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(54) ELECTRICAL CONNECTOR

(57) An electrical connector (10) for connecting to a counter connector(500) along a mating axis (X), the electrical connector (10) comprising a first connector housing (100) comprising a terminal cavity (102), a second connector housing (200) comprising a connector cavity (202) adapted to receive the first connector housing(100), a component position assurance device (300) that locks the first connector housing to the second connector housing and a terminal (400) carried in the terminal cavity in a fully assembled position (A), wherein the first connector housing (100), the terminal cavity (102) and the second connector housing (200) are aligned along the mating axis (X), wherein the electrical connector comprises a preassembled state (P), wherein the first connector housing and the second connector housing are separated and wherein the component position assurance device is assembled to and hold at the first connector housing in a pre-locked position (PL), whereby the component position assurance device is prevented from been pulled off the first connector housing by fifth locking means, provided on the component position assurance device, cooperating with first locking means provided on the first connector housing and whereby the component position assurance device is prevented from being moved in the fully assembled position (A) by second blocking means provided on the component position assurance device, cooperating with first blocking means provided on the first connector housing, whereby the second blocking means are released by first releasing means attached in the connector cavity, when the first connector housing is inserted into the second connector housing, allowing the component position assurance device to move to the fully assembled position (A).

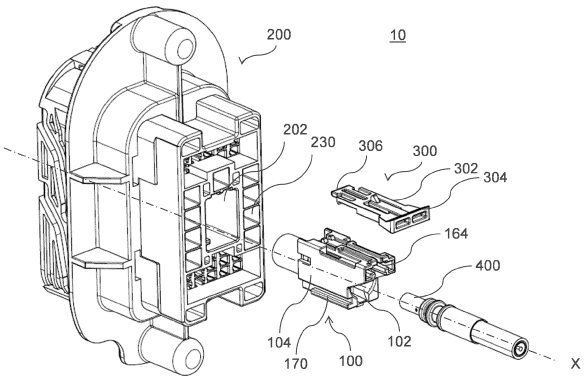

Fig. 1

EP 3 410 540 A1

Description

TECHNICAL FIELD OF INVENTION

[0001] The present invention relates to an electrical connector comprising a first connector housing that comprises a terminal cavity and a second connector housing that comprises a connector cavity adapted to receive the first connector housing. Furthermore a component position assurance device that locks the first connector housing and the second connector housing and a terminal carried in the terminal cavity in a fully assembled position.

BACKGROUND OF INVENTION

[0002] In automotive industries electrical wire harnesses are used for transport of power and information. Dependent on purpose and equipment of the vehicles the electrical wire harnesses have to cover a lot of different requirements. New technologies, e.g. in the area of autonomous driving, require very special connector types. The modularization of connectors to connector systems is one way to solve the problems that would pop up while handling in production plants during manufacturing the wire harnesses. In this connector modules, two or more sub connectors are linked together in a frame that holds the sub connectors in place. Unfortunately sometimes a frame is not usable for some reasons, e.g. space requirements. In this cases there are some alternative means necessary to hold and link the sub connectors. In cases where a lot of wires are attached on each sub connector, the linking process of the sub connectors can became impossible while manufacturing because the linking means can't be handled.

[0003] Therefore, it is one aspect of the present invention to provide an electrical connector comprising sub modules and a component position assurance device that links the sub modules reliable in an assembled status. Furthermore the electrical connector is cheap to produce and easy in handling while manufacturing of the cable harness.

[0004] These and other objects which become apparent upon reading the following description are solved by an electrical connector according to independent claim 1.

SUMMARY OF THE INVENTION

[0005] The present application relates to an electrical connector for connecting to a counter connector along a mating axis. The electrical connector comprising a first connector housing comprising a terminal cavity, a second connector housing comprising a connector cavity adapted to receive the first connector housing, a component position assurance device that locks the first connector housing to the second connector housing and a terminal carried in the terminal cavity in a fully assembled position. The first connector housing, the terminal cavity and the second connector housing are aligned along the mating axis. The electrical connector comprises a preassembled state, wherein the first connector housing and the second connector housing are separated and wherein the component position assurance device is assembled to and hold at the first connector housing in a pre-locked position. The component position assurance device is prevented from been pulled off the first connector housing by fifth locking means, provided on the component position assurance device, cooperating with first locking means provided on the first connector housing. The component position assurance device is prevented from being moved in the fully assembled position by second blocking means provided on the component position assurance device, cooperating with first blocking means provided on the first connector housing. The second blocking means are released by first releasing means attached in the connector cavity, when the first connector housing is inserted into the second connector housing, allowing the component position assurance device to move to the fully assembled position.

[0006] The disclosed invention provides an electrical connector consisting of preassembled modules. The modules can be preassembled in different manufacturing plants or even provided by various companies. The modules are equipped with terminals attached on electrical wires. While assembling to the final wired harness the modules are put together and locked in the final position by the component position assurance device. Because the component position assurance device is attached to the first connector housing when delivered, the handling while assembling is very easy. The component position assurance device protrudes opposite to the mating direction, in the direction the electrical wire leave the connector housing, which prevents problems caused by interferences of component position assurance device and electrical wires. Because the component position assurance device protrudes parallel to the electrical wires it is easy to operate by pushing it along the mating axis in mating direction. This design provides a maximum of flexibility in wire harness production and is easy and reliable in handling.

[0007] According to a preferred embodiment the component position assurance device comprises a flat elongated body aligned along the mating axis, wherein the elongated body comprises a handle on one end and a main blocking bar on the other end. The handle allows to grip and operate the component position assurance device while assembly. Furthermore the position of the good visible handle indicates a correct locked electrical connector.

[0008] Preferably the elongated body comprises a flexible fifth locking arm aligned along the mating axis, wherein the flexible fifth locking arm comprises a fifth locking protrusion protruding perpendicular to the mating axis from the free end of the flexible fifth locking arm. This design provides a cheap to produce opportunity of the locking arm.

[0009] Advantageously, the fifth locking protrusion

comprises a fifth locking stop edge facing to the handle and a fifth locking slope. The locking slope allows to flex the arm out of the mating axis while assembling the component position assurance device to the first connector housing. In the pre-locked position, the fifth locking stop edge cooperates with a protrusion on the first connector housing to prevent pull off the component position assurance device.

