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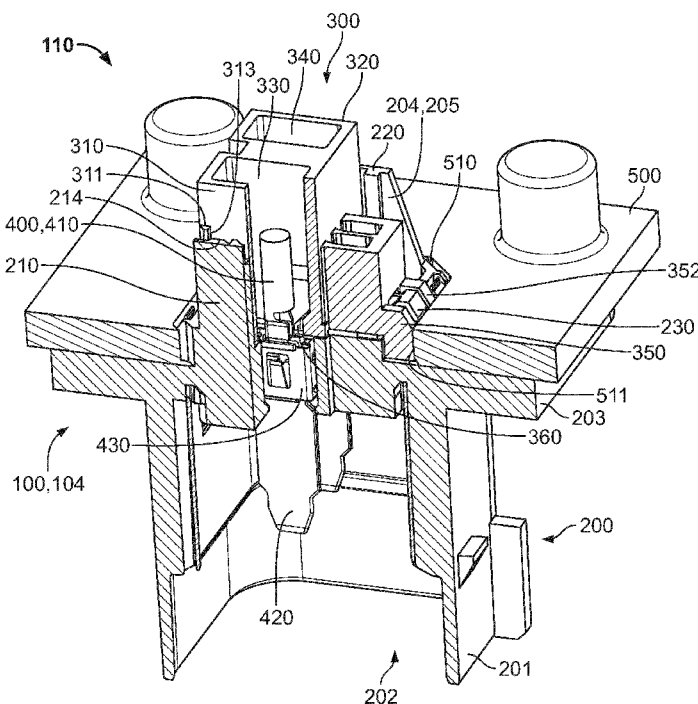


Fig. 11

(57) Abstract: An electrical connector (100) comprises a
contact cavity (20) and a contact locking device (300),
which are constructed as separate parts. The contact lock-
ing device can be arranged in a receiving area (204),
which has a side block (205), of the contact cavity and oc-
cupy a pre-locked position and a final locked position in
the side block (205). The contact locking device has a fix-
ing element (360), which is provided to fix a contact
(400) in the connector when the contact locking device is
in the final locked position. In addition the contact lock-
ing device has a blocking lug (350), which is provided to
prevent a full connection of the connector with a connect-
or mating part when the contact locking device is in the
pre-locked position. A method for assembling the connec-
tor is also disclosed.



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Description

Electrical Connector

- 5 The present invention relates to an electrical connector according to claim 1, a connector arrangement according to claim 12, and a method for the assembly of a connector according to claim 15.
- 10 Electrical connectors and connector arrangements are known in various configurations and for various uses. For example, high-voltage connectors, which serve to supply power to engine units in motor vehicles, are known.
- 15 Furthermore, it is known that contacts arranged inside a connector must be retained using a contact locking device. The mounting and retention of the contacts is often carried out in a process that is separate from the manufacture of the connector components and immediately precedes a connection of
- 20 the connector to a connector mating part. It is known that a connection of a connector to a connector mating part without the prior retention of contacts using a contact locking device absolutely must be prevented. In the case of known electrical connectors and connector arrangements this can
- 25 nevertheless occur.

The object of the present invention is to provide an improved electrical connector. This object is achieved through an electrical connector with the features of claim 1. An

30 additional object of the present invention is to provide an improved connector arrangement with a connector and a connector mating part. This object is achieved through a connector arrangement with the features of claim 12. An

additional object of the present invention is to specify an improved method for the assembly of a connector. This object is achieved through a method with the features of claim 15. Preferred developments are shown in the dependent claims.

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An electrical connector according to the invention comprises a contact cavity and a contact locking device, which are constructed as separate parts. In the process the contact locking device can be arranged inside a receiving area, which has a side block, of the contact cavity and occupy a pre-locked position and a final locked position inside this side block. The contact locking device has a fixing element, which is provided to fix a contact inside the connector when the contact locking device is in the final locked position. The contact locking device also has a blocking lug, which is provided to prevent a full connection of the connector with a connector mating part when the contact locking device is in the pre-locked position. Advantageously, the design of this electrical connector prevents the electrical connector being connected to a connector mating part without a contact being fixed inside the contact cavity of the electrical connector using the contact locking device beforehand. This advantageously results in an increased secureness of the electrical connector.

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In a preferred embodiment of the electrical connector the blocking lug has a chamfered edge, which is constructed to move the contact locking device out of the pre-locked position into the final locked position when the connector is connected to a connector mating part while the contact locking device is in the pre-locked position. Advantageously, the contact locking device then moves automatically from the pre-locked position into the final locked position when an

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attempt is made to connect the connector to a connector mating part although the contact locking device is still in the pre-locked position. Advantageously, it is then not only ensured that a contact is fixed in the contact cavity of the electrical connector by the contact locking device before the connector is fully connected to the connector mating part, but also the handling of the electrical connector is simplified in addition in a particular way since no separate process is necessary to fix the contact inside the contact cavity of the connector using the contact locking device.

