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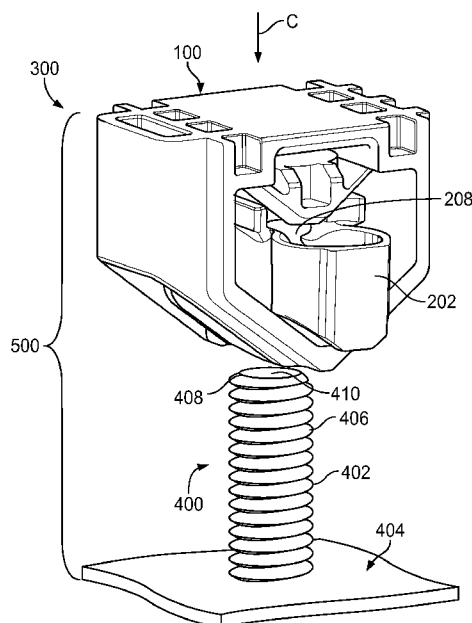


FIG. 16

(57) Abstract: A fastening assembly is configured to secure to a fastener to form a securing system. The fastening assembly includes a housing defining a clamp chamber, and a clamp that is configured to be removably inserted into the clamp chamber. The clamp includes a closed loop that is configured to trap the fastener.

FASTENING ASSEMBLY HAVING A LOOPED CLAMP**RELATED APPLICATIONS**

[0001] This application relates to and claims priority benefits from U.S. Provisional Patent Application No. 62/510,312, entitled “Fastening Assembly Having a Looped Clamp,” filed May 24, 2017, which is hereby incorporated by reference in its entirety.

FIELD OF EMBODIMENTS OF THE DISCLOSURE

[0002] Embodiments of the present disclosure generally relate to fastening devices that are configured to fasten components together, and, more particularly, to a fastening assembly having a looped clamp.

BACKGROUND

[0003] Fasteners are used to secure various components together. Certain known fasteners include a housing and a clamp that couples to the housing. The housing and the clamp cooperate together to secure to a stud. However, the clamp may inadvertently dislodge from the housing when secured to the stud. Further, the clamp may be inserted into the housing in only a single direction, which may limit installation orientations and processes.

SUMMARY OF EMBODIMENTS OF THE DISCLOSURE

[0004] A need exists for a fastening assembly including a clamp that is not susceptible to inadvertently dislodging from a housing. Further, a need exists for a fastening assembly in which a clamp may be inserted into a housing from more than one direction, thereby providing increased installation flexibility.

[0005] With those needs in mind, certain embodiments of the present disclosure provide a fastening assembly that is configured to secure to a fastener to form a securing system. The fastening assembly includes a housing defining a clamp chamber,

and a clamp that is configured to be removably inserted into the clamp chamber. The clamp includes a closed loop that is configured to trap the fastener.

[0006] In at least one embodiment, the housing includes a first open end and a second open end that is opposite from the first open end. The clamp is configured to be pushed or pulled into or out of the clamp chamber from both of the first open end and the second open end.

[0007] The housing may include one or more tie strap passages.

[0008] The housing includes a fastener inlet that leads into the clamp chamber. The fastener inlet coaxially aligns with a central fastener passage of the clamp to receive a shaft of the fastener.

[0009] The clamp may include side walls having internal arcuate surfaces that define a central fastener passage. The clamp may include one or both of retention ledges or retention ridges that are configured to be retained by reciprocal features of the housing.

[0010] In at least one embodiment, the closed loop includes side walls that define a central fastener passage. A first spring loop wall outwardly extends from first ends of the side walls. The first spring loop wall defines a first opening that connects to the central fastener passage. A second spring loop wall outwardly extends from second ends of the side walls. The second spring loop wall defines a second opening that connects to the central fastener passage.

[0011] The closed loop defines a bounded, closed internal space defined by the central fastener passage and the first and second openings on opposite sides of the central fastener passage. Outer lateral surfaces of the first and second spring loops walls may be flattened and configured to be grasped.

[0012] The first spring loop wall may outwardly extend from a first open end of the housing when the clamp is retained within the clamp chamber, and the second spring loop wall may outwardly extend from a second open end of the housing when the clamp is retained within the clamp chamber.

[0013] The clamp may be symmetrical in relation to one or both of a major axis or a minor axis of the clamp.

[0014] Certain embodiments of the present disclosure provide a securing system that includes a fastener, and a fastening assembly securable to the fastener. The fastening assembly includes a housing and a clamp, as described herein.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF THE DRAWINGS

[0015] Figure 1 illustrates a perspective front view of a housing, according to an embodiment of the present disclosure.

[0016] Figure 2 illustrates a perspective bottom view of a housing, according to an embodiment of the present disclosure.

[0017] Figure 3 illustrates a top view of a housing, according to an embodiment of the present disclosure.

[0018] Figure 4 illustrates a lateral view of a housing, according to an embodiment of the present disclosure.

[0019] Figure 5 illustrates a bottom view of a housing, according to an embodiment of the present disclosure.

[0020] Figure 6 illustrates a top view of a clamp, according to an embodiment of the present disclosure.

[0021] Figure 7 illustrates a lateral view of a clamp, according to an embodiment of the present disclosure.

[0022] Figure 8 illustrates a bottom view of a clamp, according to an embodiment of the present disclosure.

[0023] Figure 9 illustrates an end view of a clamp, according to an embodiment of the present disclosure.

[0024] Figure 10 illustrates a perspective lateral view of a clamp, according to an embodiment of the present disclosure.

[0025] Figure 11 illustrates a perspective lateral view of a clamp, according to an embodiment of the present disclosure.

[0026] Figure 12 illustrates an end view of a fastening assembly, according to an embodiment of the present disclosure.

[0027] Figure 13 illustrates a top view of a fastening assembly, according to an embodiment of the present disclosure.

[0028] Figure 14 illustrates an end view of a fastening assembly, according to an embodiment of the present disclosure.

[0029] Figure 15 illustrates a bottom view of a fastening assembly, according to an embodiment of the present disclosure.

[0030] Figure 16 illustrates a perspective view of a fastening assembly aligned over a fastener, according to an embodiment of the present disclosure.

[0031] Figure 17 illustrates a perspective view of a securing system in which a fastening assembly is securely coupled to a fastener, according to an embodiment of the present disclosure.

[0032] Figure 18 illustrates a perspective view of a fastening assembly removed from a fastener, according to an embodiment of the present disclosure.

[0033] Figure 19 illustrates a perspective lateral view of a housing, according to an embodiment of the present disclosure.

[0034] Figure 20 illustrates a perspective lateral view of a fastening assembly, according to an embodiment of the present disclosure.

[0035] Figure 21 illustrates a perspective view of a securing system in which a fastening assembly is secured to a fastener, according to an embodiment of the present disclosure.

[0036] Figure 22 illustrates a perspective view of a fastening assembly removed from a fastener, according to an embodiment of the present disclosure.

[0037] Before the embodiments of the disclosure are explained in detail, it is to be understood that the disclosure is not limited in its application to the details of construction and the arrangement of the components set forth in the following description or illustrated in the drawings. The disclosure is capable of other embodiments and of being practiced or being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein are for the purpose of description and should not be regarded as limiting. The use of "including" and "comprising" and variations thereof is meant to encompass the items listed thereafter and equivalents thereof as well as additional items and equivalents thereof.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE DISCLOSURE

[0038] Certain embodiments of the present disclosure provide a fastening assembly including a housing and a clamp. The clamp may be a looped clamp that securely and reliably remains secured to the housing when the fastening assembly is secured to a fastener, such as a threaded stud.

[0039] WO 2015/065583, entitled "Device for Fastening a Component to a Carrier Component," discloses a device for fastening a component to a carrier component having a bolt, and is hereby incorporated by reference in its entirety.

[0040] Figure 1 illustrates a perspective front view of a housing 100, according to an embodiment of the present disclosure. The housing 100 may be formed of a plastic and/or a metal, for example. The housing 100 includes an upper wall 102 integrally connected to opposite lateral walls 104 and 106, which may be generally perpendicular to the upper wall 102. Lower walls 108 and 110 downwardly and inwardly angle from the lower ends of the lateral walls 104 and 106, respectively. The lower walls 108 and 110 connect at an apex 112. As shown, the lower walls 108 and 110 form a wedged bottom surface.

[0041] A lateral sheath 114 outwardly extends from an outer surface of the lateral wall 106. The lateral sheath 114 defines a tie strap passage 116 (for example, a tunnel) that is configured to receive and retain a portion of a tie strap. Optionally and/or

additionally, a lateral sheath may outwardly extend from an outer surface of the lateral walls 104.

[0042] An internal wall 118 inwardly extends from internal surfaces of the upper wall 102 and/or the lateral walls 104 and 106. A tie strap passage 120 is defined between internal surfaces of the internal wall 118 and internal surfaces of the upper wall 102 and/or the lateral walls 104 and 106. The tie strap passage 120 is configured to receive and retain a portion of a tie strap. Alternatively, the housing 100 may not include the tie strap passage 116 and/or the tie strap passage 120.

[0043] A fastener inlet 122 is formed through the lower walls 108 and 110. The fastener inlet 122 may be coaxial with a central axis 124 of the housing 100. The fastener inlet 122 is configured to receive a portion of a fastener, such as a threaded shaft of a bolt or stud.

[0044] The fastener inlet 122 leads into a clamp chamber 126 is defined between the upper wall 102 and/or the internal wall 118, the lateral walls 104 and 106, and the lower walls 108 and 110. The clamp chamber 126 is configured to receive and retain a clamp, as described herein.

[0045] Figure 2 illustrates a perspective bottom view of the housing 100, according to an embodiment of the present disclosure. Outer surfaces of the lateral walls 104, 106 and/or the lower walls 108 and 110 may include one or more outwardly-extending ribs 128 along lengths thereof. The ribs 128 provide increased strength to the housing 100. The housing 100 may include more or less ribs 128 than shown. Optionally, the housing 100 may not include the ribs 128.

[0046] A cuff 130 extends into the clamp chamber 126 from the internal wall 118 (and/or the upper wall 102). The cuff 130 defines a pocket 132 that is axially aligned with the fastener inlet 122. The pocket 132 is configured to receive and retain a distal end of a fastener that passes into the clamp chamber 126 via the fastener inlet 122. Optionally, the housing 100 may not include the cuff 130 and the pocket 132.

[0047] Interior surfaces of the lateral walls 104, 106, the upper wall 102, the internal wall 118, and/or the lower walls 108 and 110 may include retention channels 134 and/or other retention features that are configured to receive and retain reciprocal features of the clamp. The retention channels 134 and/or features are configured to secure the clamp within the clamp chamber 126.

[0048] Figure 3 illustrates a top view of the housing 100, according to an embodiment of the present disclosure. As shown, the tie strap passage 116 provides a space into which a tie strap may be inserted and tied around the lateral sheath 114, for example.

[0049] One or more cored-out recesses 136 may be formed in the upper wall 102, and/or other portions of the housing 100. The recesses 136 reduce an overall weight of the housing 100. Optionally, the housing 100 may not include the cored-out recesses 136.

[0050] Figure 4 illustrates a lateral view of the housing 100, according to an embodiment of the present disclosure. Lower surfaces 138 of the lower walls 108 (shown in Figures 1 and 2) and 110 surrounding the fastener inlet 122 (shown in Figures 1 and 2) may be inwardly recessed, thereby providing a lead-in interface for a fastener.

[0051] Figure 5 illustrates a bottom view of the housing 100, according to an embodiment of the present disclosure. As shown, the fastener inlet 122 may be coaxial with the central axis 124 of the housing 100.

[0052] Figure 6 illustrates a top view of a clamp 200, according to an embodiment of the present disclosure. Figure 7 illustrates a lateral view of the clamp 200. Figure 8 illustrates a bottom view of the clamp 200. Figure 9 illustrates an end view of the clamp 200. The clamp 200 may be formed of a plastic and/or a metal, for example.

