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(71) Applicant: **DELPHI INTERNATIONAL OPERATIONS LUXEMBOURG S.À.R.L.** [LU/LU]; Avenue de Luxembourg, L-4940 Bascharage (LU).(72) Inventors: **CAPPE, Patrice**; 7, route de Rambouillet, F-28210 Faverolles (FR). **CORMIER, François**; 2, Sente des Ecoliers, Chenicourt, F-28210 Senantes (FR). **GUILLET, Pascal**; 35, rue des Terres Douces, F-28600 Luisant (FR). **ROZET, Dominique**; 10, rue Georges Péquin, F-78120 Rambouillet (FR). **TRISTANI, Laurent**; c/o Delphi Connection Systems Holding France, 18, Parc Ariane III, 3/5, rue Alfred Kastler, F-78280 Guyancourt (FR). **YAHYA, Ould**; c/o Delphi Connection Systems Holding France, 18, Parc Ariane III, 3/5, rue Alfred Kastler, F-78280 Guyancourt (FR).(74) Agent: **ROBERT, Vincent**; Delphi France SAS - IP Department, Bât. Le Raspali - ZAC Paris Nord 2, 22, avenue

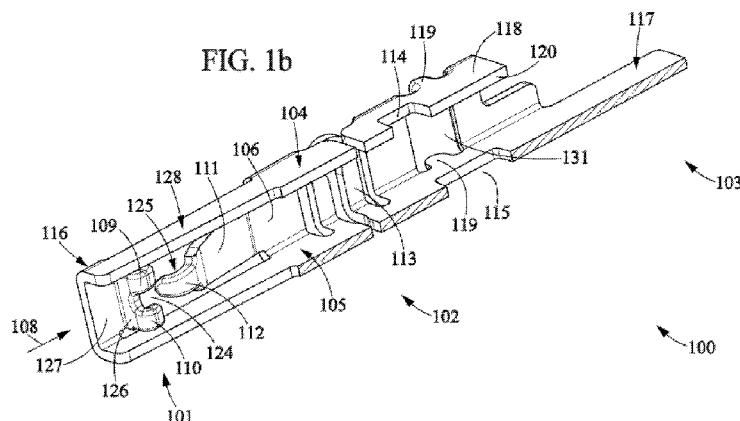
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(54) Title: ASSEMBLY OF A MALE TERMINAL AND A FEMALE TERMINAL HAVING A CONTACT POINT AND A RETENTION ARM



(57) Abstract: The present invention relates to an assembly of a male terminal and a female terminal (100), the female terminal (100) consisting of an elongated box-shaped body having : -a front opening (108), -a contact point (112) establishing electrical contact with the male terminal, and -a retention arm (126) establishing a mechanical contact with the male terminal and thus holding the male terminal inside the female terminal. A force applied by the contact point (112) on the male terminal is smaller than a force applied by the retention arm (126) to the male terminal.

**ASSEMBLY OF A MALE TERMINAL AND A FEMALE TERMINAL HAVING A CONTACT
POINT AND A RETENTION ARM**

The present invention relates to electrical terminals, in particular female terminals.

5

In particular, the present invention is related to female terminals and features of such terminals which hold the male terminal inside of the female terminal.

10 Various methods and features have been introduced to help the retention of the male terminal inside the female terminal. For example, such features may comprise one or more of resilient arms. The resilient arms are cut out of lateral walls of the female terminal and impose an elastic
15 force onto the male terminal, which holds the male terminal in place inside of the female terminal. The resilient arms or lances also establish an electrical contact between the male terminal and the female terminal.

20 However, this general setting may show some drawbacks. The male terminal is held in place by elastic force, i.e. a force applied to a specific contact point of the male terminal. The same specific contact point is also a point of contact for establishing the electrical connection.

25

Thus, when the male terminal is moved, usually as a result of applied stress, e.g. vibrations or shifts, the contact point is rubbed by the resilient arms and becomes damaged. As a result, fretting corrosion occurs and the electrical
30 conductivity of the connection is compromised.

The present invention has notably for object to mitigate those drawbacks.

35 To this aim, an assembly of a male terminal and a female terminal consisting of an elongated box-shaped body having

:

- a front opening,
- a contact point establishing electrical contact with the male terminal, and
- 5 - a retention arm establishing a mechanical contact with the male terminal and thus holding the male terminal inside the female terminal,

wherein a force applied by the contact point on the male terminal is smaller than a force applied by the retention
10 arm to the male terminal.

With these features, the damage of the electrical contact point between the male terminal and the female terminal is reduced, which reduces a fretting corrosion and establishes
15 a more reliable electrical contact.

In some embodiments, one might also use one or more features defined in the claims.

20 These features help the retention of the male terminal inside the female terminal, reduce the damage of the electrical contact point between the male terminal and the female terminal, and further reduce the fretting corrosion.

25 In one embodiment, the assembly of the male terminal and the female terminal may be inserted into an external cage, comprising:

- a top wall,
- a bottom wall,
- 30 - a first lateral wall,
- a second lateral wall, and
- a front portion,

wherein the front portion of the external cage further comprises at least one contact point, and wherein the force
35 applied by the contact point to the male terminal is bigger

than the force applied by the first contact section of the female terminal.

The external cage protects the assembly from damages, increases resiliency of the female terminal, helps to hold the male terminal inside of the female terminal. The external cage may further reduce damage of the electrical contact point of the male terminal and the female terminal.

Of course, different features, alternatives and/or embodiments of the present invention can be combined with each other in various arrangement to the extent that they are not incompatible or mutually exclusive of others.

The present invention will be better understood and other features and advantages will become apparent upon reading the following detailed description including embodiments for illustrative purposes with reference to the figures, presented as non-limitative examples, which can be used to complete the understanding of the present invention and the description and, where appropriate, contribute to its definition, in which:

- Figure 1a shows a female terminal according to a first embodiment of the present invention,
- Figure 1b shows a cross section view along line Ib-Ib of the female terminal of Figure 1,
- Figure 1c shows a cross section view along line Ic-Ic of the female terminal of Figure 1,
- Figure 2a shows a female terminal according to a second embodiment of the present invention,
- Figure 2b shows a cross section view along line IIb-IIb of the female terminal of Figure 2,
- Figure 2c shows a cross section view along line IIc-IIC of the female terminal of Figure 2,
- Figure 3a shows a female terminal according to a third embodiment of the present invention,

- Figure 3b shows a cross section view along line IIIb-IIIb of the female terminal of Figure 3,
- Figure 3c shows a cross section view along line IIIc-IIIc of the female terminal of Figure 3,
- 5 - Figure 4a shows an external cage to be used with the female terminal according to the present invention,
- Figure 4b shows a cross section view of the external cage of Figure 4a,
- 10 - Figure 5a shows an assembly of the female terminal according to the present invention inserted into the external cage of Figure 4a,
- Figure 5b shows a cross section view of the assembly of Figure 5a, and
- 15 - Figure 6 shows a male terminal.

It should be noted that, on figures, structural and/or functional elements which are common to different embodiments may have the same reference sign. Thus, unless
20 otherwise stated, these elements have structural, dimensional and material properties which are identical.

An example of a female terminal 100, 200, 300 according to the present invention, as shown on Figures 1a to 1c, 2a to
25 2c and 3a to 3c, generally consists of an elongated box-shaped body having, respectively :

- a top wall 104, 204, 304,
- a bottom wall 105, 205, 305,
- a first lateral wall 106, 206, 306, and
- 30 - a second lateral wall 107, 207, 307.

The female terminal 100, 200, 300 comprises:

- a contact section 101, 201, 301,
- an intermediate section 102, 202, 302 and
- 35 - a connection section 103, 203, 303,

provided one after the other along a longitudinal axis of the female terminal 100, 200, 300.

The connection section 103, 203, 303 comprises :

- 5 - a crimping portion,
- a body part 118, 218, 318,
- abutments 119, 219,
- a seam 120, 220, 320, and
- openings 114, 214 and 115, 215.

10

When the female terminal 100, 200, 300 is attached to a wire, not currently shown, a crimping tab, not currently shown, extending from each side of a crimping base 117, 217, 317, is bent so as to surround the wire. A crimped
15 connection between the female terminal 100, 200, 300 and the wire is established.

The connection section 103, 203, 303 further comprises opposed openings 130, 230 and 131, 231. The opposed
20 openings 130, 230 and 131, 231 are shaped to receive a plastic lance of a housing to lock the female terminal 100, 200 in the housing.

The contact section 101, 201, 301 comprises an front
25 opening 108, 208, 308, formed by the top wall 104, 204, 304, the bottom wall 105, 205, 305, the first lateral wall 106, 206, 306 and the second lateral wall 107, 207, 307.

A male terminal 400 is inserted through the front opening
30 108, 208, 308. The male terminal 400 is preferably coated in a conductive material such as gold, silver, copper or the like.

The contact section 101, 201, 301 further comprises one or
35 more lances 111, 211, 311, advantageously one or more

resilient lances 111, 211, 311, and, adjacent to the front opening 108, 208, 308, retention arms 126, 226, 326, advantageously resilient retention arms 126, 226, 326.

- 5 In the embodiments shown on Figures 1a to 1c, 2a to 2c and 3a to 3c, there is a pair of lances 111, 211, 311.

The lances 111, 211, 311 are positioned symmetrically in the first lateral wall 106, 206, 306 and the second lateral
10 wall 107, 207, 307.

The lances 111, 211, 311 protrude from the first lateral wall 106, 206, 306 and the second lateral wall 107, 207, 307 towards the inside of the female terminal 100, 200, 300
15 and towards the front opening 108, 208, 308.