[0010] Preferably the elongated body comprises a flexible second blocking arm aligned along the mating axis, wherein the flexible second blocking arm comprises a second blocking protrusion protruding perpendicular to the mating axis from the free end of the flexible second blocking arm. The second blocking protrusion keeps the component position assurance device in the pre-locked position, by preventing movement along the mating axis in the pre-locked position and allows movement in the fully assembled state.

[0011] Advantageously, the second blocking protrusion comprises a second blocking stop edge facing to the main blocking bar and a second releasing slope starting from the second blocking stop edge sloped towards the handle. The second blocking protrusion covers two functions. The second blocking stop edge cooperate with the first connector housing to block movement of the component position assurance device along the mating axis, whereby the flexible second blocking arm is not flexed. The second releasing slope, cooperates with the second connector housing when the first connector housing is inserted into the second connector housing, whereby the flexible second blocking arm is flexed, to allow movement of the component position assurance device along the mating axis.

[0012] Preferably the first connector housing comprises an elongated housing body surrounding the terminal cavity aligned along the mating axis, wherein the elongated housing body comprises a guiding cavity adapted to guide the component position assurance device along the mating axis. In this embodiment there is only one terminal cavity, adapted to receive a coaxial terminal. The guiding cavity can be designed in various ways. Also a construction using rails to guide the component position assurance device in relation to the first connector housing is an opportunity.

[0013] Preferably the elongated housing body comprising a flexible first arm and a flexible second arm parallel to each other and aligned along the mating axis. The flexible first arm and the flexible second arm do not protrude outside the first connector housing. This design makes the first connector housing robust against damages. Furthermore the length of the flexible arms can be easily adjusted to reach the required flexibility.

[0014] In a preferred embodiment, the flexible first arm comprises a latch protrusion on its free end, protruding inwards the elongated housing body, perpendicular to the mating axis. The latch protrusion pre-locks the terminal in the terminal cavity by protruding in to a recess of the terminal. While insertion of the terminal, the flexible first arm is flexed out towards the terminal cavity.

[0015] Advantageously, the flexible second arm comprises a third locking protrusion on its free end, protruding outwards the elongated housing body, perpendicular to the mating axis. The third locking protrusion pre-locks the first connector housing in the connector clarity by coming in engagement with a protrusion, protruding inside the connector cavity. While insertion of the first connector housing, the flexible second arm is flexed towards the terminal cavity.

[0016] Preferably the first releasing means of the second connector housing comprises a first releasing protrusion protruding perpendicular inwards the connector cavity.

[0017] Advantageously, the first releasing protrusion comprises a first releasing slope, arranged sloped to the mating axis, adapted to cooperate with the second releasing slope of the component position assurance device, to release the component position assurance device, when the first connector housing is inserted in the second connector housing, whereby the second blocking arm is flexed inwards the first connector housing. The first releasing slope and the second releasing slope are sloped in that way, that when pressed against each other along the mating axis, the second releasing slope slides along the first releasing slope towards the first connector housing because the second blocking arm is much more flexible than the connector cavity in the second connector housing.

[0018] Preferably the second connector housing comprises a fourth locking protrusion protruding perpendicular inwards the connector cavity adapted to cooperate with the third locking protrusion to lock the connector housings. After fully insertion of the first connector housing into the second connector housing, the fourth locking protrusion and the third locking protrusion our in engagement, but the flexibility of the second flexible arm makes it possible to pull out the first connector.

[0019] Advantageously, the main blocking bar is located in between the first flexible arm and the second flexible arm, preventing movement of the first flexible arm and the second flexible arm towards each other, when the connector housings are in the fully assembled state and the component position assurance device is in a locked position. After movement of the component position assurance device interlock position, the flexibility of the flexible arms is drastically limited, so that the connector housings and the terminal are permanently locked in position.

[0020] The invention also comprises an electrical assembly comprising the electrical connector, and a counter connector. The counter connector comprises a first counter connector housing and a second counter connector housing and the component position assurance device. The first counter connector housing and the second counter connector housing are locked to each other by the component position assurance device. The design of the first connector housings can be adapted to use the same component position assurance devices to lock

components together. That really uses the amount of different parts and save costs.

Description of the preferred embodiments

[0021] In the following, the invention is described exemplarily with reference to the enclosed figures, in which

Fig. 1 shows a perspective, view of the electrical connector;

Fig. 2 Figure 2 shows a perspective, view of the component position assurance device;

Fig. 3 Figure 3 shows a perspective, view of the first connector housing and the component position assurance device;

Fig. 4 Figure 4 shows a perspective, view of the first connector housing with attached component position assurance device;

Fig. 5 Figure 5 shows a perspective, view of the second connector housing;

Fig. 6 Figure 6 shows a perspective, view of the first connector housing fully inserted in the second connector housing;

Fig. 7, 8 Figure 7 and figure 8 show cut views of the area indicated in figure 6 whereby the cut is conducted along the line;

Fig. 9 shows a perspective, view an electrical assembly comprising the electrical connector and a counter connector;

[0022] Figure 1 shows a perspective, view of an electrical connector 10.
The electrical connector 10 his adapted for connecting to a counter connector 500 along a mating axis X. The electrical connector 10 comprising a first connector housing 100 comprising a terminal cavity 102, a second connector housing 200 comprising a connector cavity 202 adapted to receive the first connector housing 100. A component position assurance device 300 that locks the first connector housing to the second connector housing and a terminal 400 adapted to be carried in the terminal cavity in a fully assembled position A. The first connector housing 100, the terminal cavity 102 and the second connector housing 200 are aligned along the mating axis X. The electrical connector 10 comprises a preassembled state P, wherein the first connector housing 100 and the second connector housing 200 are separated and wherein the component position assurance device 300 is assembled to and hold at the first connector housing in a pre-locked position PL. The component position assurance device 300 is prevented from been pulled off the first connector housing 100 by fifth locking means, provided on the component position assurance device 300, cooperating with first locking means provided on the first connector housing 100. The component position assurance device 300 is prevented from being moved in the fully assembled position A by second blocking means provided on the component position assurance device 300, cooperating with first blocking means provided on the first connector housing 100. The second blocking means are released by first releasing means attached in the connector cavity 202, when the first connector housing 100 is inserted into the second connector housing 200, allowing the component position assurance device 300 to move to the fully assembled position A.