[0053] Referring to Figures 6-9, the clamp 200 includes a main body 202 that includes side walls 204 having internal arcuate surfaces 206 that define a central fastener passage 208. Retention ledges 210 may upwardly extend from the side walls 204. The

retention ledges 210 are configured to be retained within reciprocal features of the housing 100 (shown in Figures 1-5), such as the cuff 130 and/or the retention channels 134 (shown in Figure 2). Optionally, the clamp 200 may include additional retention features. In at least one other embodiment, the clamp 200 may not include the retention ledges 210.

[0054] A first spring loop wall 212 outwardly extends from first ends of the side walls 204 and defines a first opening 213 that connects to the central fastener passage 208. A second spring loop wall 214 outwardly extends from opposite second ends of the side walls 204 and defined a second opening 215 that connects to the central fastener passage 208 opposite from the first opening 213. Accordingly, the clamp 200 provides a bounded, closed loop 220 defined by the first spring loop wall 212, the side walls 204, and the second spring loop wall 214 that defines a bounded, closed internal space defined by the central fastener passage 208 and the first and second openings 213 and 215 on opposite sides of the central fastener passage 208.

[0055] Outer lateral surfaces 222 of the first and second spring loops walls 212 and 214 may include flattened edges. The flattened lateral walls 222 may be easily grasped, so as to push or pull the clamp 200 in relation to the housing 100 (shown in Figures 1-5). Optionally, the first and second spring loop walls 212 and 214 may not include the flattened outer lateral walls 222.

[0056] The clamp 200 may be symmetrical in relation to a major axis 224 and a minor axis 226 that is orthogonal to the major axis 224. Optionally, the clamp 200 may be symmetrical in relation to the major axis 224, but not the minor axis 226, or vice versa.

[0057] Figure 10 illustrates a perspective lateral view of a clamp 200, according to an embodiment of the present disclosure. The internal surfaces 206 of the side walls 204 may include threads 238 that are configured to threadably engage an outer threaded shaft of a fastener.

[0058] Retention ridges 240 may extend downwardly from the retention ledges 210. The retention ridges 240 may be perpendicular to the retention ledges 210. The retention ridges 240 are configured to be retained within reciprocal channels or other such features formed in the housing 100 (shown in Figures 1-5). Optionally, the clamp 200 may not include the retention ridges 240.

[0059] Lower edges 250 of the clamp 200 may inwardly angle towards an apex 252. In this manner, the lower edges 250 may conform to a wedge-shape of the lower walls 108 and 110 of the housing (shown in Figures 1 and 2, for example).

[0060] Figure 11 illustrates a perspective lateral view of a clamp 200, according to an embodiment of the present disclosure. In this embodiment, an outer lateral surface 260 may be flat. Optionally, both outer lateral surfaces may be flat.

[0061] Figure 12 illustrates an end view of a fastening assembly 300, according to an embodiment of the present disclosure. The fastening assembly 300 includes the housing 100 and the clamp 200.

[0062] Referring to Figures 1-12, the clamp 200 may be pushed into the clamp chamber 126 from either open end of the housing 100. The retention ridges 210 may be guided into the clamp chamber 126 and secured therein by the retention channels 134 of the housing 100. The clamp 200 is moved into the clamp chamber 126 until the central fastener passage 208 is coaxially aligned with the fastener inlet 122 of the housing 100. The retention ridges 210 and/or the retention ridges 240 of the clamp 200 may cooperate with reciprocal retention features of the housing 100 (such as the cuff 130 and/or the retention channels 134) to securely lock the clamp 200 into an aligned position with respect to the housing 100, such as when the central fastener passage 208 is coaxially aligned with the fastener inlet 122.

[0063] Figure 13 illustrates a top view of the fastening assembly 300. Figure 14 illustrates an end view of the fastening assembly 300. Figure 15 illustrates a bottom view of the fastening assembly 300. Referring to Figures 1-15, in the aligned position,

the central fastener passage 208 of the clamp 200 is coaxially aligned with the fastener inlet 122 of the housing 100.

[0064] The first spring loop wall 212 outwardly extends from a first open end 170 of the housing 100, while the second spring loop wall 214 outwardly extends from a second open end 172 of the housing 100. An individual may grasp the spring loop wall 212 and push the clamp 200 out of the clamp chamber 126 of the housing 100 in the direction of arrow A. Optionally, the individual may pull the spring loop wall 212 to pull the clamp 200 out of the clamp chamber 126 in the direction of arrow B. Similarly, the individual may grasp the spring loop wall 214 and push the clamp 200 out of the clamp chamber 126 in the direction of arrow B. Optionally, the individual may pull the spring loop wall 214 and pull the clamp 200 out of the clamp chamber 126 in the direction of arrow A. As indicated, the clamp 200 may be inserted into the housing 100 from either open end 170 and 172, and pushed or pulled out of the housing from either open end 170 and 172.

[0065] Figure 16 illustrates a perspective view of the fastening assembly 300 aligned over a fastener 400, according to an embodiment of the present disclosure. The fastening assembly 300 and the fastener 400 provide a securing system 500.

[0066] The fastener 400 may be a bolt, stud, or the like having a shaft 402 extending from a base 404. The shaft 402 may include outer threads 406. The fastening assembly 300 may be shipped such that the fastener passage 208 of the clamp 200 is coaxially aligned with the fastener inlet 122 (shown in Figures 1 and 2, for example) of the housing 100.

[0067] Referring to Figures 1-16, a distal end 408 of the fastener 400 is coaxially aligned with the fastener inlet 122. In order to securely couple the fastening assembly 300 to the fastener 400, the fastening assembly 400 is urged onto the distal end 408 of the fastener in the direction of arrow C, such that the distal end 408 passes into the fastener inlet 122, and into the central fastener passage 208 of the clamp 200. In this position, the fastening assembly 300 may then be rotated about the central axis 410 of the

fastener 400 so that the internal threads of the central fastener passage 208 threadably engage the threads 406 of the fastener 400. In at least one embodiment, the fastening assembly 300 may be pressed onto the fastener 400 without being rotated.

[0068] Figure 17 illustrates a perspective view of the securing system 500 in which the fastening assembly 300 is securely coupled to the fastener 400, according to an embodiment of the present disclosure. Referring to Figures 1-17, the shaft 402 is retained within the central fastener passage 208 of the clamp 200. The distal end 408 of the fastener 400 may be retained within the pocket 132 of the housing 100.

[0069] In the event that the shaft 402 inadvertently uncouples from the central fastener passage 208, the bounded, closed loop 220 defined by the first spring loop wall 212, the side walls 204, and the second spring loop wall 214 traps the shaft 402 therein. As such, the fastener 400 remains connected to the fastening assembly 300. The closed loop 220 of the clamp 200 laterally traps the shaft 402 of the fastener 400 therein. The closed loop 220 of the clamp 200 ensures that the fastening assembly 300 remains secured to the fastener 400 until the fastening assembly 300 is upwardly pulled off of the fastener 400. The fastener 400 traps a disengaged clamp 200 so that the clamp 200 is not inadvertently separated from the fastener 400 and the fastening assembly 200.

[0070] In at least one embodiment, in order to remove the fastening assembly 300 from the fastener 400, the clamp 200 may be laterally urged out of the housing 100 (such as via pushing, sliding, prying, or the like) until the shaft 402 of the fastener 400 is in an opening 213 or 215 defined by one of the spring loop walls 212 or 214. The fastening assembly 300 may then be removed from the fastener 400 (such as by being lifted off the fastener 400), and reusable for a subsequent re-installation.

[0071] Figure 18 illustrates a perspective view of the fastening assembly 300 removed from the fastener 400, according to an embodiment of the present disclosure. Referring to Figures 1-18, after the fastening assembly 300 is removed from the fastener 400, the clamp 200 may be pushed or pulled out of either open end 170 or 172 of the

housing 100, as the clamp 200 is no longer coupled to (for example, hooked onto) the shaft 402 of the fastener 400.

[0072] Figure 19 illustrates a perspective lateral view of a housing 100, according to an embodiment of the present disclosure. Figure 20 illustrates a perspective lateral view of a fastening assembly 300, according to an embodiment of the present disclosure. Figure 21 illustrates a perspective view of a securing system 500 in which a fastening assembly 300 is secured to a fastener 400, according to an embodiment of the present disclosure. Figure 22 illustrates a perspective view of a fastening assembly 300 removed from a fastener 400, according to an embodiment of the present disclosure.

[0073] Referring to Figures 19-22, the fastening assembly 300, including the housing 100 and the clamp 200, is similar to those described with respect to Figures 1-18, except that the embodiments shown in Figures 19-22 have different sizes and shapes. The fastening assemblies described herein may include various sizes and shapes other than shown.

[0074] Referring to Figures 1-22, embodiments of the present disclosure provide a fastening assembly 300 that includes including a housing 100 and a clamp 200 that couples to the housing 100. The clamp 200 provides a closed loop 220 that ensures that the clamp 200 remains connected to the housing 100 when the fastening assembly 300 is secured to a fastener 400.

[0075] The fastening assembly 300 is configured to secure to the fastener 400 to form the securing system 500. The fastening assembly 300 includes the housing 100 defining the clamp chamber 126, and the clamp 200 that is configured to be removably inserted into the clamp chamber 126. The clamp 200 includes the closed loop 220 that is configured to trap the fastener 400. For example, the closed loop 220 laterally traps the shaft 402 of the fastener therein.

[0076] The housing 100 may include one or more tie strap passages 116 or 120. The closed loop 220 of the clamp 200 may include one or more resilient spring loop

walls 212 and 214. The clamp 200 is configured to be inserted into a clamp chamber 126 of the housing 100, which may be below a tie strap passage 120.

[0077] The fastening assembly 300 may be mounted onto a fastener 400 in an installed position. The clamp 200 may be urged out of the clamp chamber 126 of the housing 100 to unlock the fastening assembly 300 from the fastener 400. In the unlocked position, the clamp 200 may be pushed or pulled out of the housing 100, such as in relation to either open end 170 or 172.

[0078] Tie straps may be fed through the tie strap passages 116 and/or 120, and coupled to an electrical bundle or similar component that utilizes a routing fastener. The securing system 500 may then be shipped to an original equipment manufacturer. The tie strap passages 116 and/or 120 allow the fastening assembly 300 to be easily and securely coupled to another component(s) (such as an electrical bundle) via one or more tie straps.

[0079] The received system (including the fastener assembly and the electrical bundle, for example) may then be secured to a component, such as within a vehicle, through a fastener, such as a threaded stud. The fastener assembly 300 is pressed onto the threaded fastener 400 through the fastener inlet 122 in the housing 100, and threaded features of the clamp 200 resist extraction from the fastener 400.

[0080] In order to remove the fastening assembly 300 from the fastener 400, the clamp 200 may be laterally urged out of the housing 100 (such as via pushing, sliding, prying, or the like) until the shaft 402 of the fastener 400 is in an opening 213 or 215 defined by one of the spring loop walls 212 or 214. The fastening assembly 300 may then be removed from the fastener 400, and reusable for a subsequent re-installation.

[0081] The closed loop 220 of the clamp 200 provides security as the clamp 200 is unable to be removed from the housing 100 until the fastening assembly 300 is removed from the fastener 400. Further, the clamp 200 may be urged laterally out of the housing 100 in either of two directions that are opposite from one another.

[0082] As described herein, embodiments of the present disclosure provide a fastening assembly that includes a housing and a looped clamp. The clamp is inserted into a channel of the housing. The clamp may include a tie strap tunnel that allows the fastening assembly to be easily tied to a component. The closed loop of the clamp prevents the clamp from being removed from the housing when a fastener (such as a threaded bolt) is coupled to the fastening assembly. After the fastening assembly is removed off the fastener, the clamp may be laterally urged out of the housing in either of two opposite directions.