The lances 111, 211, 311 may be attached on both sides, preferably, an end 125, 225, 325 of the lances 111, 211, 311, adjacent to the front opening 108, 208, 308, is free.
20

The free end 125, 225, 325 may be either tapered, as shown of Figures 1a to 1c and 2a to 2c for the first and second embodiments of the present invention, or of essentially the same width along the lance 111, 211, 311, as shown on
25 Figures 3a to 3c for the third embodiment of the present invention.

At the free end 125, 225, 325 of the lance 111, 211, 311, there is a contact point 112, 212, 312. Figures 1a to 1c and 2a to 2c show an example of a free end 125, 225 that is bent to an overall shape of a rounded curve, thus forming the contact point 112, 212. Figures 3a to 3c show an example of the contact point 312 formed as a rounded protrusion projecting from the surface of the free end 325.
30

35

Once the male terminal 400 is inserted, the point of

contact 112, 212, 312 contacts the male terminal 400 and establishes the electrical connection between the male terminal 400 and the female terminal 100, 200, 300.

- 5 The point of contact 112, 212, 312 might be coated in a conductive material such as gold or tin, and even the whole contact section can show such a coating.

Adjacent to the front opening 108, 208, 308, retention arms
10 126, 226, 326, advantageously resilient retention arms 126, 226, 326, are positioned. Examples of such retention arms 126, 226, 326 can be seen on Figures 1a to 1c, 2a to 2c and 3a to 3c.

- 15 The first lateral wall 106, 206, 306 and the second lateral wall 107, 207, 307 have, adjacent to the front opening 108, 208, 308, a front portion 116, 216, 316. The front portion 116, 216, 316 further comprises a part that is folded or bent inwardly.

20

The folded or bent part of the front portion 116, 216, 316 forms an inwardly protruding plate, which may be further divided into at least two fingers 109, 209, 309 and 110, 210, 310, advantageously at least two resilient fingers
25 109, 209, 309 and 110, 210, 310.

The fingers 109, 209, 309 and 110, 210, 310 may be positioned symmetrically and protrude from the front portion 116, 216, 316 of the contact section 101, 201, 301
30 towards the inside of the female terminal 100, 200, 300 and towards the connection portion 103, 203, 303.

Two possible arrangements are shown on Figures 1a to 1c, 2a to 2c and 3a to 3c. Figures 1a to 1c show the fingers 109
35 being cut out of a tab 127 positioned at the front portion 116 and bent at an angle less than 90 degrees towards the

inside of the terminal 100 and towards the connection section 103.

Figures 2a to 2c and 3a to 3c show a tab 227, 327 being
5 elongated in the direction opposite to the direction towards the connection section 203, 303. The fingers 209, 309 are cut out of the tab 227, 327 and folded backwards and inside of the female terminal 200, 300.

10 When the male terminal 400 is inserted into the female terminal 100, 200, 300, the lances 111, 211, 311 apply on the male terminal 400 a weaker force than the force exerted by the retention arms 126, 226, 326. When one of the sections has split arms, the forces provided by each arm of
15 this section are added in order to determine the force applied by this section.

The lances 111, 211, 311 establish an electrical contact. The retention arms 126, 226, 326 establish a mechanical
20 contact, thus holding the male terminal 400 inside the female terminal 100, 200, 300.

Therefore, when the male terminal 400 and the female terminal 100, 200, 300 are assembled and relative movements
25 of the male terminal 400 and the female terminal 100, 200, 300 occur, the lance 111, 211, 311 is pressed to the male terminal 400 by a weaker force, therefore reducing friction between the contact point 112, 212, 312 and the male terminal 400.

30

In this way, less fretting corrosion occurs between the contact point 112, 212, 312 and the male terminal 400 and the reliability of the electrical connection between the male terminal 400 and the female terminal 100, 200, 300 is
35 enhanced.

Typically, the force exerted by the retention arms 126, 226, 326, together, would be at least 1 Newton (N) more than that applied by the contact point 112, 212, 312, together.

- 5 Typically, the force applied by the contact point 112, 212, 312 could be between 1 N and 5 N, and the force exerted by the retention arms 126, 226, 326 between 3 N and 15 N.

10 The fingers 109, 209, 309 and 110, 210, 310 are spaced apart from each other, thus forming a passage 124, 224, 324 between them. Each of the fingers 109, 209, 309 and 110, 210, 310 has a contact point which contacts the male terminal 400 when inserted. The contact point of each of the fingers 109, 209, 309 and 110, 210, 310 may be formed
15 as a rounded protrusion, or take any other suitable shape.

In the example from Figures 1a to 1c and 2a to 2c; the free end 125, 225 of the lance 111, 211 is tapered. The free end 125, 225 of the lance 111, 211 is positioned between the
20 fingers 109, 209 and 110, 210, i.e. in the passage 124, 224.

The fingers 109, 209 and 110, 210 are short so as not to reach the free end 125, 225 of the lance 111, 211, as shown
25 on Figures 1a to 1c and 2a to 2c.

In such case, the free end 125, 225 of the lance 111, 211, especially the contact point 112, 212, lies in line with the passage 124, 224 formed between the fingers 109, 209
30 and 110, 210.

In this way, when the male terminal 400 is inserted into the female terminal 100, 200, the friction which occurs upon insertion between the male terminal 400 and the
35 fingers 109, 209 and 110, 210 is applied only on the sides of the male terminal 400 and not in its center, where the

lance 111, 211 touches the male terminal 400 and established an electrical contact. Thus the male terminal 400 is not damaged at the electrical contact point upon insertion.

5

In the embodiment shown on Figures 3a to 3c, the lance 311 is long so as to have its free end 325 surrounded by the front portion with the fingers 309, 310. This helps to protect the lance 311 and secure the correct insertion of the male terminal 400.

10

As the contact point 312 lies between the fingers 309 and 310 when seen from the insertion direction, the male terminal 400 is also not damaged upon insertion on the contact point 312.

15

Moreover, the part of the front portion 116, 216, 316 that is folded or bent inwardly may also serve as a guiding portion, which leads the male terminal 400 inside the female terminal 100, 200, 300.

20

As can easily be seen, the described features of all the three above-described embodiments may be easily combined.

Once the male terminal 400 is inserted, it is encountered by the lances 111, 211, 311 as well as by the front portion 116, 216, 316.

25

When the male terminal 400 is inserted, the force applied by the lances 111, 211, 311 is weaker than the force applied by the front portion 116, 216, 316. In other words, the male terminal 400 is held in place by the front portion 116, 216, 316 rather than the lances 111, 211, 311.

30

The lances 111, 211, 311 establish the electrical contact between the male terminal 400 and the female terminal 100,

35

200, 300.

The lances 111, 211, 311 may also help to hold the male terminal 400 inside the female terminal 100, 200, 300, but
5 the force applied by them is weaker than the force applied by the front portion 116, 216, 316.

The assembly of the female terminal 100, 200, 300 and the male terminal 400, when in use, may be positioned in a
10 vibratory environment.

When the male terminal 400 is inserted into the female terminal 100, 200, 300 and the assembly is placed in the vibratory environment, for example subject to vibrations,
15 the female terminal 100, 200, 300 and the male terminal 400 move relatively to each other. As the force applied by the lance 111, 211, 311 is reduced, the lance 111, 211, 311 does not rub against the male terminal 400 with intensity and the fretting corrosion is reduced.

20

The intermediate section 102, 202, 302 may optionally comprise a spring section provided with a spring 113, 213, as shown on Figures 1a to 1c and 2a to 2c. The spring 113, 213 may be installed to help to relieve stress applied to
25 the male terminal 400.

Once the stress is applied, the spring 113, 213 rather deforms than allows movements of the male terminal 400, therefore further reducing the movements of the male
30 terminal 400 with respect to the female terminal 100, 200, and, especially, with respect to the contact point established by the lances 111, 211 and the fretting corrosion is further reduced.

35 For example, the spring 113, 213 may be formed as a generally S-shaped or U-shaped strip cut out of the top

wall 104, 204, 304, the bottom wall 105, 205, 305, and/or first lateral wall 106, 206, 306 and the second lateral wall 107, 207, 307.

- 5 To further enhance the retention features which hold the male terminal 400 inside the female terminal 100, 200, 300, the female terminal 100, 200, 300 may be provided with the contact section 101, 201, 301 divided into two separate branches 128, 228, 328 and 129, 229, 329 respectively,
10 advantageously two separate resilient branches 128, 228, 328 and 129, 229, 329.

The branches 128, 228, 328 and 129, 229, 329 are terminated in the front portion 116, 216, 316 with the retention arms
15 126, 226, 326. This arrangement prolongs the retention arms 126, 226, 326, so the force applied by them is more easily adjustable and the contact provided by the retention arms 126, 226, 326 is more flexible.

- 20 The branches 128, 228, 328 and 129, 229, 329 are separated by the seam 120, 220, 320, and by a U-shaped or a V-shaped slit 13, 23, which extends from the front opening 108, 208 towards the seam 120, 220. Alternatively, the U-shaped or V-shaped slit 13, 23 can be replaced by a substantially
25 elliptical slit 33.

In an alternative embodiment, the retention function of the front portion 116, 216, 316 may be either further enhanced or entirely replaced by a corresponding feature on an
30 external cage 500.

An example of an external cage is shown on Figures 4a and 4b. The external cage 500 comprises an insertion section 501 and a connection section 503. The external cage 500 is
35 formed as a box-shaped body comprising :

- a top wall 504,
- a bottom wall 505,
- a first lateral wall 506, and
- a second lateral wall 507, respectively.