[0023] Figure 2 shows a perspective, view of the component position assurance device 300 that comprises a flat elongated body 302 aligned along the mating axis X. The elongated body 302 comprises a handle 304 on one end and a main blocking bar 306 on the other end. The main blocking bar 306 is arranged on the free end of a flexible arm 308 protruding along the mating axis X. The elongated body 302 comprises a flexible fifth locking arm 312 aligned along the mating axis X. The flexible fifth locking arm 312 comprises a fifth locking protrusion 314 protruding perpendicular to the mating axis X from the free end of the flexible fifth locking arm 312. The fifth locking protrusion 314 comprises a fifth locking stop edge 316 facing to the handle 304 and a fifth locking slope 318. The elongated body 302 comprises a flexible second blocking arm 322 aligned along the mating axis X. The flexible second blocking arm 322 comprises a second blocking protrusion 324 protruding perpendicular to the mating axis X from the free end of the flexible second blocking arm 322. The second blocking protrusion 324 comprises a second blocking stop edge 326 facing to the main blocking bar 306 and a second releasing slope 328 starting from the second blocking stop edge 326 sloped towards the handle 304.

[0024] Figure 3 shows a perspective, view of the first connector housing 100 and the component position assurance device 300 not connected to each other but aligned along the axis X. The connector housing 100 comprises an elongated housing body 104 surrounding the terminal cavity 102 aligned along the mating axis X.

[0025] Figure 4 shows a perspective, view of the first connector housing 100 with attached component position assurance device 300 in the pre-locked position PL. Figure 4a and figure 4b show details of figure 4 in an enlarged cut view. Whereby the cut is conducted along the line C1. The elongated housing body 104 comprises a guiding cavity 164 adapted to guide the component position assurance device 300 along the mating axis X. The elongated housing body 104 comprising a flexible first arm 112 and a flexible second arm 142 parallel to each other and aligned along the mating axis X. The flexible first arm 112 comprises a latch protrusion 114 on its free end, protruding inwards the elongated housing body 104, perpendicular to the mating axis X. The flexible second arm

142 comprises a third locking protrusion 144 on its free end, protruding outwards the elongated housing body 104, perpendicular to the mating axis X.

[0026] Figure 5 shows a perspective, view of the second connector housing 200 that comprises a first releasing protrusion 222 protruding perpendicular inwards the connector cavity 202. The first connector housing 100 with attached component position assurance device 300 is in the preassembled state P. The first connector housing 100 is not connected to the second connector housing 200 but aligned along the axis X.

[0027] Figure 6 shows a perspective, view of the first connector housing 100 fully inserted in the second connector housing 200 in the fully assembled position. The component position assurance device 300 it is in the locked position securing the first connector housing 100 to the second connector housing 200.

[0028] Figure 7 and figure 8 show cut views of the area indicated in figure 6 whereby the cut is conducted along the line C2.

[0029] Figure 7 shows the first connector 100 fully inserted into the second connector 200 whereby the component position assurance device 300 is in the pre-locked position PL. The first releasing protrusion 222 comprises a first releasing slope 224, arranged sloped to the mating axis X, adapted to cooperate with the second releasing slope 328 of the component position assurance device 300, to release the component position assurance device 300, when the first connector housing 100 is inserted in the second connector housing 200, whereby the second blocking arm 322 is flexed inwards the first connector housing.

[0030] Figure 8 shows the first connector 100 fully inserted into the second connector 200 whereby the component position assurance device 300 is in the locked position P. The second connector housing 200 comprises a fourth locking protrusion 212 protruding perpendicular inwards the connector cavity 202 adapted to cooperate with the third locking protrusion 144 to lock the connector housings 100, 200. The main blocking bar 306 is located in between the first flexible arm 112 and the second flexible arm 142, preventing movement of the first flexible arm 112 and the second flexible arm 142 towards each other, when the connector housings 100, 200 are in the fully assembled state A and the component position assurance device is in a locked position LP. The flexible first arm 112 comprises a latch protrusion 114 on its free end, protruding inwards the elongated housing body 104, perpendicular to the mating axis X thereby blocking the terminal 400 in the terminal cavity 102.

[0031] Figure 9 shows an electrical assembly comprising the electrical connector 10 and a counter connector 500. The counter connector 500 comprises a first counter connector housing 510 and a second counter connector housing 520 and the component position assurance device 300. In the preassembled state P. The first counter connector housing 510 and the second counter connector housing 510 are aligned along the mating axis X, but not yet locked to each other by the component position assurance device 300.

Claims

1. An electrical connector (10) for connecting to a counter connector (500) along a mating axis (X), the electrical connector (10) comprising a first connector housing (100) comprising a terminal cavity (102), a second connector housing (200) comprising a connector cavity (202) adapted to receive the first connector housing (100), a component position assurance device (300) that locks the first connector housing to the second connector housing and a terminal (400) carried in the terminal cavity in a fully assembled position (A), wherein the first connector housing (100), the terminal cavity (102) and the second connector housing (200) are aligned along the mating axis (X), wherein the electrical connector comprises a preassembled state (P), wherein the first connector housing and the second connector housing are separated and wherein the component position assurance device is assembled to and hold at the first connector housing in a pre-locked position (PL), whereby the component position assurance device is prevented from been pulled off the first connector housing by fifth locking means, provided on the component position assurance device, cooperating with first locking means provided on the first connector housing and whereby the component position assurance device is prevented from being moved in the fully assembled position (A) by second blocking means provided on the component position assurance device, cooperating with first blocking means provided on the first connector housing, whereby the second blocking means are released by first releasing means attached in the connector cavity, when the first connector housing is inserted into the second connector housing, allowing the component position assurance device to move to the fully assembled position (A).

2. An electrical connector (10) according to claim 1, wherein the component position assurance device (300) comprises a flat elongated body (302) aligned along the mating axis (X), wherein the elongated body (302) comprises a handle (304) on one end and a main blocking bar (306) on the other end.