[0083] Embodiments of the present disclosure provide a fastening assembly including a clamp that is unlikely to inadvertently dislodge from a housing. Further, the clamp may be inserted into a housing from more than one direction, thereby providing increased installation flexibility.

[0084] While various spatial and directional terms, such as top, bottom, lower, mid, lateral, horizontal, vertical, front and the like may be used to describe embodiments of the present disclosure, it is understood that such terms are merely used with respect to the orientations shown in the drawings. The orientations may be inverted, rotated, or otherwise changed, such that an upper portion is a lower portion, and vice versa, horizontal becomes vertical, and the like.

[0085] Variations and modifications of the foregoing are within the scope of the present disclosure. It is understood that the embodiments disclosed and defined herein extend to all alternative combinations of two or more of the individual features mentioned or evident from the text and/or drawings. All of these different combinations constitute various alternative aspects of the present disclosure. The embodiments described herein explain the best modes known for practicing the disclosure and will enable others skilled in the art to utilize the disclosure. The claims are to be construed to include alternative embodiments to the extent permitted by the prior art.

[0086] To the extent used in the appended claims, the terms "including" and "in which" are used as the plain-English equivalents of the respective terms "comprising"

and "wherein." Moreover, to the extent used in the following claims, the terms "first," "second," and "third," etc. are used merely as labels, and are not intended to impose numerical requirements on their objects. Further, the limitations of the following claims are not written in means-plus-function format and are not intended to be interpreted based on 35 U.S.C. § 112(f), unless and until such claim limitations expressly use the phrase "means for" followed by a statement of function void of further structure.

[0087] Various features of the disclosure are set forth in the following claims.

CLAIMS

1. A fastening assembly that is configured to secure to a fastener to form a securing system, the fastening assembly comprising:

a housing defining a clamp chamber; and

a clamp that is configured to be removably inserted into the clamp chamber, the clamp including a closed loop that is configured to trap the fastener.

2. The fastening assembly of claim 1, wherein the housing comprises a first open end and a second open end that is opposite from the first open end, wherein the clamp is configured to be pushed or pulled into or out of the clamp chamber from both of the first open end and the second open end.

3. The fastening assembly of claim 1, wherein the housing comprises one or more tie strap passages.

4. The fastening assembly of claim 1, wherein the housing comprises a fastener inlet that leads into the clamp chamber, wherein the fastener inlet coaxially aligns with a central fastener passage of the clamp to receive a shaft of the fastener.

5. The fastening assembly of claim 1, wherein the clamp comprises side walls having internal arcuate surfaces that define a central fastener passage.

6. The fastening assembly of claim 1, wherein the clamp comprises one or both of retention ledges or retention ridges that are configured to be retained by reciprocal features of the housing.

7. The fastening assembly of claim 1, wherein the closed loop comprises:
- side walls that define a central fastener passage;
 - a first spring loop wall that outwardly extends from first ends of the side walls, wherein the first spring loop wall defines a first opening that connects to the central fastener passage; and
 - a second spring loop wall that outwardly extends from second ends of the side walls, wherein the second spring loop wall defines a second opening that connects to the central fastener passage.
8. The fastening assembly of claim 7, wherein the closed loop defines a bounded, closed internal space defined by the central fastener passage and the first and second openings on opposite sides of the central fastener passage.
9. The fastening assembly of claim 7, wherein outer lateral surfaces of the first and second spring loops walls are flattened and configured to be grasped.
10. The fastening assembly of claim 7, wherein the first spring loop wall outwardly extends from a first open end of the housing when the clamp is retained within the clamp chamber, and wherein the second spring loop wall outwardly extends from a second open end of the housing when the clamp is retained within the clamp chamber.
11. The fastening assembly of claim 1, wherein the clamp is symmetrical in relation to one or both of a major axis or a minor axis of the clamp.

12. A securing system comprising:
a fastener; and
a fastening assembly secureable to the fastener, the fastening assembly comprising:

a housing defining a clamp chamber, wherein the housing comprises a first open end and a second open end that is opposite from the first open end, and a fastener inlet that leads into the clamp chamber; and

a clamp that is configured to be removably inserted into the clamp chamber, the clamp comprising a closed loop that is configured to trap the fastener, and side walls having internal arcuate surfaces that define a central fastener passage, wherein the clamp is configured to be pushed or pulled into or out of the clamp chamber from both of the first open end and the second open end, wherein the fastener inlet coaxially aligns with a central fastener passage of the clamp to receive a shaft of the fastener.

13. The securing system of claim 12, wherein the housing comprises one or more tie strap passages.

14. The securing system of claim 12, wherein the clamp further comprises one or both of retention ledges or retention ridges that are configured to be retained by reciprocal features of the housing.

15. The securing system of claim 12, wherein the closed loop comprises:
a first spring loop wall that outwardly extends from first ends of the side walls, wherein the first spring loop wall defines a first opening that connects to the central fastener passage; and

a second spring loop wall that outwardly extends from second ends of the side walls, wherein the second spring loop wall defines a second opening that connects to the central fastener passage.

16. The securing system of claim 15, wherein the closed loop defines a bounded, closed internal space defined by the central fastener passage and the first and second openings on opposite sides of the central fastener passage.

17. The securing system of claim 15, wherein outer lateral surfaces of the first and second spring loops walls are flattened and configured to be grasped.

18. The securing system of claim 15, wherein the first spring loop wall outwardly extends from the first open end of the housing when the clamp is retained within the clamp chamber, and wherein the second spring loop wall outwardly extends from the second open end of the housing when the clamp is retained within the clamp chamber.

19. The securing system of claim 15, wherein the clamp is symmetrical in relation to one or both of a major axis or a minor axis of the clamp.

20. A securing system comprising:
a fastener; and
a fastening assembly secureable to the fastener, the fastening assembly comprising:

a housing defining a clamp chamber, wherein the housing comprises a first open end and a second open end that is opposite from the first open end, a fastener inlet that leads into the clamp chamber, and one or more tie strap passages; and

a clamp that is configured to be removably inserted into the clamp chamber, the clamp comprising a closed loop that is configured to trap the fastener, side walls having internal arcuate surfaces that define a central fastener passage, and one or both of retention ledges or retention ridges that are configured to be retained by reciprocal features of the housing, wherein the clamp is configured to be pushed or pulled into or out of the clamp chamber from both of the first open end and the second open end, wherein the fastener inlet coaxially aligns with a central fastener passage of the clamp to receive a shaft of the fastener, wherein the closed loop comprises (a) a first spring loop wall that outwardly extends from first ends of the side walls, wherein the first spring loop wall defines a first opening that connects to the central fastener passage, and (b) a second spring loop wall that outwardly extends from second ends of the side walls, wherein the second spring loop wall defines a second opening that connects to the central fastener passage, wherein the closed loop defines a bounded, closed internal space defined by the central fastener passage and the first and second openings on opposite sides of the central fastener passage, wherein outer lateral surfaces of the first and second spring loops walls are flattened and configured to be grasped, wherein the first spring loop wall outwardly extends from the first open end of the housing when the clamp is retained within the clamp chamber, and wherein the second spring loop wall outwardly extends from the second open end of the housing when the clamp is retained within the clamp chamber.

