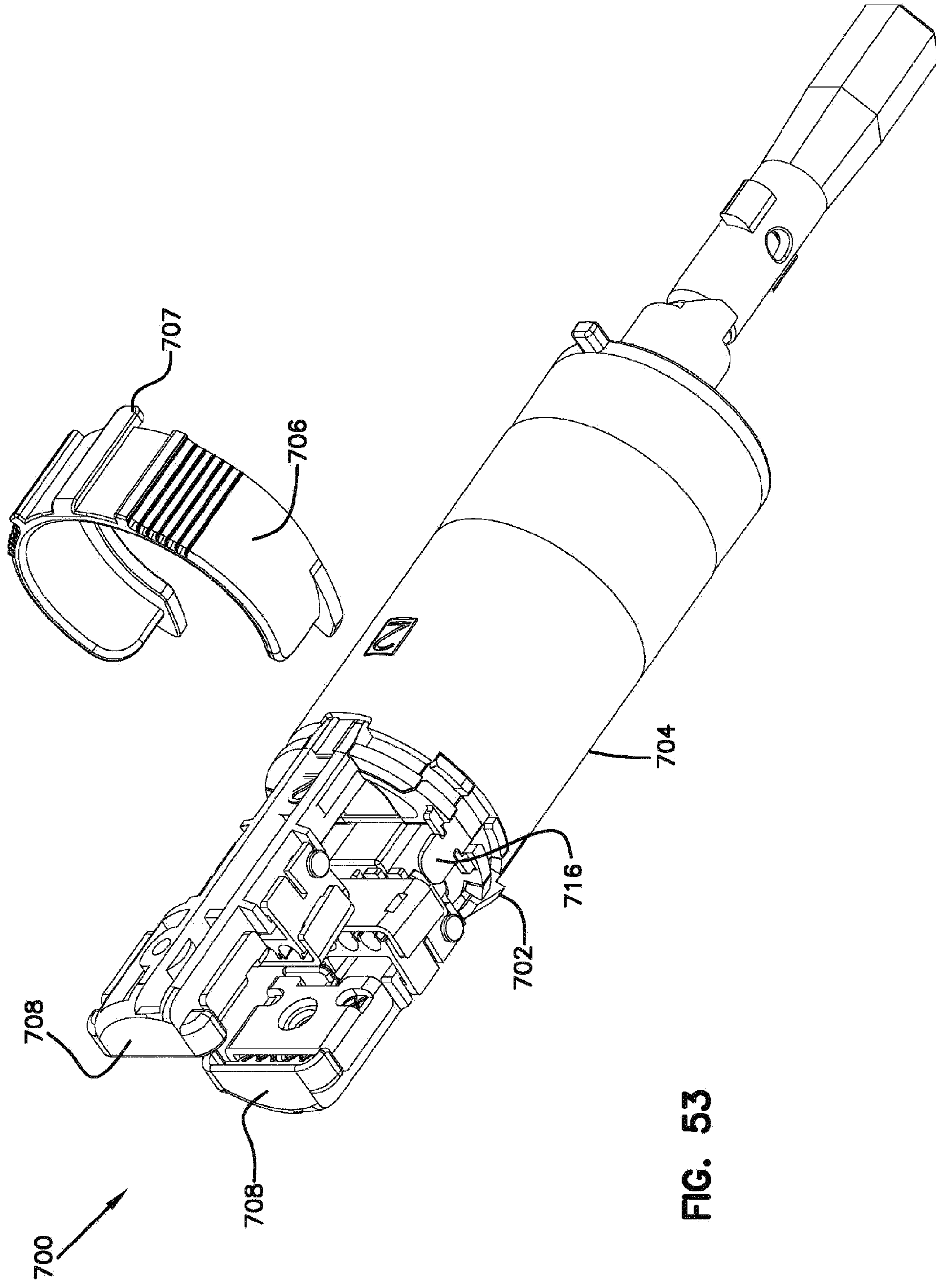
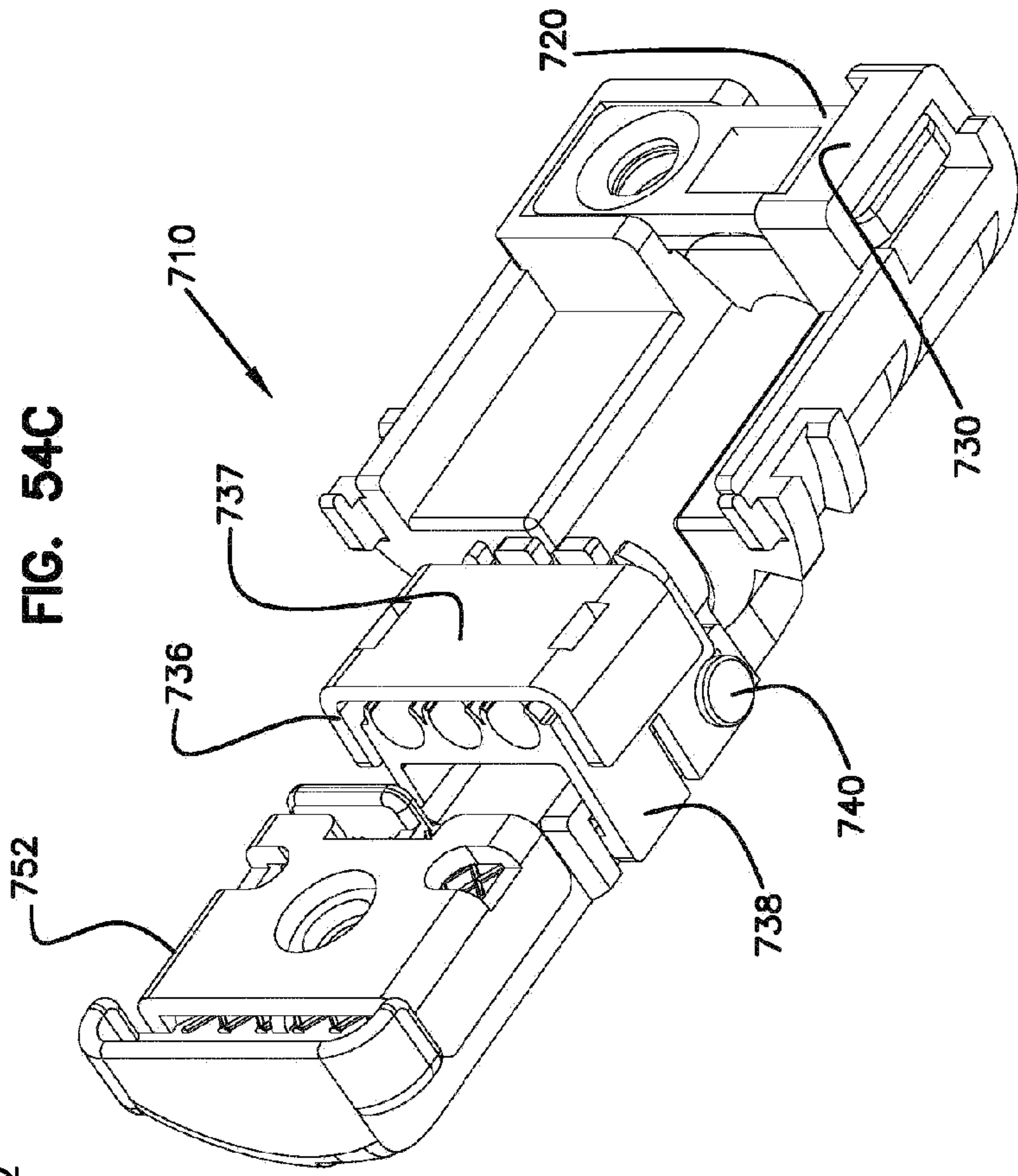
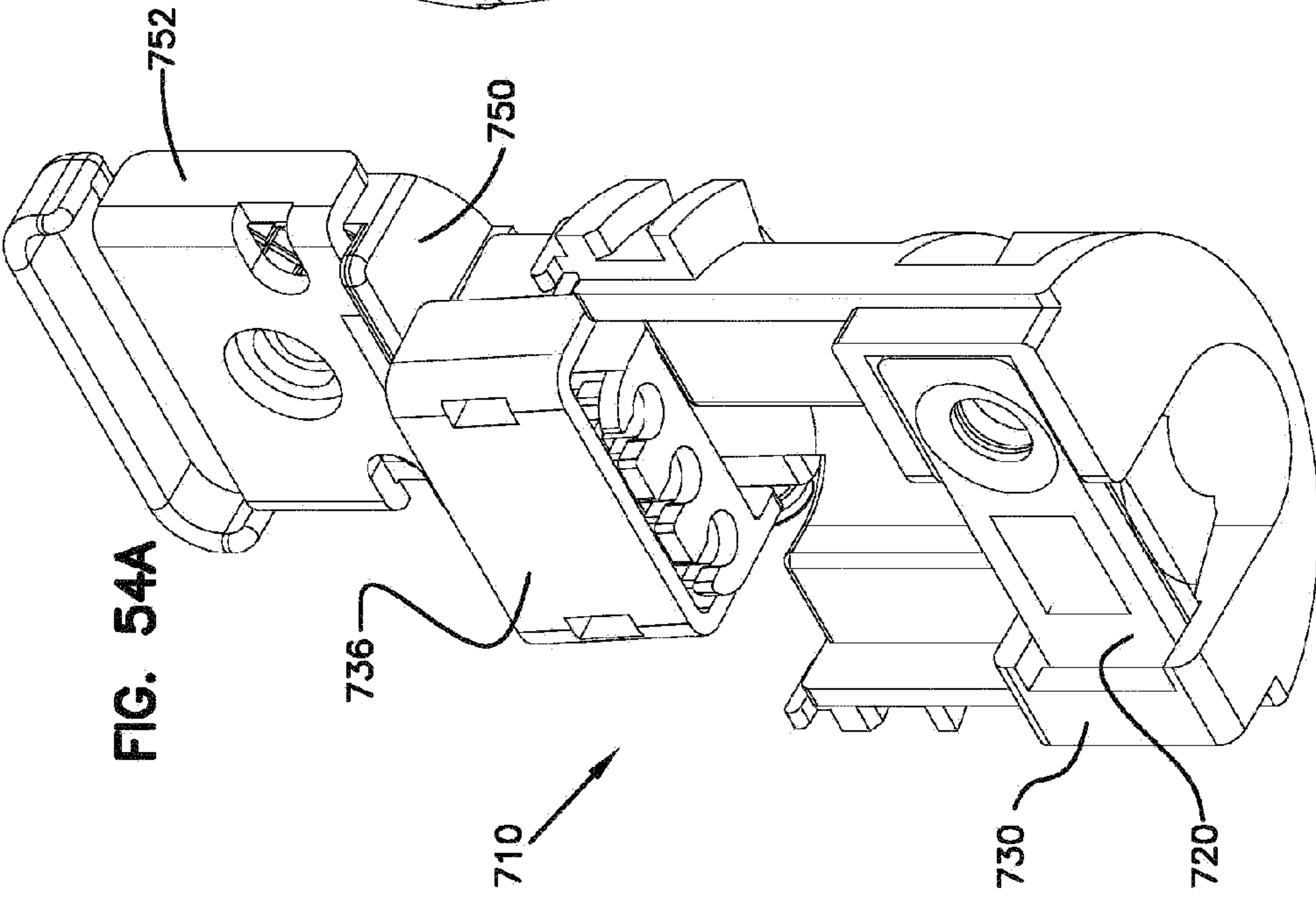
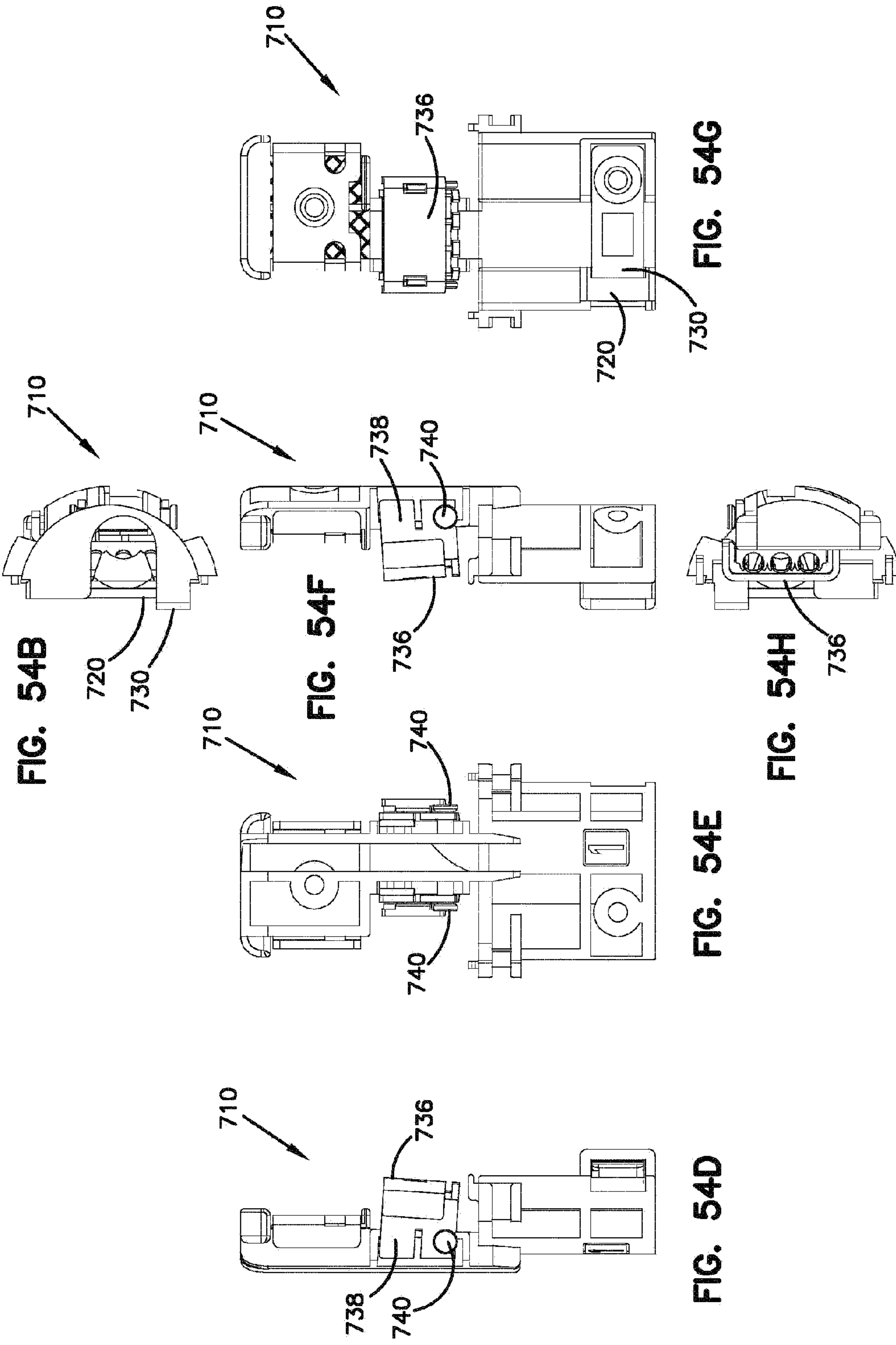