3. An electrical connector (10) according to claim 2, wherein the elongated body (302) comprises a flexible fifth locking arm (312) aligned along the mating axis (X), wherein the flexible fifth locking arm (312) comprises a fifth locking protrusion (314) protruding perpendicular to the mating axis (X) from the free end of the flexible fifth locking arm (312).

4. An electrical connector (10) according to claim 3, wherein the fifth locking protrusion (314) comprises a fifth locking stop edge (316) facing to the handle (304) and a fifth locking slope (318).

5. An electrical connector (10) according to any of claims 2 to 4, wherein the elongated body (302) comprises a flexible second blocking arm (322) aligned along the mating axis (X), wherein the flexible second blocking arm (322) comprises a second blocking protrusion (324) protruding perpendicular to the mating axis (X) from the free end of the flexible second blocking arm (322).

6. An electrical connector (10) according to claims 2 and 5, wherein the second blocking protrusion (324) comprises a second blocking stop edge (326) facing to the main blocking bar (306) and a second releasing slope (328) starting from the second blocking stop edge (326) sloped towards the handle (304).

7. An electrical connector (10) according to any preceding claim, wherein the first connector housing (100) comprises an elongated housing body (104) surrounding the terminal cavity (102) aligned along the mating axis (X), wherein the elongated housing body (104) comprises a guiding cavity (164) adapted to guide the component position assurance device (300) along the mating axis (X).

8. An electrical connector (10) according to claim 7, wherein the elongated housing body (104) comprising a flexible first arm (112) and a flexible second arm (142) parallel to each other and aligned along the mating axis (X).

9. An electrical connector (10) according to claim 8, wherein the flexible first arm (112) comprises a latch protrusion (114) on its free end, protruding inwards the elongated housing body (104), perpendicular to the mating axis (X).

10. An electrical connector (10) according to any of claims 8 to 9, wherein the flexible second arm (142) comprises a third locking protrusion (144) on its free end, protruding outwards the elongated housing body (104) and perpendicular to the mating axis (X).

11. An electrical connector (10) according to any preceding claim, wherein the first releasing means of the second connector housing (200) comprises a first releasing protrusion (222) protruding perpendicular inwards the connector cavity (202).

12. An electrical connector (10) according to claim 6 and 11, wherein the first releasing protrusion (222) comprises a first releasing slope (224), arranged sloped to the mating axis (X), adapted to cooperate with the second releasing slope (328) of the component position assurance device (300), to release the component position assurance device (300), when the first connector housing (100) is inserted in the second connector housing (200), whereby the second blocking arm (322) is flexed inwards the first connector housing.

13. An electrical connector (10) according to claim 10, wherein the second connector housing comprises a fourth locking protrusion (212) protruding perpendicular inwards the connector cavity (202) adapted to cooperate with the third locking protrusion (144) to lock the connector housings (100, 200).

14. An electrical connector (10) according to claims 2 and 8, wherein the main blocking bar (306) is located in between the first flexible arm (112) and the second flexible arm (142), preventing movement of the first flexible arm (112) and the second flexible arm (142) towards each other, when the connector housings (100, 200) are in the fully assembled state (A) and the component position assurance device is in a locked position (LP).

15. An electrical assembly comprising the electrical connector (10) according to any one of claims 1 to 14, and a counter connector (500) comprising a first counter connector housing (510) and a second counter connector housing (520) and the component position assurance device (300), whereby the first counter connector housing and the second counter connector housing component are locked to each other by the component position assurance device.