5

In the insertion section 501, an opening 508 is formed. The external cage 500 provides protection for the female terminal 100, 200, 300, which is inserted inside the external cage 500.

10

A front portion 516 of the first lateral wall 506 and the second lateral wall 507, respectively, which is located adjacent to the opening 508, is elongated and folded towards the inside.

15

The front portion 516 is preferably further divided to two separate fingers 509, 510. Each finger 509, 510 may comprise a contact protrusion 513, 514.

20

The top wall 504 and the bottom wall 505 of the external cage 500 further respectively comprises two inwardly bent retention tabs 511 and 512.

An example of a female terminal 100 inserted into the external cage 500 is shown on Figures 5a and 5b.

Only cooperation of the first embodiment of the female terminal 100 with the external cage 500 will be now described in detail. For the second and the third embodiments of the female terminal 200, 300, the cooperation with the external cage 500 can be similar.

Once the female terminal 100 is inserted into the external cage 500, the retention tabs 511 and 512 encounter the openings 114, 115 provided on the female terminal 100, thus

holding the female terminal 100 inside of the external cage 500.

5 The inwardly bent front portion 516 of the external cage 500 surrounds the front portion 116 of the female terminal 100. This may provide protection of the female terminal 100. It may also help to guide the male terminal 400 inside the female terminal 100 upon insertion.

10 When the male terminal 400 is inserted into the female terminal 100, the male terminal 400 is encountered by the front portion 516 of the external cage 500, as well as by the lance 111 and the front portion 116 of the female terminal 100.

15

Notably, a gap can be provided between the female terminal 100 and the external cage 500, so that a deflection of the branches 128 and 129 is not prevented by an abutment on the first lateral wall 506 and the second lateral wall 507 of
20 the cage external 500.

Hence, the force on the male terminal 400 is defined by the stiffness of the fingers 109, 110, the stiffness of the branches 128, 129 and the stiffness of the fingers 509, 510
25 on each side of the male terminal 400.

The front portion 516 together with the fingers 109 and 110 provides force which is stronger than the force provided by the lance 111. This helps the retention of the male
30 terminal 400 inside the female terminal 100.

As the front portion 516 of the external cage 500 is preferably divided into two fingers 509, 510 and the contact point 112 of the lance 111 lies between the fingers
35 509, 510, the male terminal 400 is not damaged by the electrical contact point upon insertion.

When the female terminal 100 is intended to be used with the external cage 500, it may be provided with abutments 119. These abutments 119 are provided symmetrically positioned on the top wall 104 and the bottom wall 105 of the female terminal 100.

The abutments 119 help to hold the female terminal 100 inside the external cage 500 and also help the female terminal 100 to be centered inside the external cage 500.

When the female terminal 100 is provided with the two resilient branches 128, 129, the external cage 500 might be further provided with a pre-opener 515. The pre-opener 515 is provided adjacent to the opening 508, preferably in the top wall 504 or the bottom wall 505. The pre-opener 515 is centered.

Once the female terminal 100 is inserted, the pre-opener 515 enters the U-shaped or V-shaped slit 13, 23, 33. The pre-opener 515 helps to hold the female terminal 100 centered and also holds the branches 128, 129 in a pre-tensioned state.

Hence, for the first embodiment, the retention force is provided by adding up the force applied both by the rearward lances 111 of the female terminal 100 and those applied by the external cage 500. In the second embodiment, one could provide a external cage with a first section used to guide the male terminal 400 into the female terminal 200, but not in contact with the male terminal 100, once the connectors are locked to one another. The third embodiment might not include an external cage.

Even though the embodiment above is provided for a female terminal, a similar spring section could be provided for a

male terminal. The female terminal and the male terminal according to the present invention are designated as electrical terminal.

5 Obviously, the present invention is not limited to embodiments which are here above described and provided only as examples. It also includes different modifications, and alternatives that may be considered by the person skill in the art as part of the present invention, including all
10 combinations of different embodiments here above described, taken alone or in combination.

CLAIMS

1. Assembly of a male terminal (400) and a female terminal (100, 200, 300), the female terminal (100, 200, 300) consisting of an elongated box-shaped body having :
- a front opening (108, 208, 308),
- a contact point (112, 212, 312) establishing electrical contact with the male terminal (400), and
- a retention arm (126, 226, 236) establishing a mechanical contact with the male terminal (400) and thus holding the male terminal (400) inside the female terminal (100, 200, 300),

wherein a force applied by the contact point (112, 212, 312) on the male terminal (400) is smaller than a force applied by the retention arm (126, 226, 236) to the male terminal (400).

2. Assembly according to claim 1, **wherein** the contact point (112, 212, 312) of the female terminal (100, 200, 300) is located at a free end (125, 225, 325) of a lance (111, 211, 311) protruding from at least a lateral wall (106, 107, 206, 207, 306, 307) towards the inside of the female terminal (100, 200, 300) and towards the front opening (108, 208, 308).

3. Assembly according to claim 2, **wherein** a front portion (116, 216, 316) of the female terminal (100, 200, 300) surrounds the free end (125, 225, 325) of the lance (111, 211, 311).

4. Assembly according to any of claims 1 to 3, **wherein** the retention arm (126, 226, 236) of the female terminal (100, 200, 300) is further divided into two fingers (109, 110, 209, 210, 309, 310).

5. Assembly according to claim 4, **wherein** the fingers (109, 110, 209, 210, 309, 310) are spaced apart from each other.

5 6. Assembly according to claims 4 or 5, **wherein** the fingers (109, 110, 209, 210, 309, 310) are positioned at ends of branches (128, 129, 228, 229, 328, 329).

7. Assembly according to any of claims 1 to 6, **wherein**
10 the retention arm (126, 226, 236) is provided as an inwardly bent front portion (116, 216, 316).

8. Assembly according to any of the preceding claims, **wherein** the female terminal (100, 200) further comprises an
15 intermediate section (102, 202) comprising a spring (113, 213).

9. Assembly according to any of claims 1 to 8, **wherein** the contact point (112, 212, 312) and the retention arm
20 (126, 226, 236) are spaced apart along a longitudinal axis of the female terminal (100, 200, 300).

10. Assembly according to any of claims 1 to 9, further comprising an external cage (500) comprising :

- 25 - a top wall (504),
 - a bottom wall (505),
 - a first lateral wall (506),
 - a second lateral walls (507), and
 - a front portion (516),

30 **wherein** the front portion (516) of the external cage (500) further comprises at least one contact point (509, 510), and

wherein the force applied by the contact point (509, 510) on the male terminal (400) is bigger than the force applied
35 by the first contact section (112, 212, 312) of the female

terminal.

11. Assembly according to any of claims 1 to 9, **wherein**
the female terminal (100, 200, 300) further comprises an
5 external cage (500), and
wherein the contact point (112, 212) is provided on the
female terminal (100, 200) and the retention arm (126, 226)
is provided at least on the external cage (500).