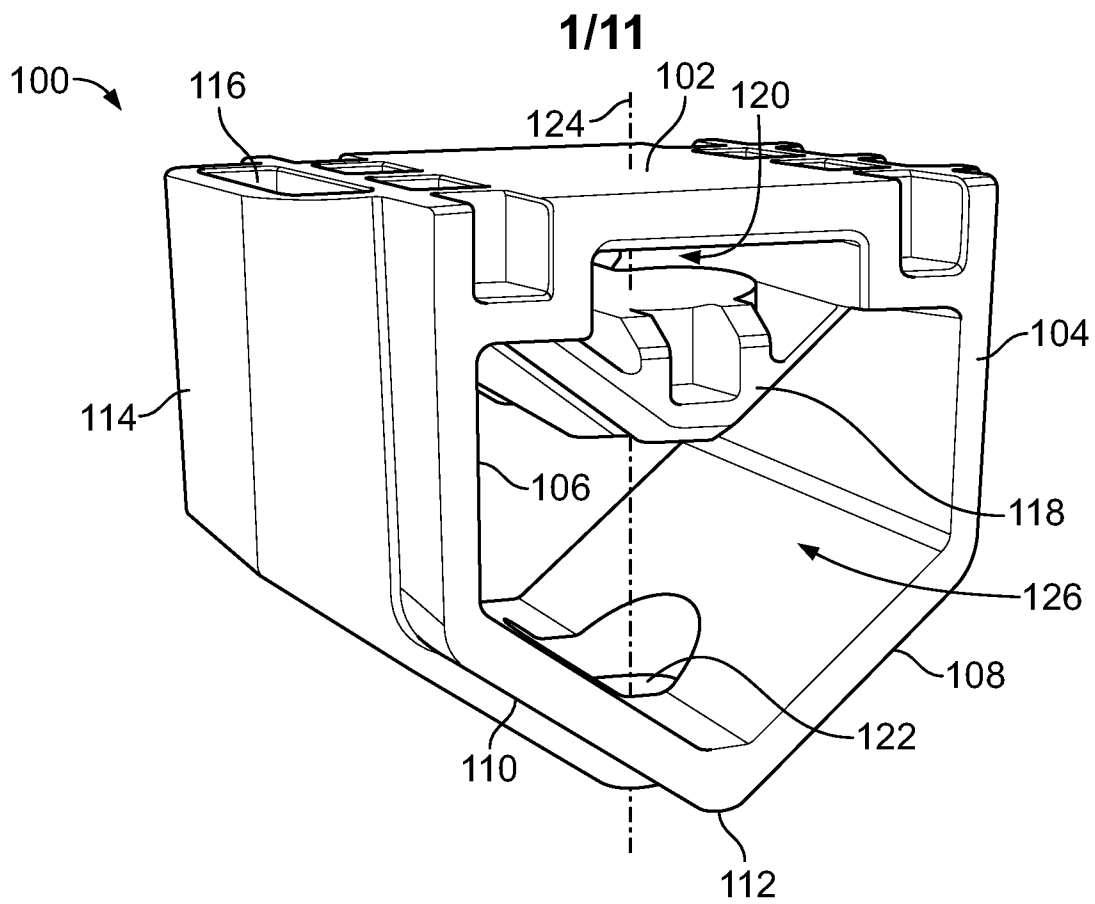


FIG. 1

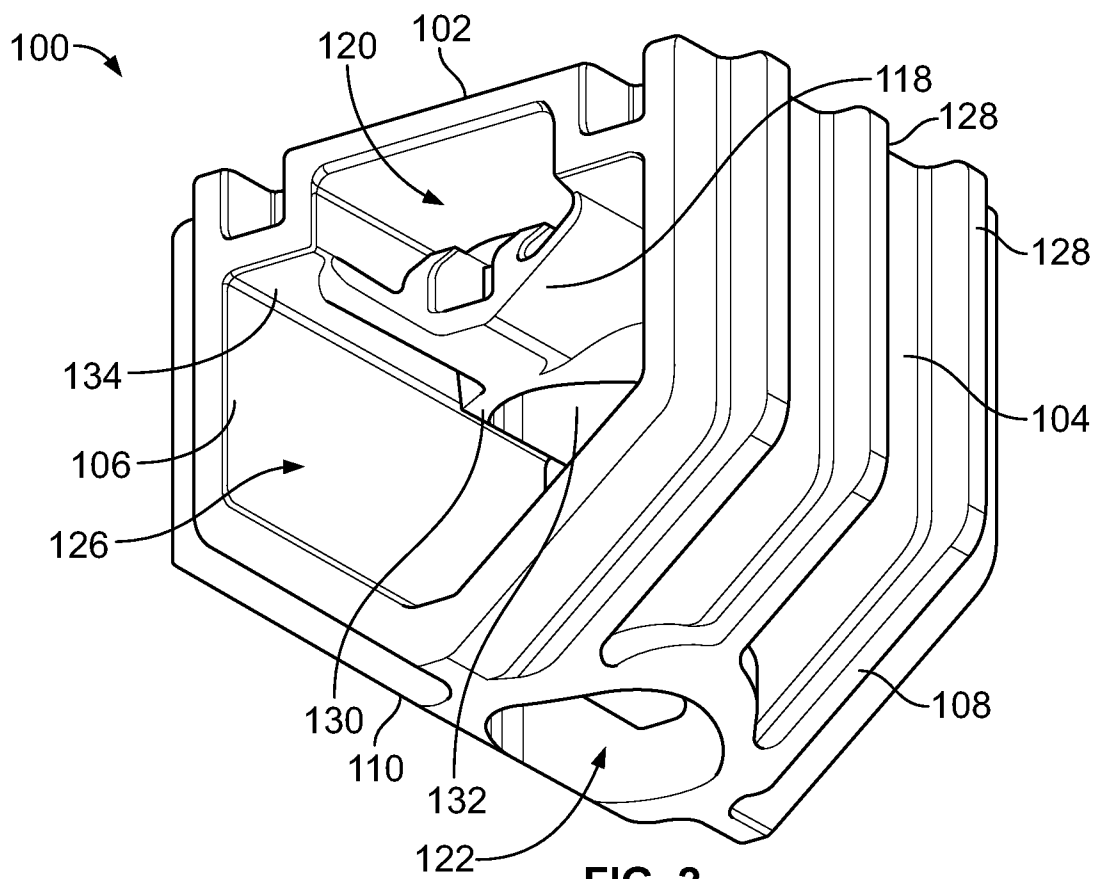


FIG. 2

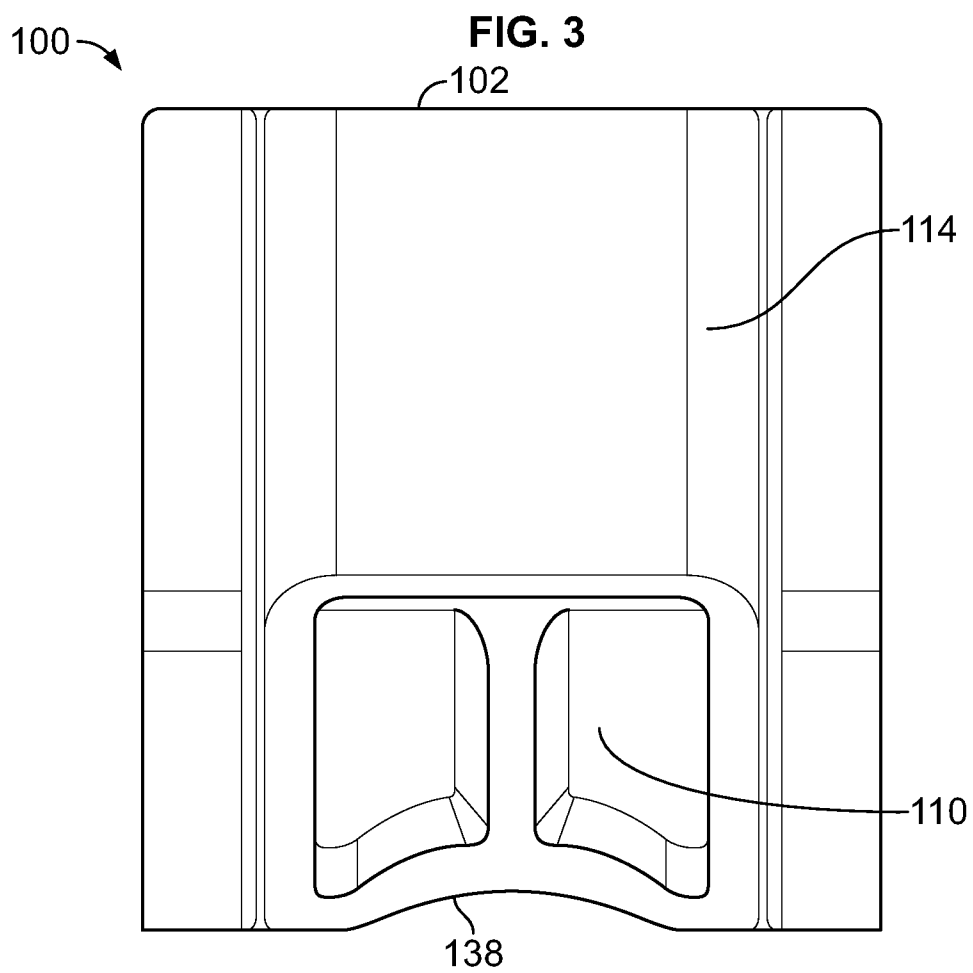
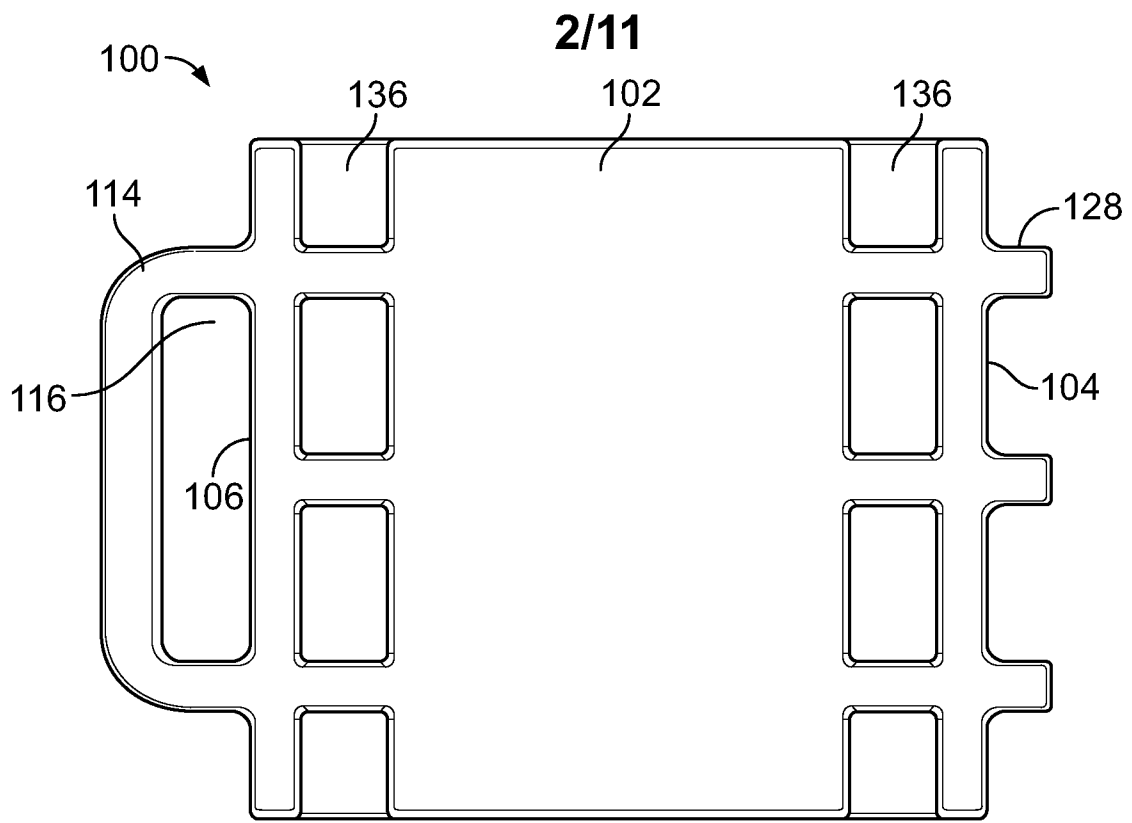


FIG. 4

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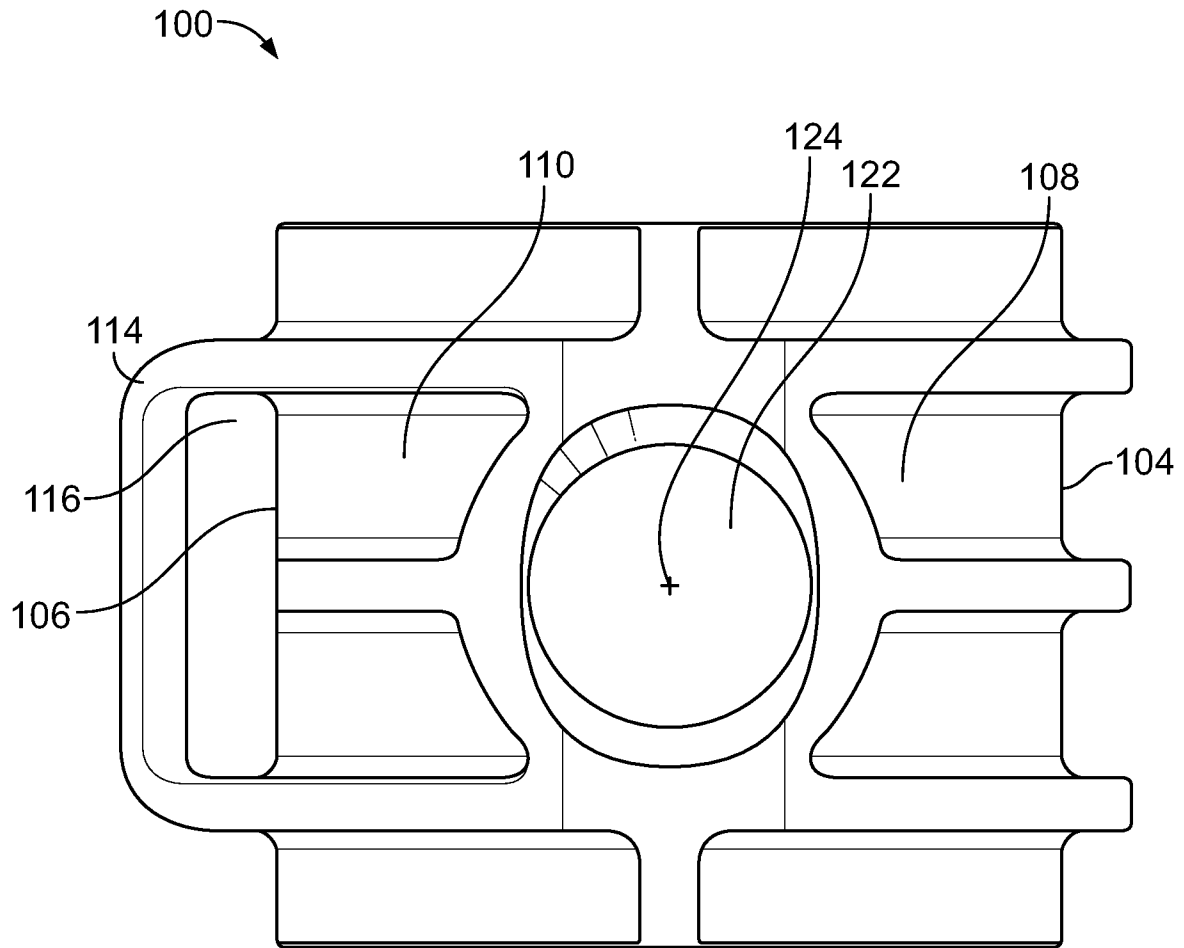