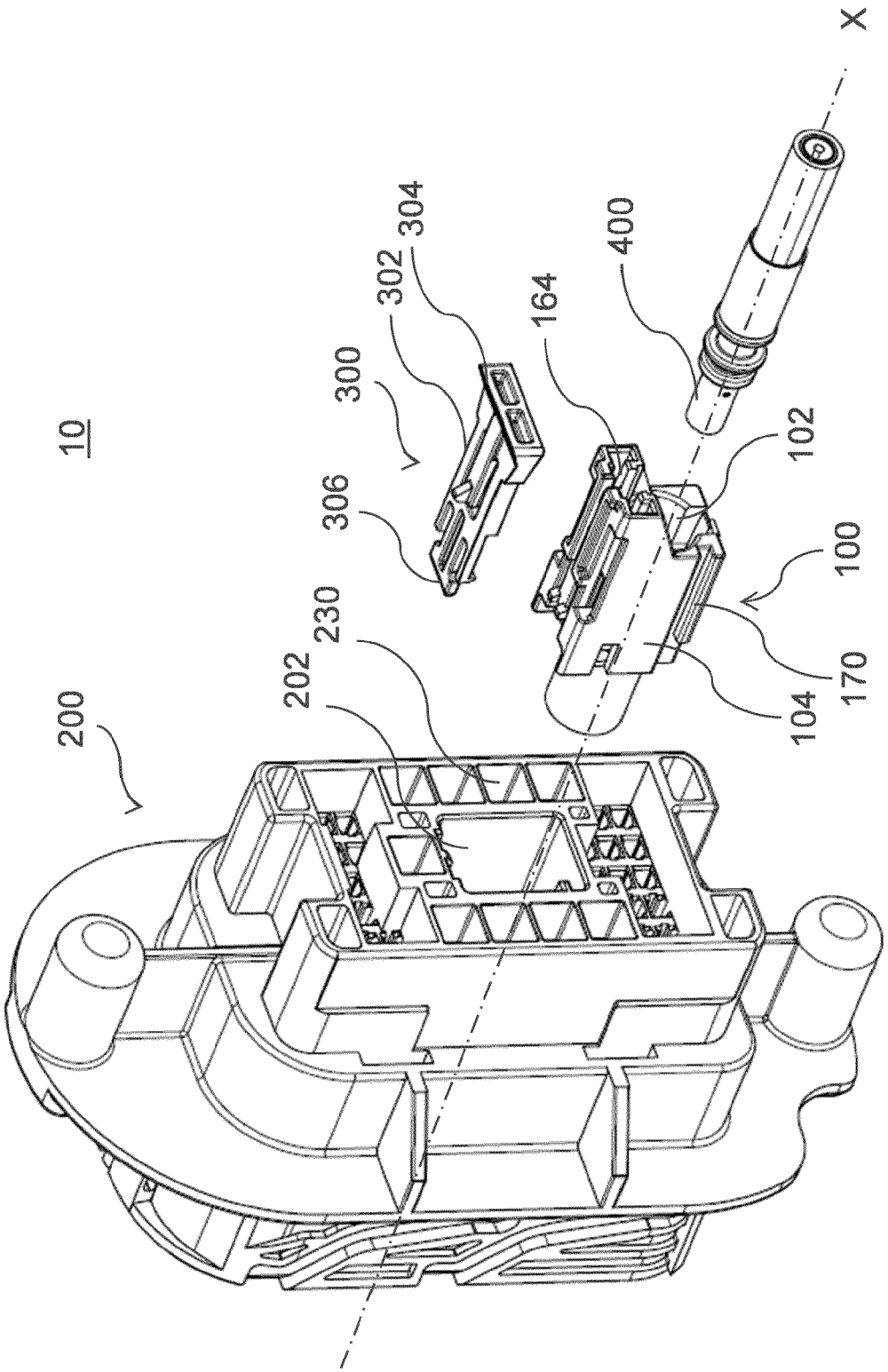

Fig. 1

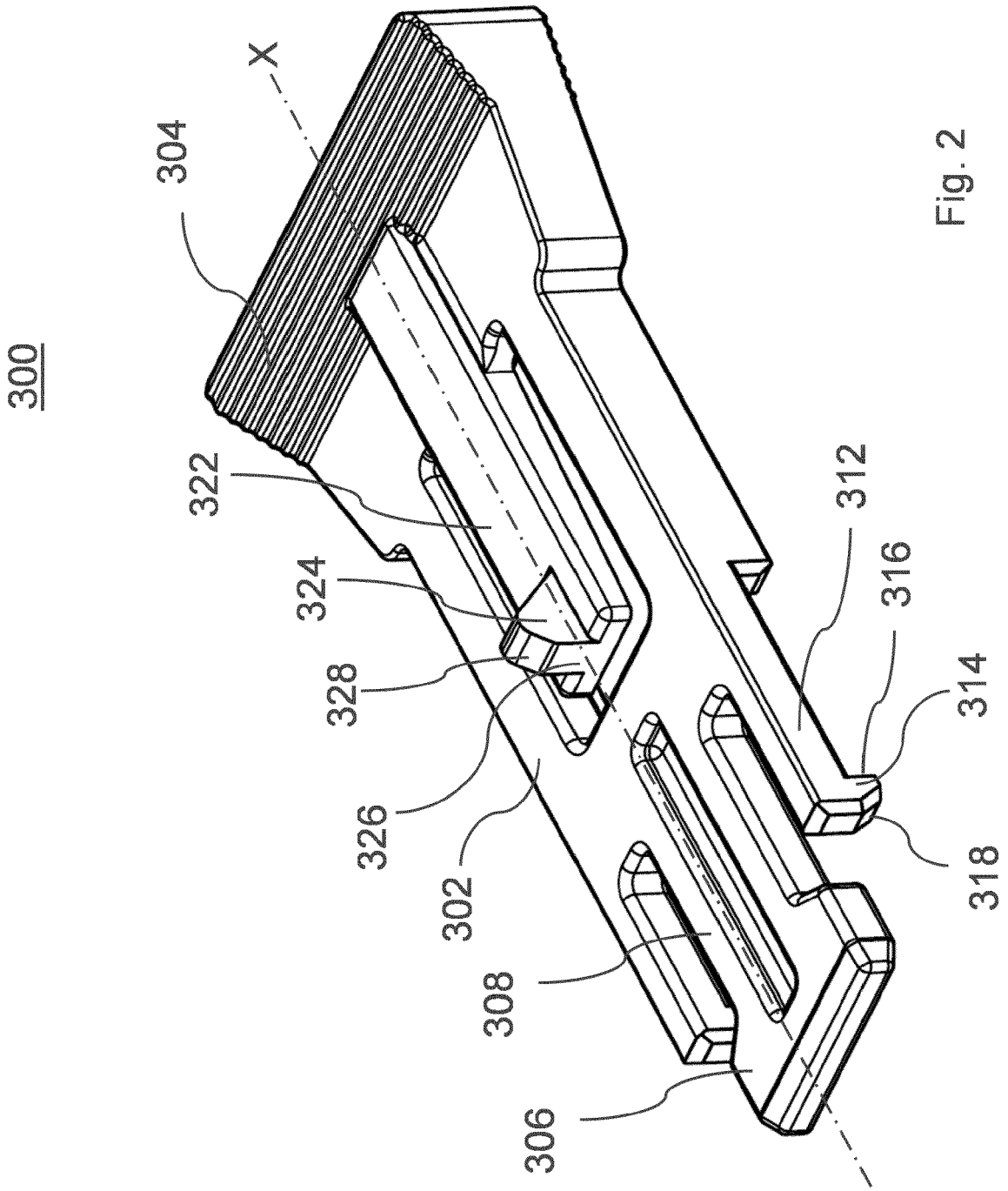

Fig. 2

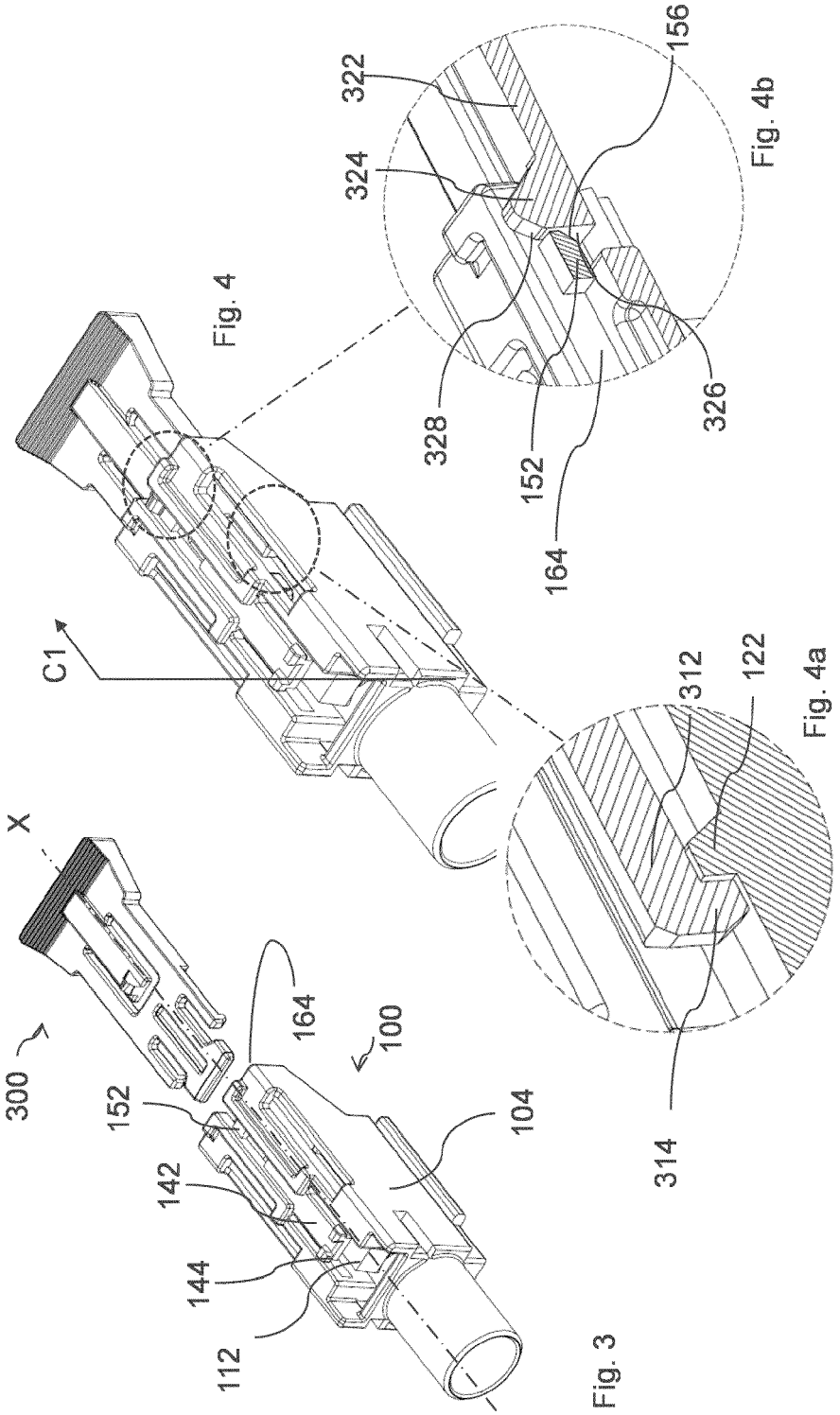

Fig. 3

Fig. 4

Fig. 4a

Fig. 4b

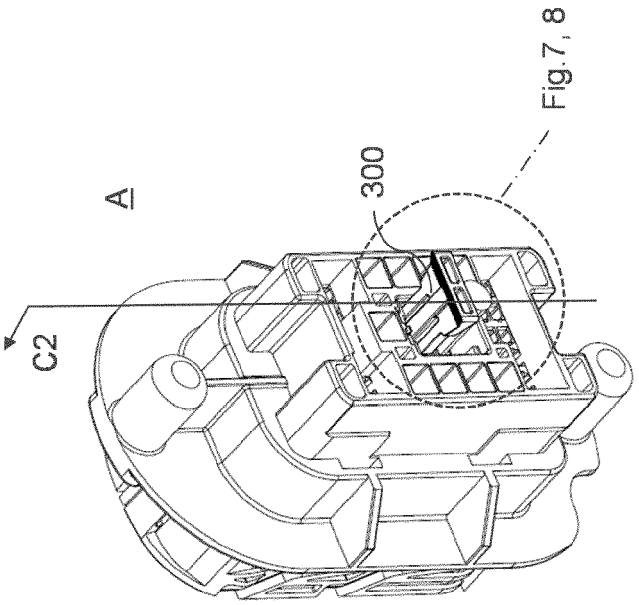

Fig. 6

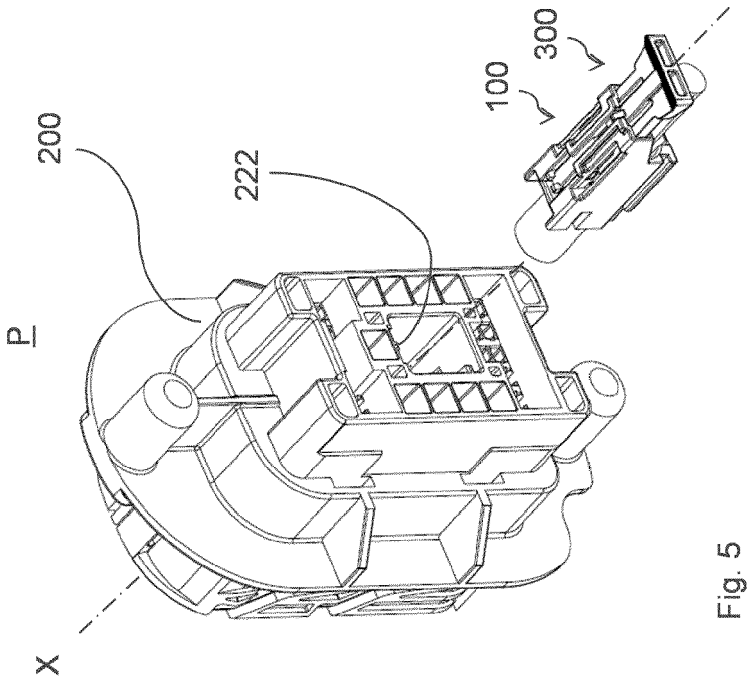

Fig. 5

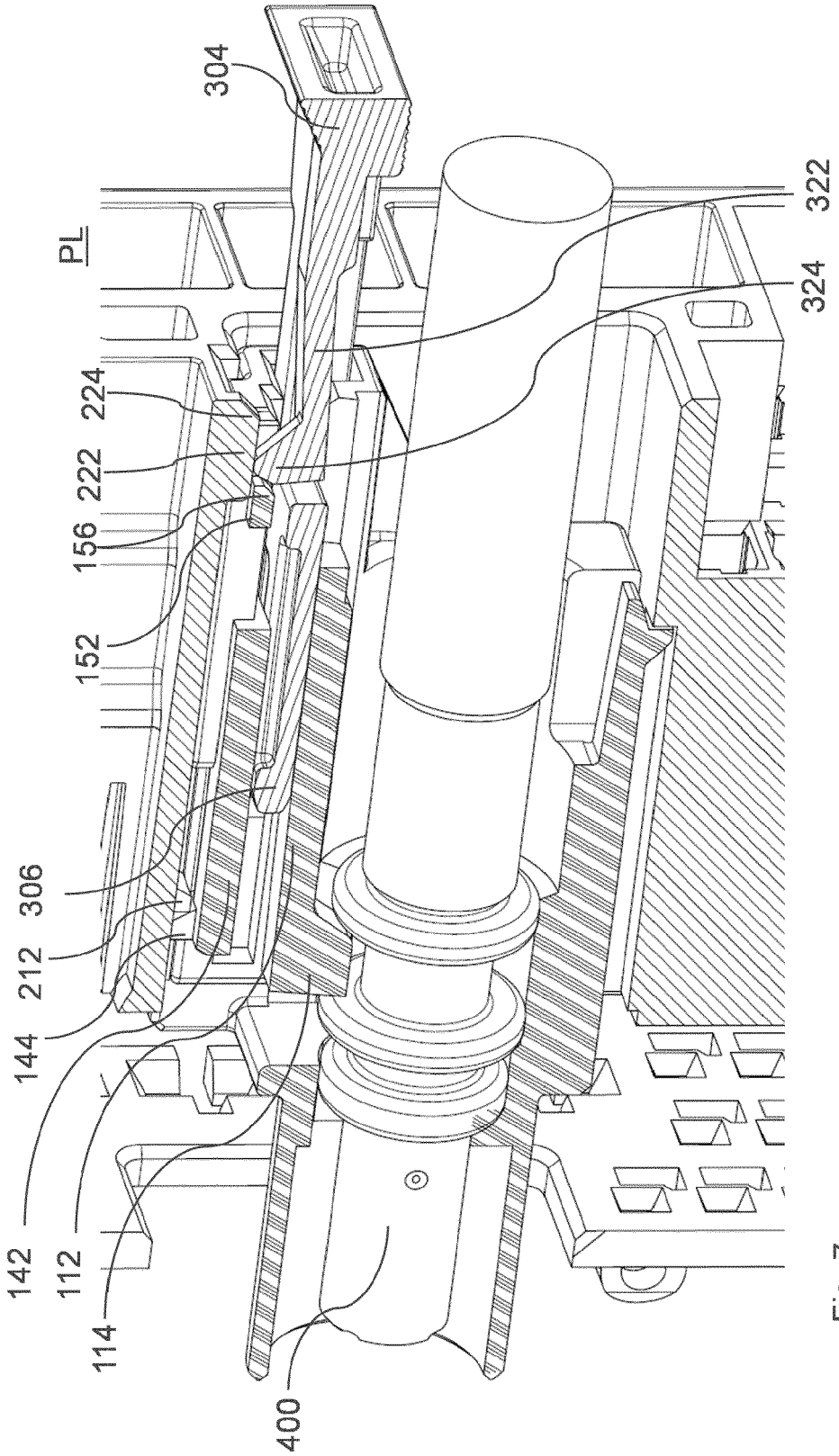