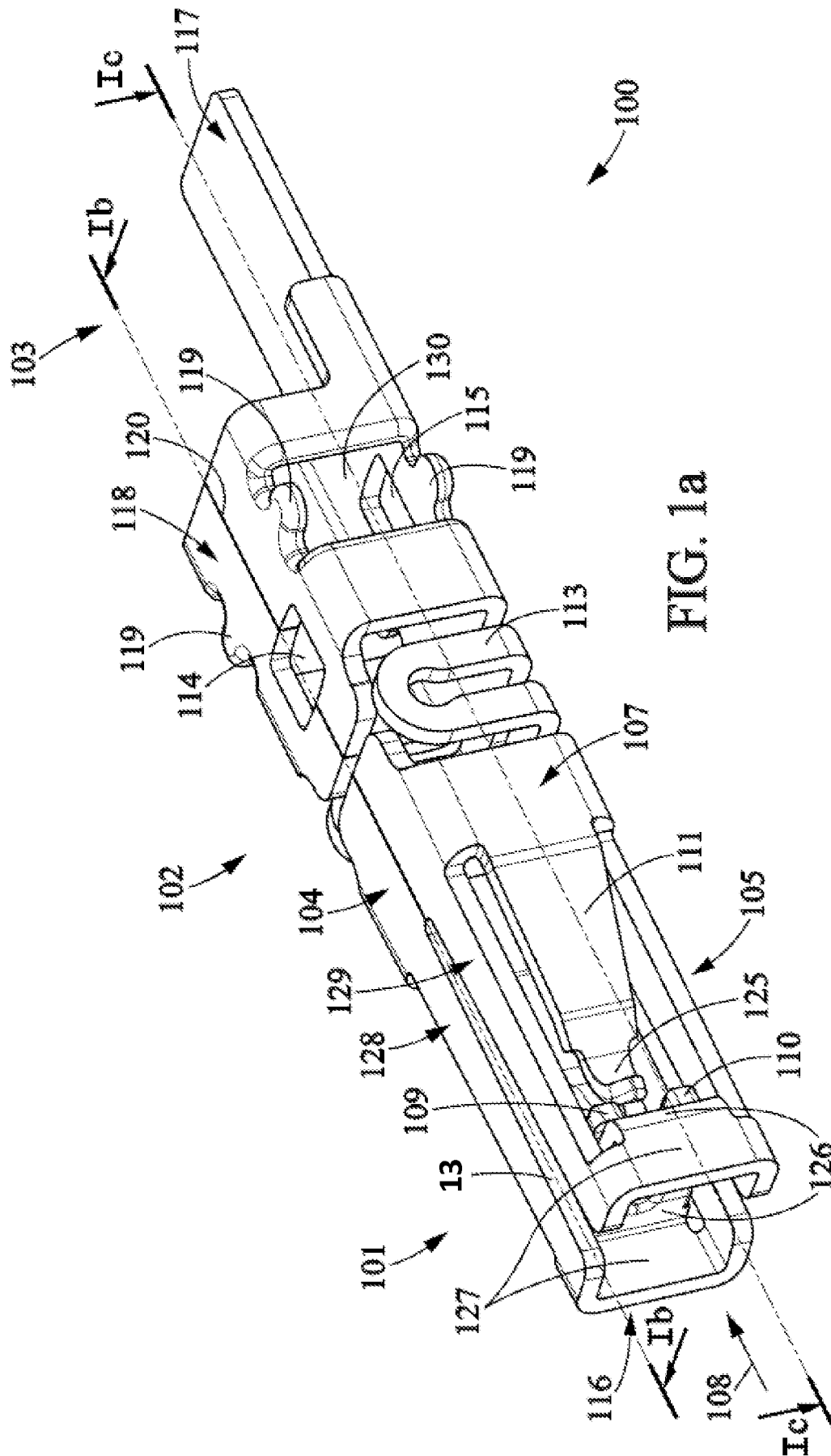
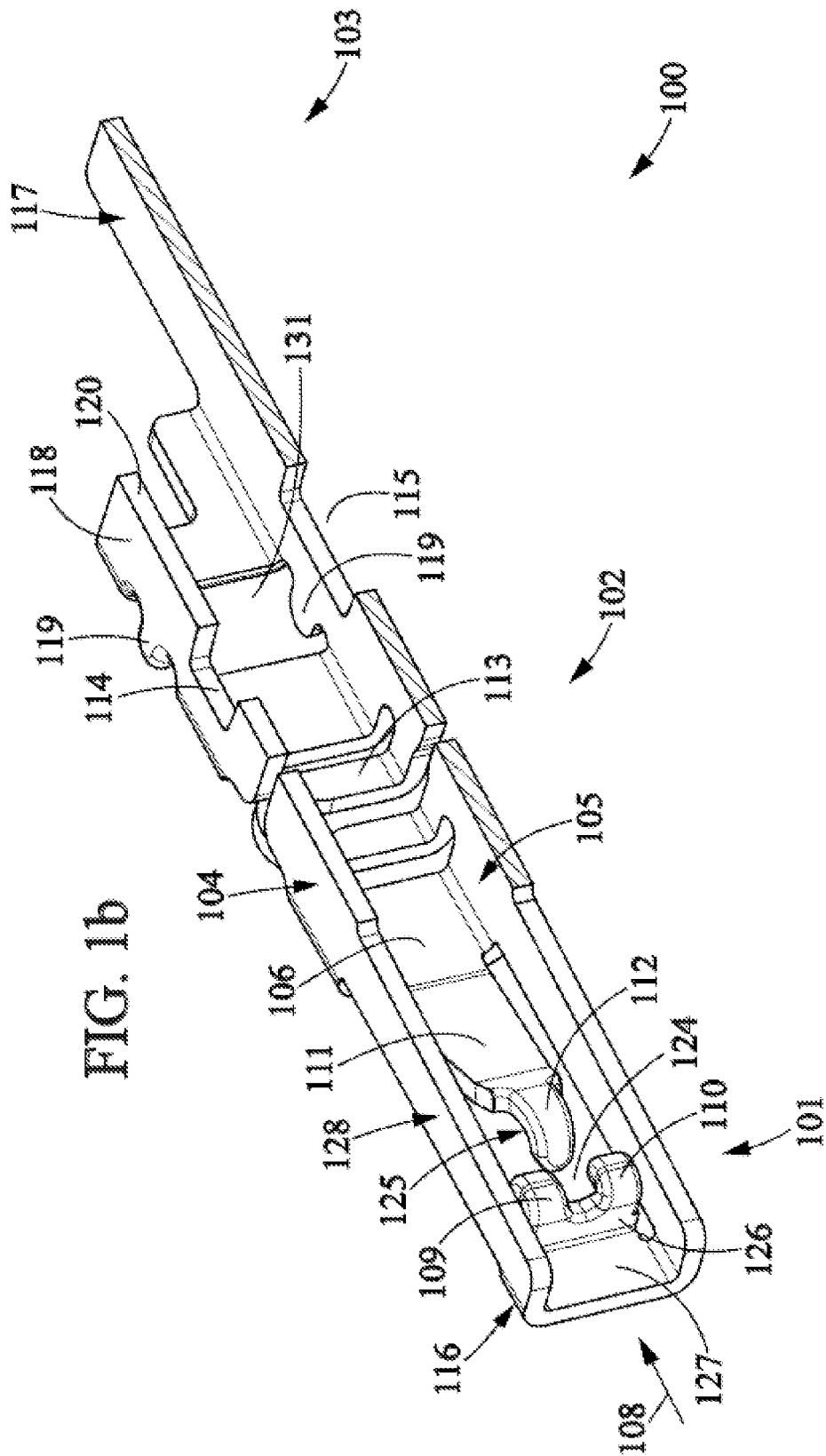
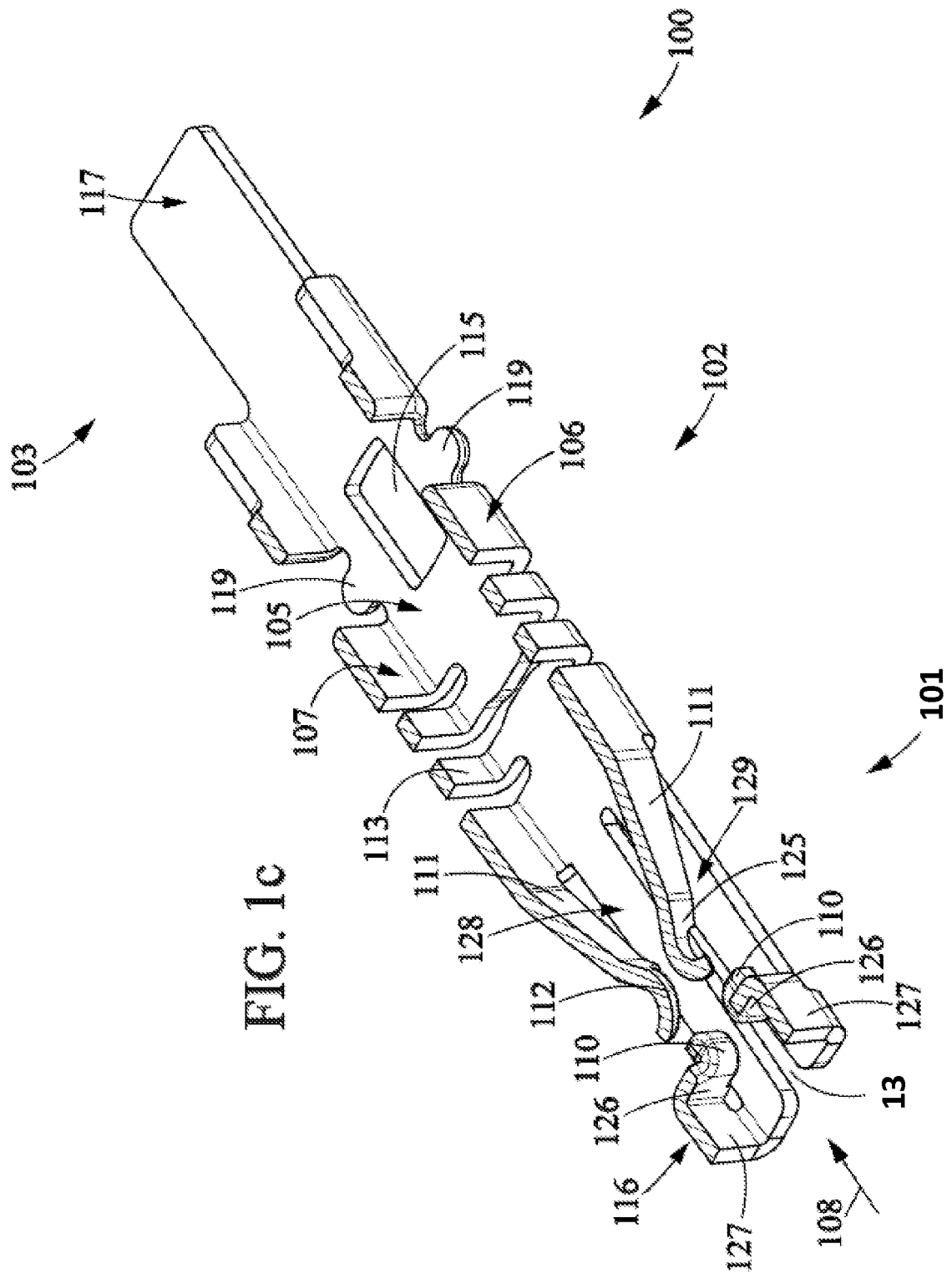