FIG. 53





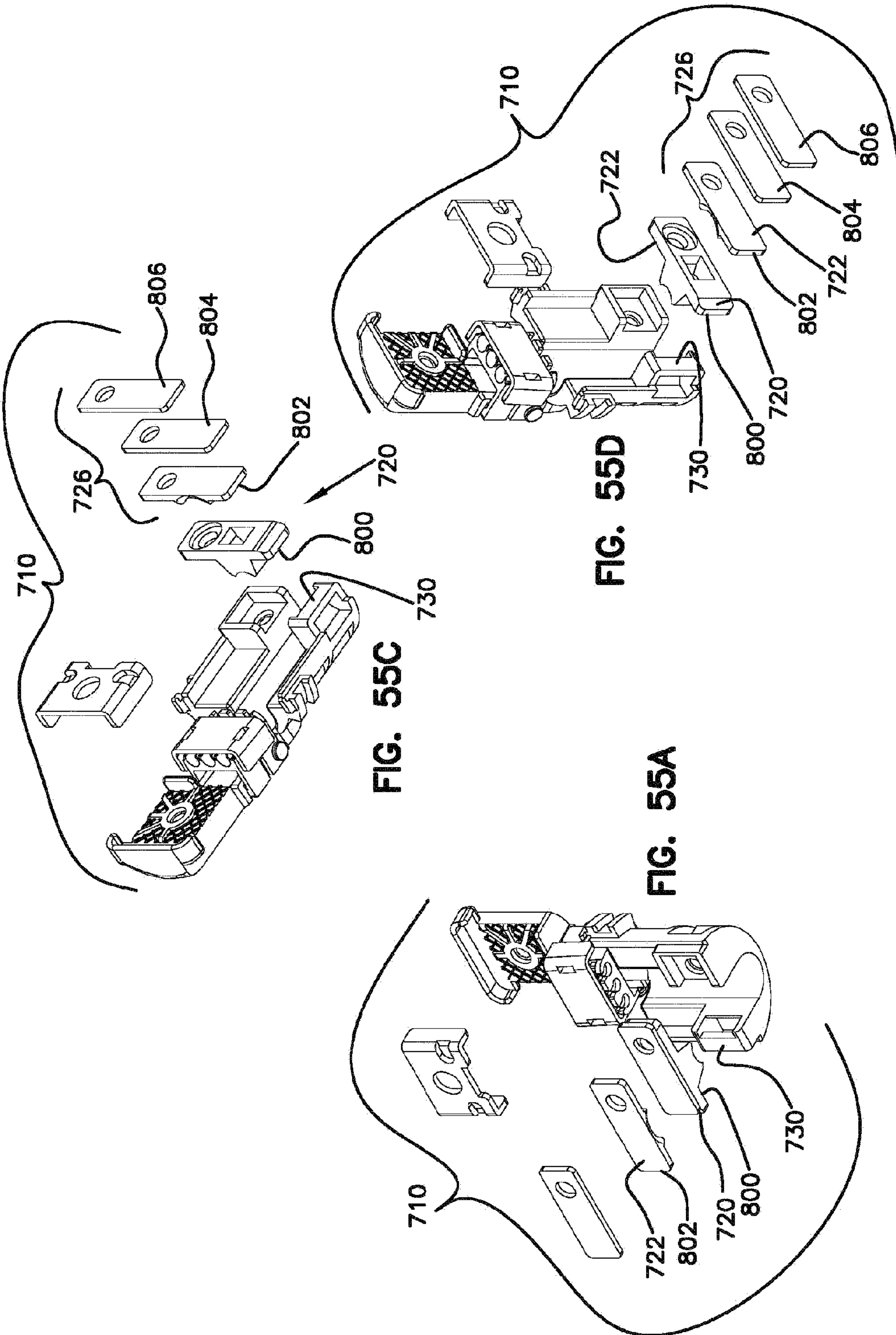


FIG. 55B

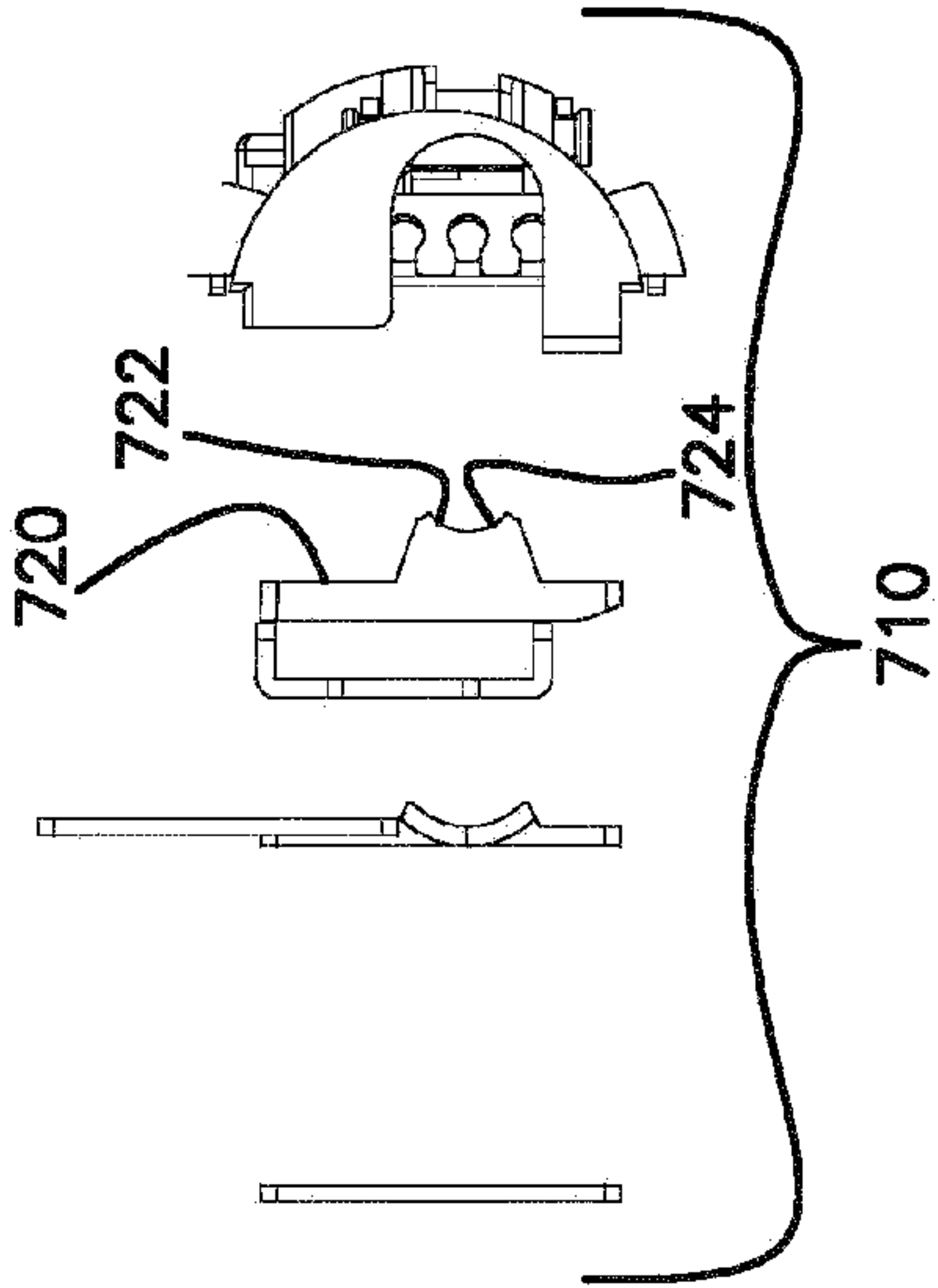


FIG. 55E

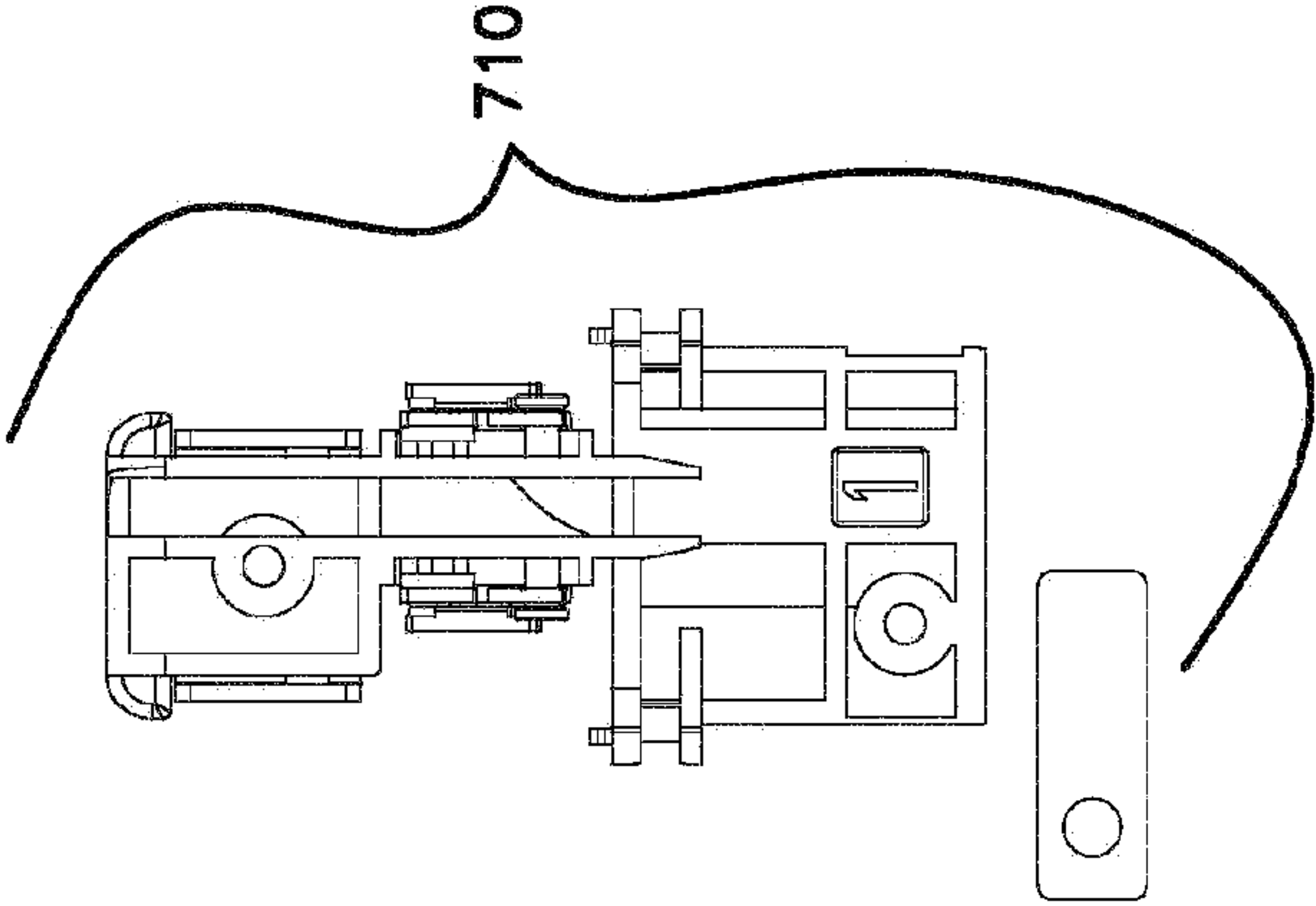
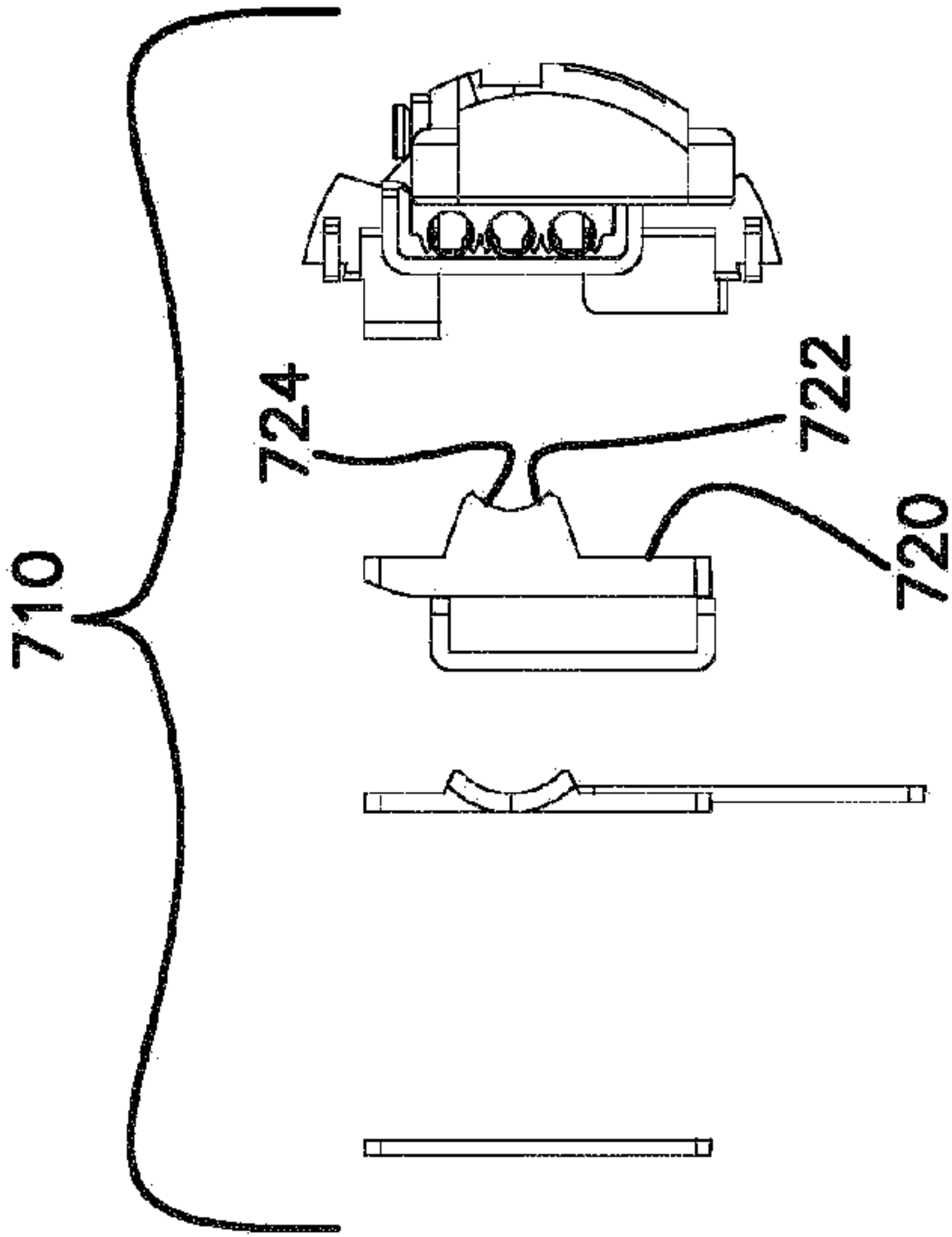


FIG. 55I



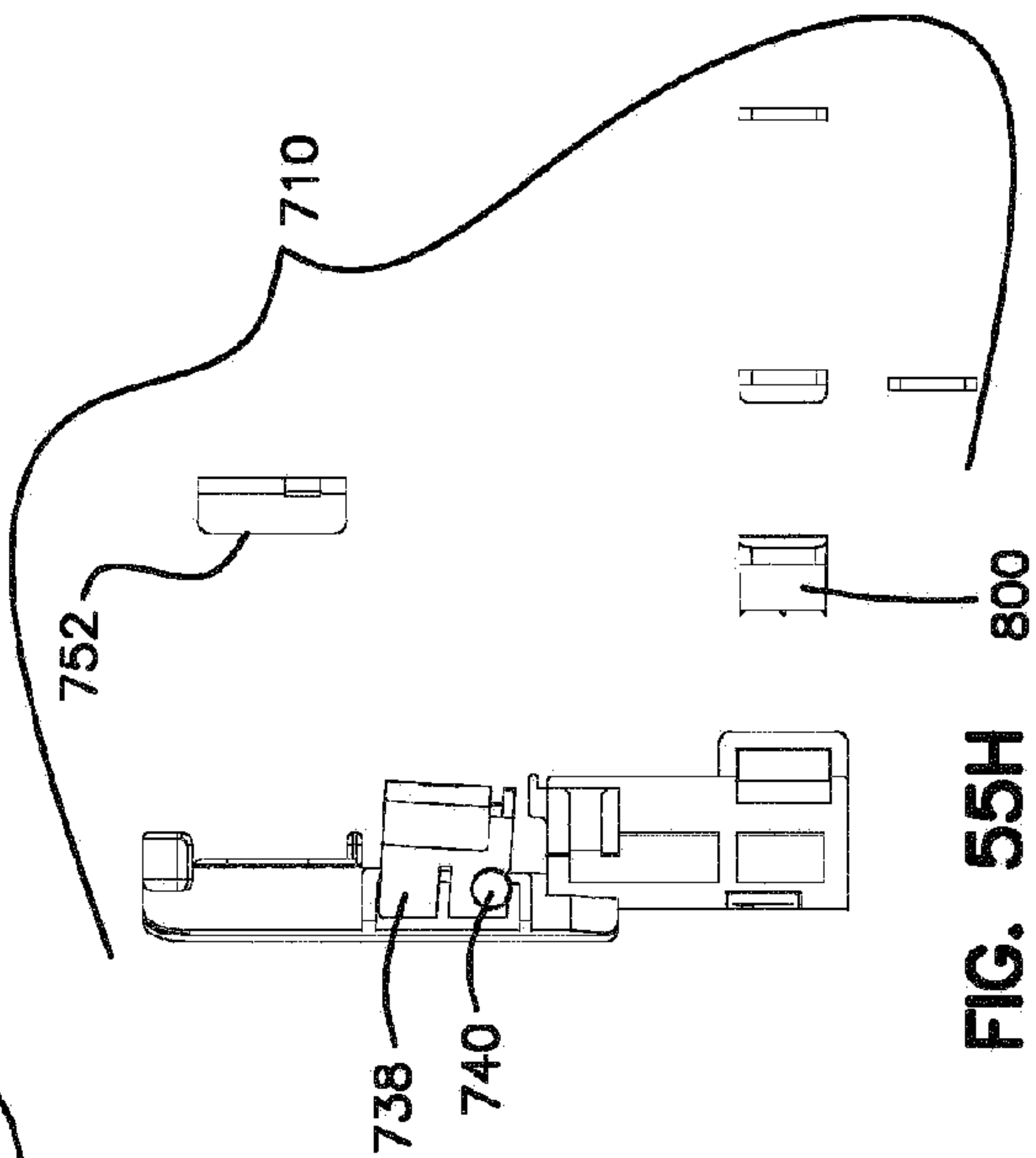
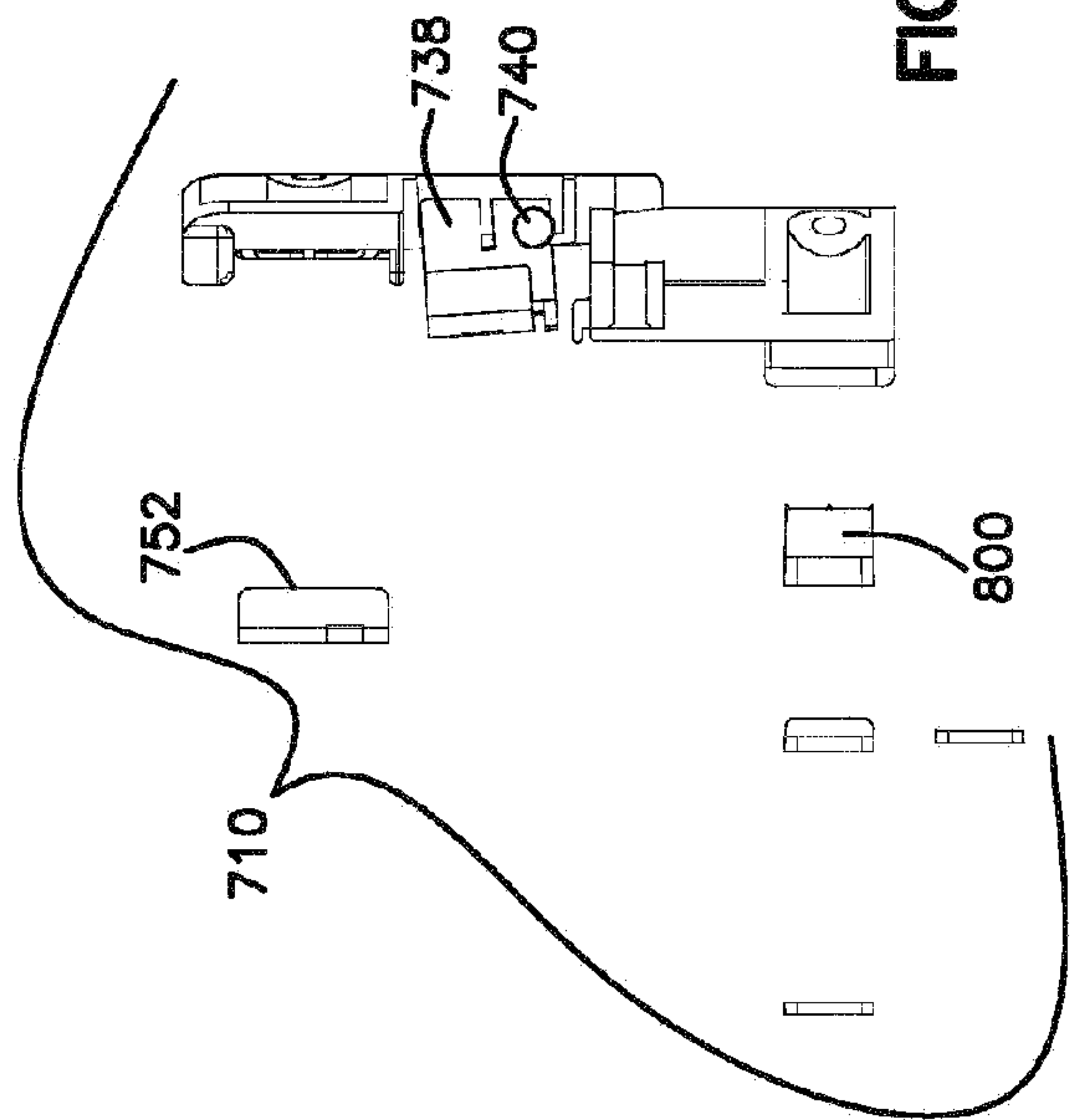
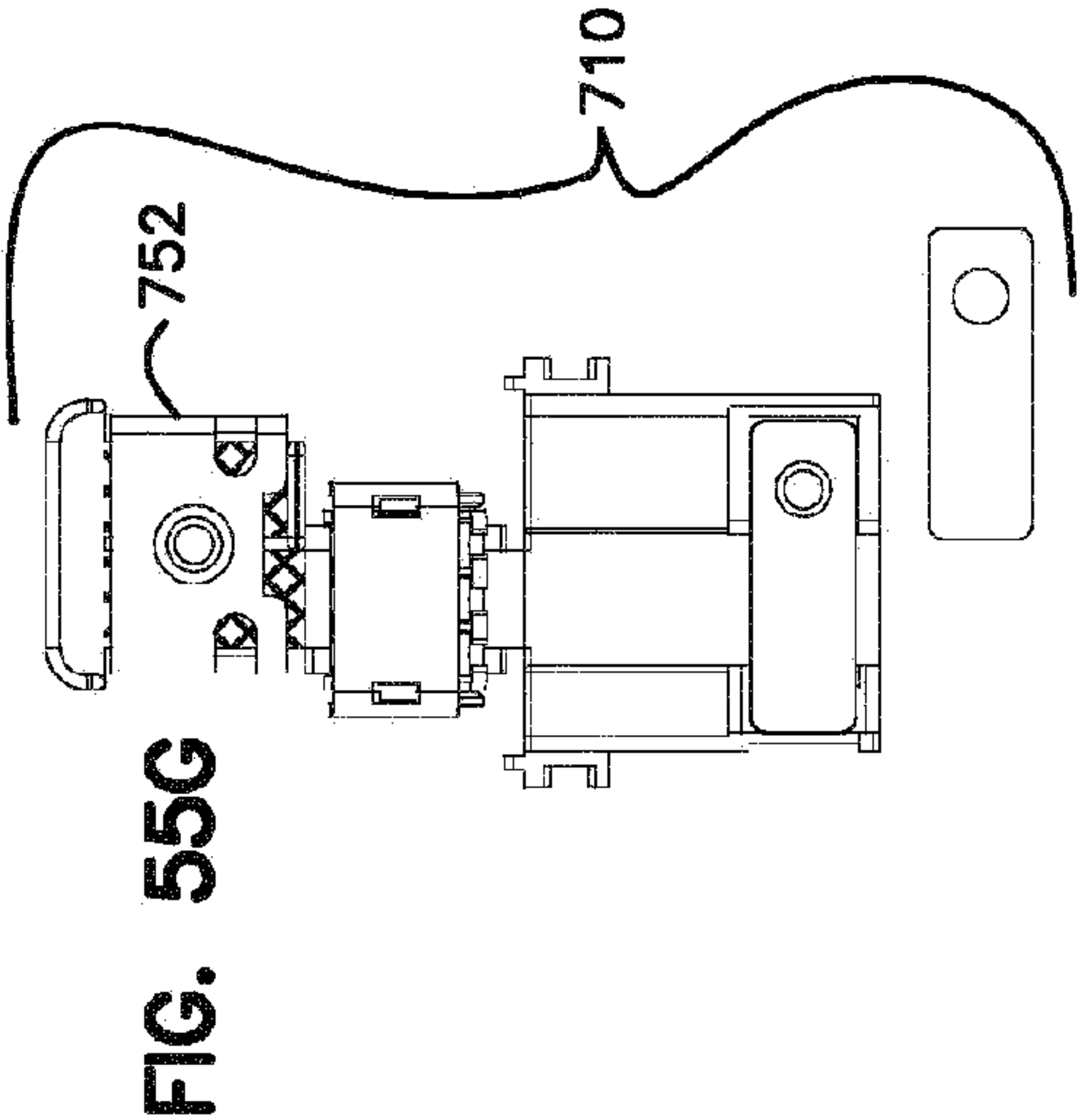