Fig. 7

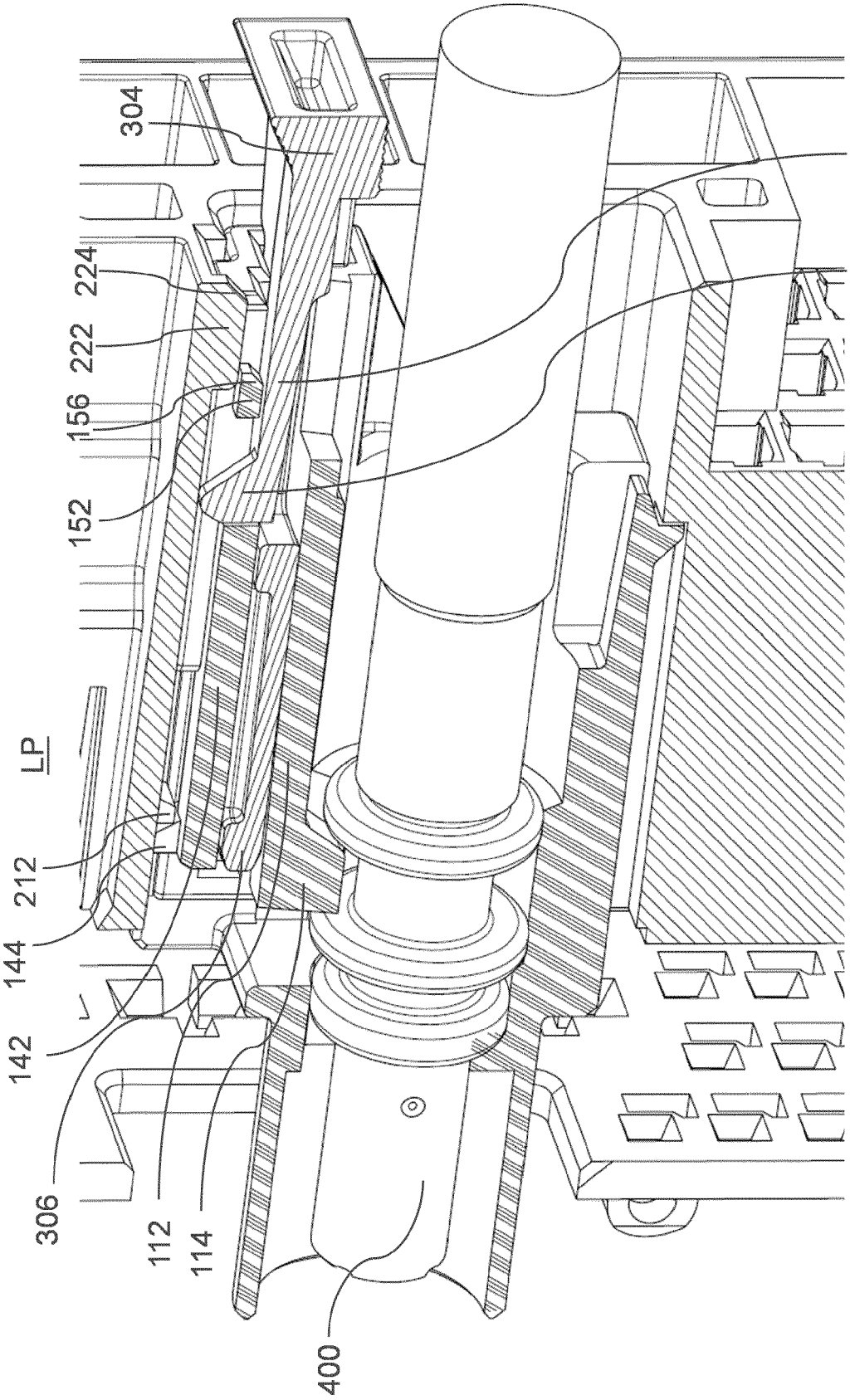

Fig. 8

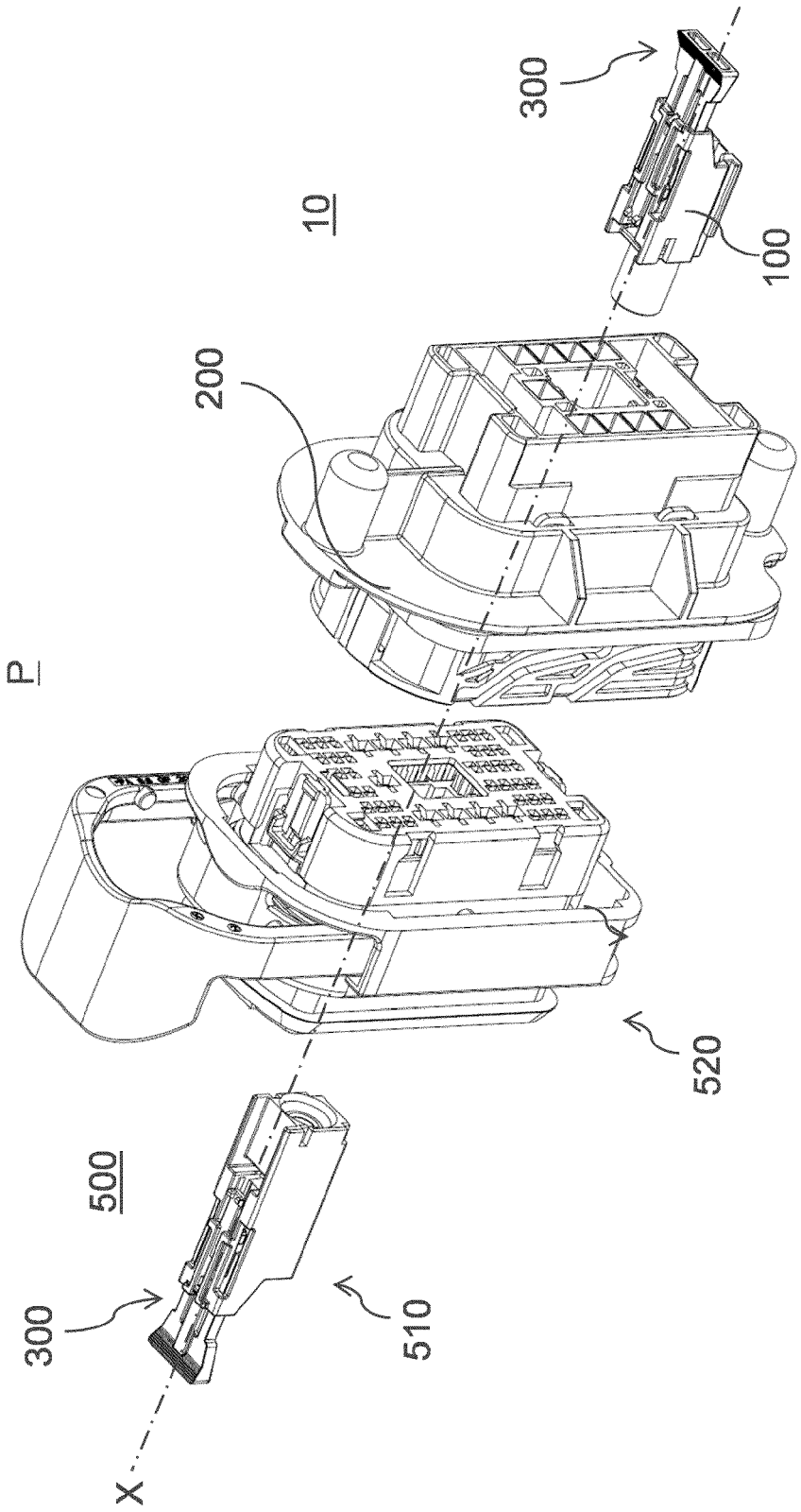

Fig. 9

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EUROPEAN SEARCH REPORT

Application Number
EP 17 17 3210

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2014/060229 A1 (TYCO ELECTRONICS AMP ITALIA SRL [IT]) 24 April 2014 (2014-04-24) * the whole document *	1,2, 7-10,12, 13,15	INV. H01R13/514 H01R13/642 H01R13/422 H01R13/506
X	US 8 016 606 B1 (KWAN MENG SANG [SG] ET AL) 13 September 2011 (2011-09-13) * column 3 - column 4; figures 1-9 *	1-7,11	ADD. H01R13/641
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A	US 2009/053917 A1 (SASAKI YASUHIRO [JP] ET AL) 26 February 2009 (2009-02-26) * the whole document *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	13 October 2017	Vautrin, Florent

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 17 17 3210

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