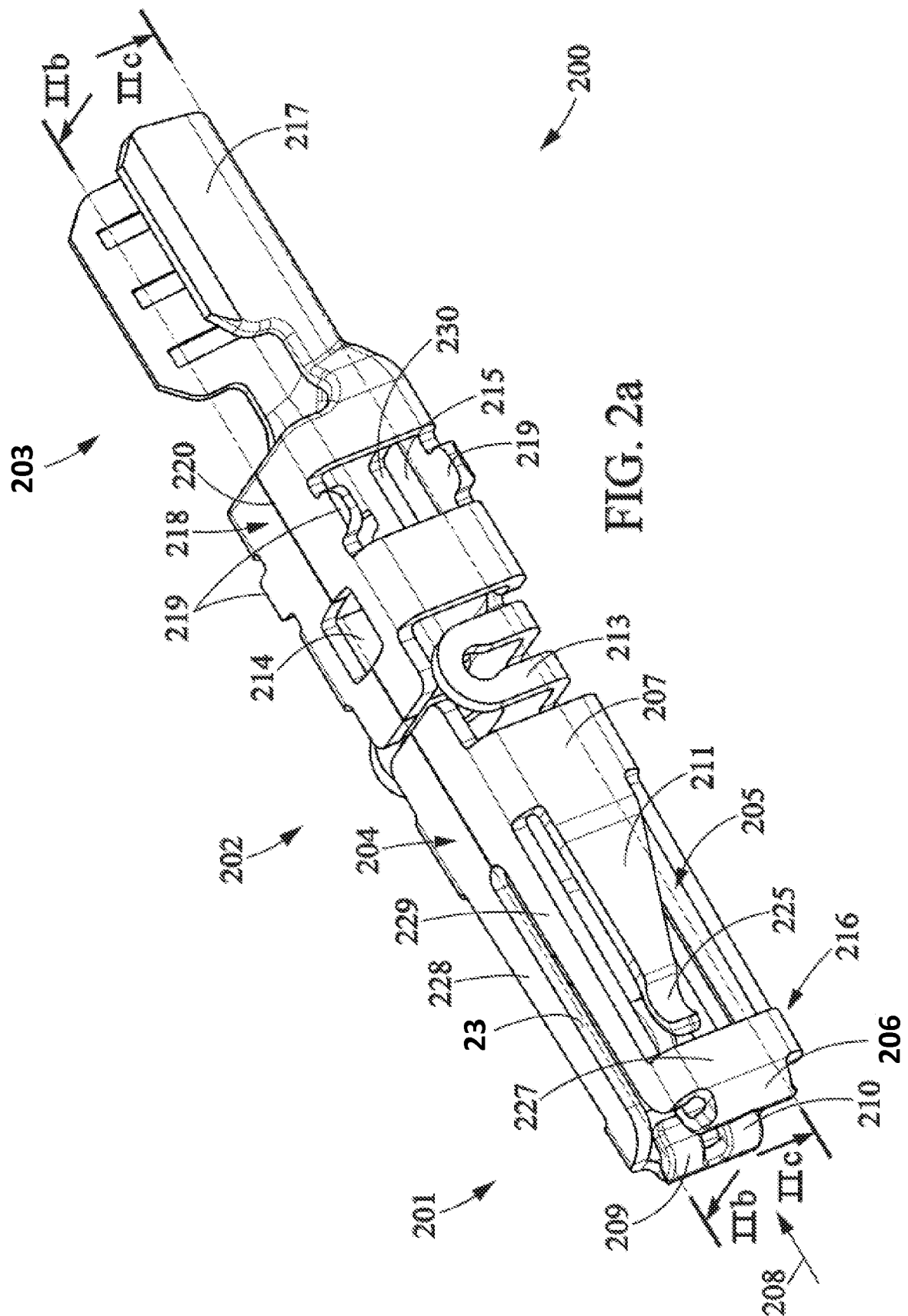
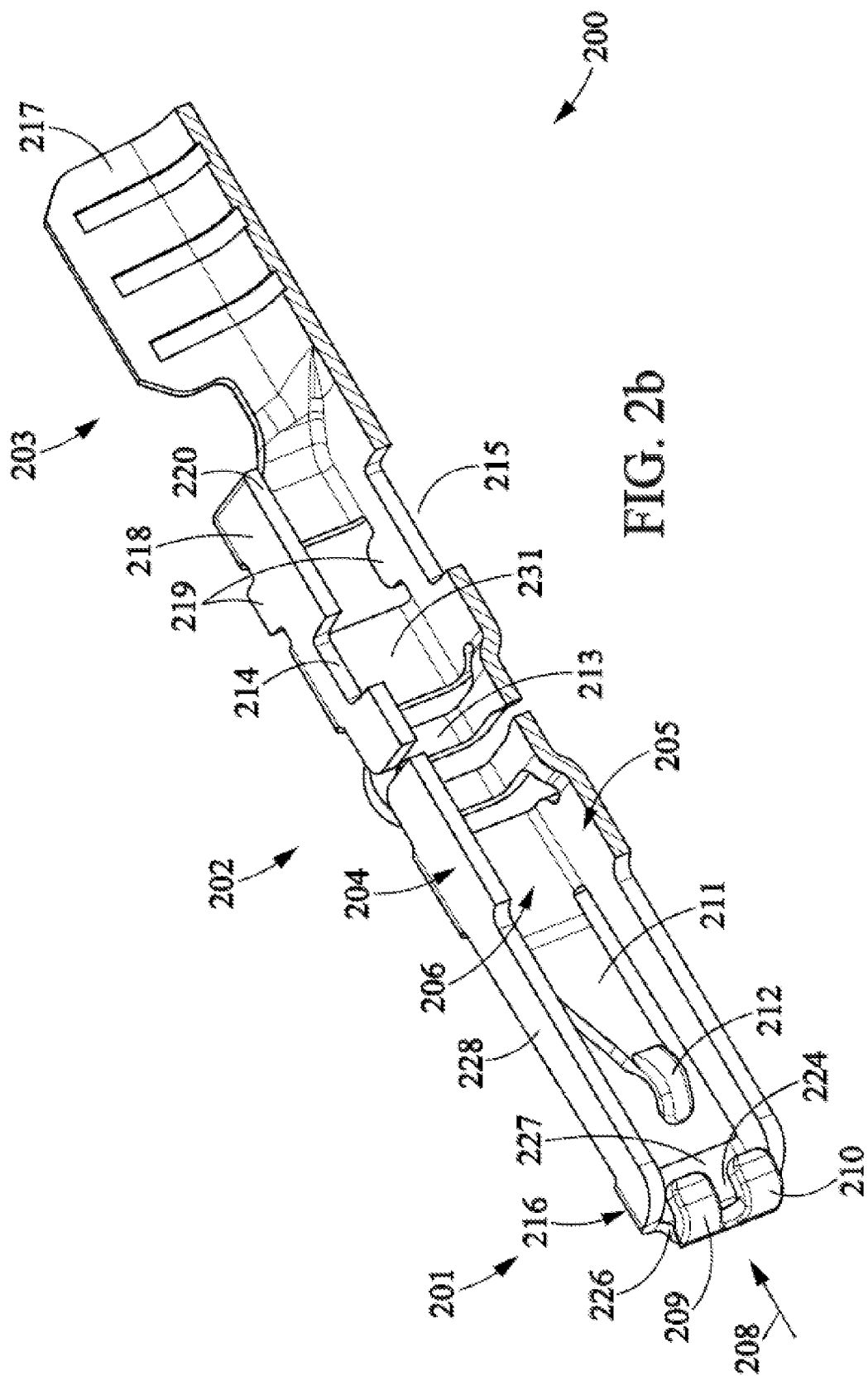