FIG. 56C

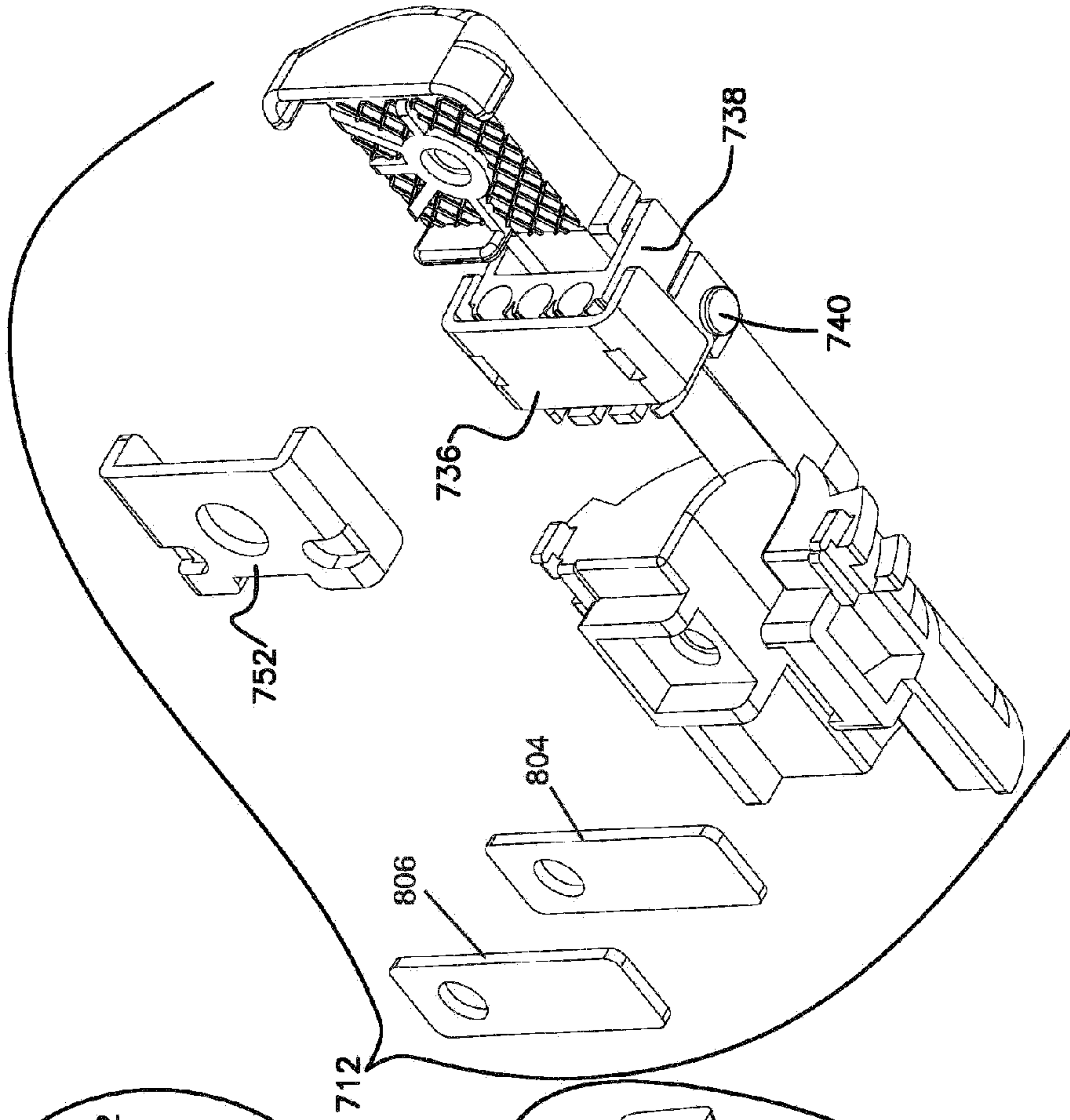


FIG. 56A

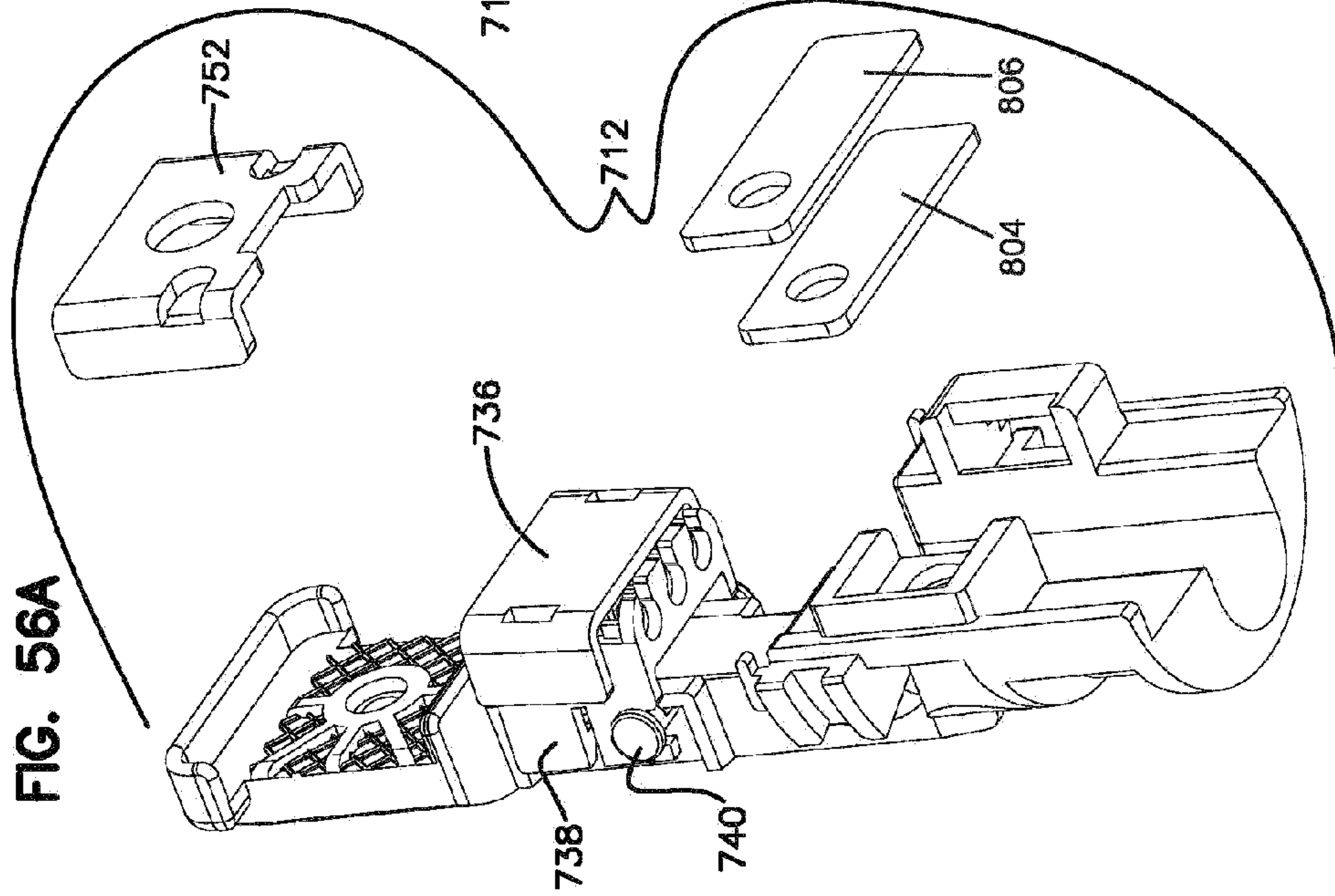


FIG. 56B

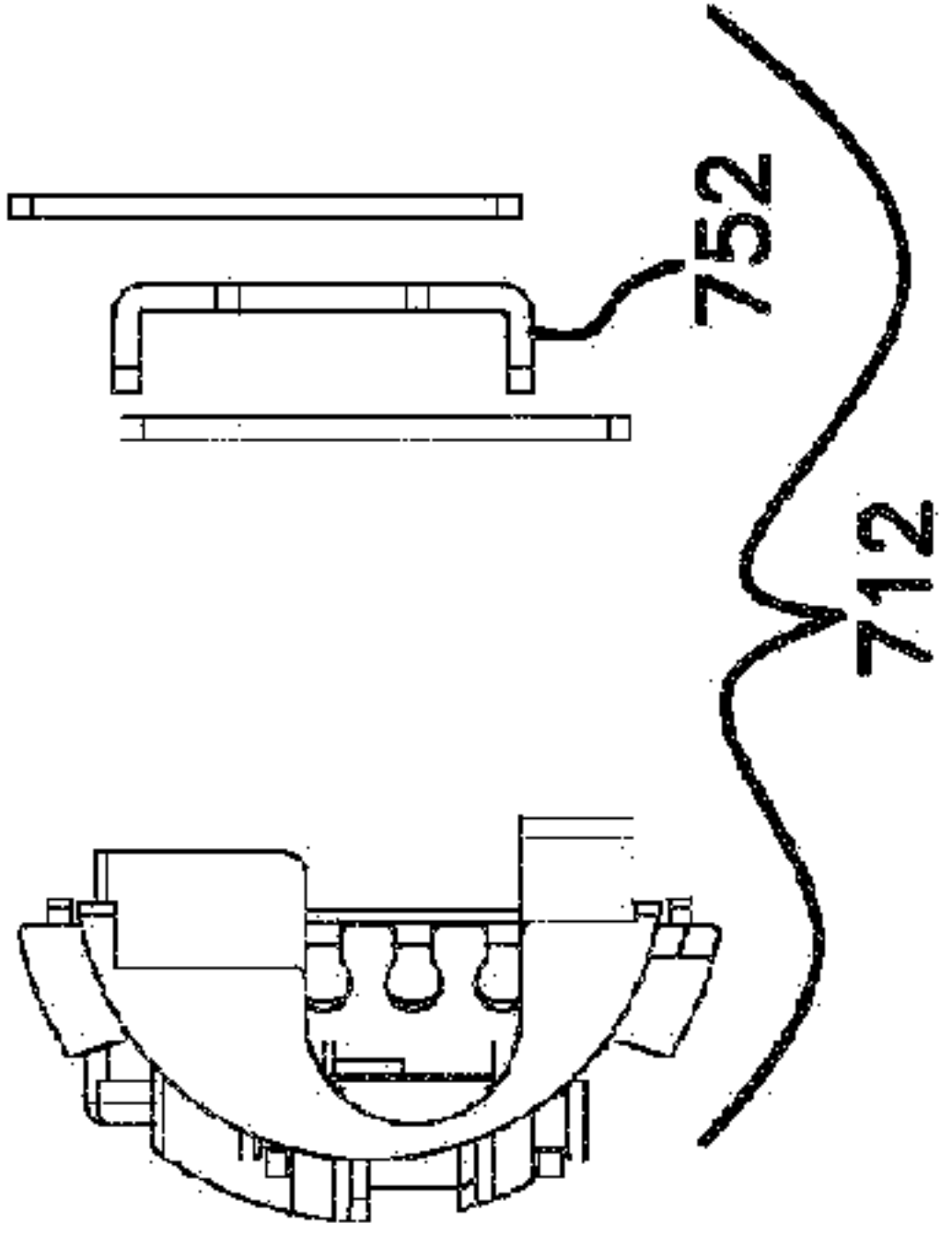


FIG. 56F

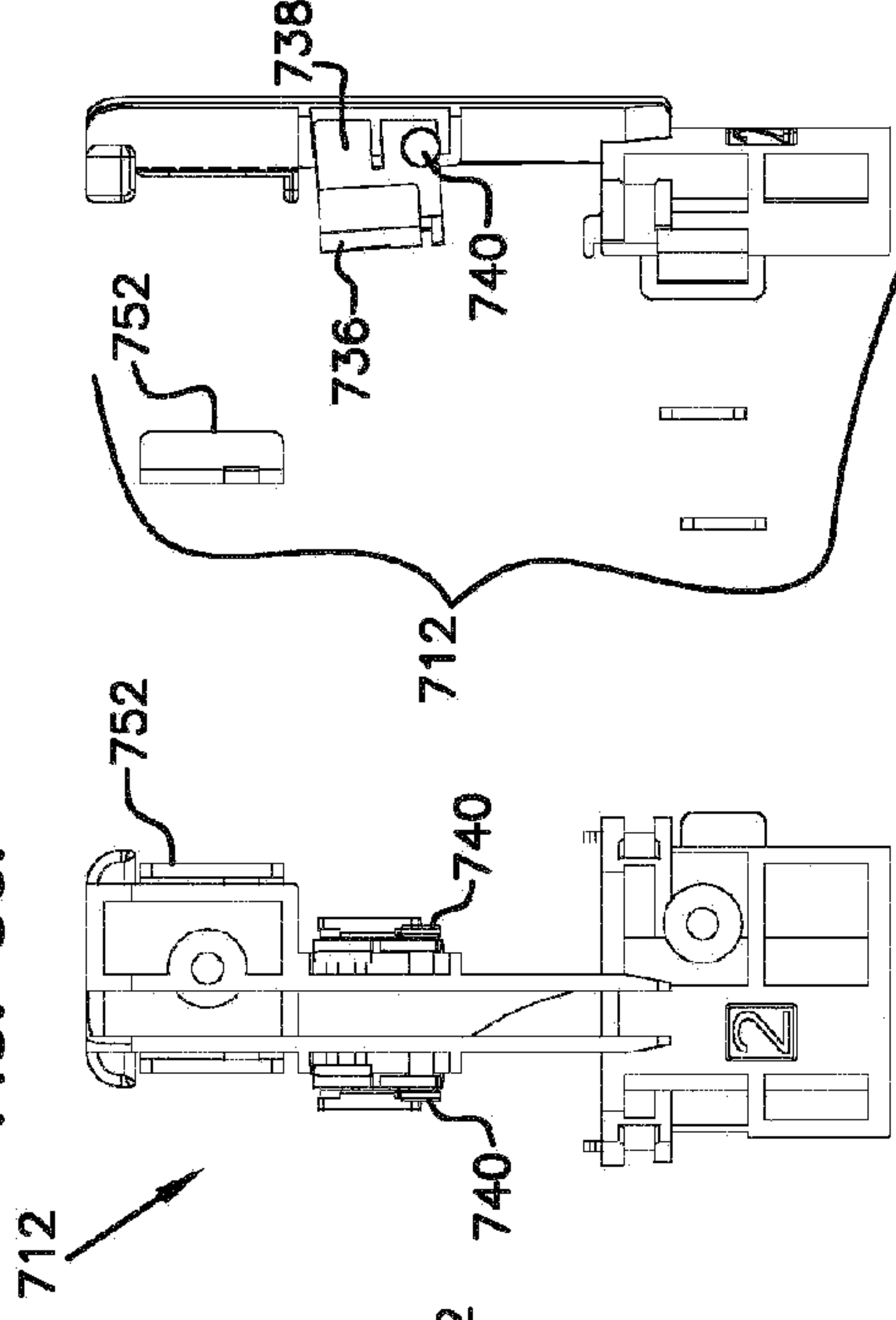


FIG. 56D

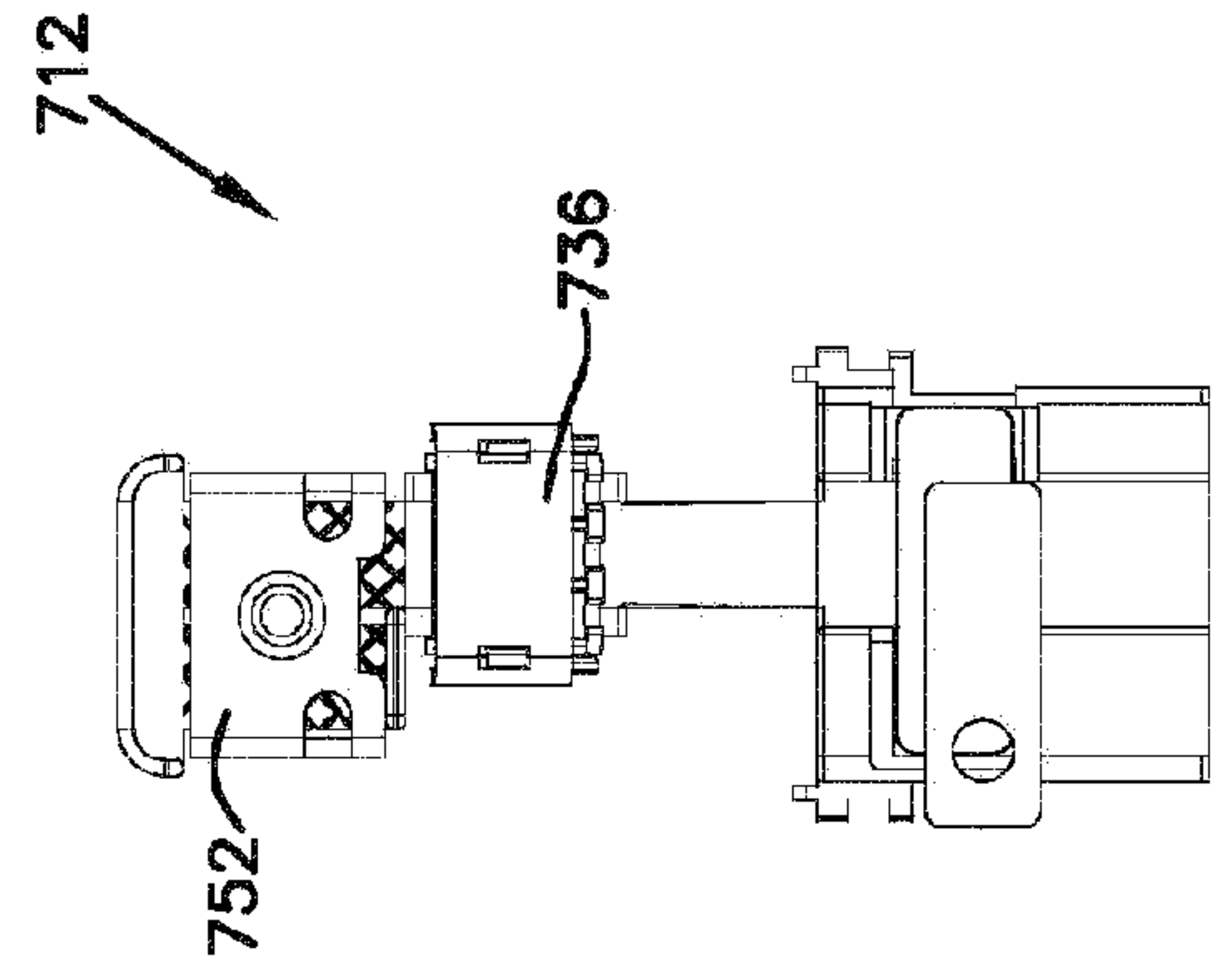


FIG. 56E

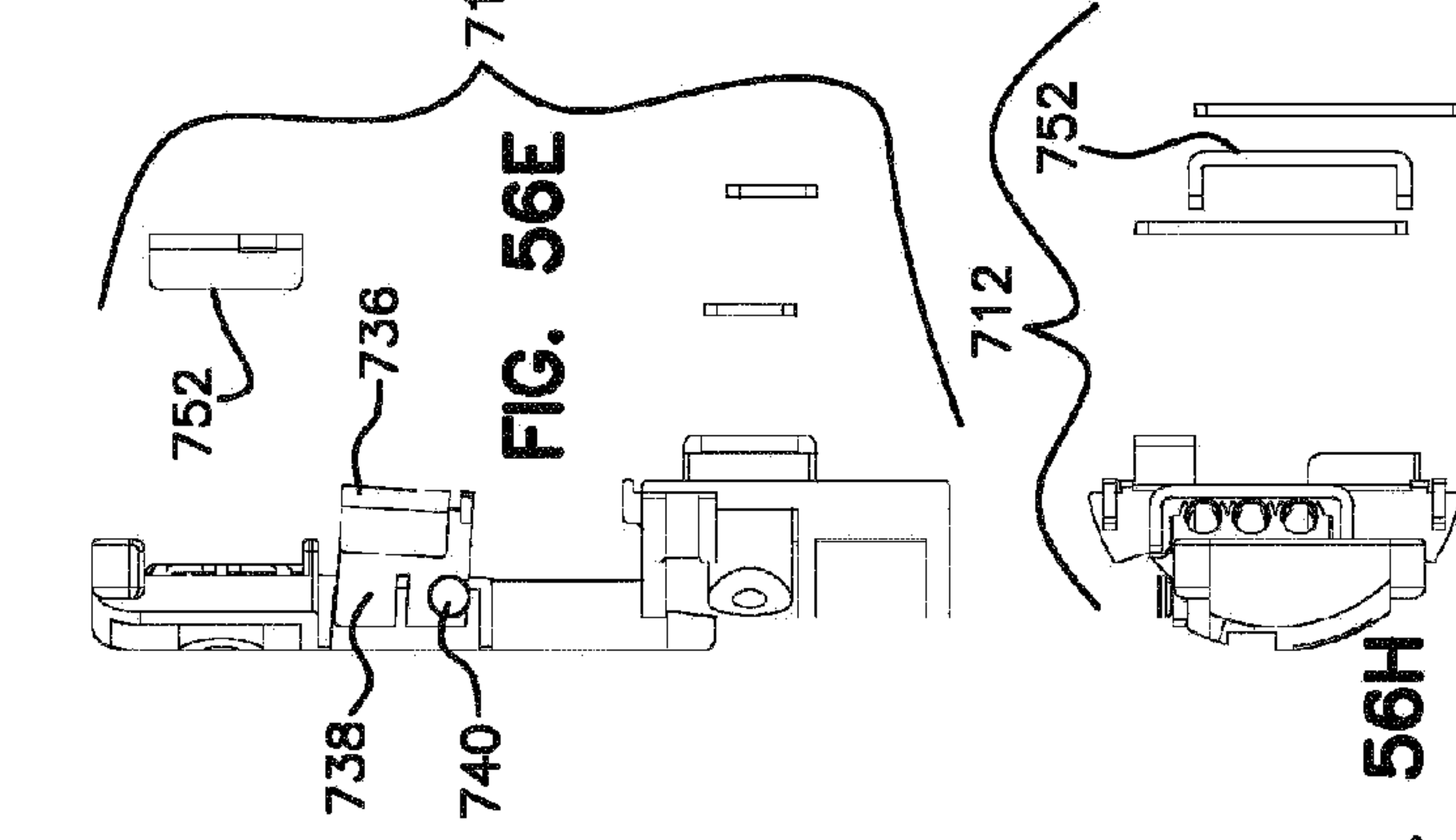


FIG. 56G

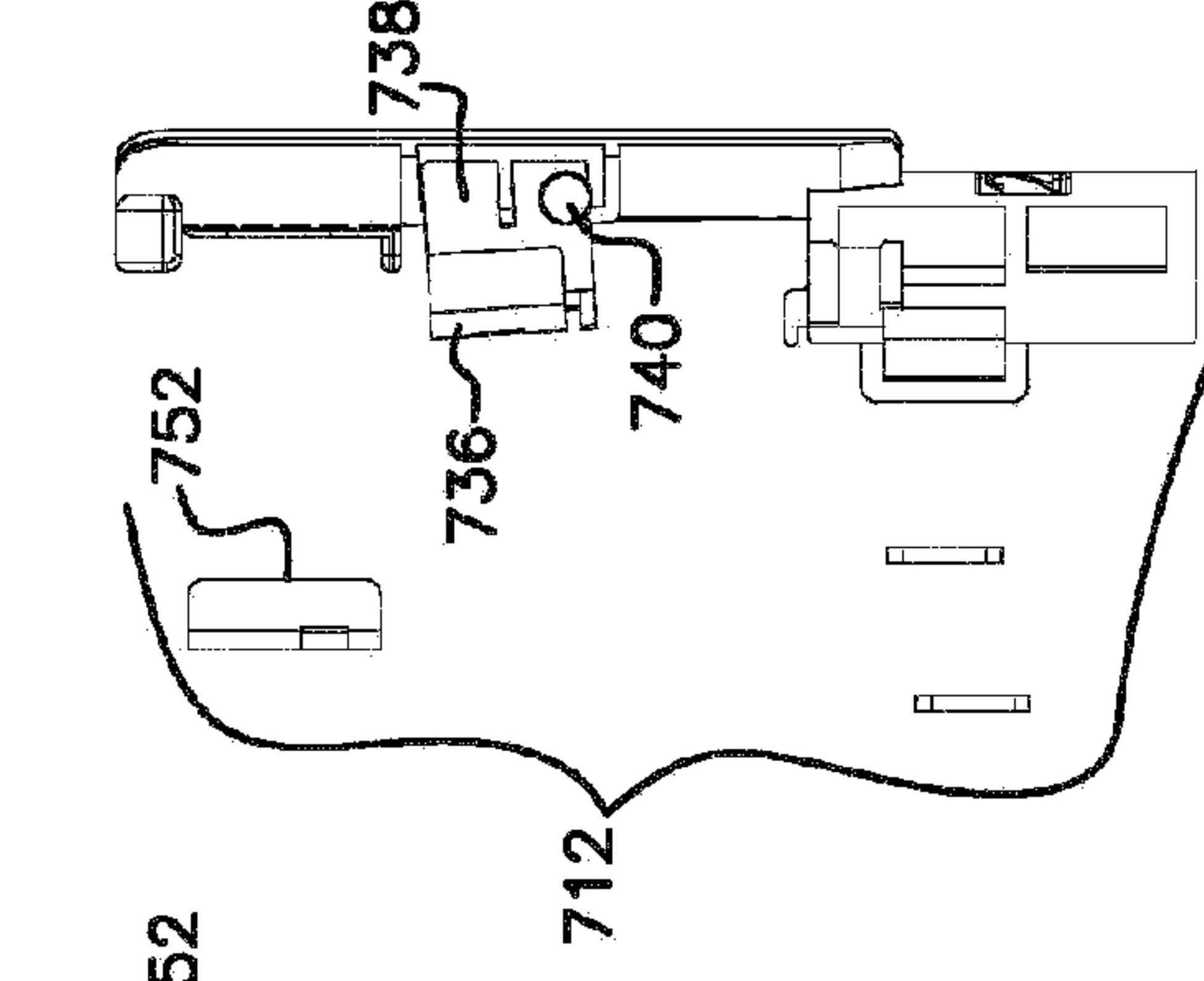
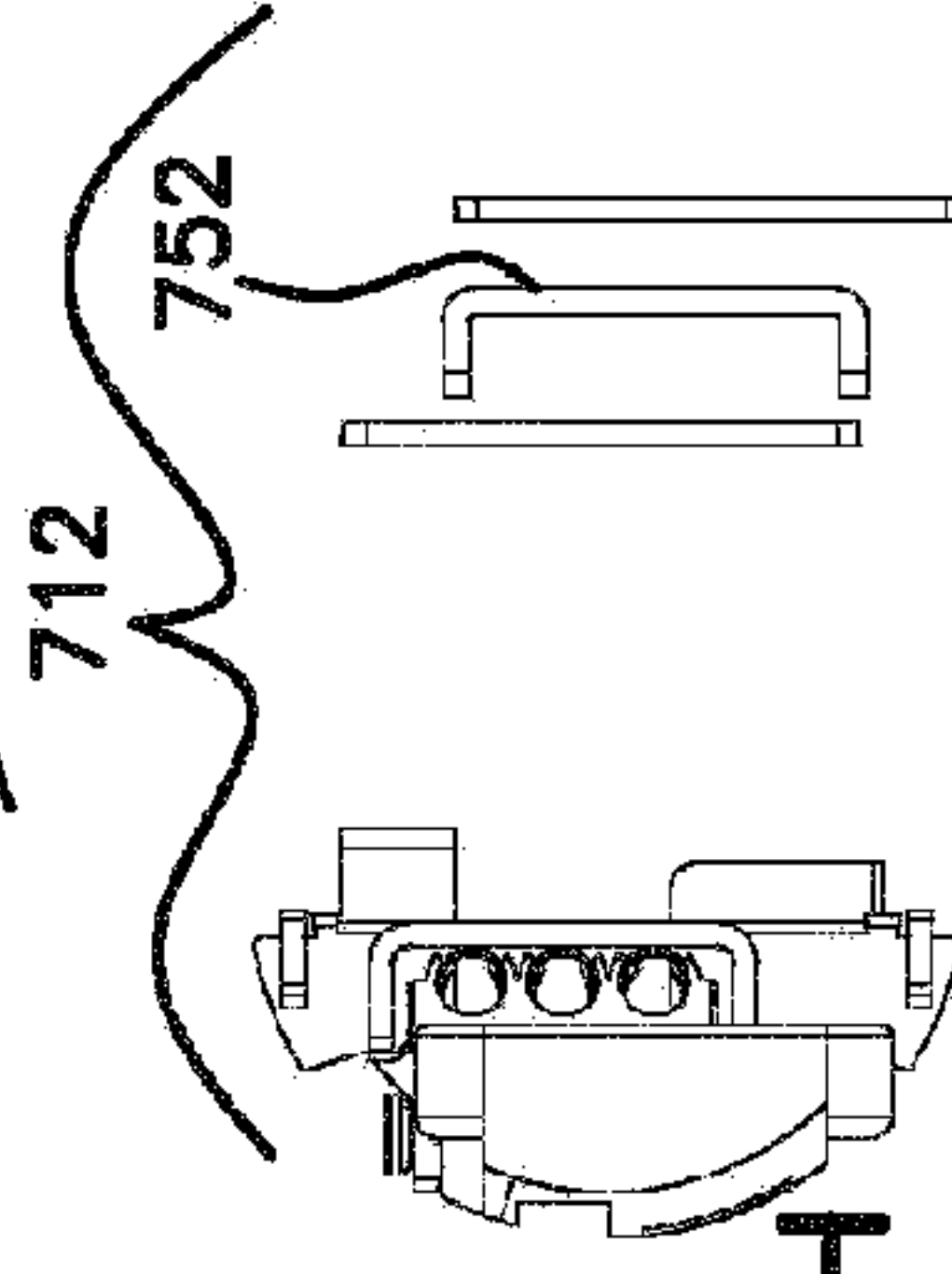