FIG. 5

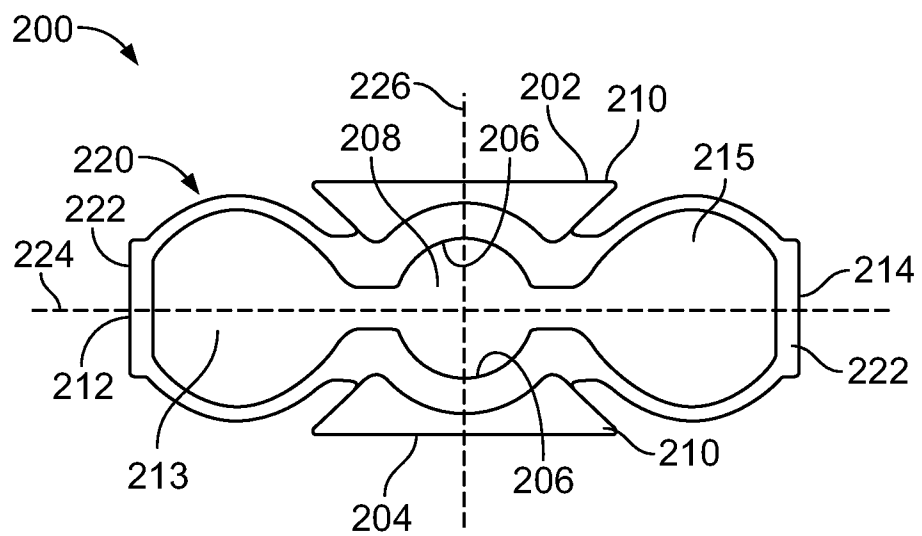


FIG. 6

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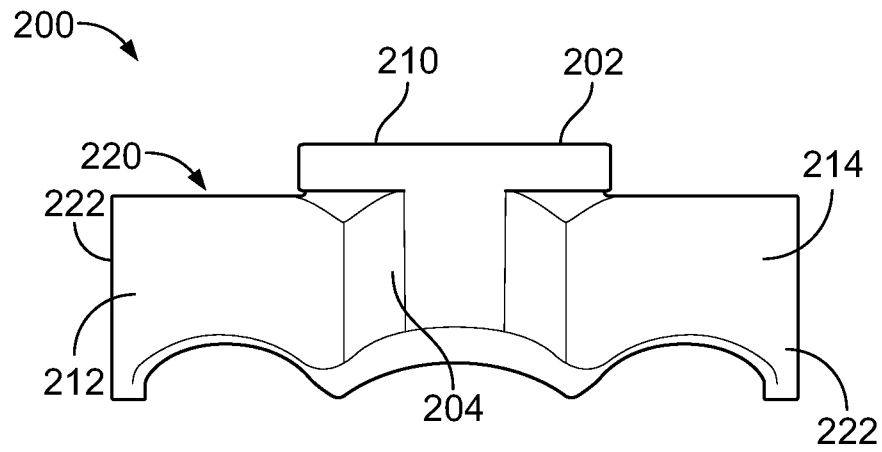