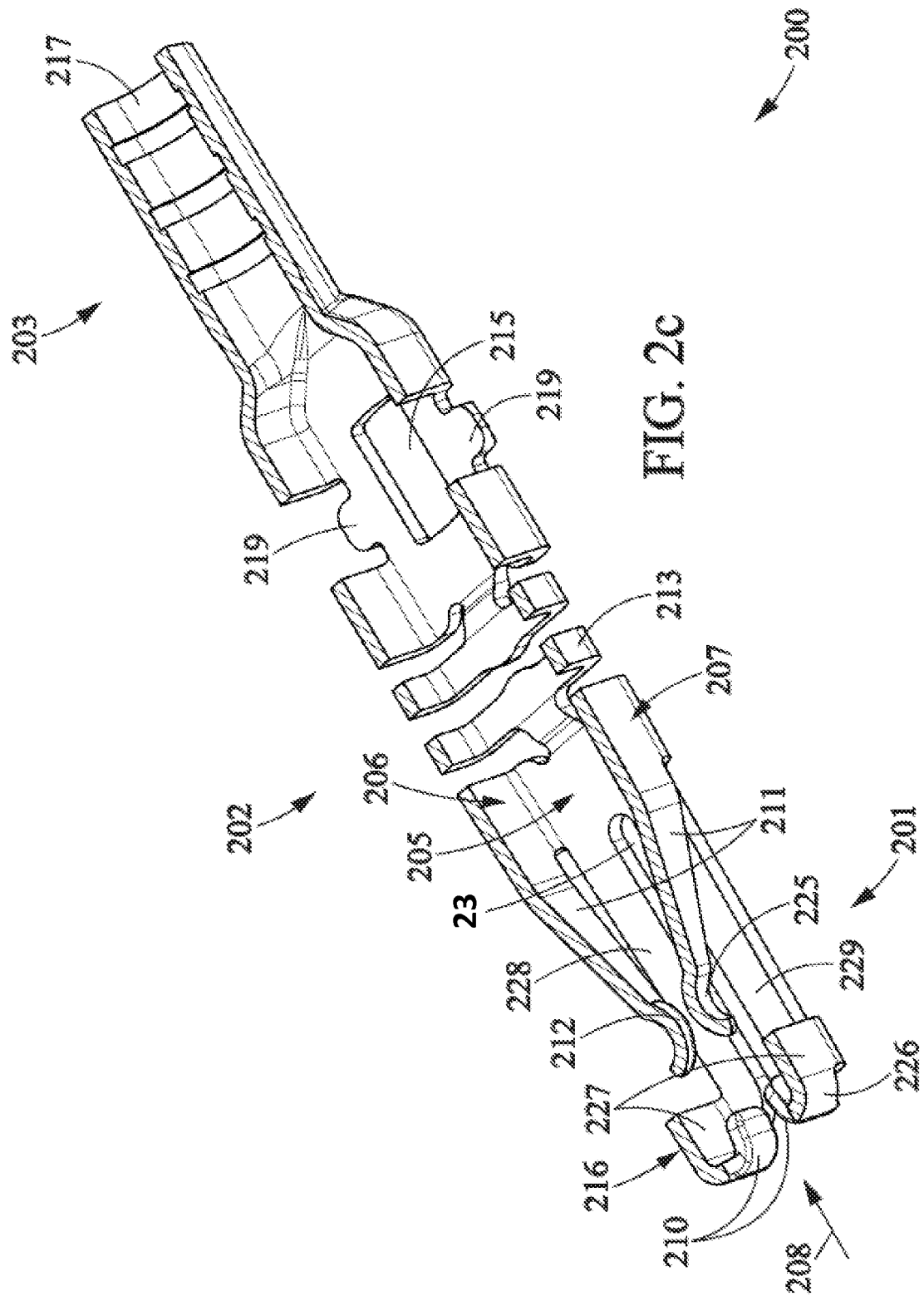
FIG. 1a

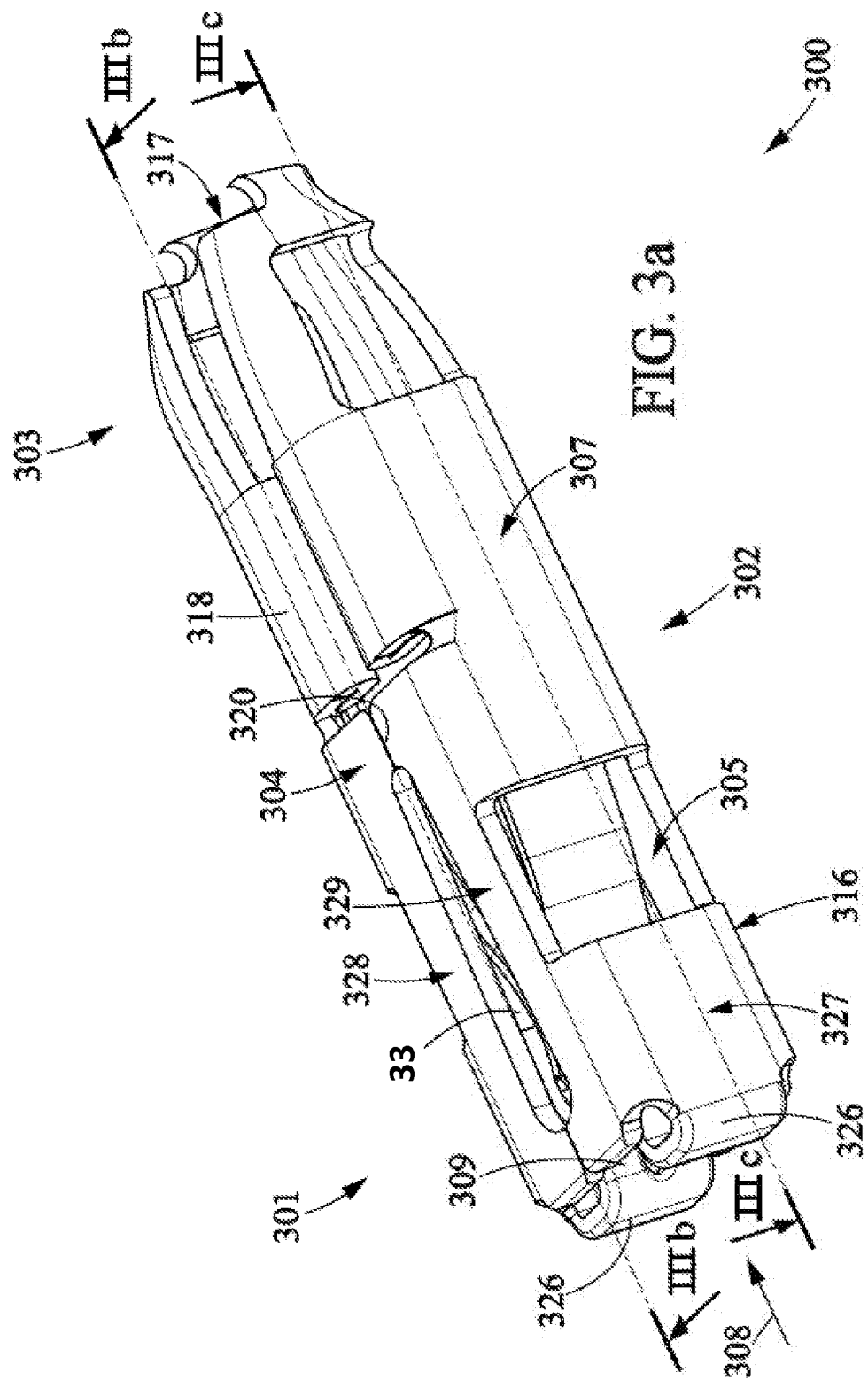


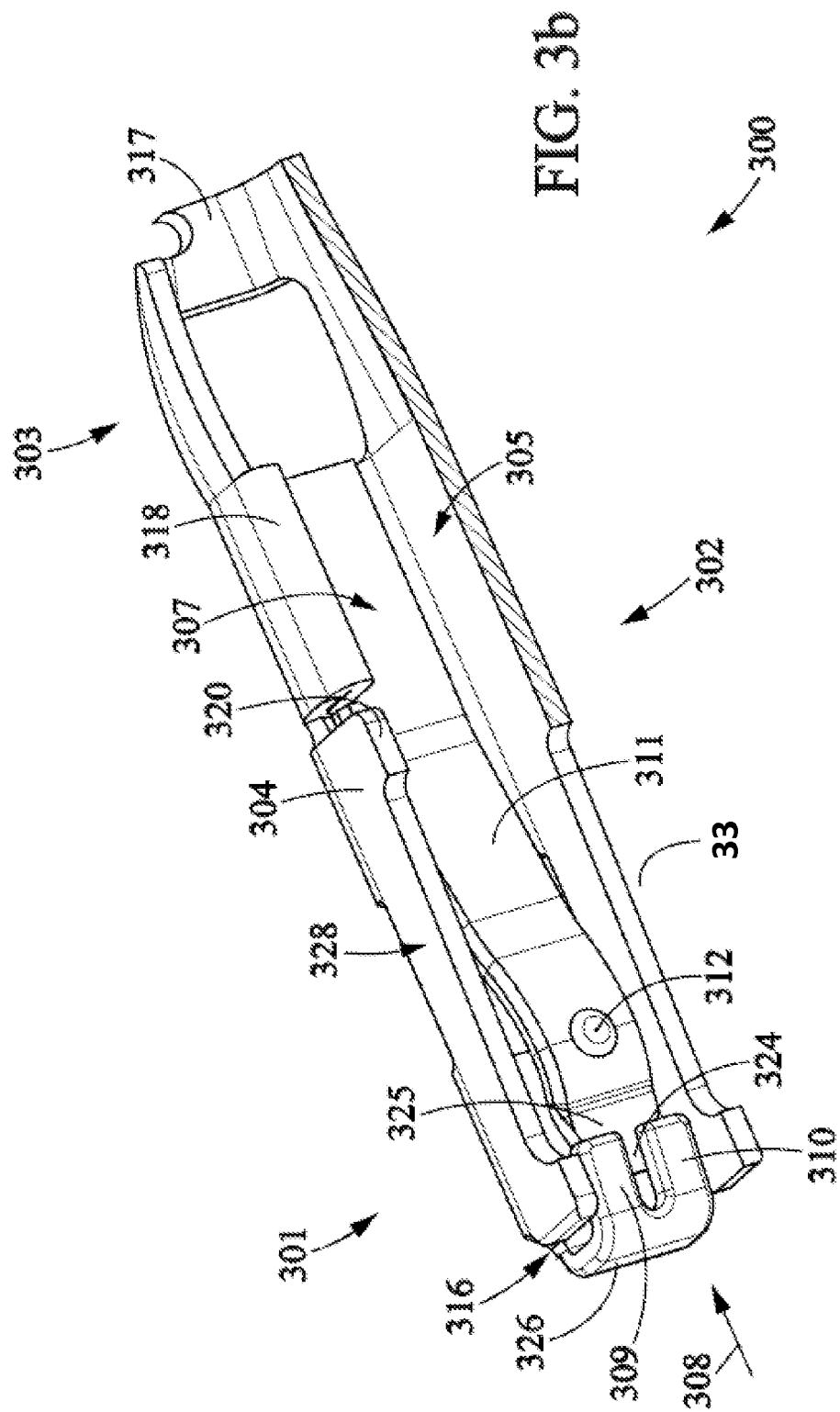


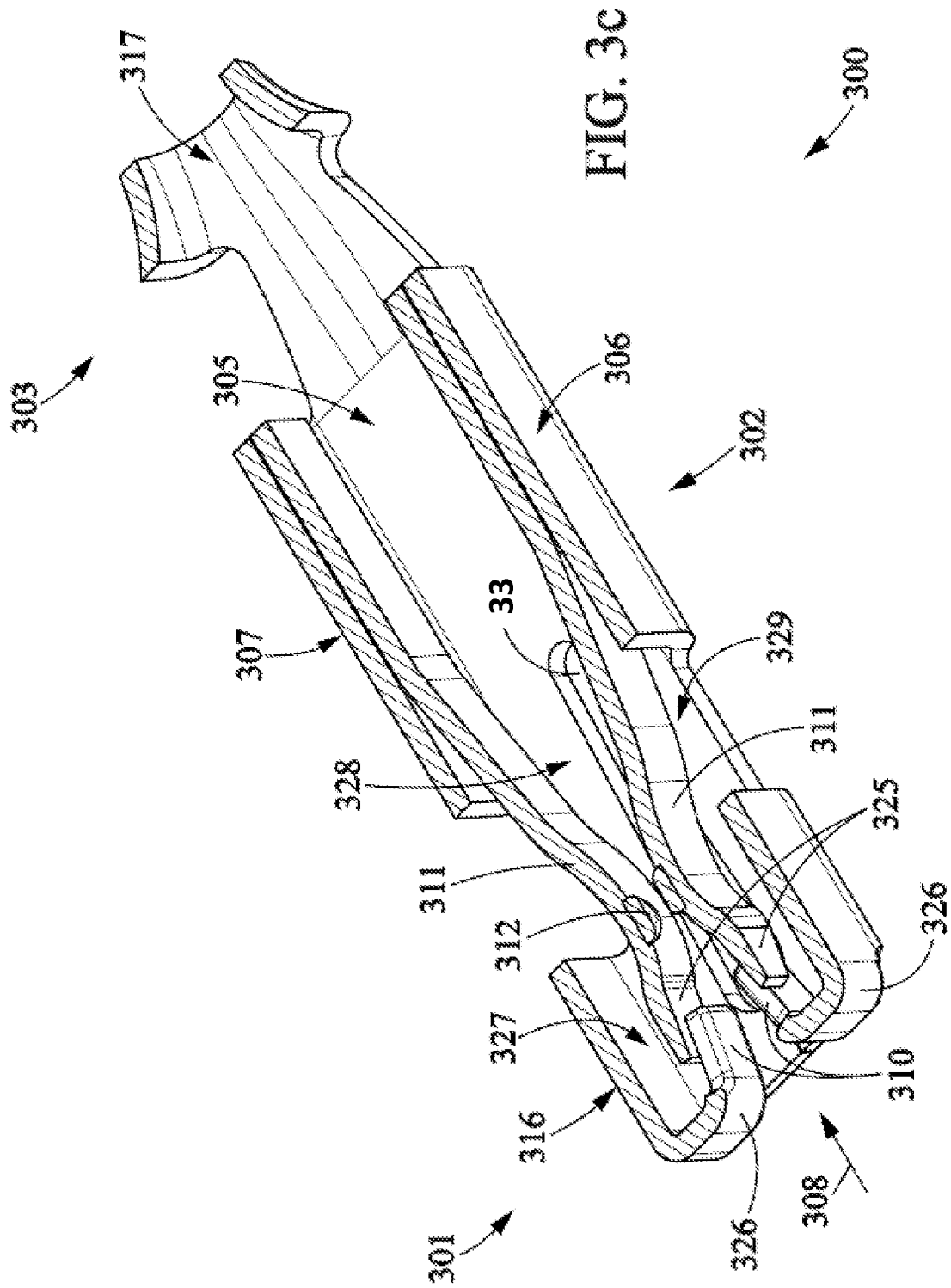


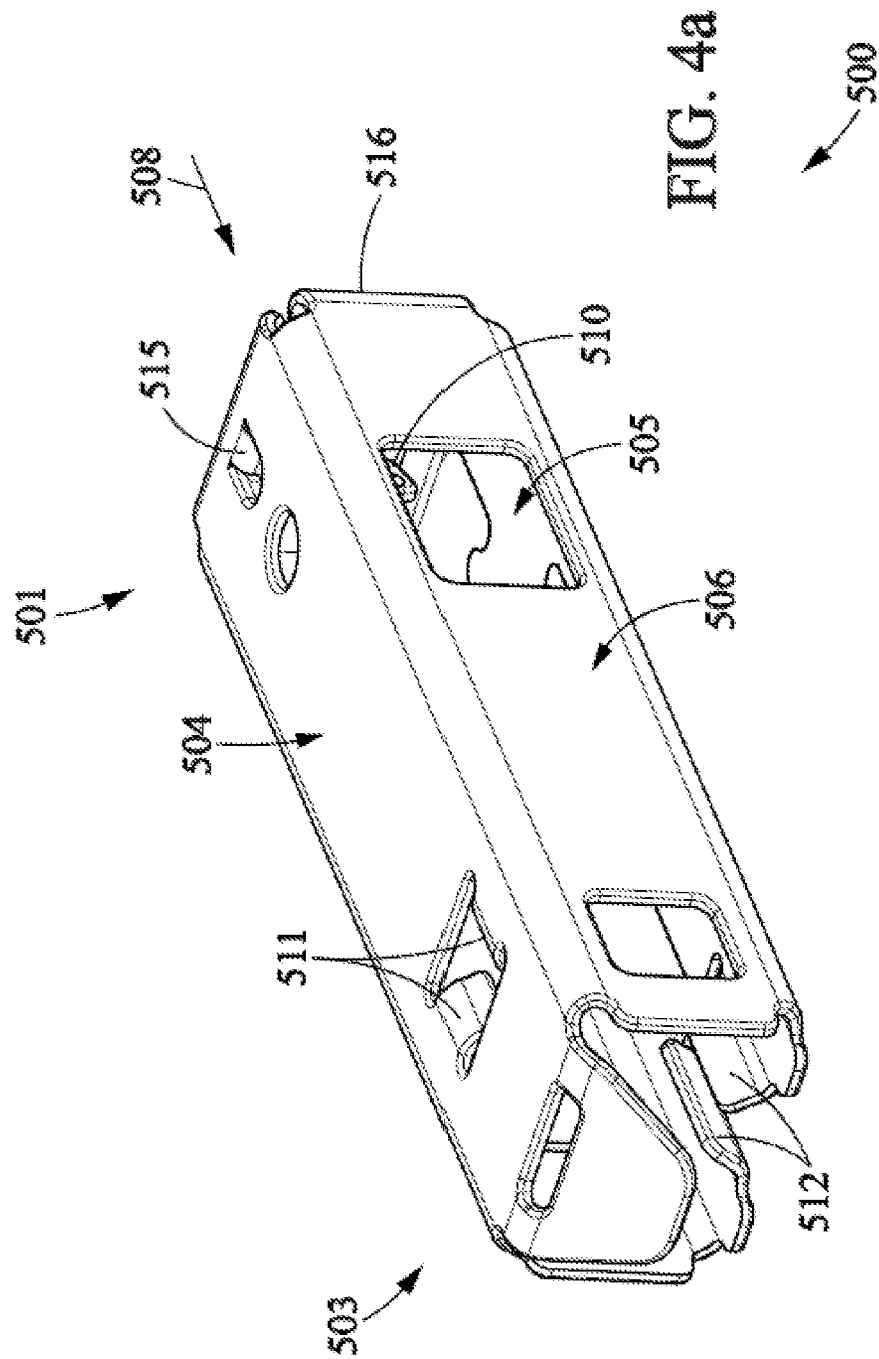


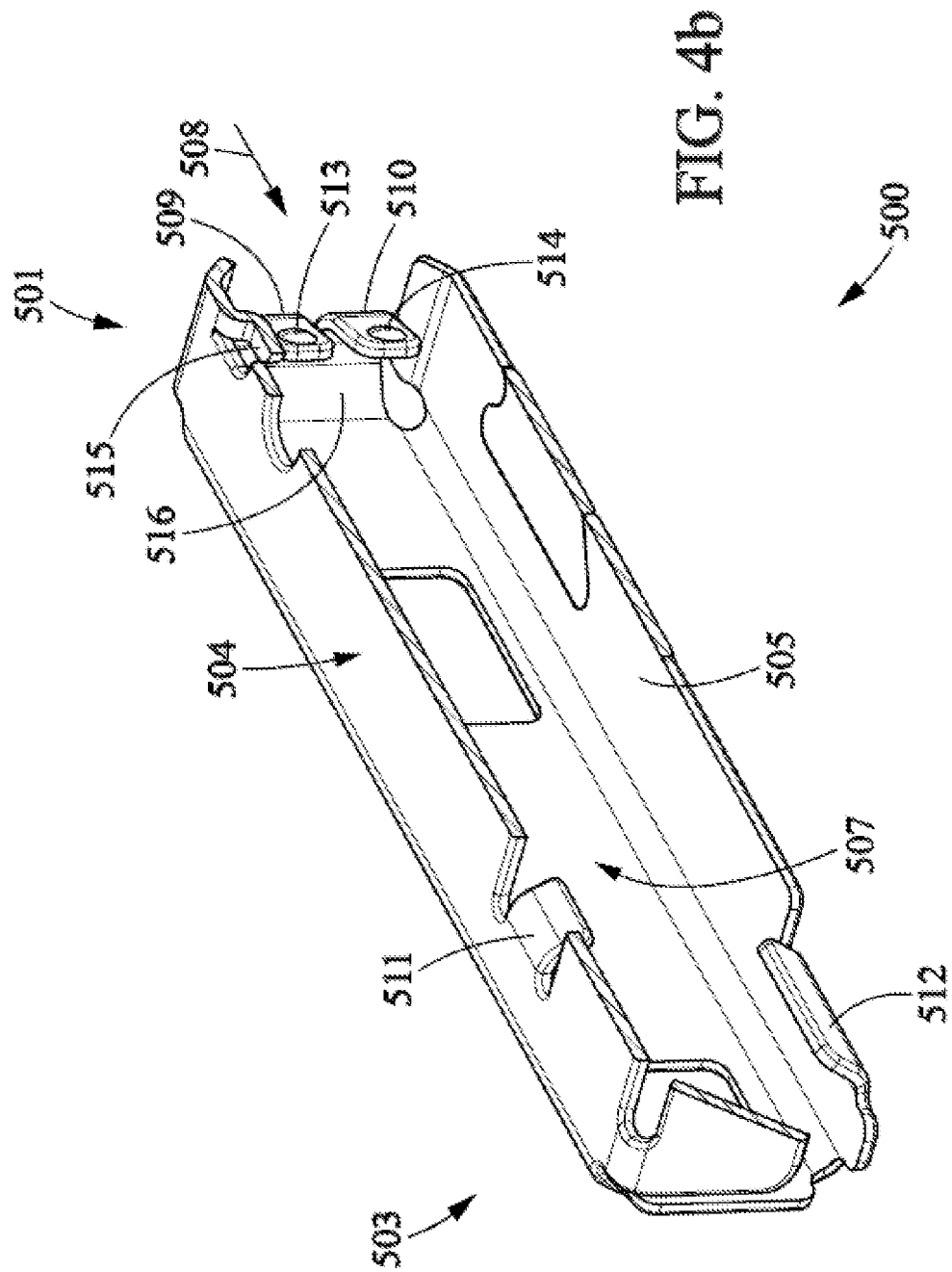


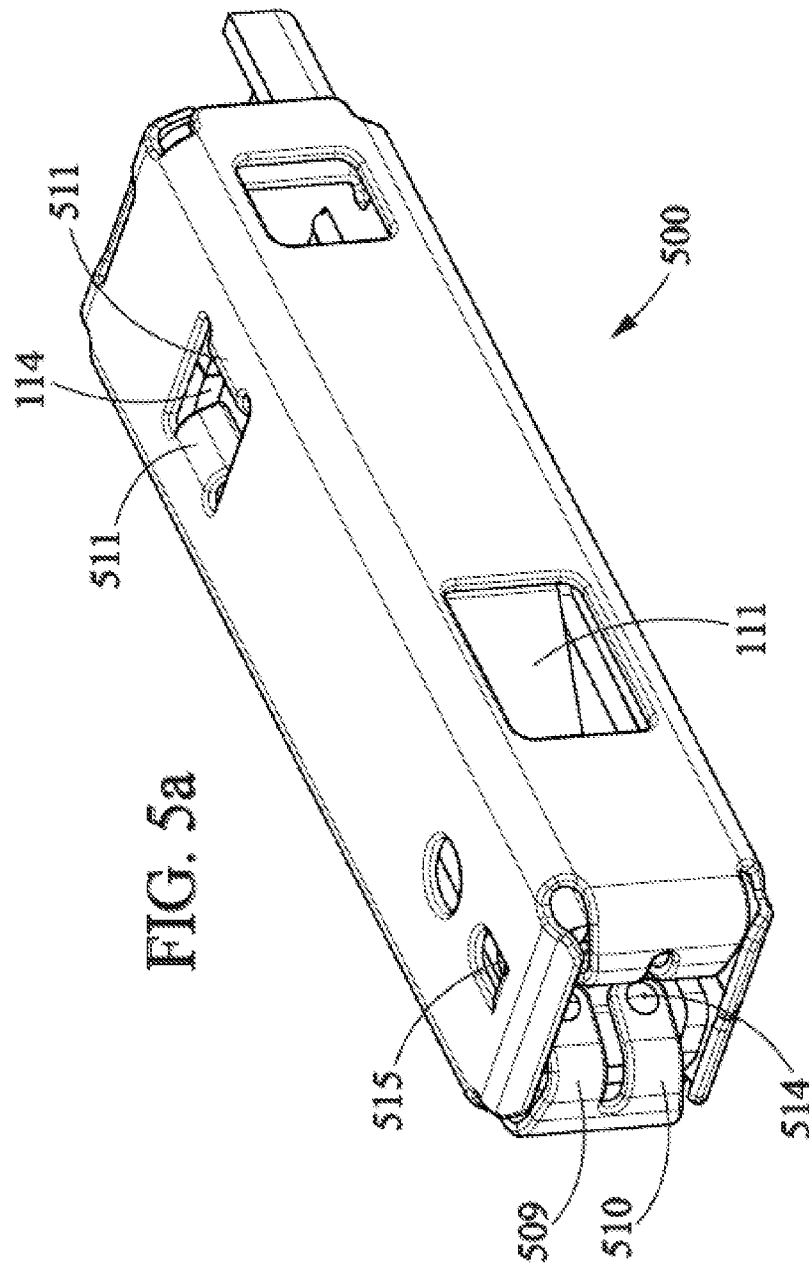


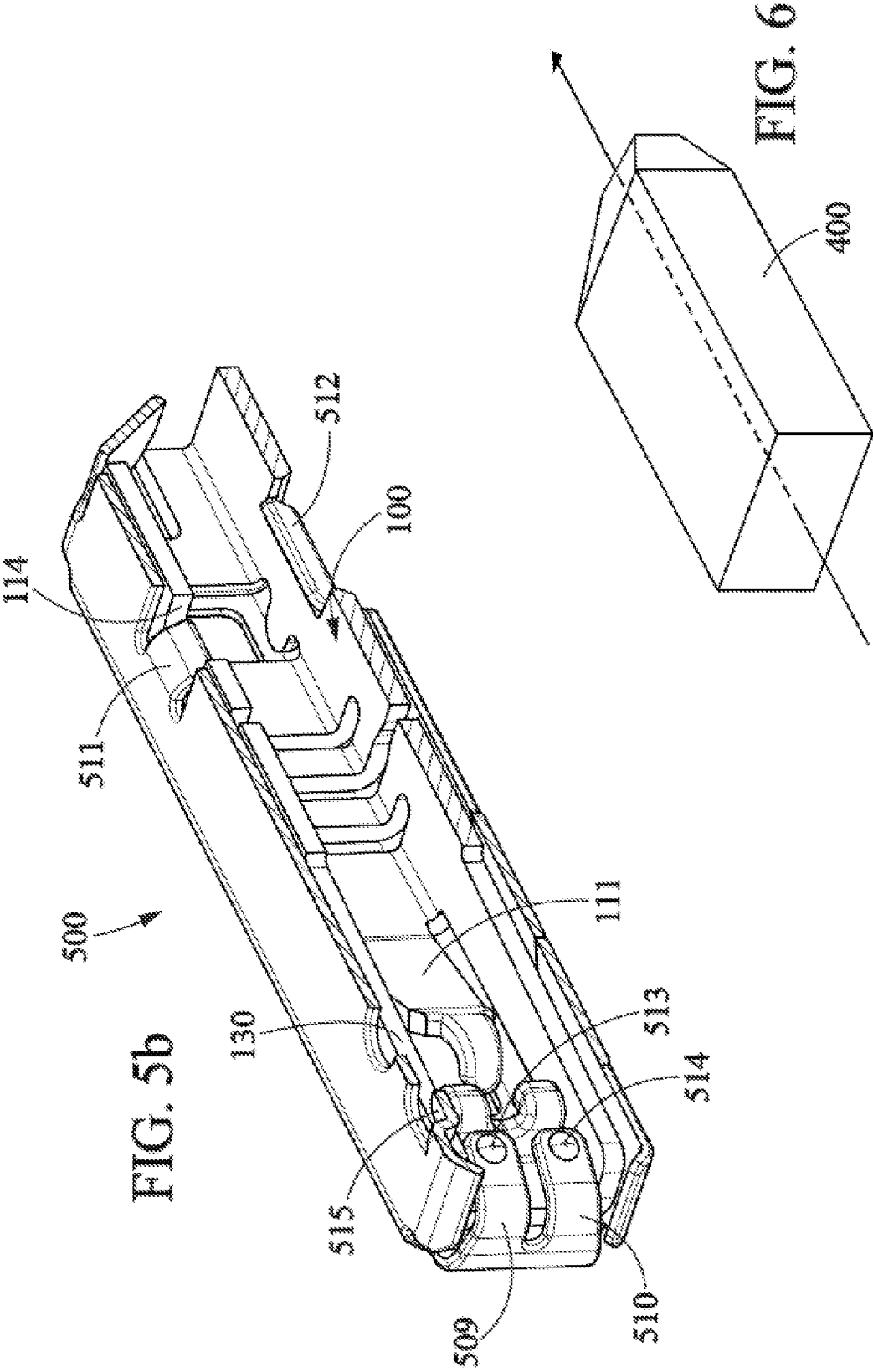












INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2012/002873

A. CLASSIFICATION OF SUBJECT MATTER
INV. H01R13/11
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)
H01R

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/029146 A1 (MYER JOHN MARK [US] ET AL) 4 February 2010 (2010-02-04)	1-7
Y	figures 1-7	8,11
X	US 5 083 936 A (YANG SU-PEI [TW]) 28 January 1992 (1992-01-28)	1,7,9
Y	US 5 611 717 A (JOLY JEAN C [FR]) 18 March 1997 (1997-03-18)	8,11



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

12 September 2013

Date of mailing of the international search report

23/09/2013

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Esmiol, Marc-Olivier

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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