FIG. 56H



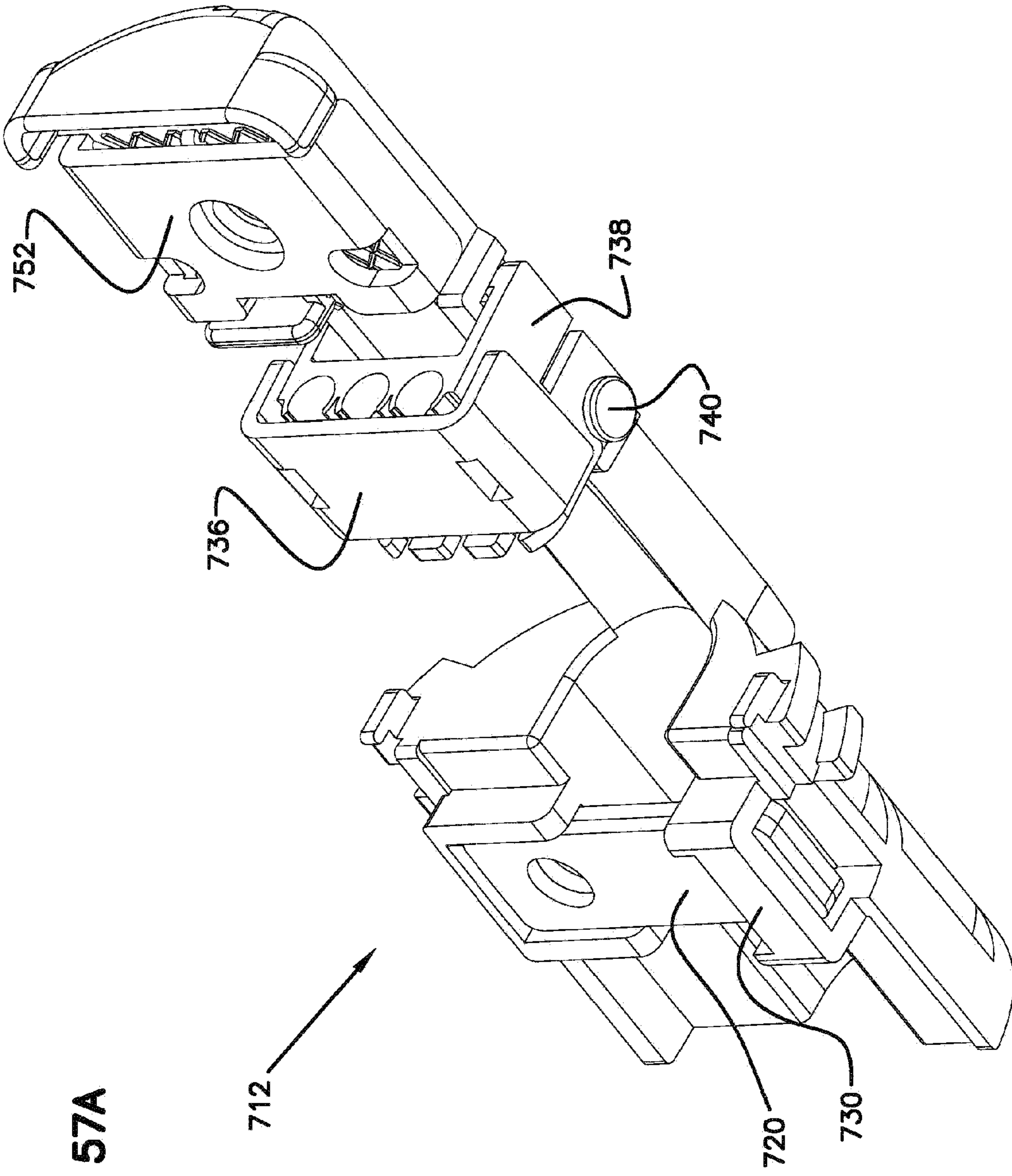


FIG. 57A

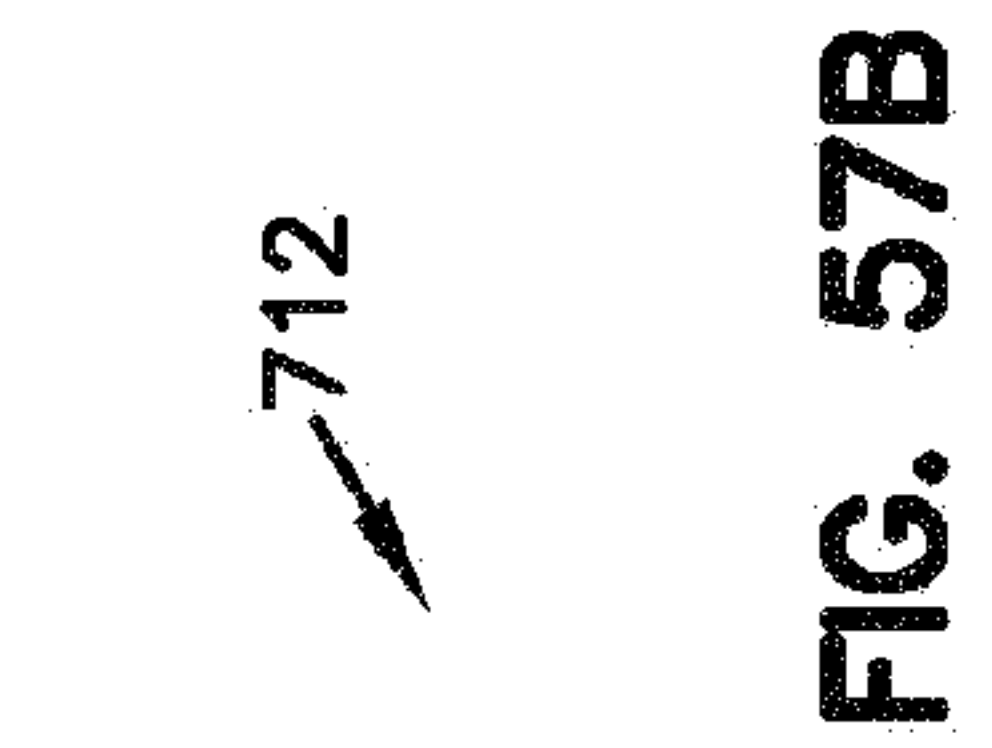
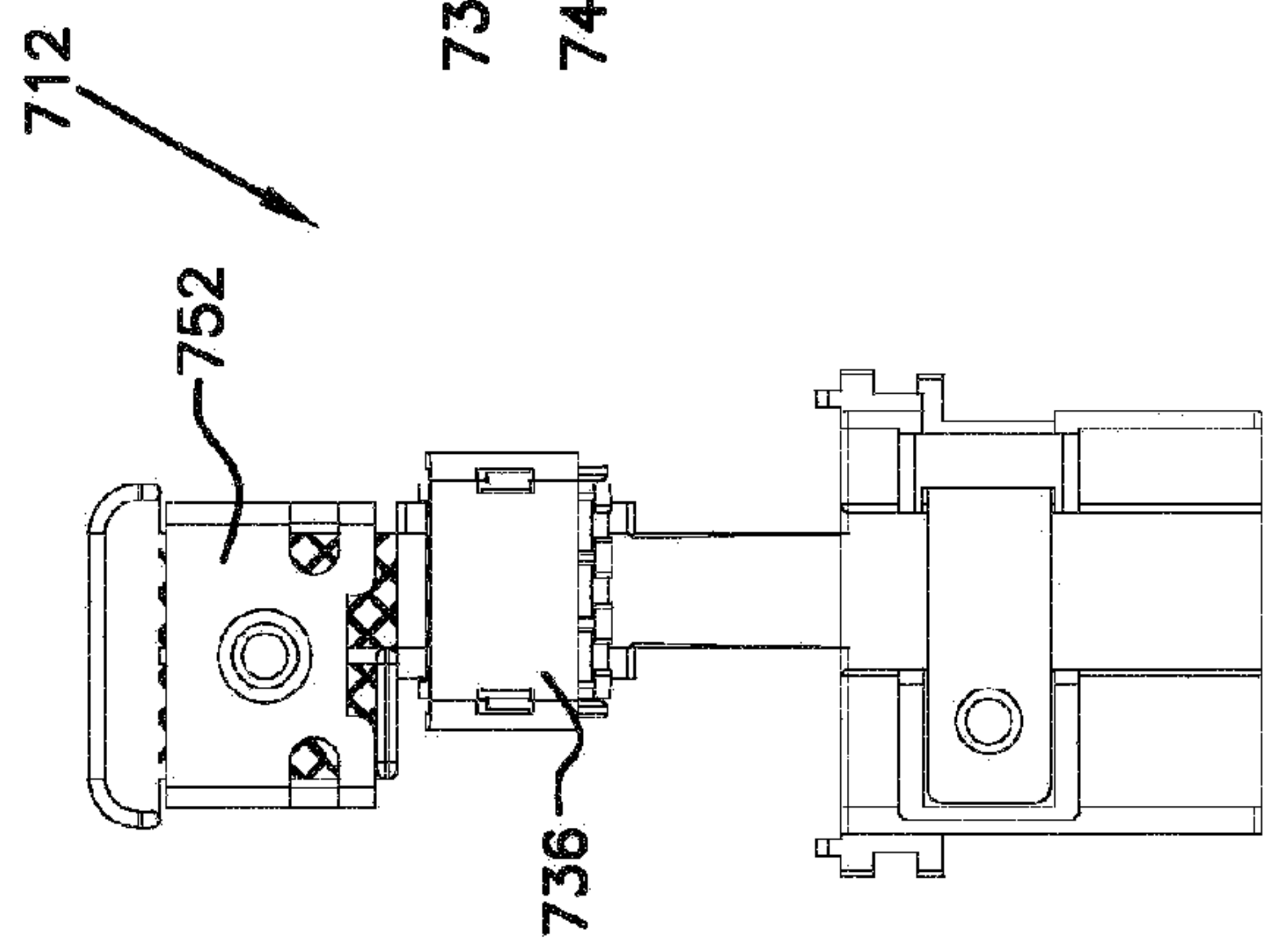
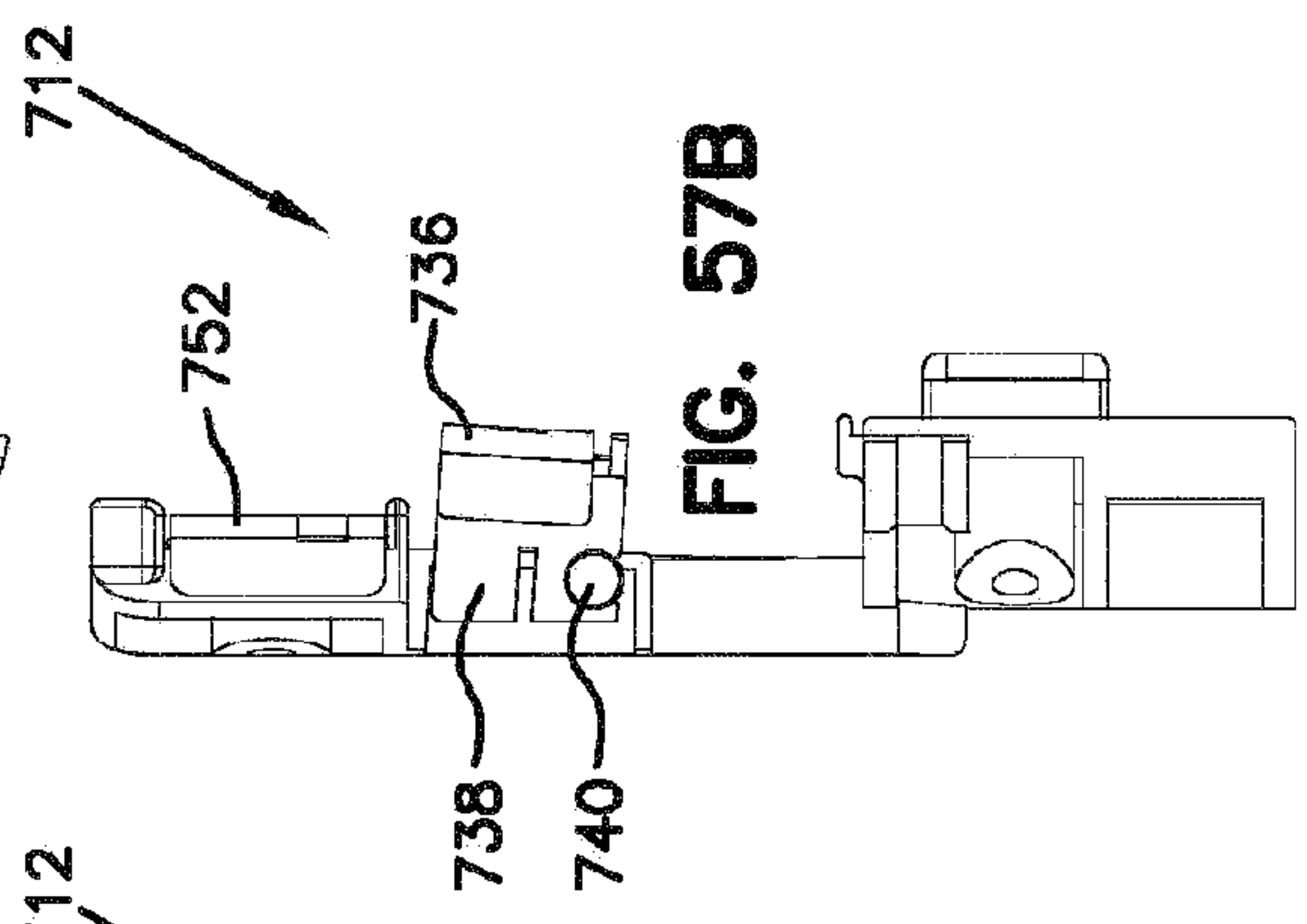
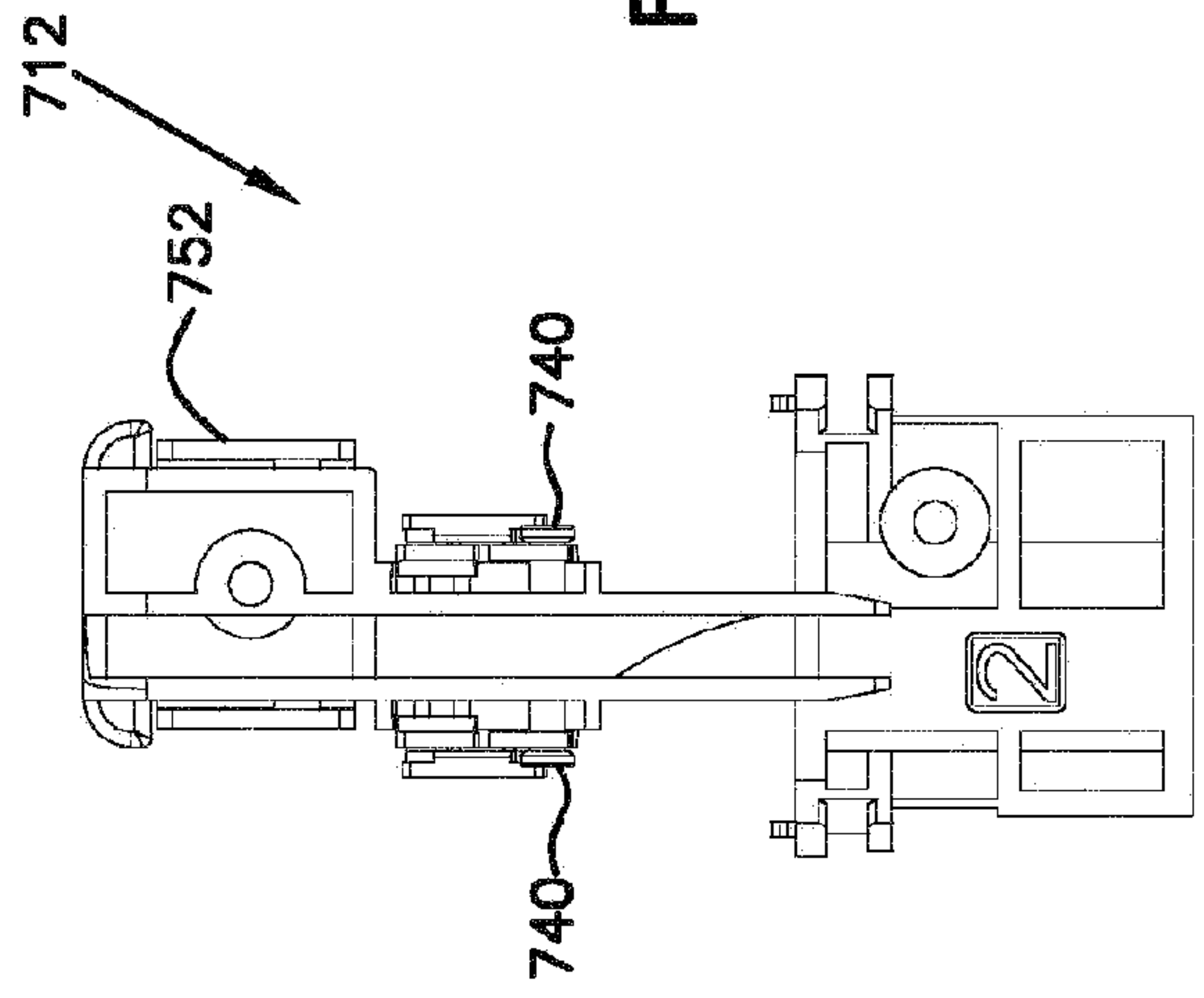
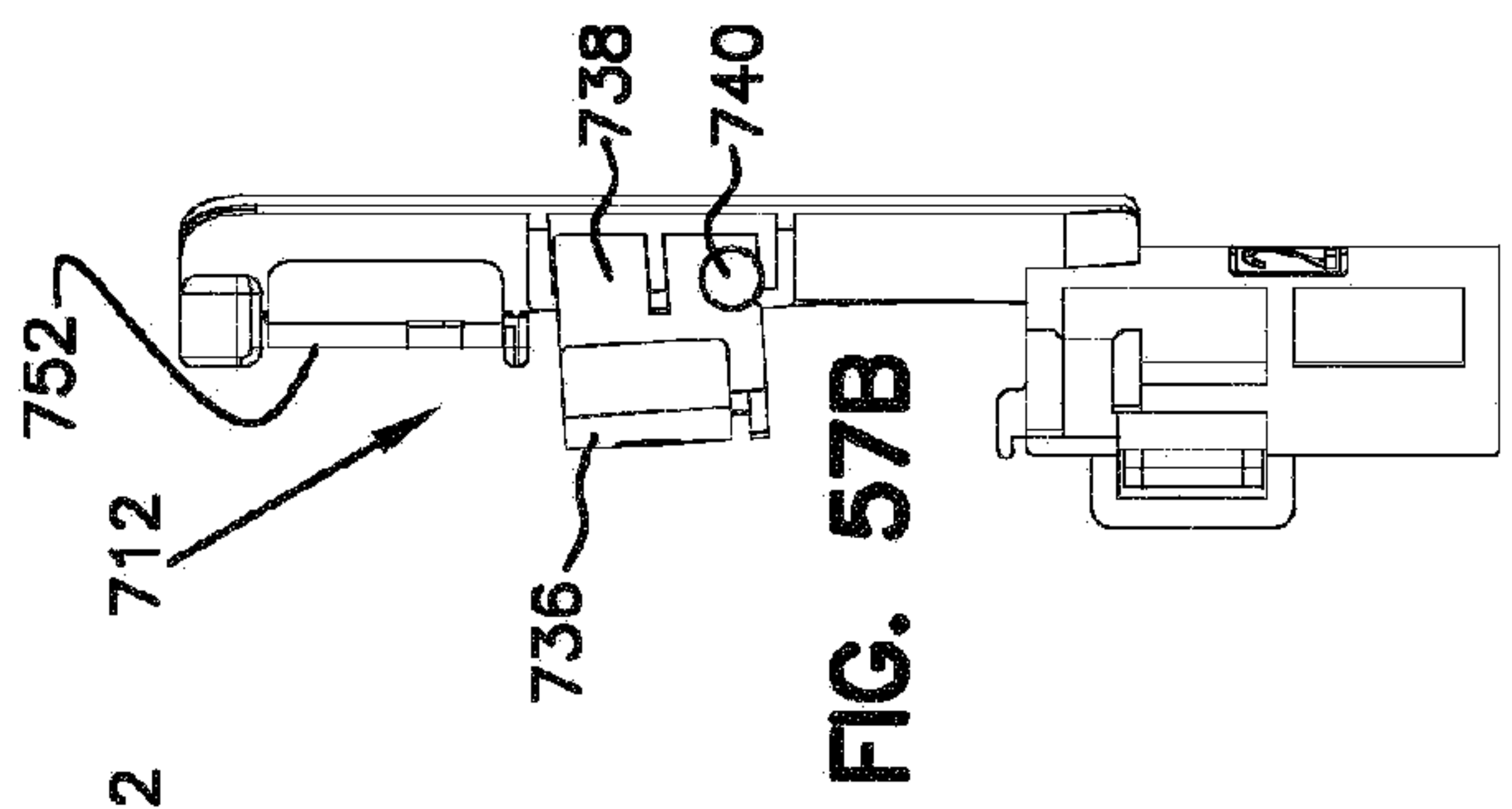
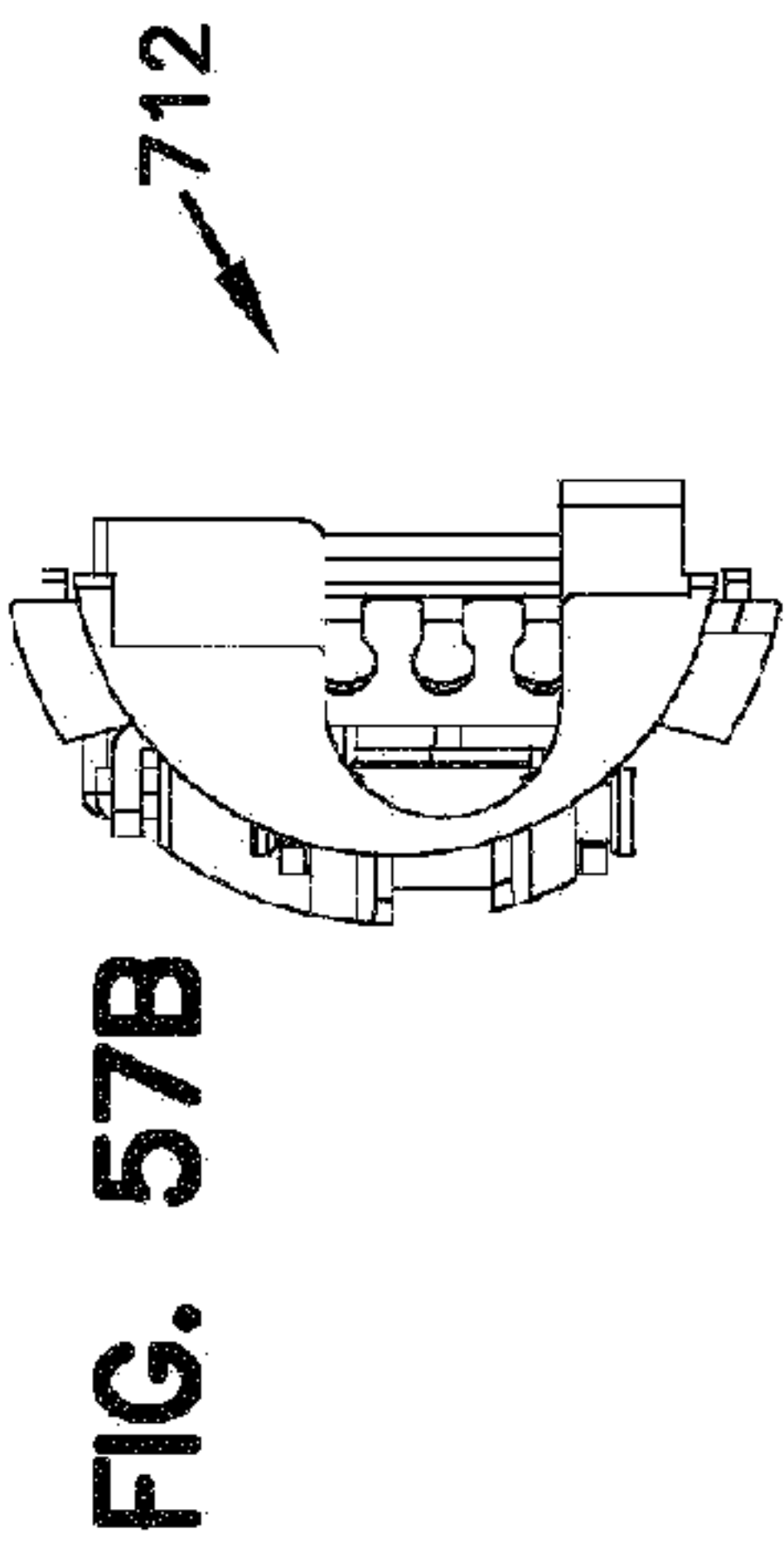