In a preferred embodiment of the electrical connector the contact locking device has a locking lug, the side block having a first locking edge and a second locking edge. In the process the locking lug locks onto the first locking edge in the pre-locked position, while the locking lug locks onto the second locking edge in the final locked position. Advantageously, when the contact locking device is moved into the pre-locked position and into the final locked position clearly audible clicking noises occur in each case, which provide an assembly operator who is occupied with the assembly of the electrical connector with a clear feedback signal that the respective assembly position has been reached.

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In a development of the electrical connector the side block has a first guide groove. In this case the contact locking device can also occupy an assembly position in the side block. In the assembly position of the contact locking device the locking lug is arranged in the first guide groove. Advantageously, the guiding of the locking lug in the first guide groove then facilitates an assembly of the contact locking device in the receiving area of the contact cavity.

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In a preferred embodiment of the electrical connector the contact locking device can be moved out of the assembly position into the pre-locked position. In addition the
5 contact locking device can be moved between the pre-locked position and the final locked position. Advantageously, the contact locking device can then be moved out of its final locked position back into its pre-locked position, for example in order to replace a contact arranged inside the
10 contact cavity of the connector or to replace a cable connected to the connector. Expediently, the contact locking device can, however, not be moved back out of the pre-locked position into the assembly position. This prevents an accidental separation of the contact locking device from the
15 contact cavity, which also prevents individual parts of the electrical connector becoming lost.

In a preferred embodiment of the electrical connector the contact locking device has a rib, while the side block has a
20 recess. In the process the rib is arranged in the recess in the pre-locked position and in the final locked position. Advantageously, the rib of the contact locking device that is arranged in the recess then prevents an accidental separation of the contact locking device from the contact cavity of the
25 electrical connector.

In a development of the electrical connector the side block has a second guide groove. In this case the rib is arranged in the second guide groove in the assembly position of the
30 contact locking device. Advantageously, the guiding of the rib in the second guide groove then facilitates an assembly of the contact locking device of the electrical connector in the receiving area of the contact cavity.

In a preferred embodiment of the electrical connector it is constructed so that a contact can be inserted into the connector and be removed from the connector when the contact locking device is in the pre-locked position. Advantageously, the contact locking device and the contact cavity of the electrical connector can then be connected to each other in the pre-locked position after the manufacture of the electrical connector, thus simplifying the delivery of the electrical connector. A mounting of the pre-assembled electrical connector with the contact can then follow directly before the connection of the electrical connector to a connector mating part.

In a preferred embodiment of the electrical connector the contact locking device cannot be separated from the contact cavity without deforming the contact cavity when the contact locking device is in the pre-locked position. Advantageously, an accidental separation of the contact locking device from the contact cavity is thus prevented, preventing a loss of individual parts of the electrical connector.

In a preferred embodiment of the electrical connector the contact cavity has a hold-down device with a contact surface, the contact locking device having a blocking lug with a contact surface. In this case the contact surface of the blocking lug engages with the contact surface of the hold-down device when the contact locking device is in the pre-locked position or the final locked position. Advantageously, the blocking lug, which is engaged with the hold-down device, then also prevents an accidental separation of the contact locking device from the contact cavity.

In a preferred embodiment of the electrical connector it is a high-voltage connector. Advantageously, the connector can then serve to supply an engine with high voltage.

5 A connector arrangement according to the invention comprises a connector of the type described above and a connector mating part. In this case the connector can be connected to the connector mating part when the contact locking device of the connector is in the final locked position. In addition,
10 the connector cannot be completely connected to the connector mating part when the contact locking device of the connector is in the pre-locked position. Advantageously, it is ensured in the case of this connector arrangement that the connector is not connected to the connector mating part before a
15 contact, which is arranged inside the connector, has been retained by the contact locking device of the connector. This results in an increased secureness of the connector arrangement.

20 In a preferred embodiment of the connector arrangement the contact locking device cannot be moved out of the final locked position into the pre-locked position when the connector is connected to the connector mating part. Advantageously, this prevents a contact arranged inside a
25 connector being released while the connector is still connected to the connector mating part.

In a preferred embodiment of the connector arrangement the connector mating part is constructed on an engine unit of a
30 motor vehicle. Advantageously, the connector arrangement can then serve to supply the engine unit of the motor vehicle with electric current.

A method according to the invention for assembling a connector, which comprises a contact cavity and a contact locking device that are constructed as separate parts, comprises steps to arrange the contact locking device in a receiving area, which has a side block, of the contact cavity in an assembly position, to move the contact locking device from the assembly position into a pre-locked position, to insert a contact into the connector and to move the contact locking device out of the pre-locked position into a final locked position. Advantageously, this method ensures that a contact arranged inside a connector is consistently retained using the contact locking device before the connector is connected to a connector mating part. As a result of this the method offers a high level of secureness.