FIG. 7

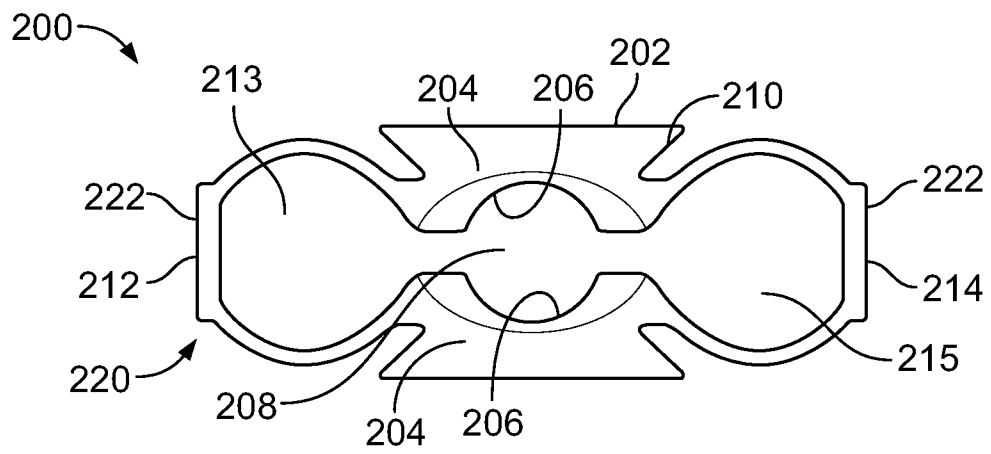


FIG. 8

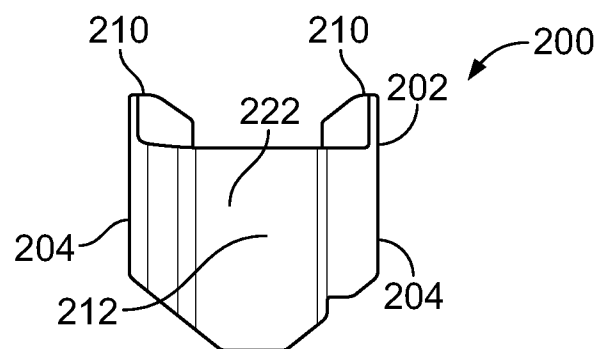


FIG. 9

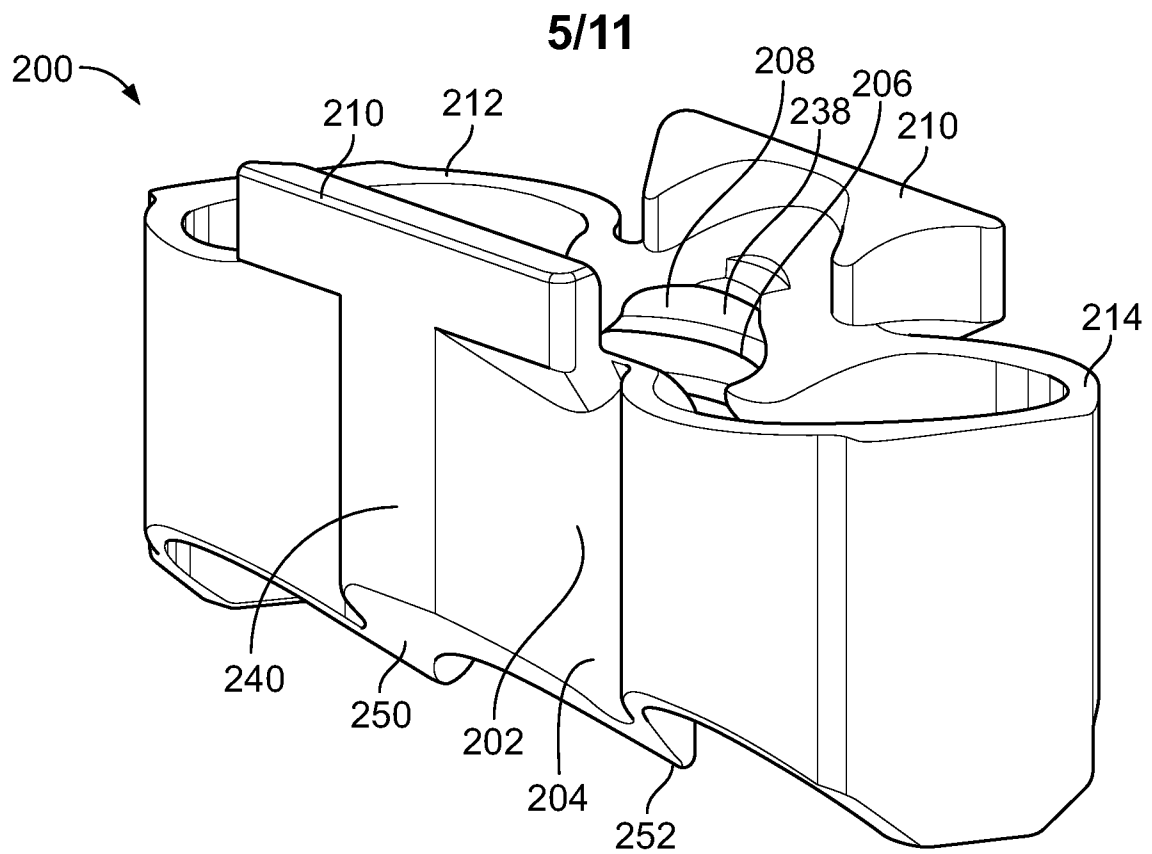


FIG. 10

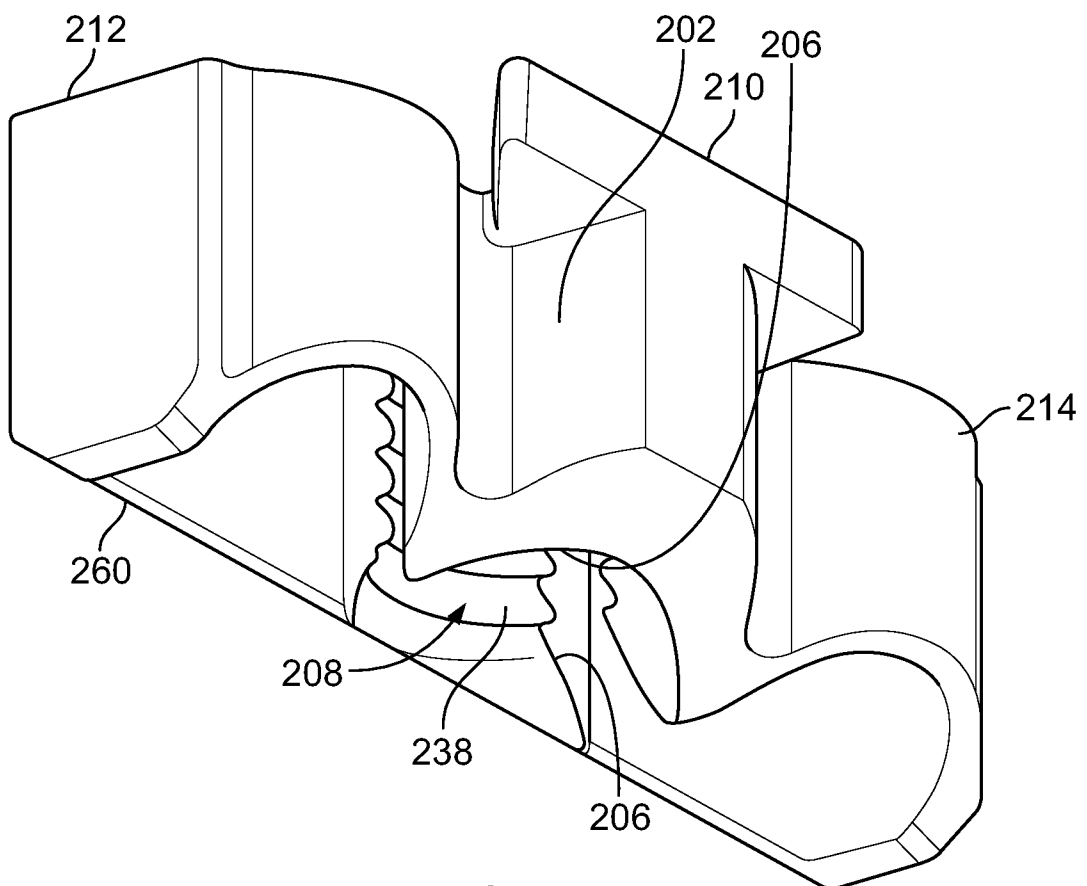


FIG. 11

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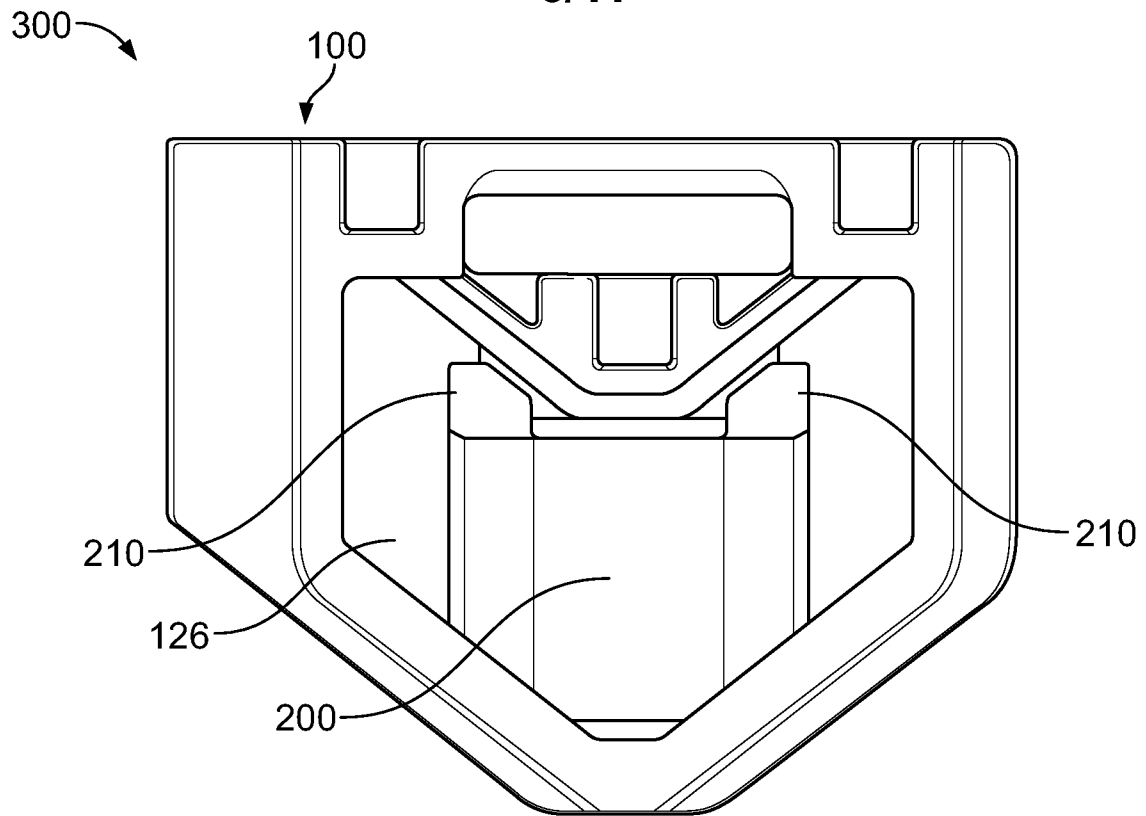