FIG. 57B

FIG. 57B

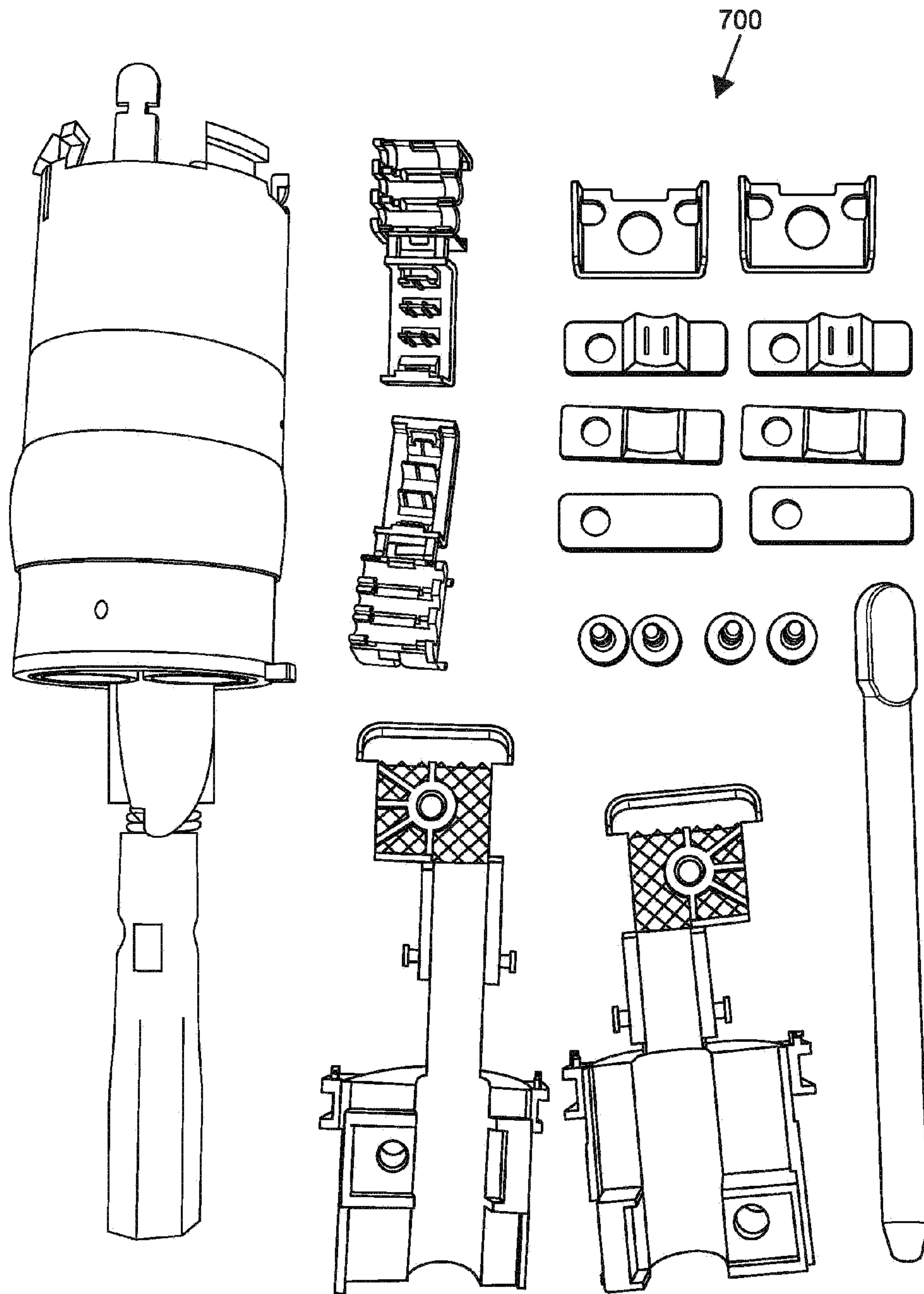


FIG. 58

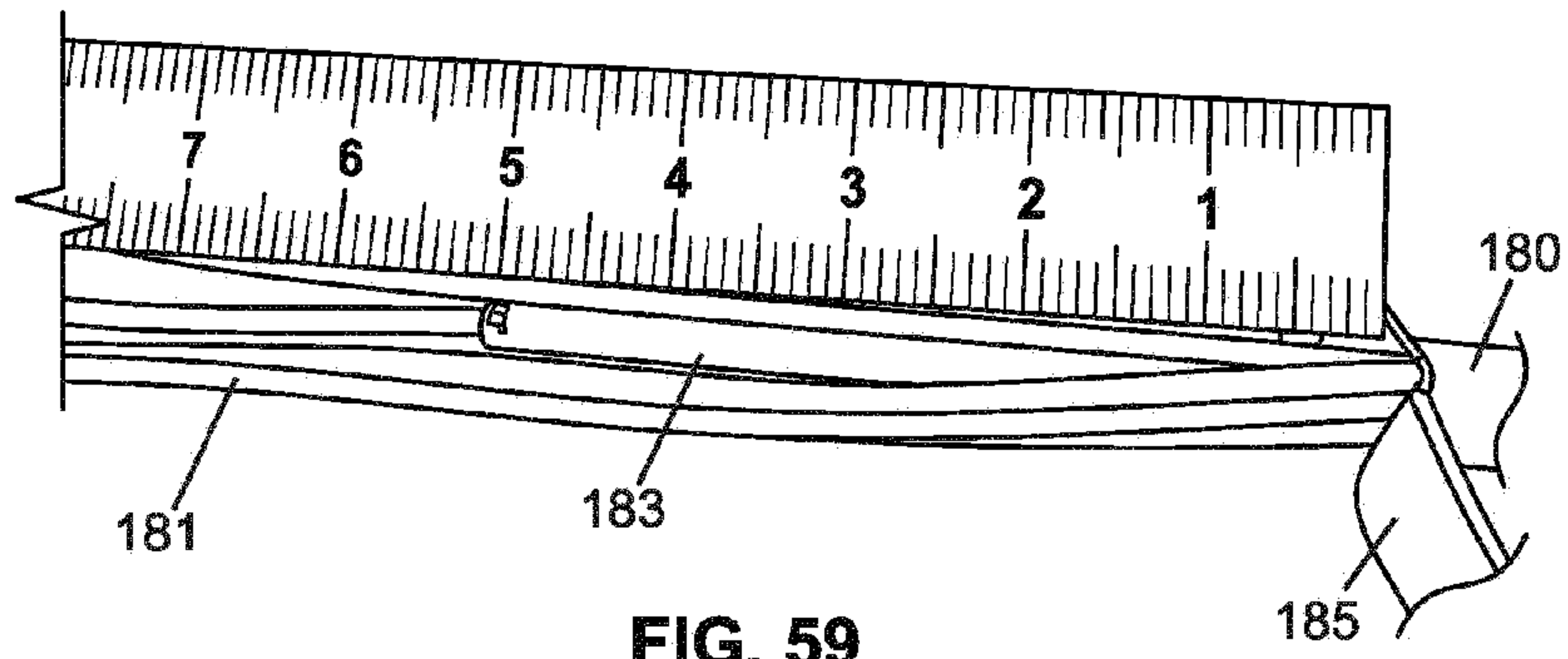


FIG. 59

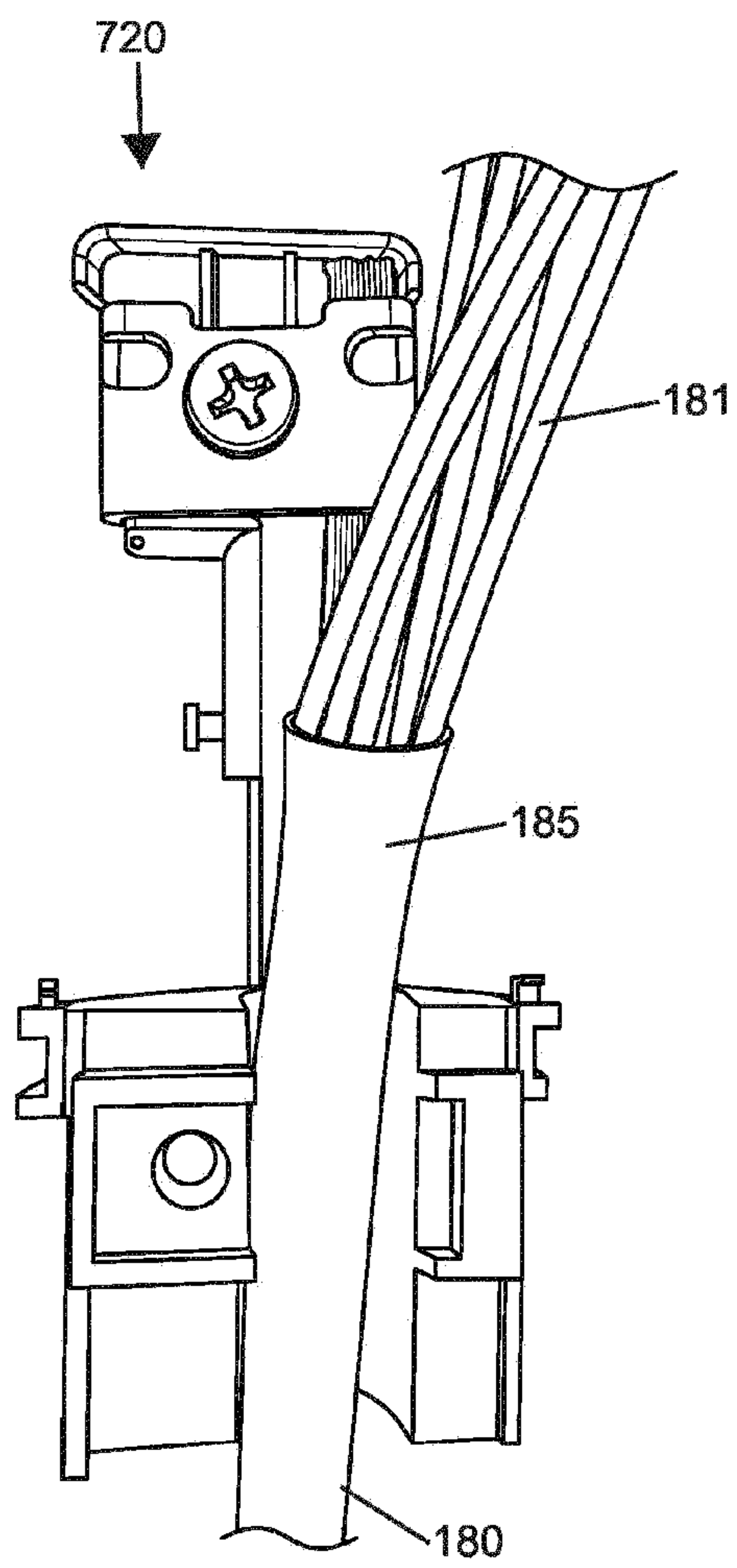


FIG. 60

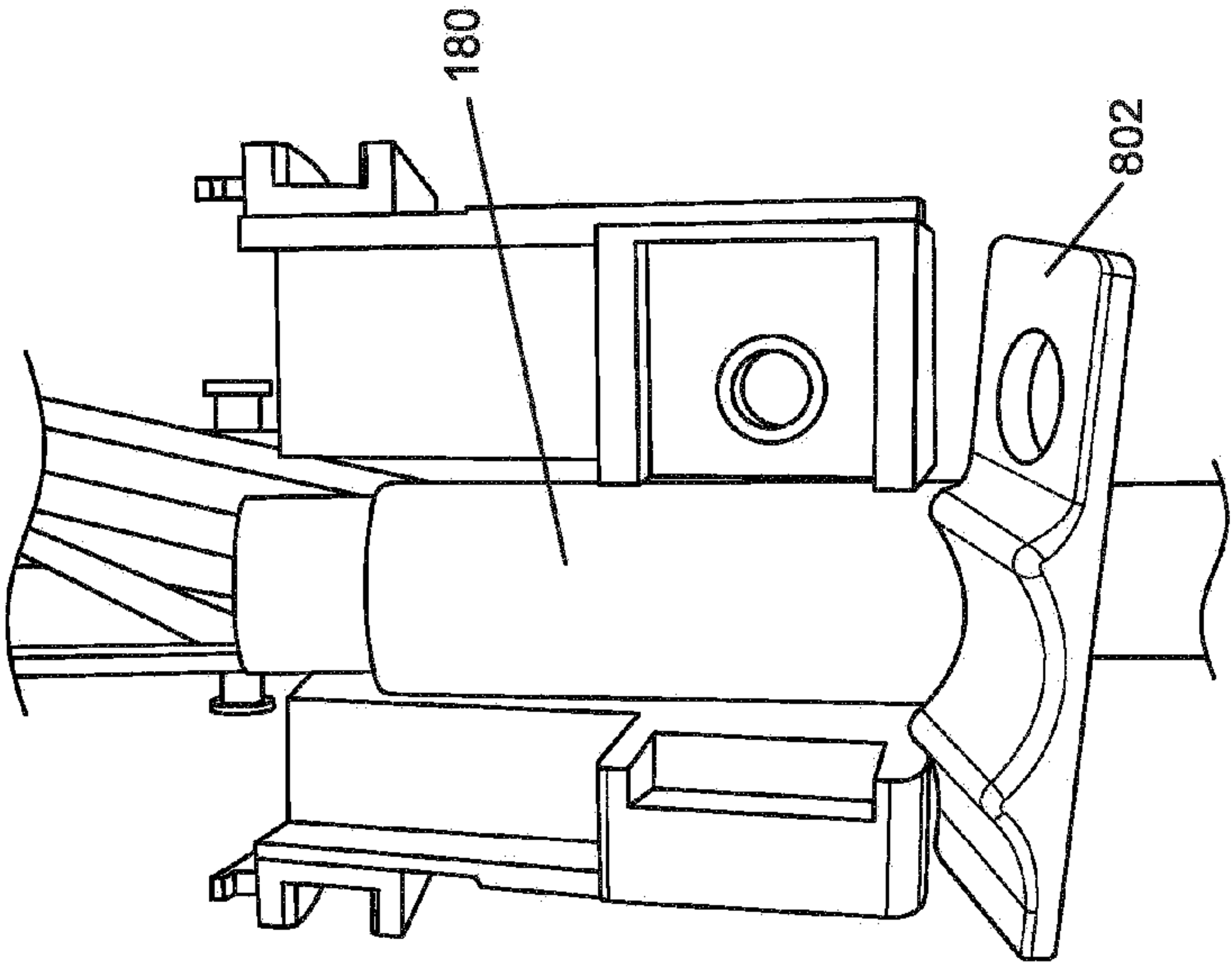


FIG. 61

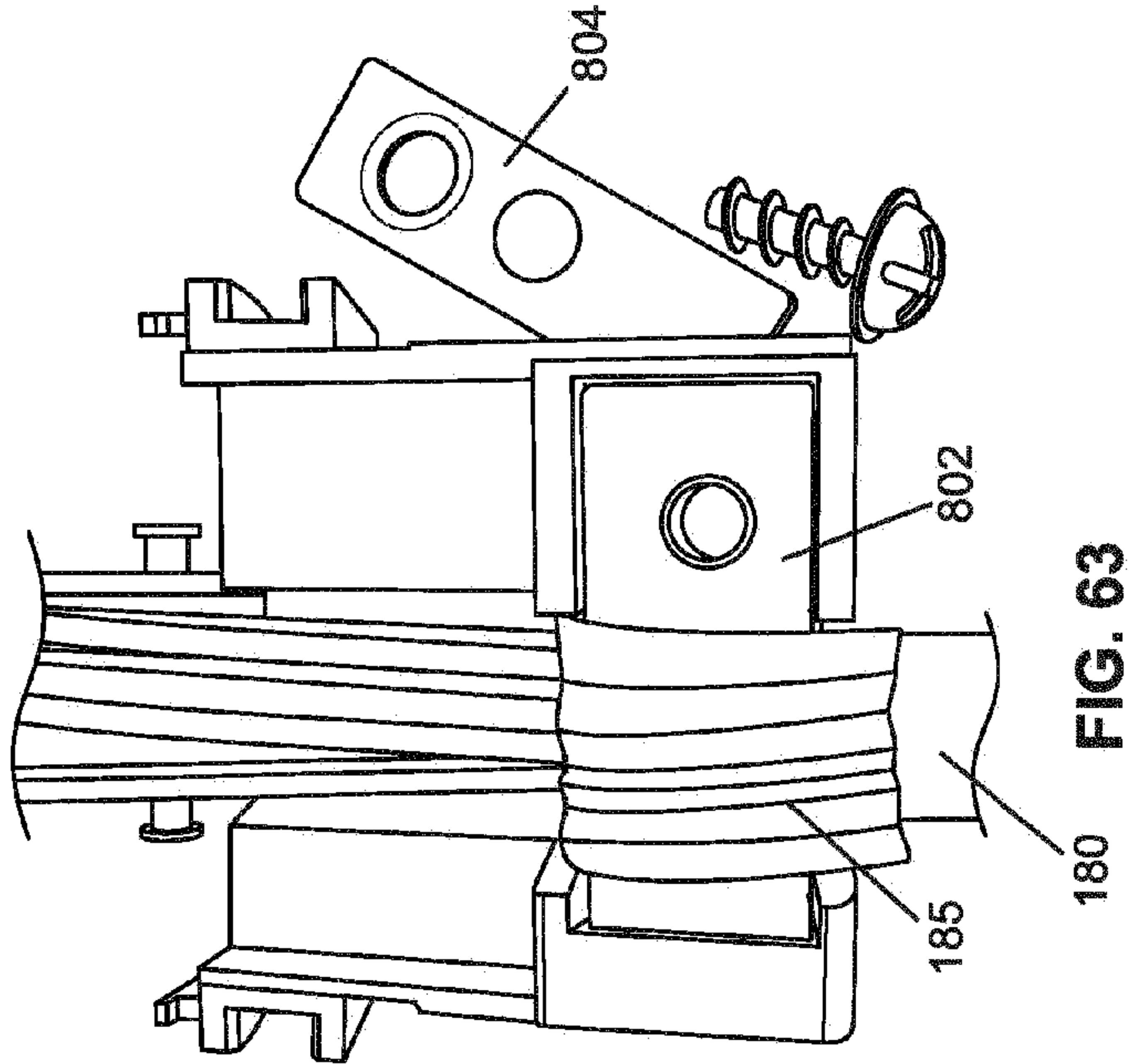


FIG. 63

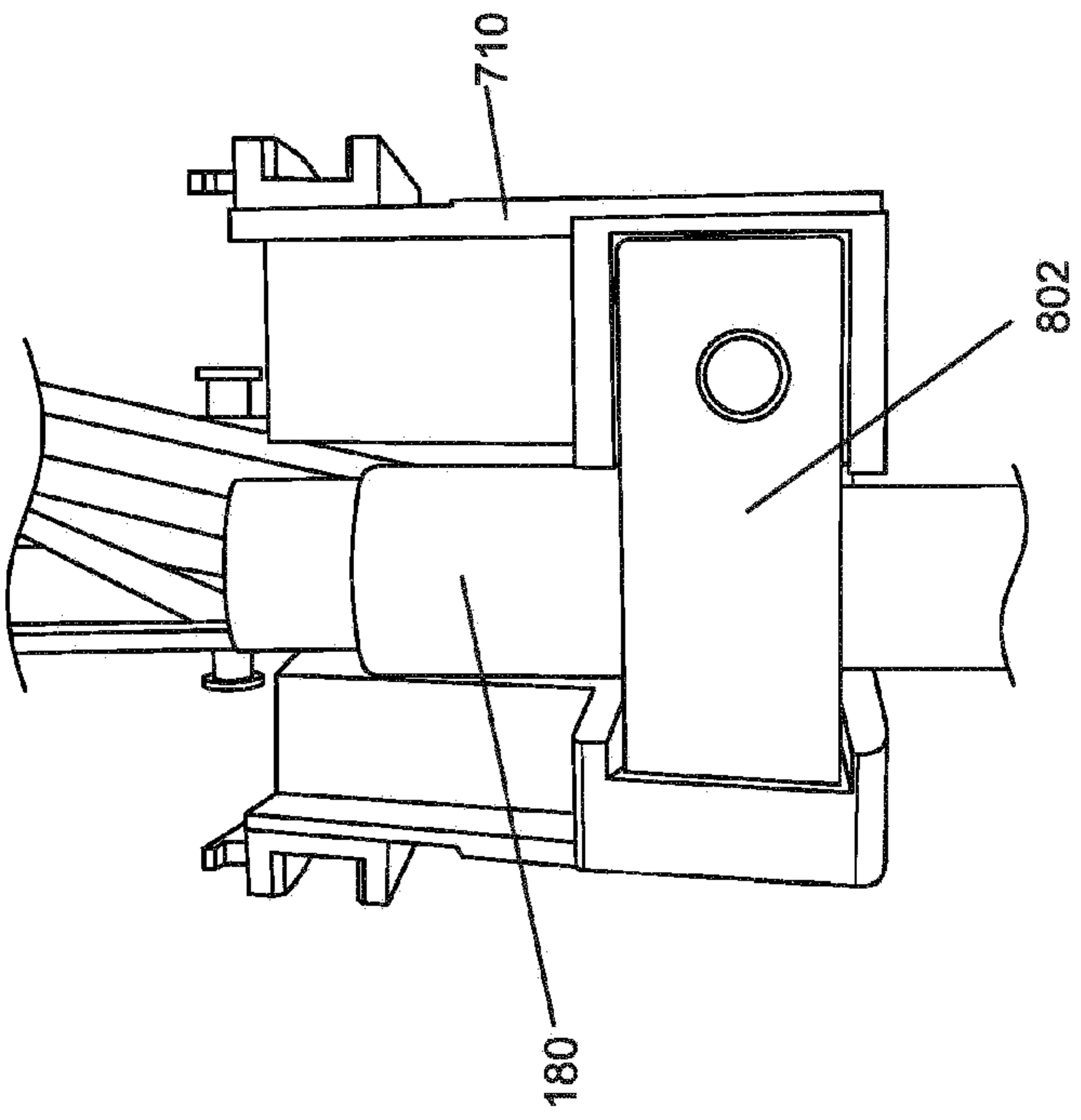


FIG. 62

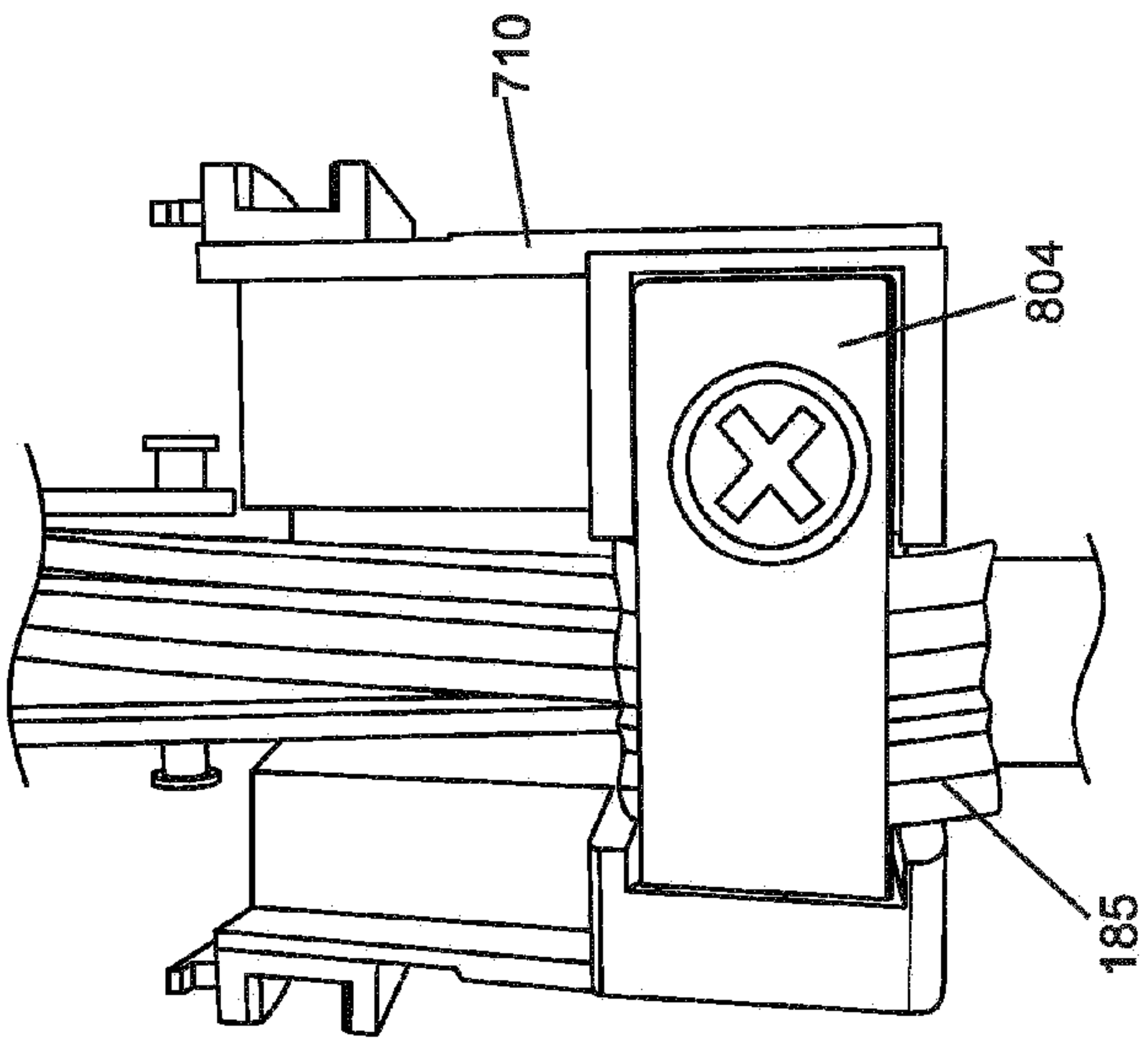
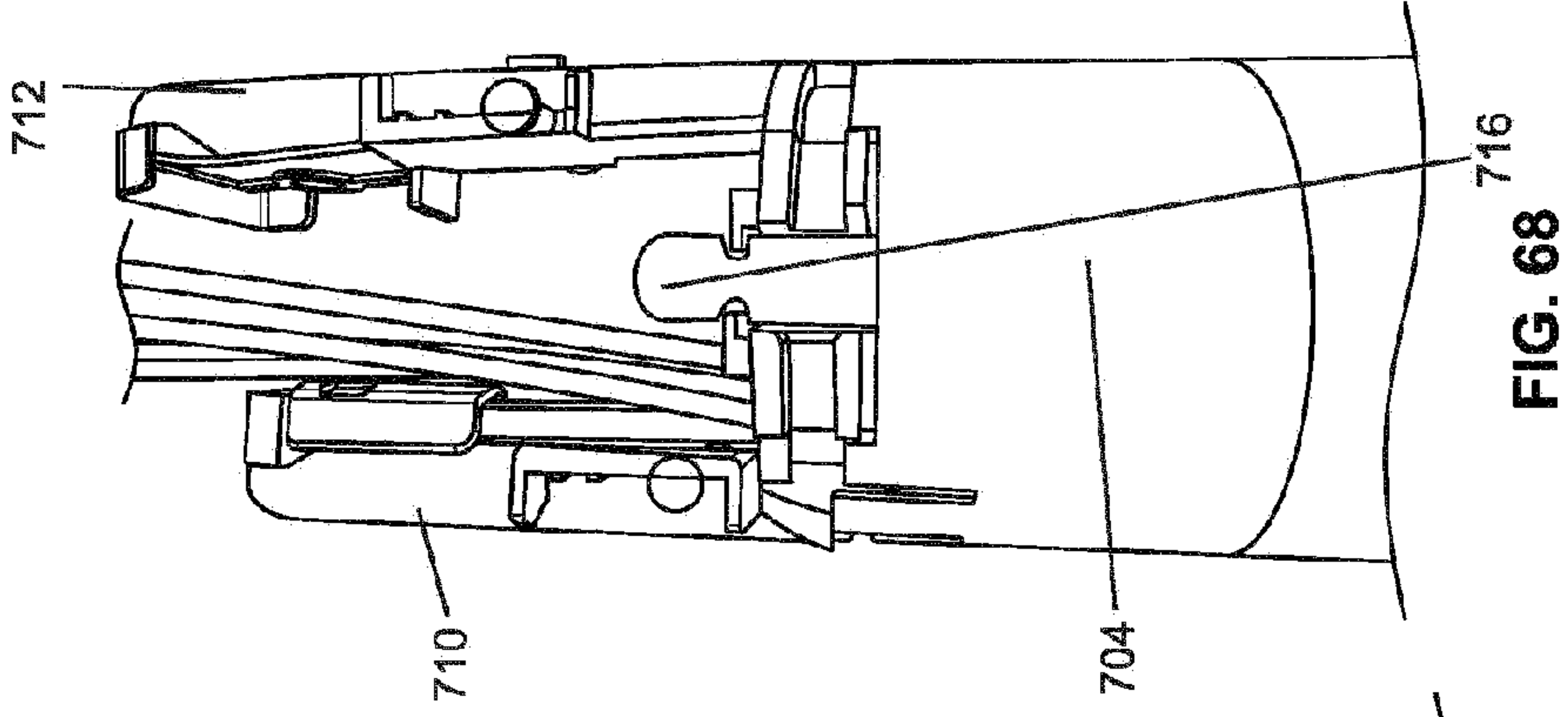
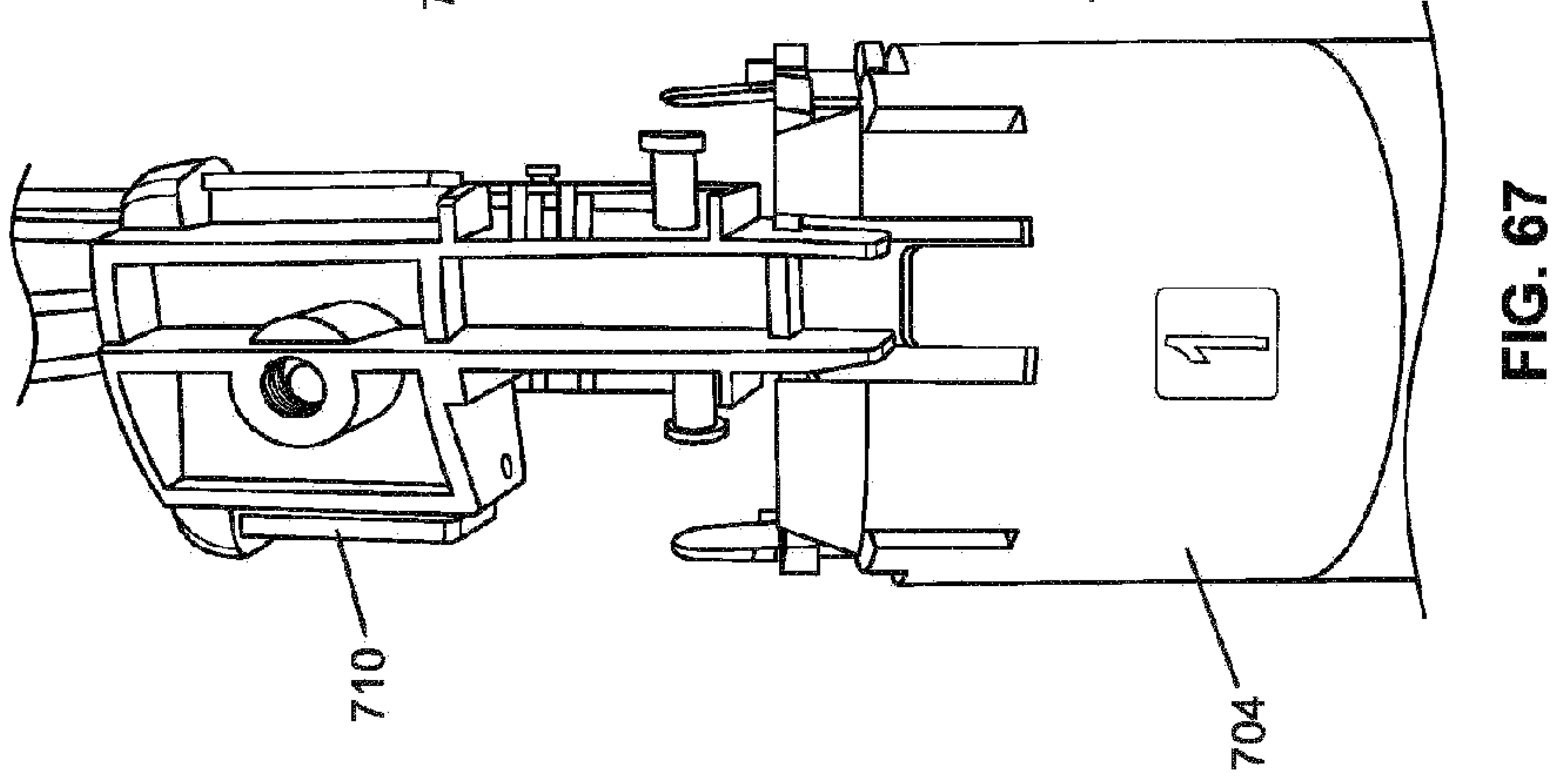
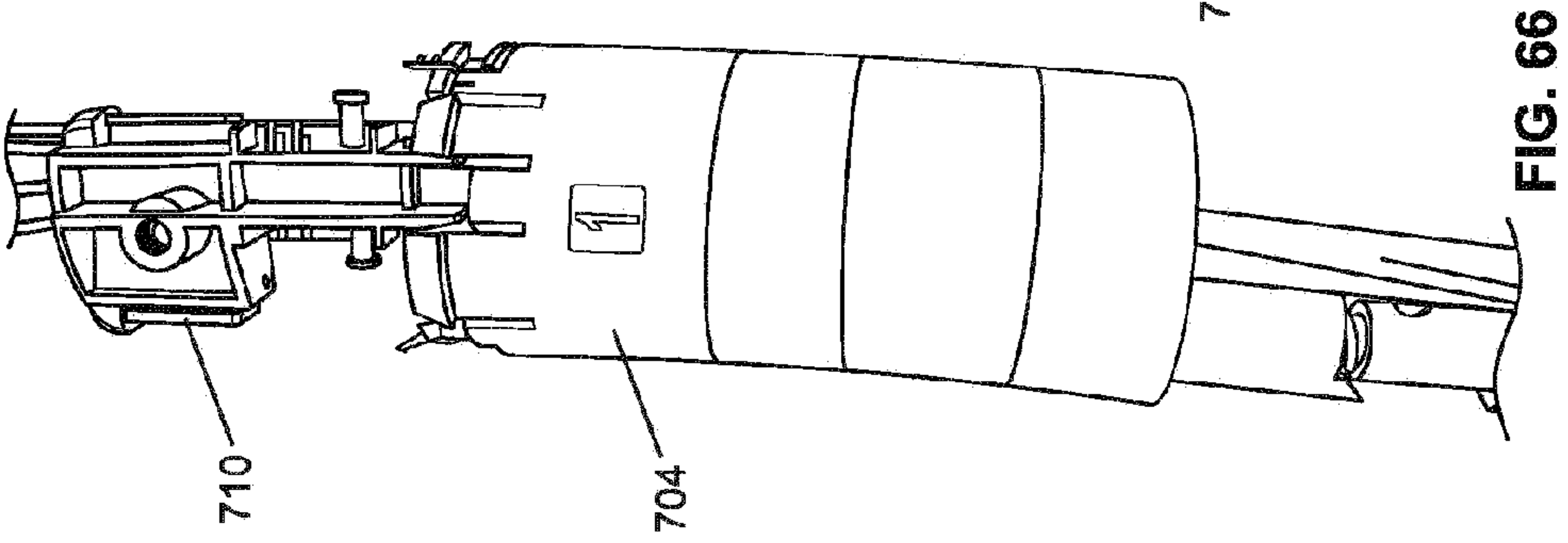
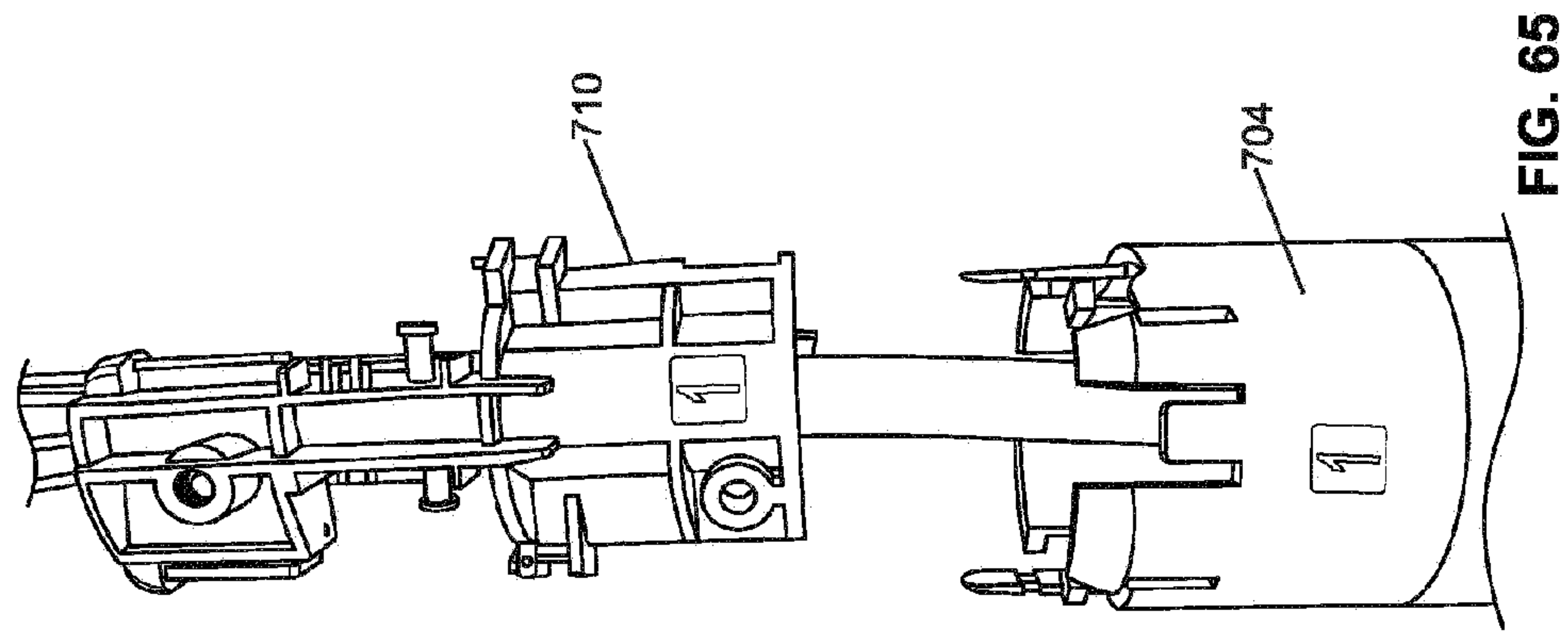