FIG. 12

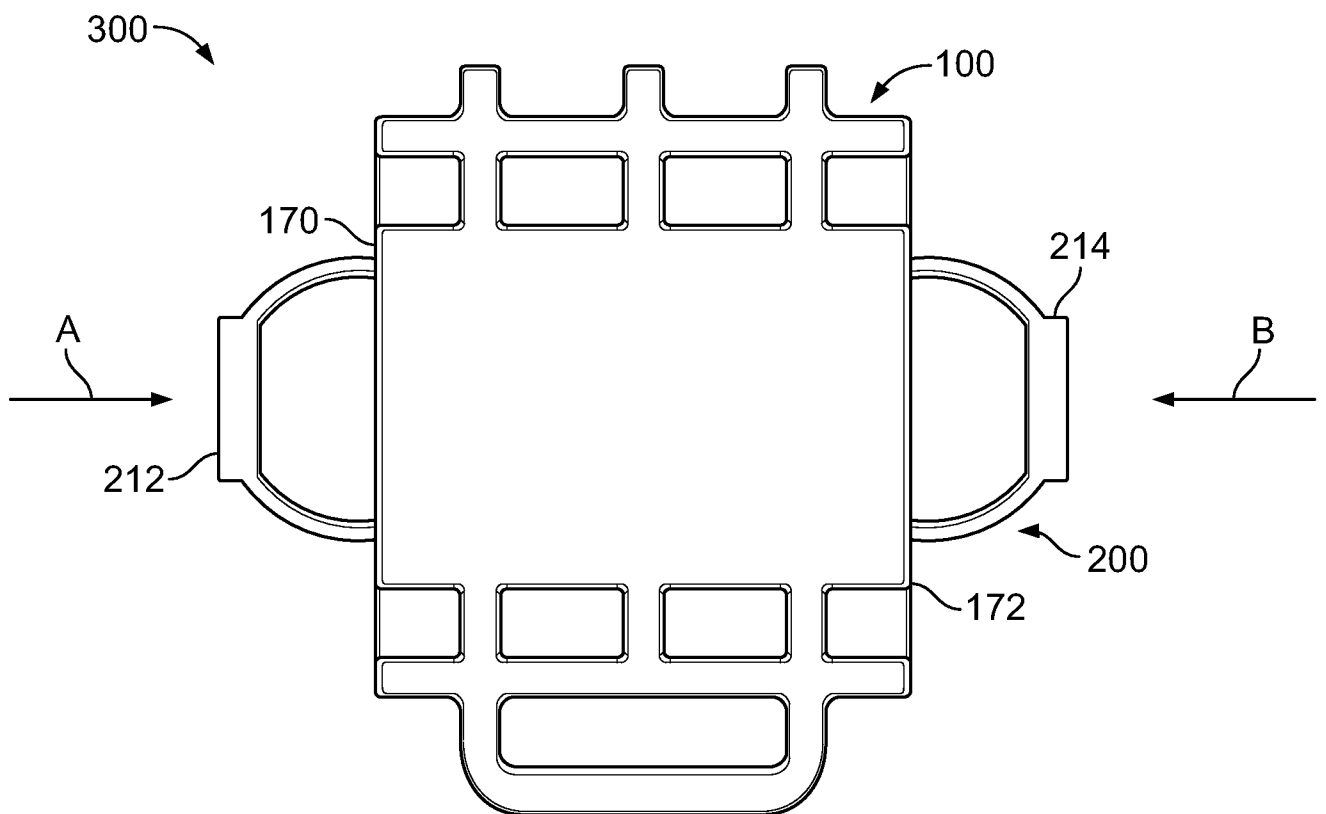


FIG. 13

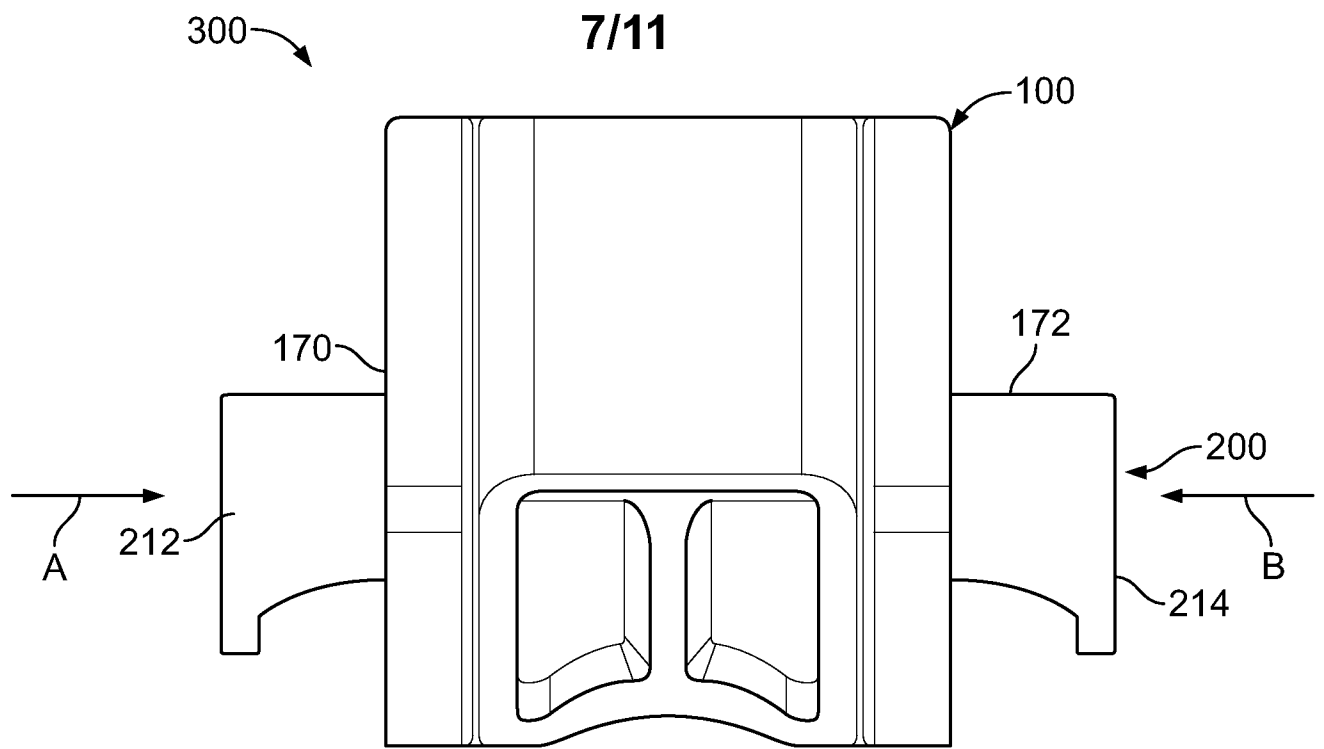


FIG. 14

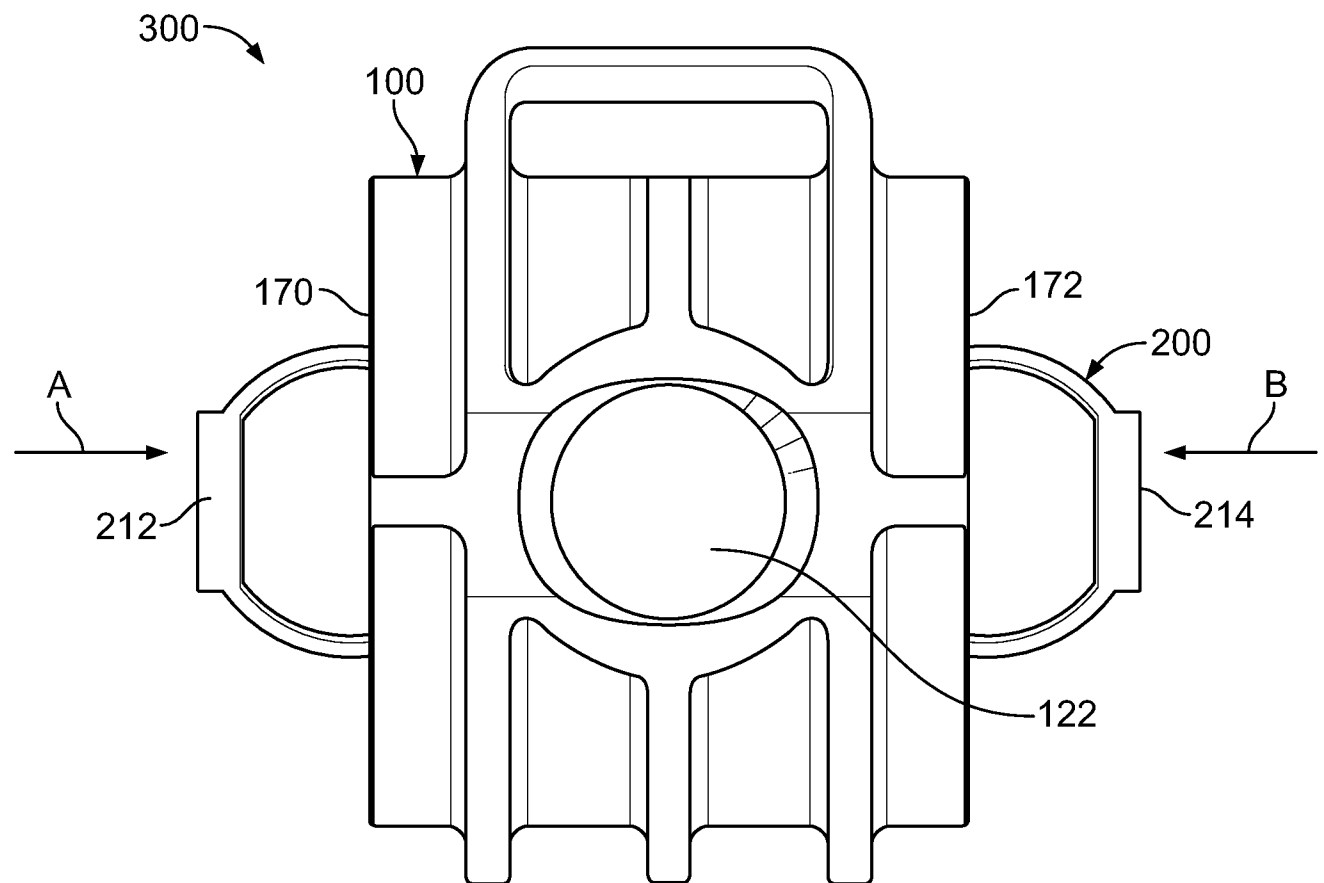


FIG. 15

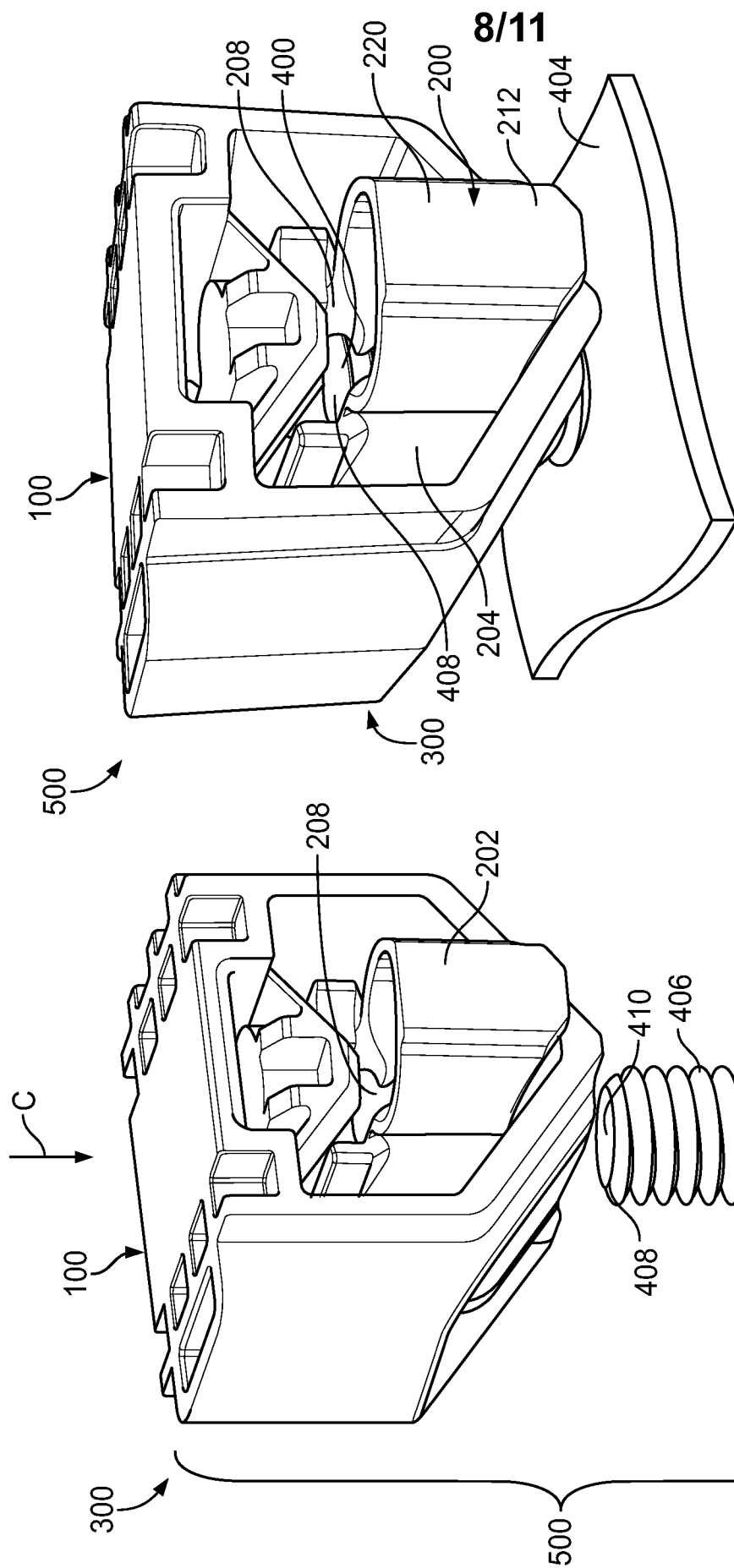


FIG. 17

FIG. 16

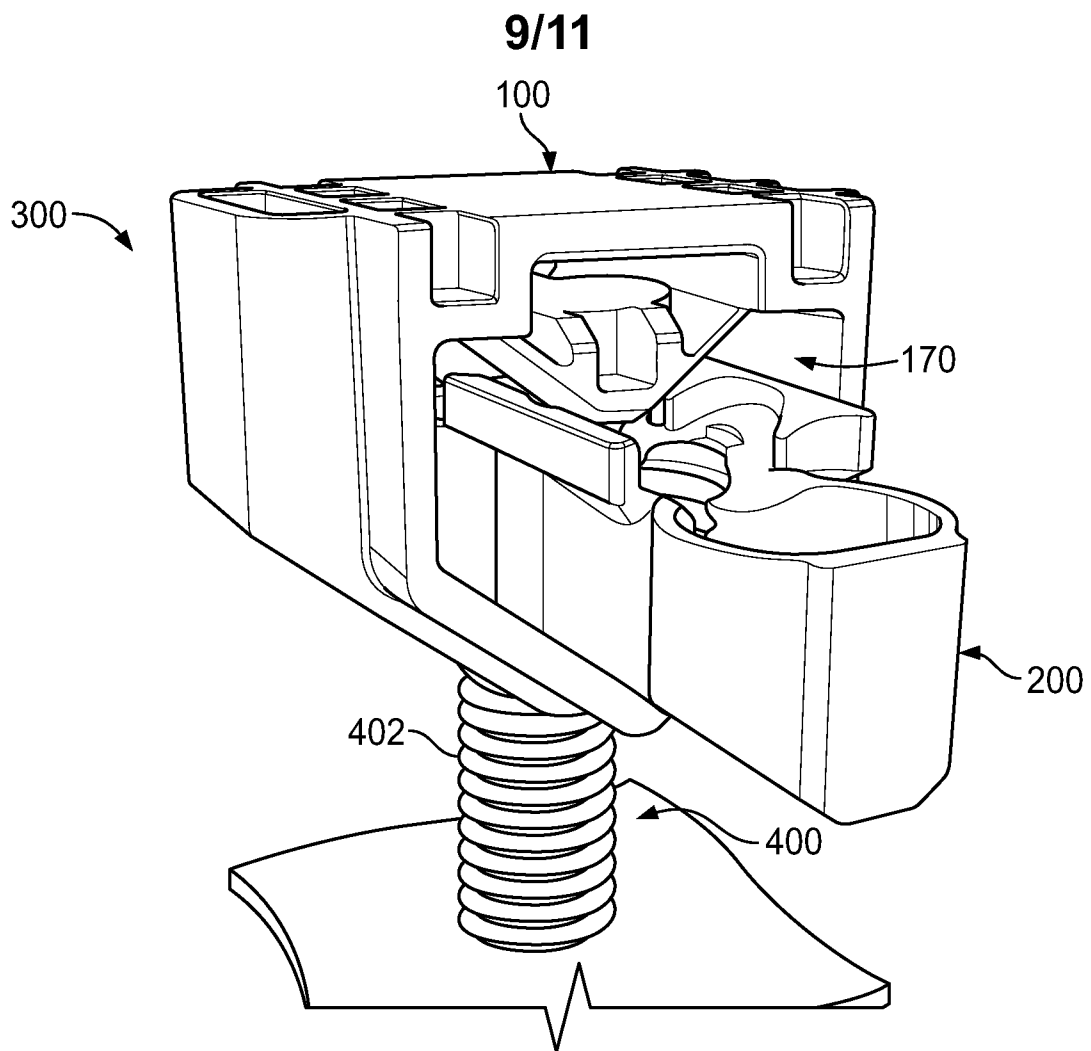


FIG. 18

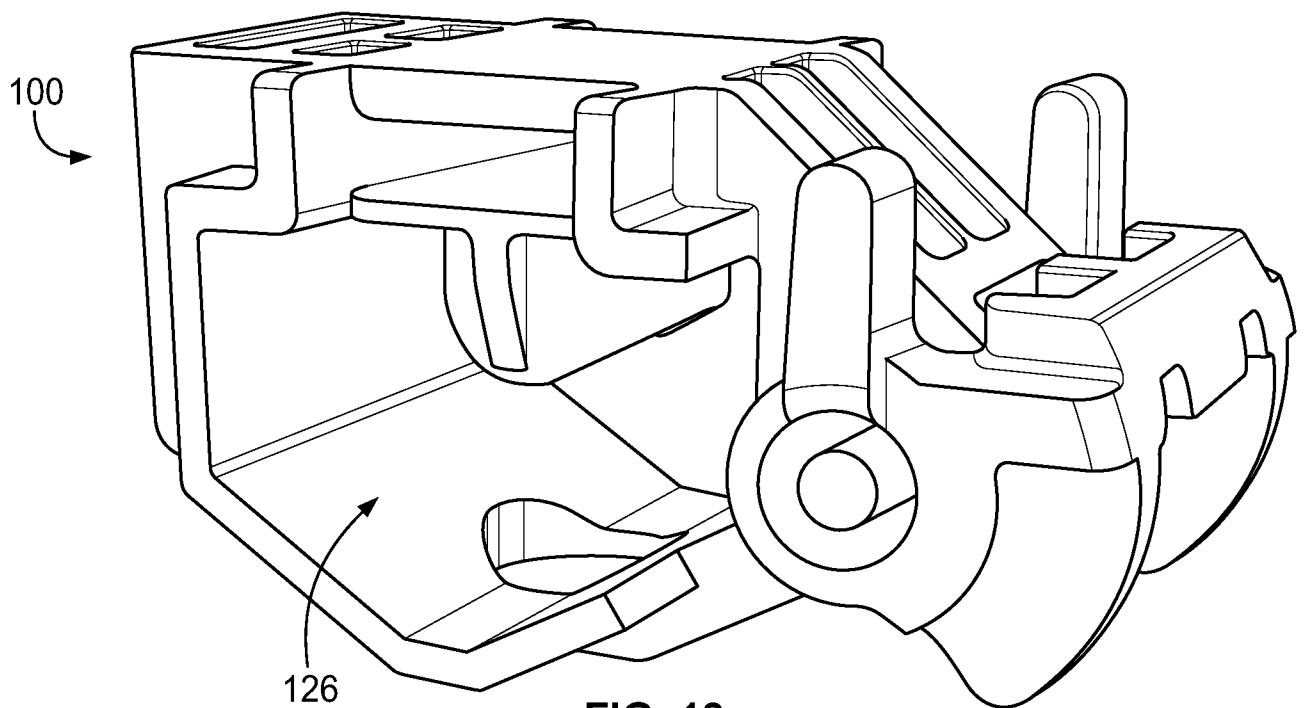


FIG. 19

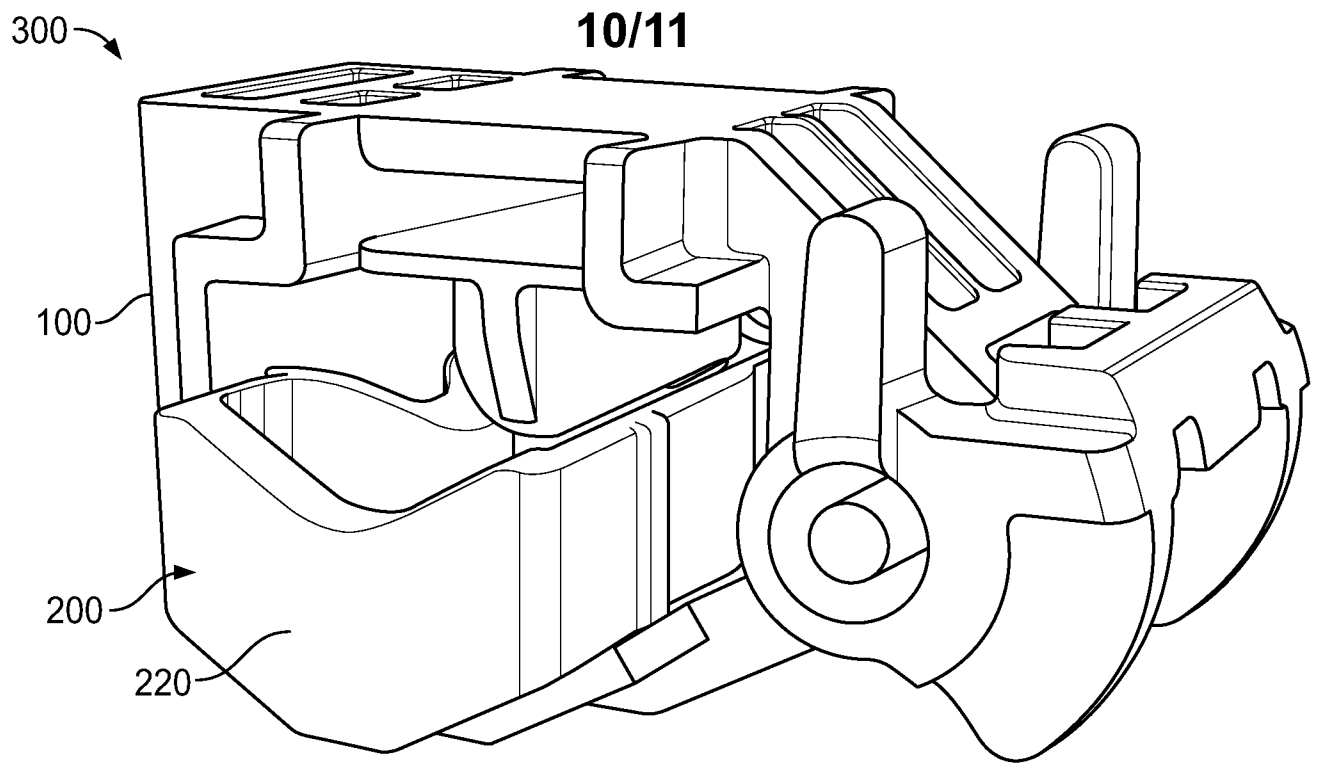


FIG. 20

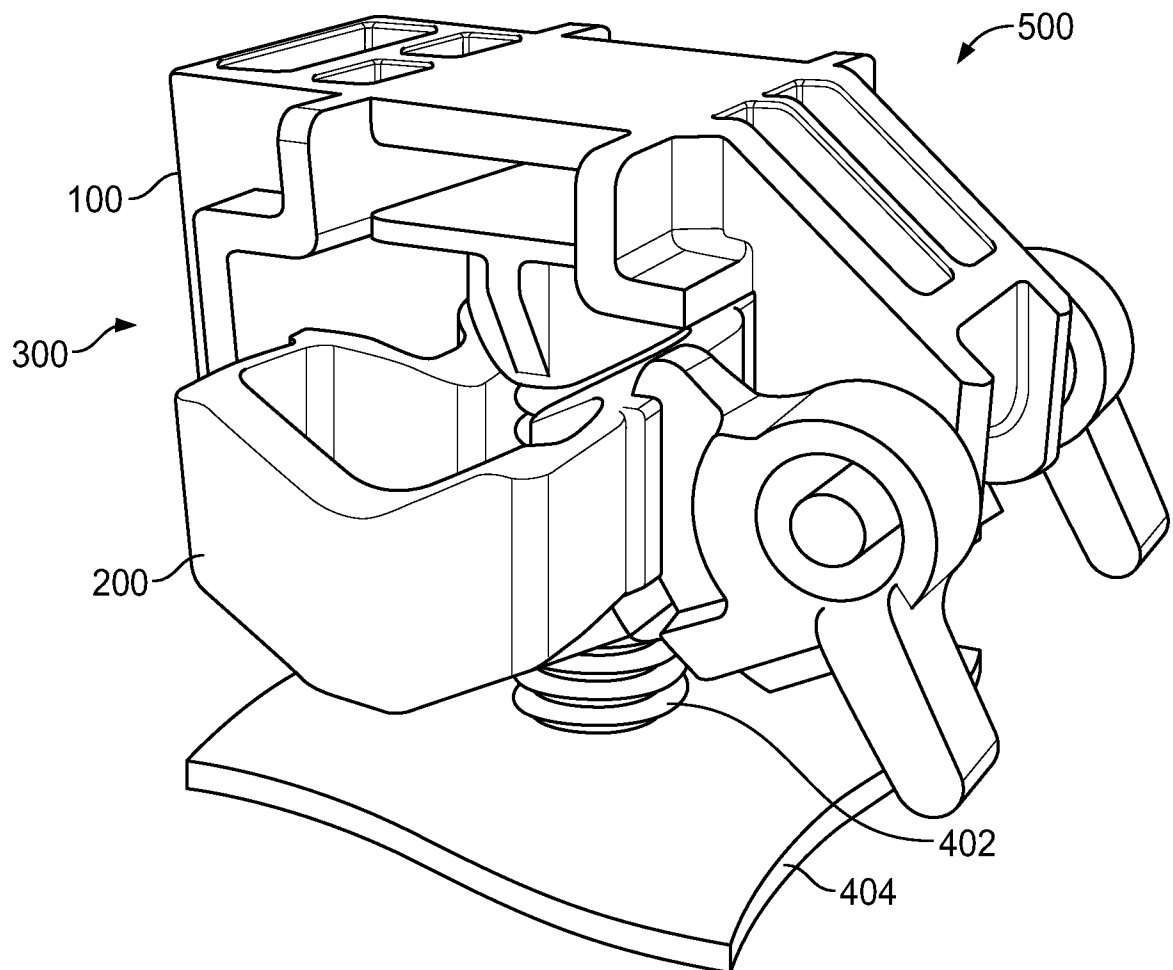


FIG. 21

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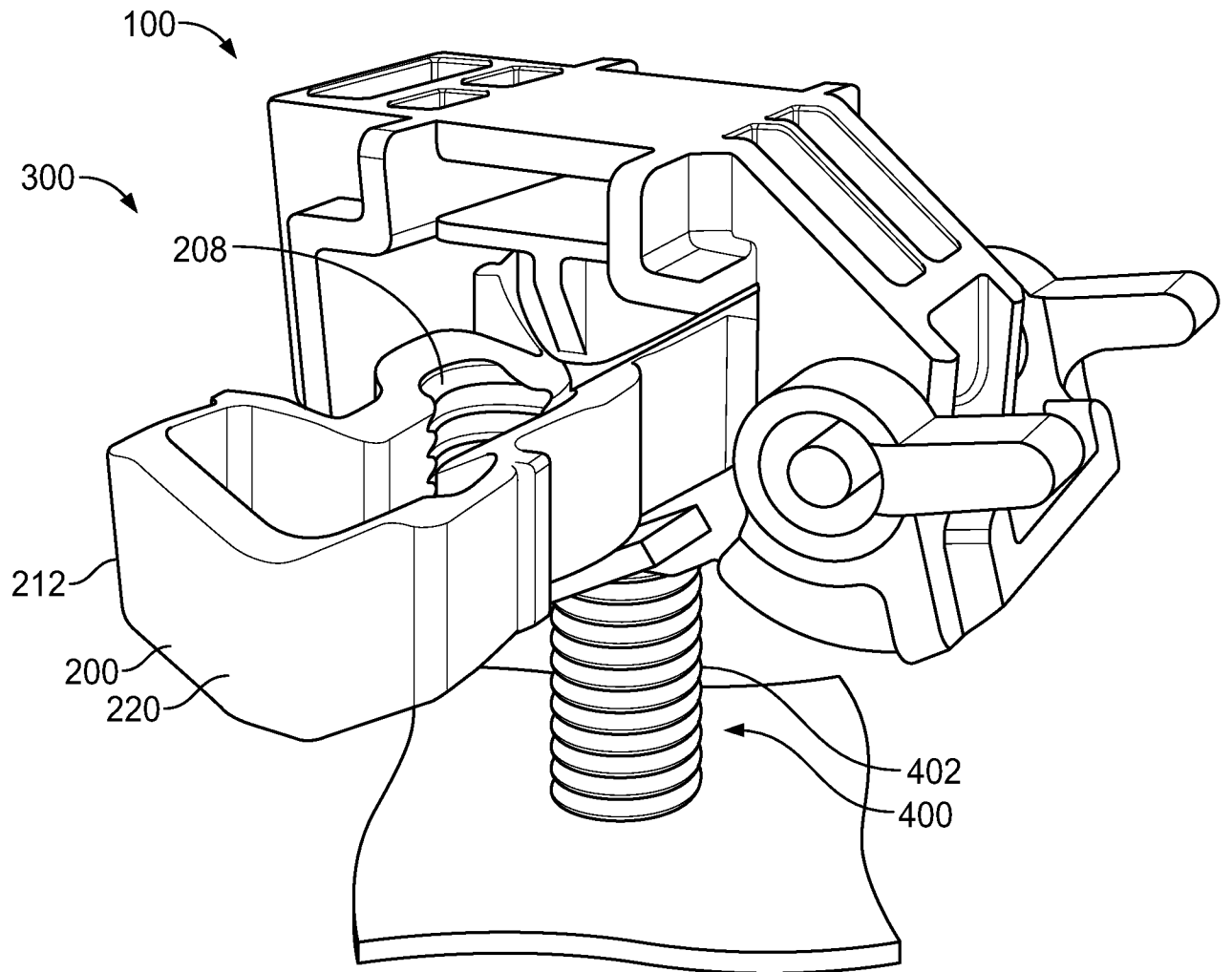


FIG. 22

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2018/032864

A. CLASSIFICATION OF SUBJECT MATTER
INV. F16B37/08
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)
F16B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	WO 2015/065583 A1 (ILLINOIS TOOL WORKS [US]) 7 May 2015 (2015-05-07) cited in the application figures -----	1,3-9,11 2,10, 12-20



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"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

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"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

4 July 2018

Date of mailing of the international search report

20/07/2018

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
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Fax: (+31-70) 340-3016

Authorized officer

Pirog, Pawel

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2018/032864

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2015065583 A1	07-05-2015	CN 105637240 A	01-06-2016
		DE 102014103535 A1	30-04-2015
		JP 2016540163 A	22-12-2016
		US 2016238058 A1	18-08-2016
		WO 2015065583 A1	07-05-2015