FIG. 64



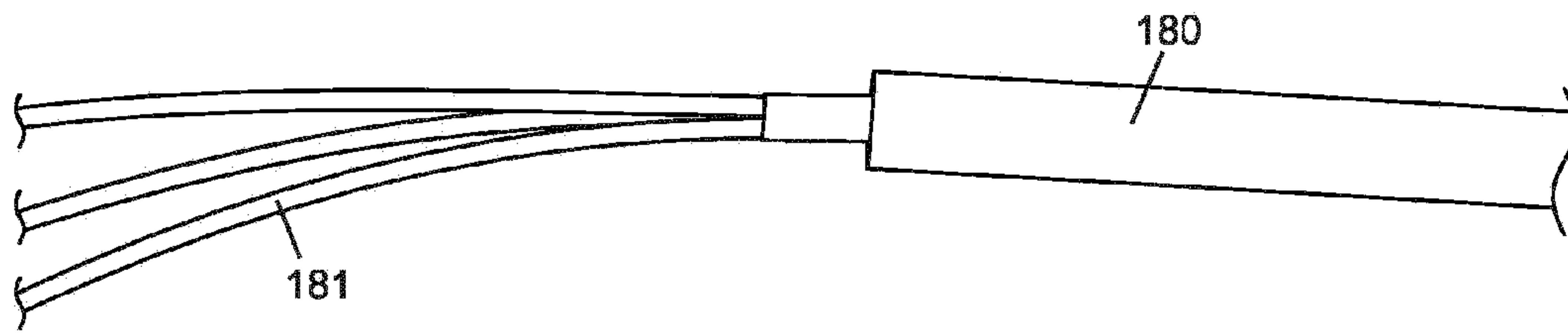


FIG. 69

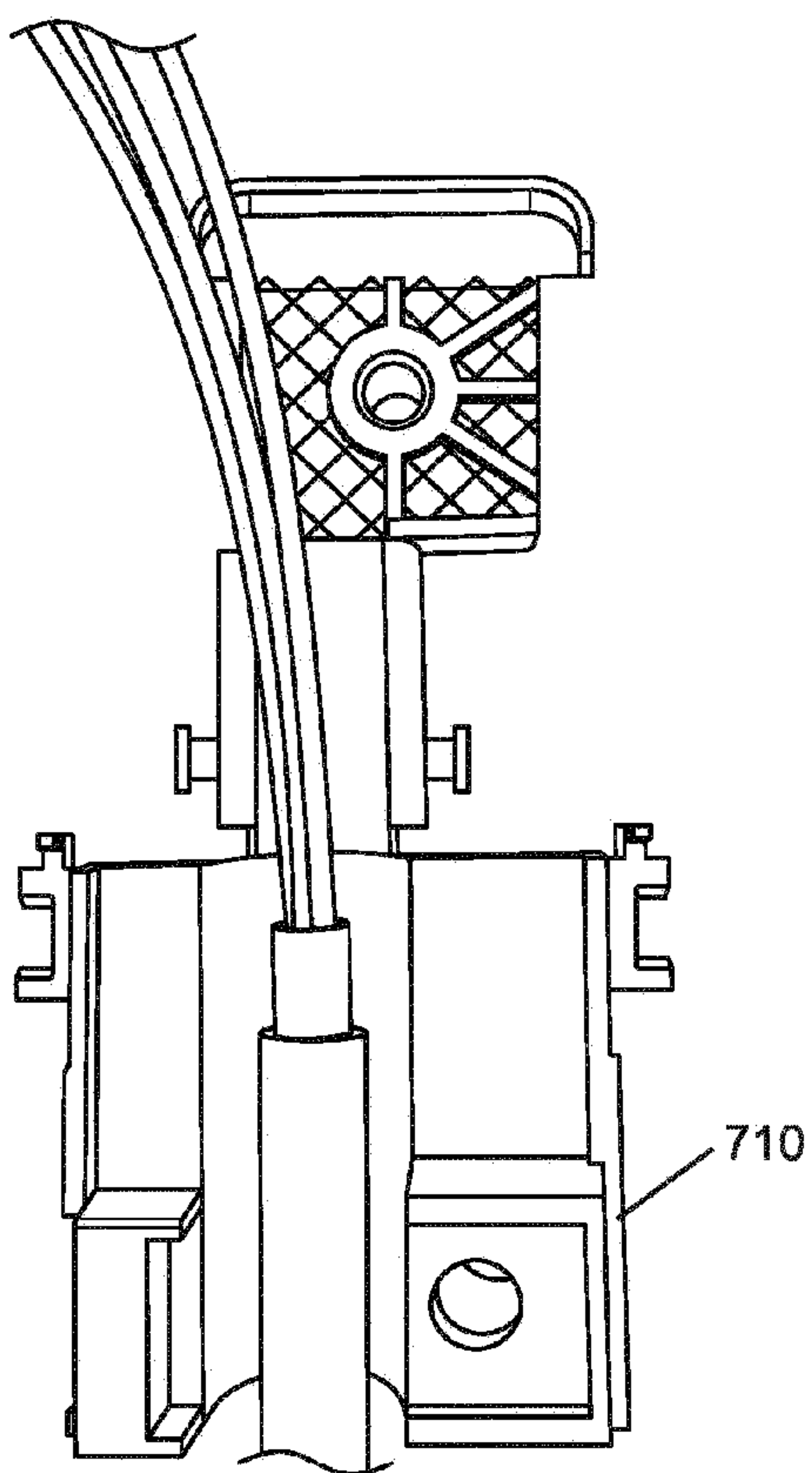


FIG. 70

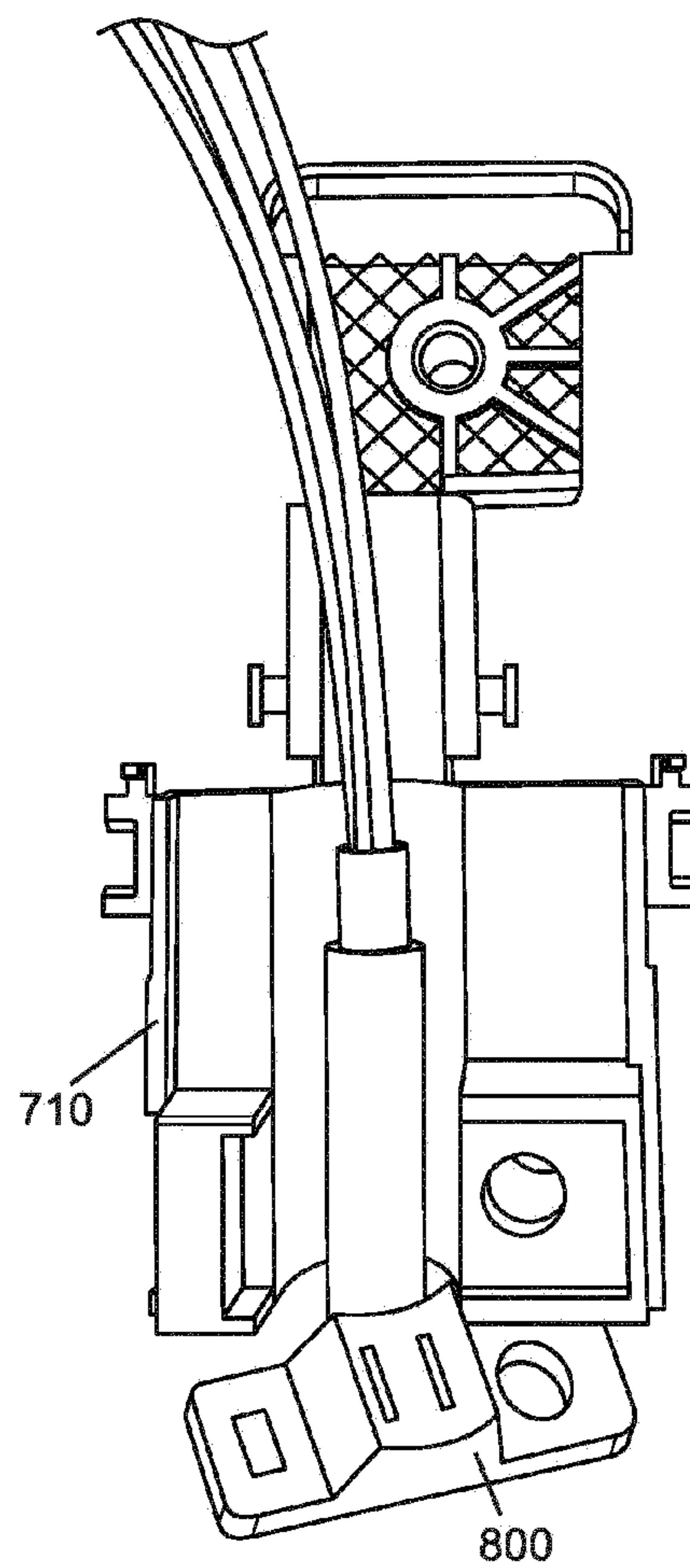


FIG. 71

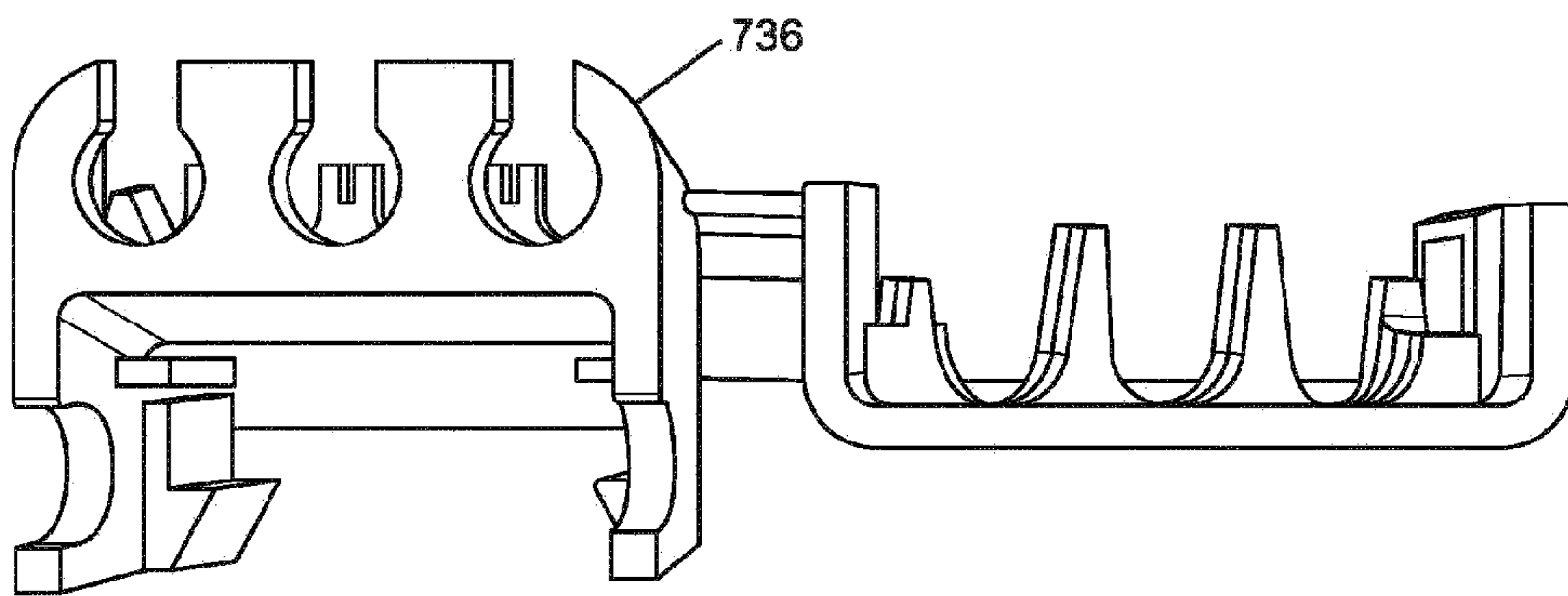
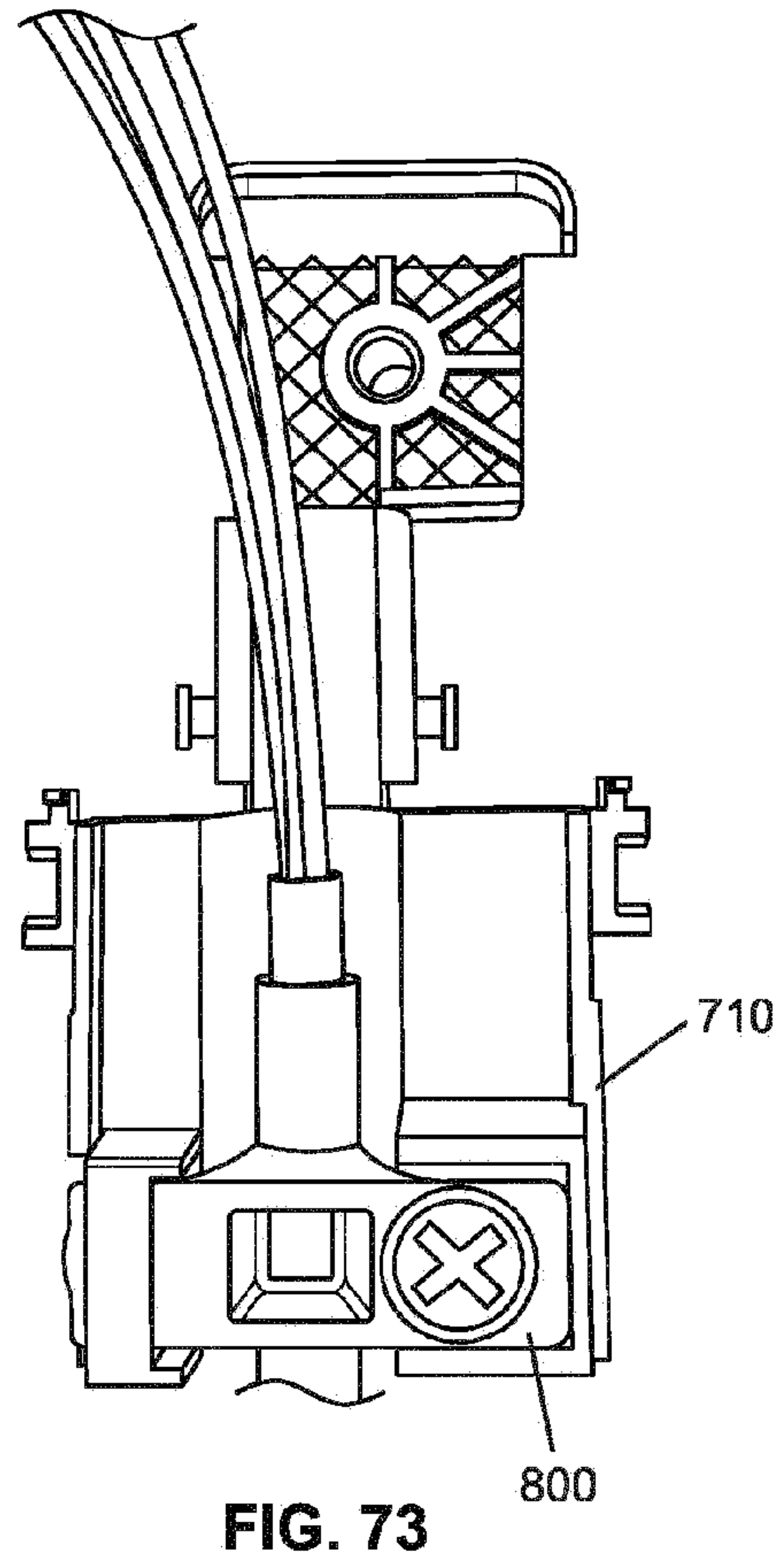
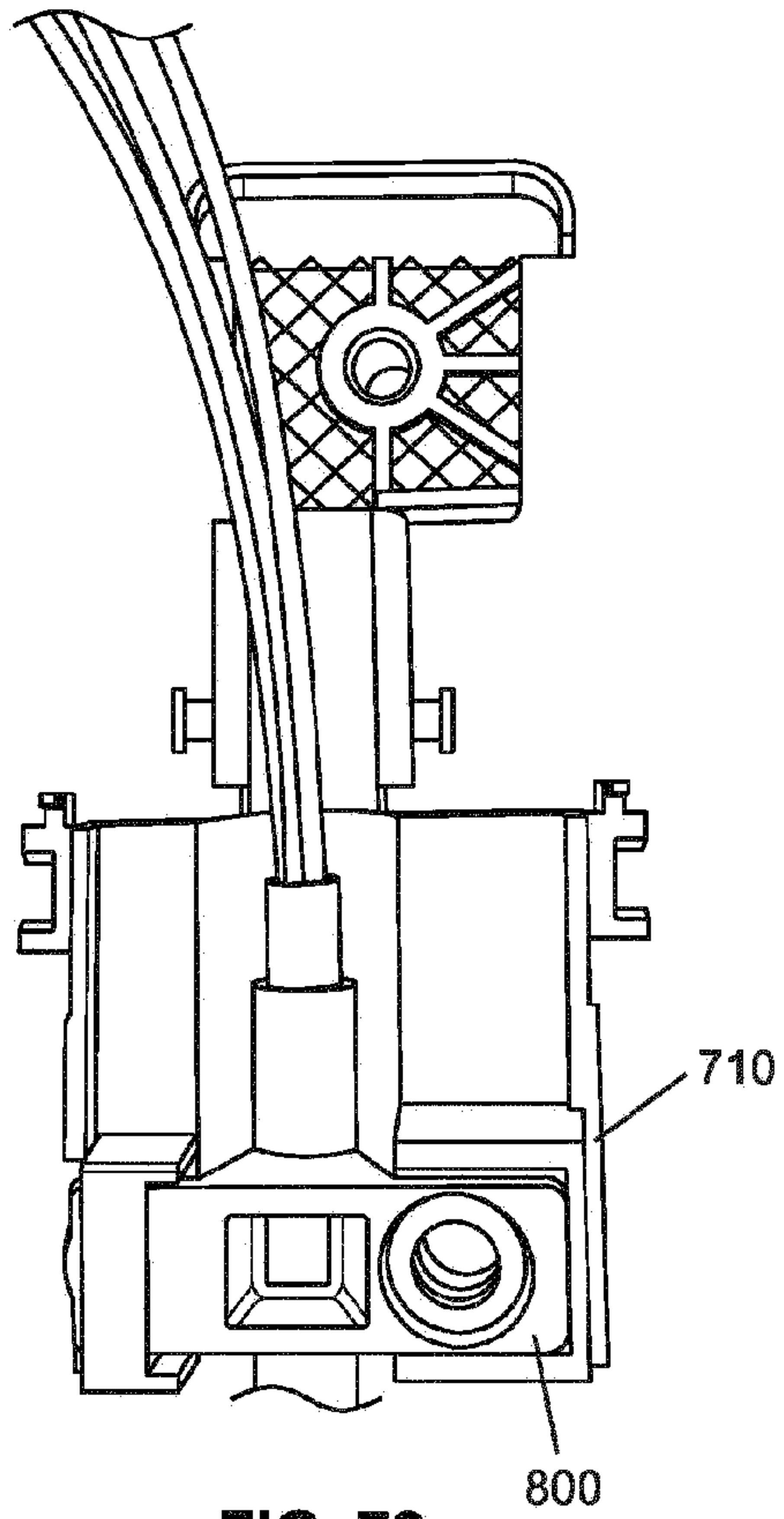


FIG. 74

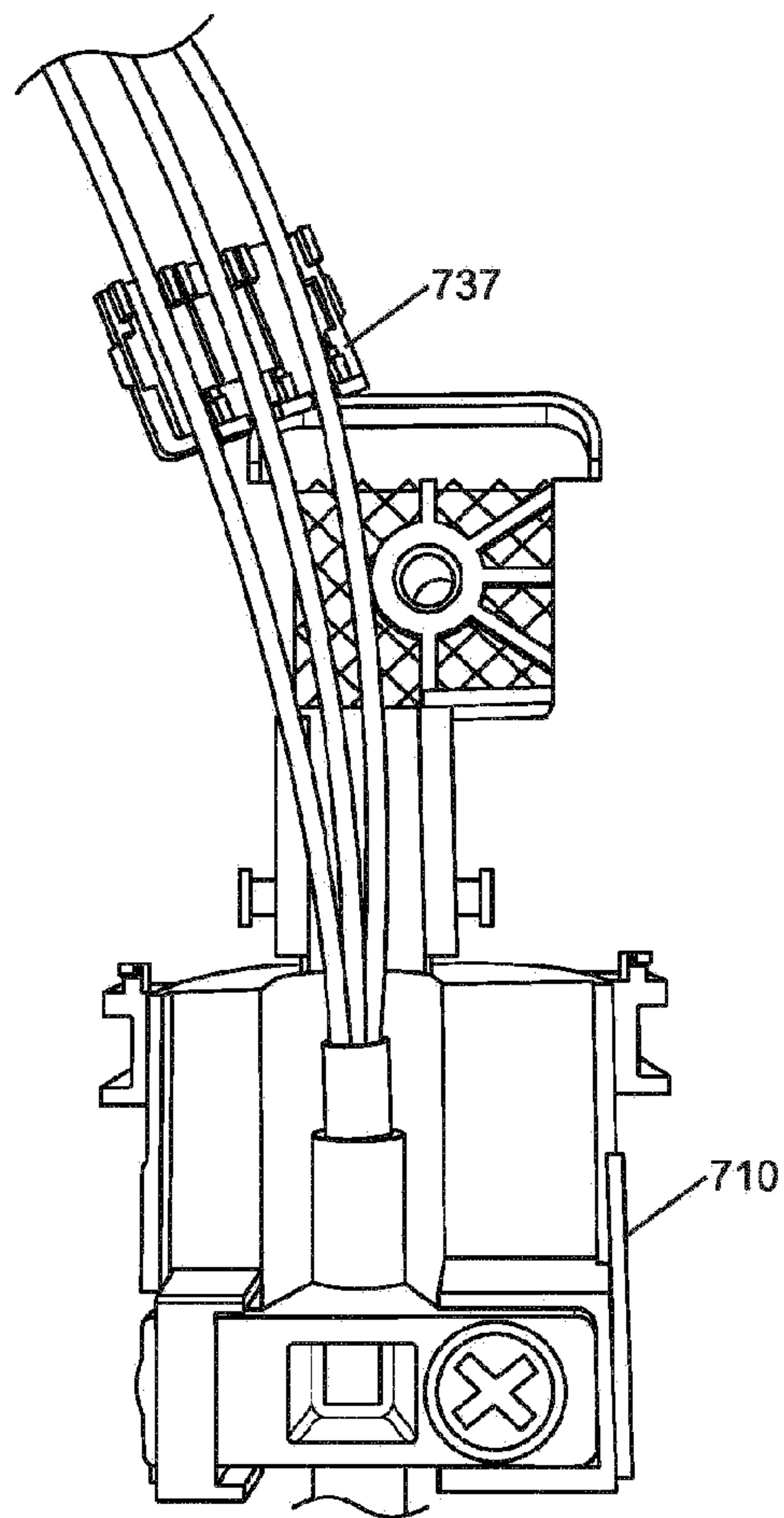
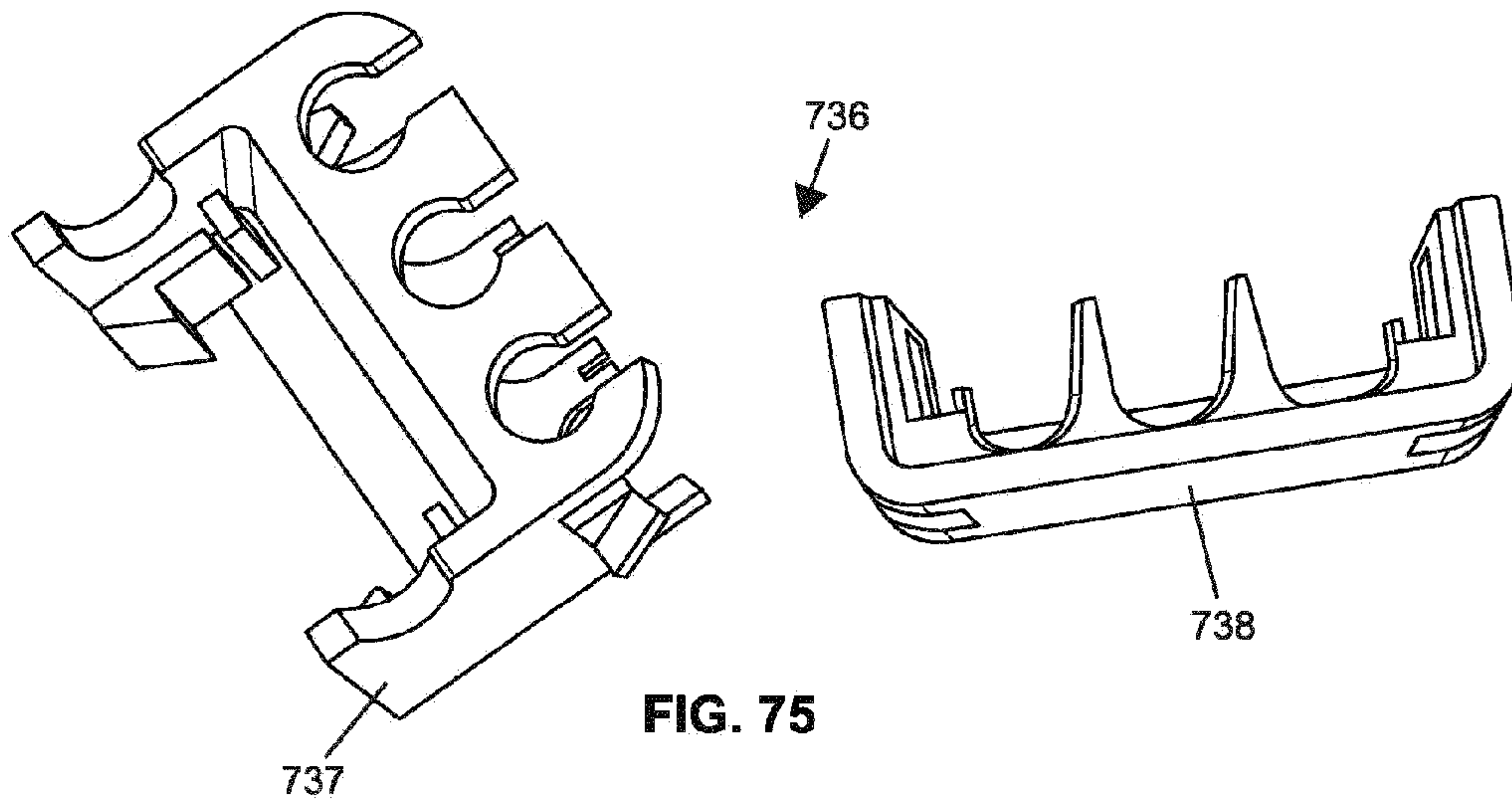
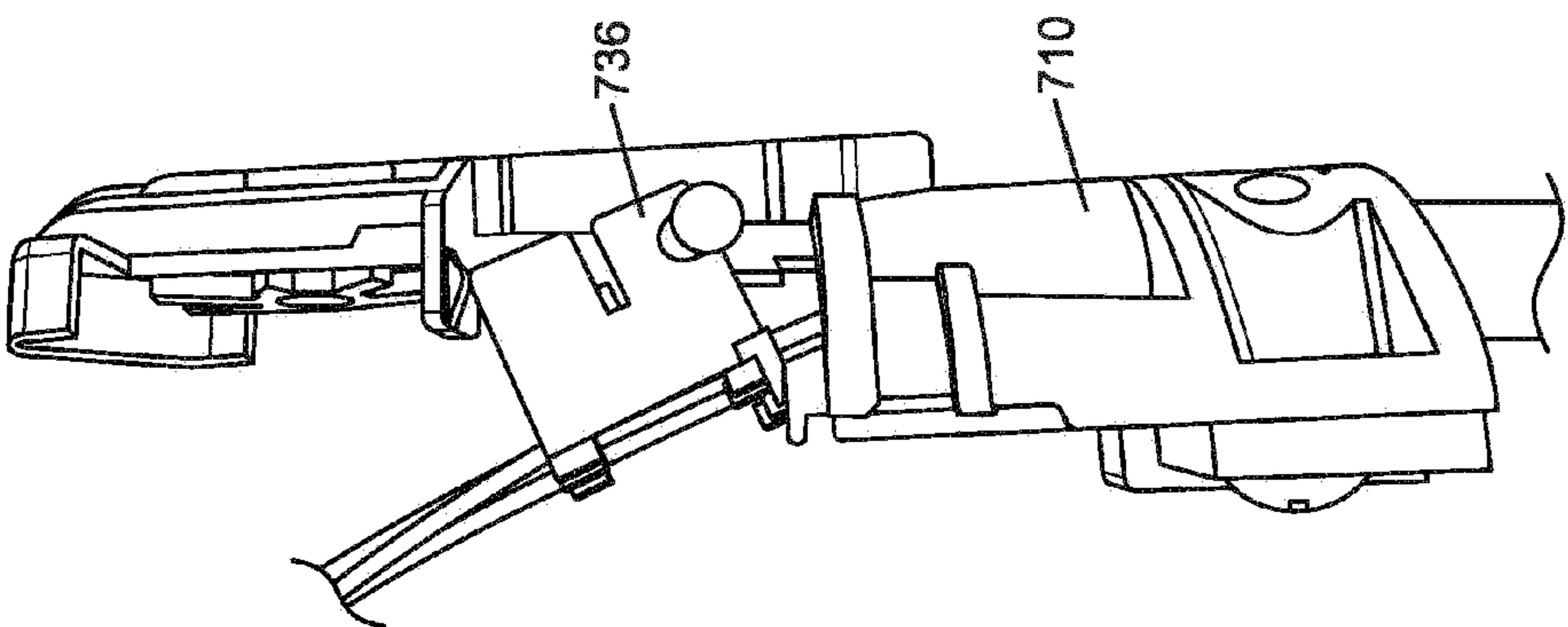
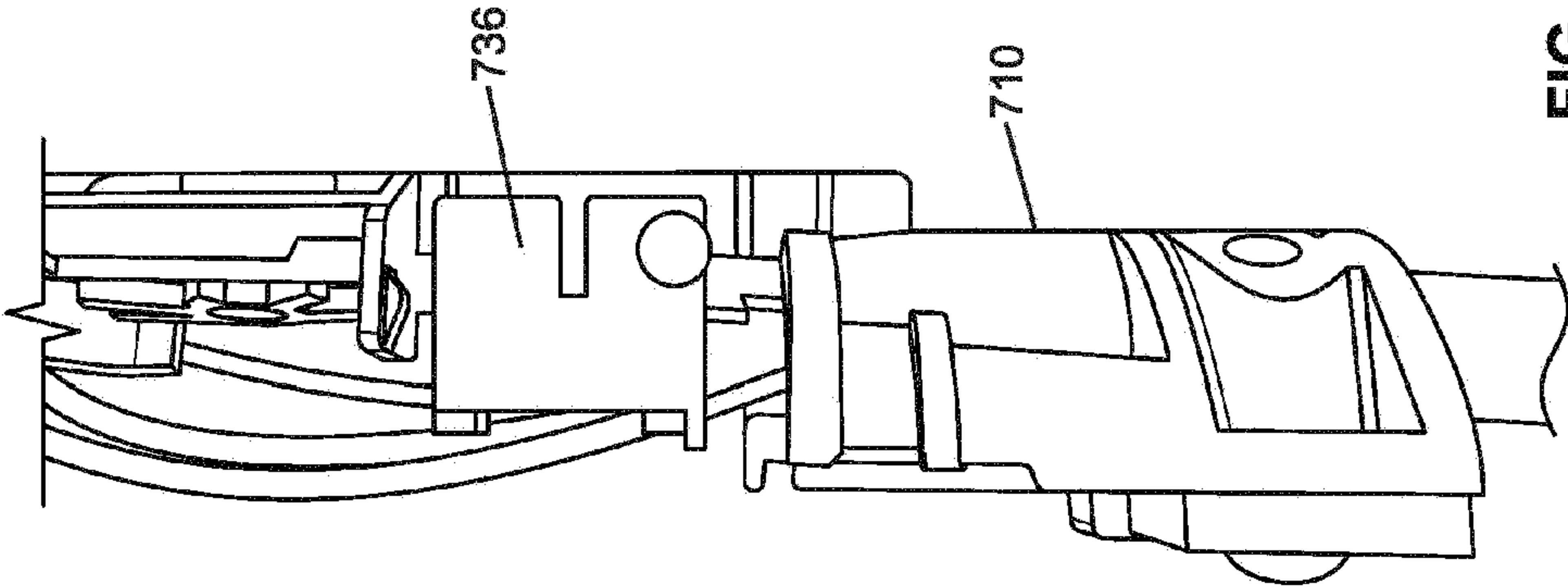
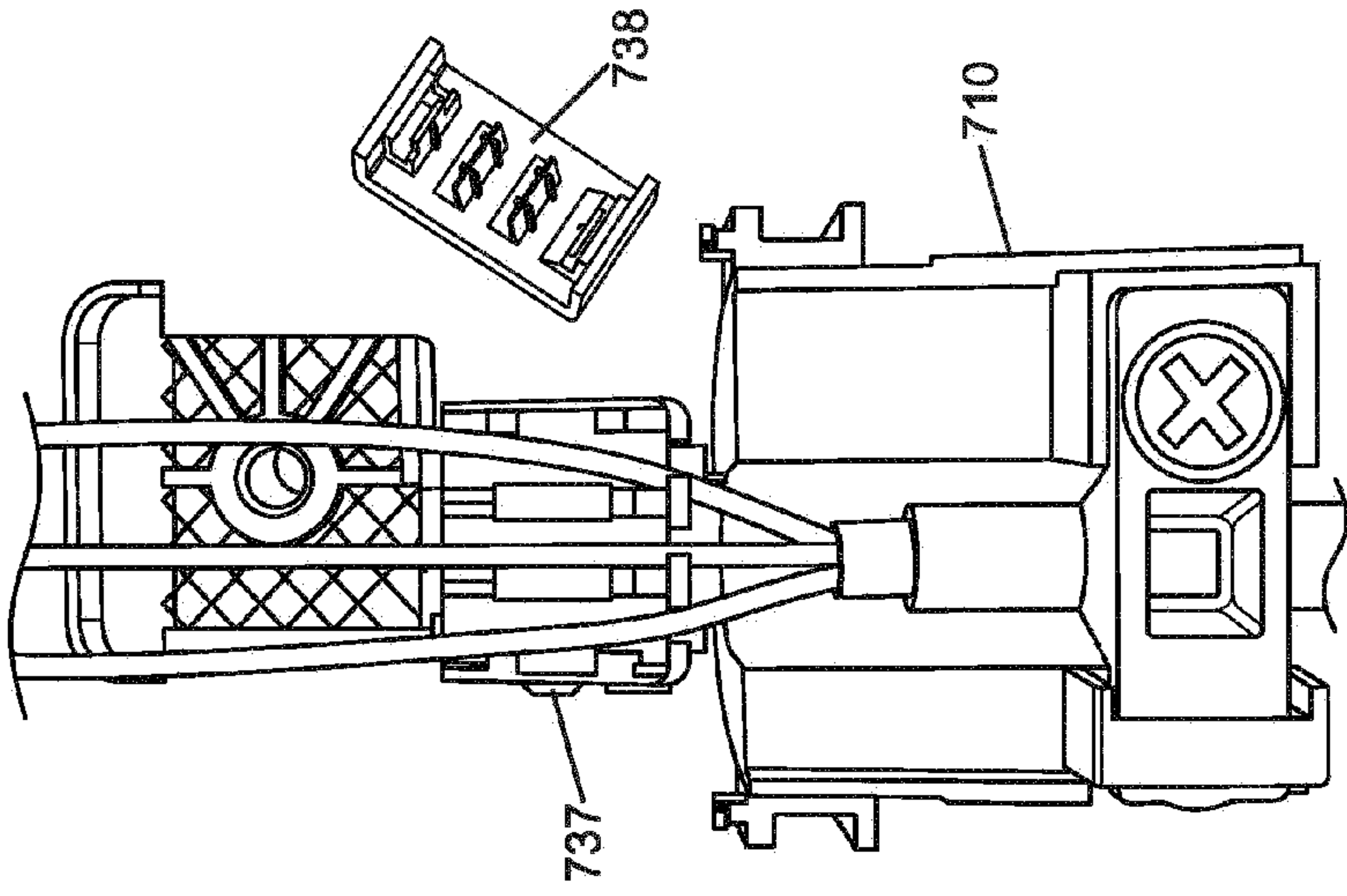
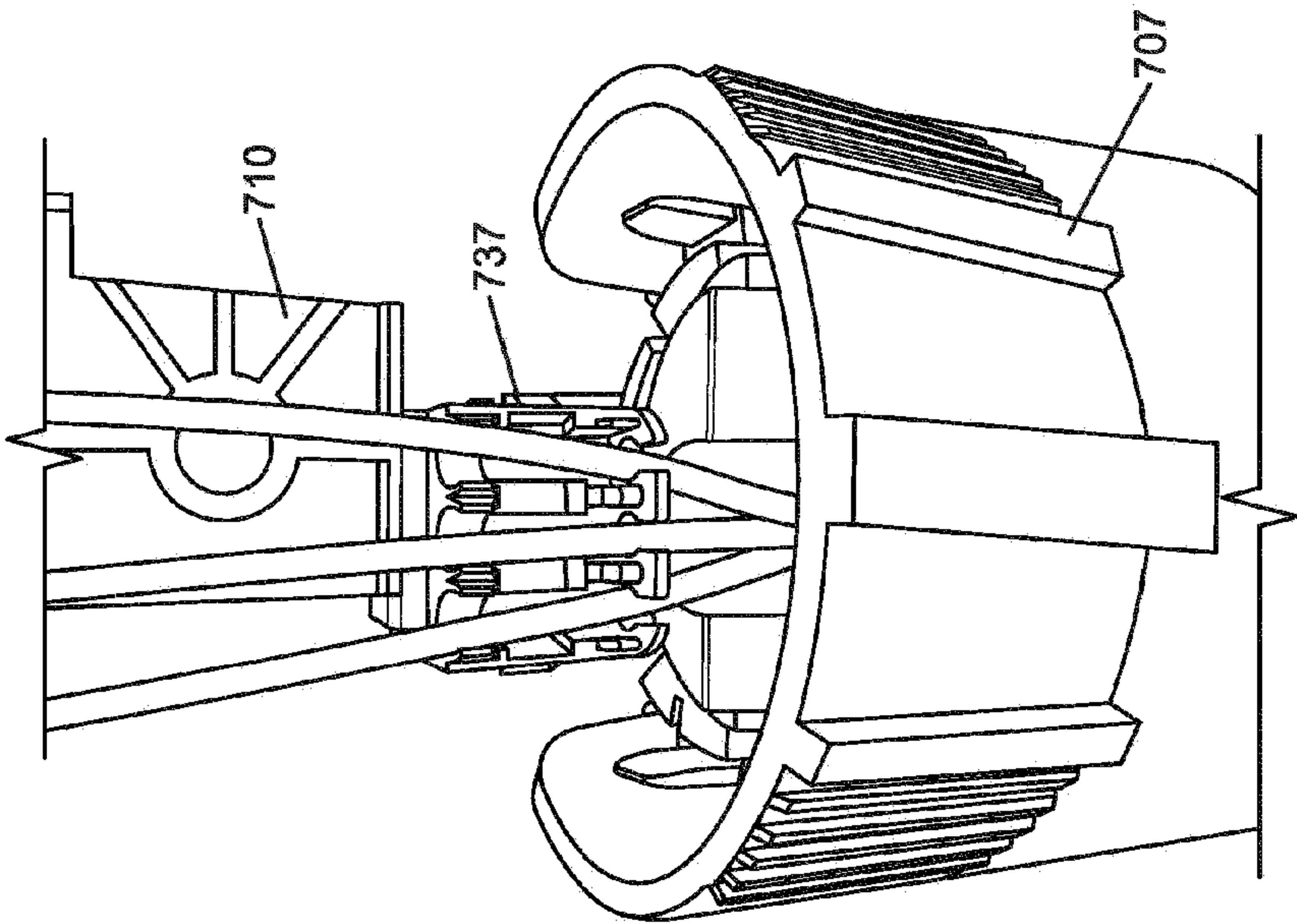
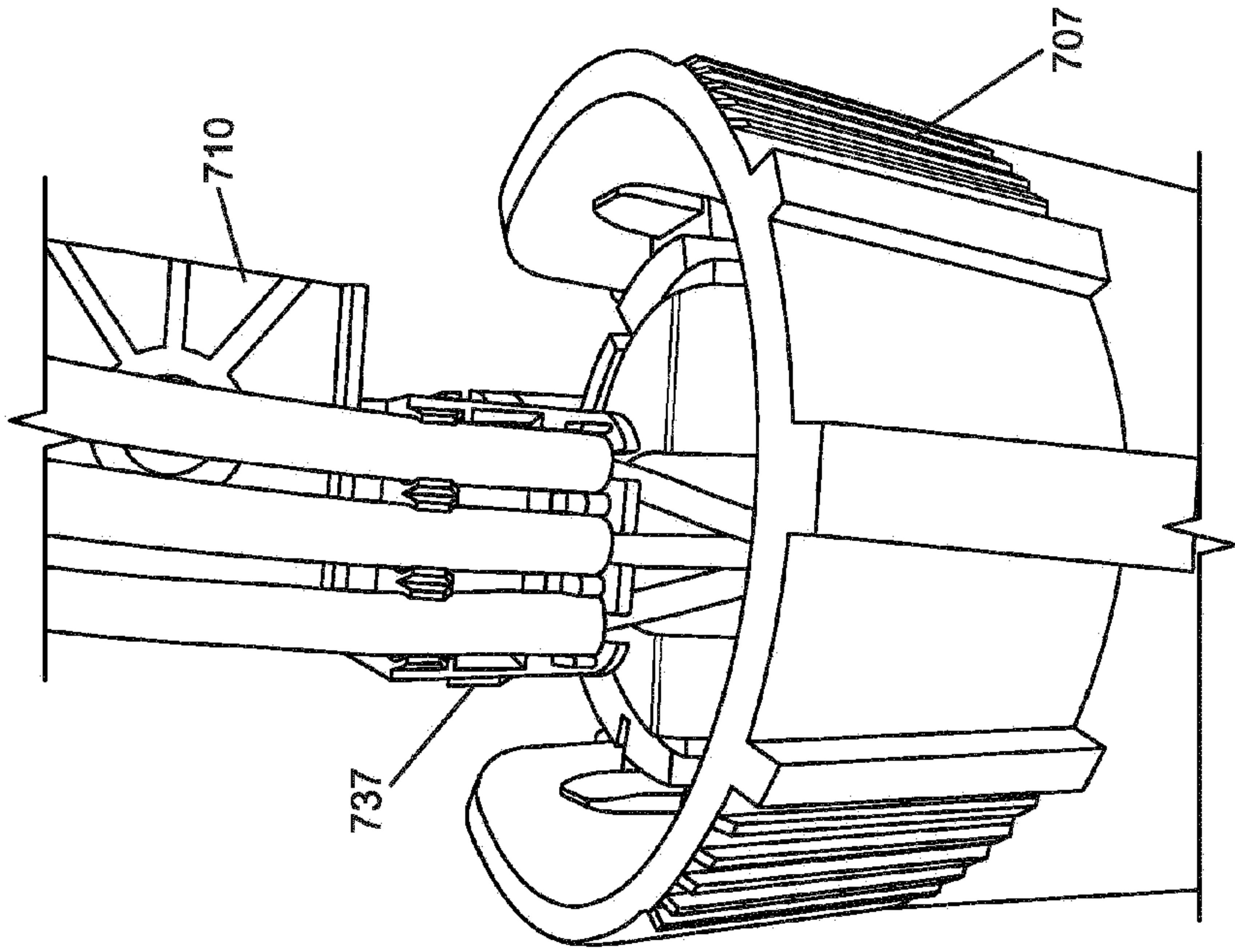


FIG. 76





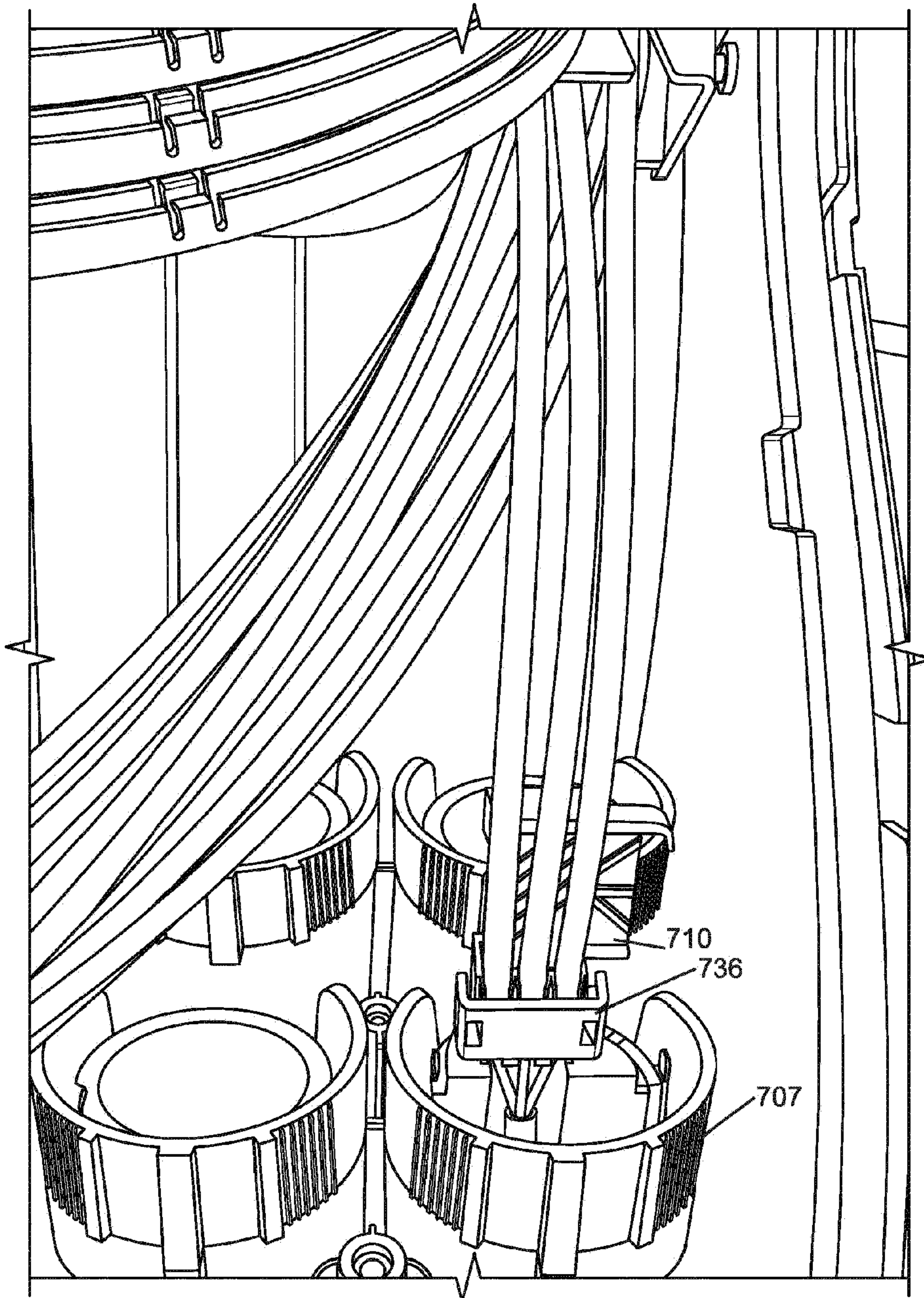


FIG. 82

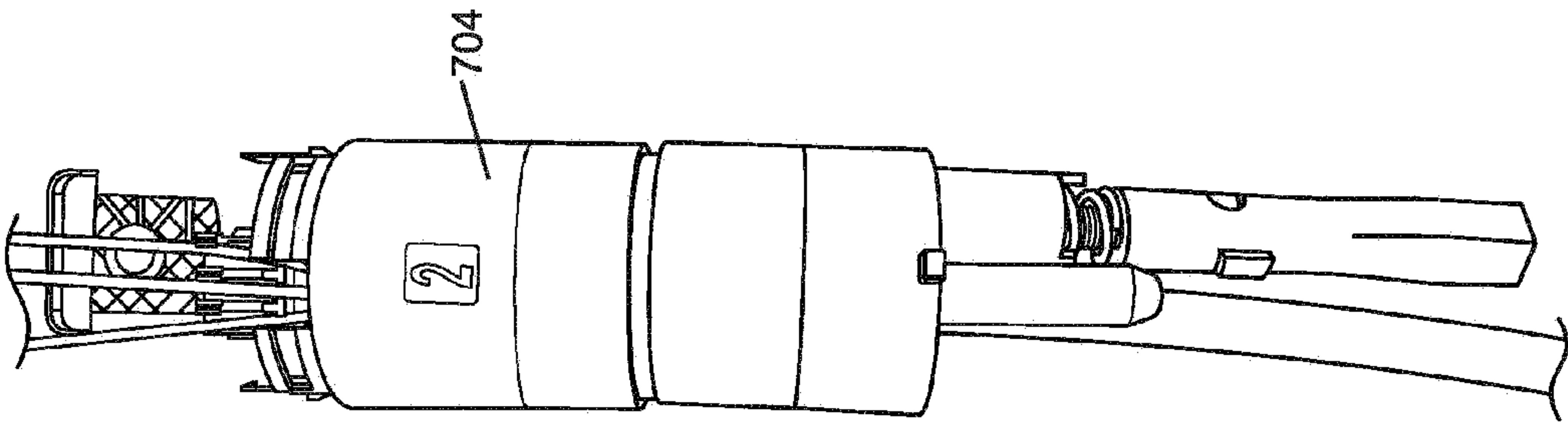


FIG. 84

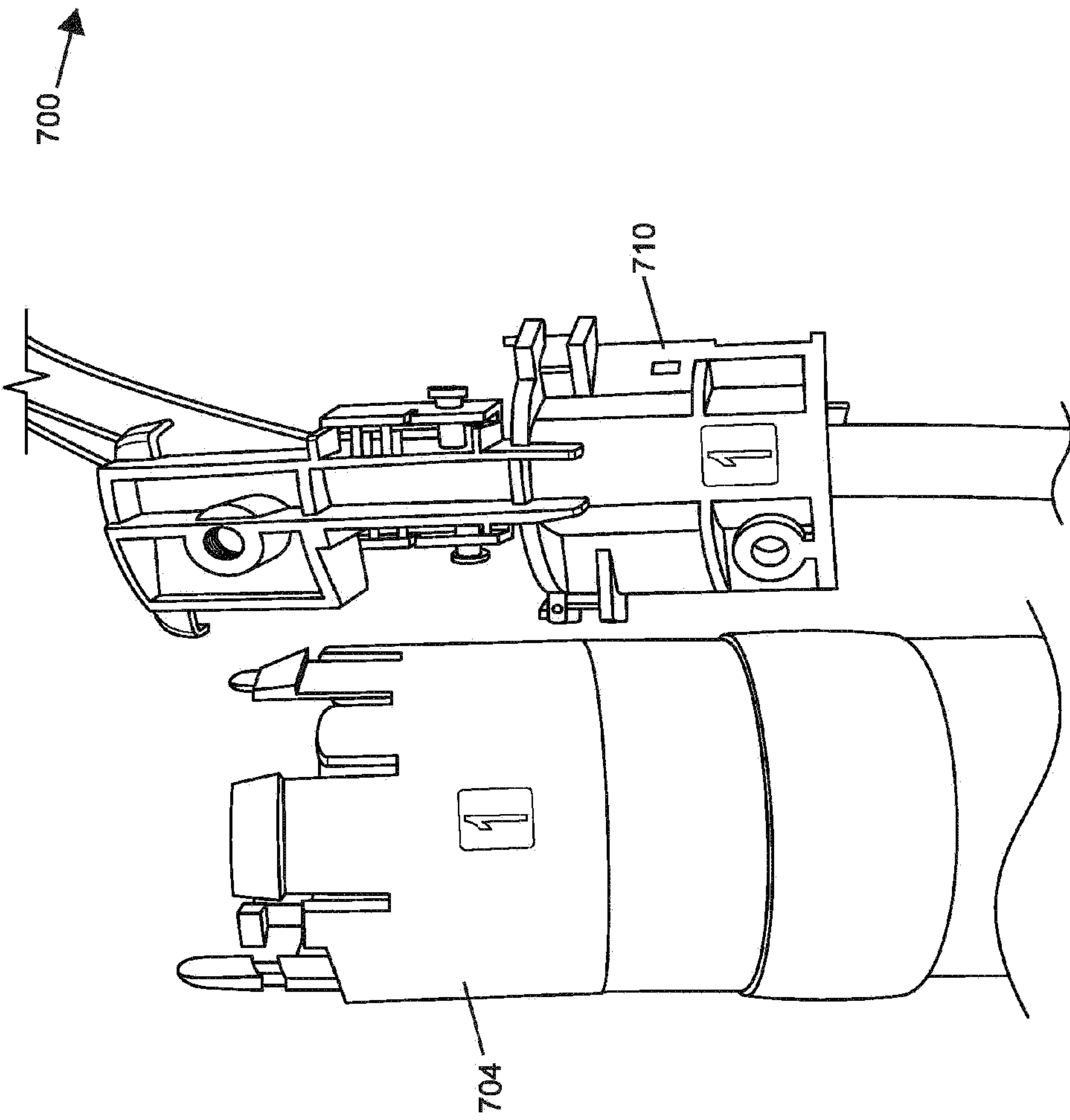


FIG. 83