The invention is described in more detail hereinafter with reference to the drawings, in which:

Figure 1 shows a perspective view of a contact cavity and a contact locking device of a connector in a separated state;

Figure 2 shows a cross-sectional view of the contact cavity with the contact locking device that has been brought closer;

Figure 3 shows a perspective view of the connector in an assembly position;

Figure 4 shows a cross-sectional view of the connector in the assembly position;

Figure 5 shows a perspective view of the connector in a pre-locked position;

Figure 6 shows a cross-sectional view of the connector in the pre-locked position with contacts;

5 Figure 7 shows a cross-sectional view of the connector in the pre-locked position with inserted contacts;

Figure 8 shows a cross-sectional view of the connector in the pre-locked position with the connector mating part that has been brought closer;

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Figure 9 shows a perspective view of the connector in a final locked position;

15 Figure 10 shows a cross-sectional view of the connector in the final locked position; and

Figure 11 shows a cross-sectional view of the connector in the final locked position connected to the connector mating part.

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Figure 1 shows a perspective view of a connector 100. The connector 100 can, for example, be a high-voltage connector (HV connector). The connector 100 can, for example, serve to supply an engine unit of a motor vehicle.

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The connector 100 comprises a contact cavity 200 and a contact locking device 300. The contact cavity 200 and the contact locking device 300 are constructed as separate parts and shown in Figure 1 in a separated state 101. The contact
30 cavity 200 and the contact locking device 300 can each be made of plastics material and can be produced cheaply due to the simple shape.

The contact cavity 200 has a contact cavity body 201, which encloses the contact cavity interior 202, which is constructed as a hollow space, and is visible in the cross-sectional view of Figure 2.

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On a longitudinal end of the contact cavity body 201 a base plate 203, which is constructed as a substantially rectangular plate, is arranged. The contact cavity body 201, which encloses the contact cavity interior 202, is attached
10 to a first surface of the base plate 203. A receiving area 204 is attached to the opposite surface of the base plate 203. An aperture is constructed in the base plate 203 between the receiving area 204 and the contact cavity interior 202, which is enclosed by the contact cavity body 201.

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The receiving area 204 comprises a first leaf 210 arranged vertically on the surface of the base plate 203 and a second leaf 220 arranged parallel to the first leaf 210. The receiving area 204 is constructed between the leaves 210,
20 220. The receiving area 204 serves to receive the contact locking device 300, as will become clear hereinafter.

On the surfaces, which are facing each other, of the first leaf 210 and the second leaf 220 a side block 205 is
25 constructed, which serves to guide and steer the side block of the contact locking device 300. In particular, the first leaf 210 has a first guide groove 215 and a second guide groove 216. The first guide groove 215 and the second guide groove 216 extend parallel to each other from a longitudinal
30 end of the first leaf 210 turned away from the base plate 203 towards the base plate 203. At the same time the second guide groove 216 is longer than the first guide groove 215, and therefore extends closer to the base plate 203. The first

leaf 210 also has a recess 217 totally breaking through the first leaf 210, which is rectangular and abuts the second guide groove 216. Furthermore, the first leaf 210 has a first locking edge 212 and a second locking edge 214. The first locking edge 212 and the second locking edge 214 are laterally offset parallel to the plane of the base plate 203 in relation to the first guide groove 215. Between the first guide groove 215 and the first locking edge 212 a first chamfer 211 is constructed. Between the first locking edge 212 and the second locking edge 214 a second chamfer 213 is constructed.

The second leaf 220 is constructed mirror-symmetrical to the first leaf 210. Thus a first guide groove 225, a second guide groove 226 and a recess 227 are constructed on the second leaf 220. In addition, the second leaf 220 has a first locking edge 222, a second locking edge 224, a first chamfer 221 and a second chamfer 223.

Furthermore, the contact cavity 220 has a hold-down device 230 constructed like a hook. The hold-down device is arranged on an edge of the receiving area 204 on the base plate 203 of the contact cavity 200 and points away from the receiving area 204. The hold-down device 230 has a contact surface 231, which is arranged on a side of the hook-shaped hold-down device 230 that is turned towards the base plate 203.

The contact locking device 300 is constructed so that the contact locking device 300 can be arranged in the receiving area 204 of the contact cavity 200 between the first leaf 210 and the second leaf 220. If the contact locking device 300 is arranged in the receiving area 204 then a first lateral surface 310 of the contact locking device 300 is turned

towards the first leaf 210 of the contact cavity, while a second lateral surface 320 opposite the first lateral surface 310 of the contact locking device 300 is turned towards the second leaf 220 of the contact cavity 200.

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A first terminal opening 330 and a second terminal opening 340 are constructed in the body of the contact locking device 300, which is arranged between the first lateral surface 310 and the second lateral surface 320. The terminal openings 330, 340 extend through the contact locking device 300. If the contact locking device 300 is arranged in the receiving area 204 of the contact cavity 200 then the terminal openings 330, 340 extend perpendicular to the plane of the base plate 203 of the contact cavity 200 towards the hole in the base plate 203 constructed between the receiving area 204 of the contact cavity 200 and the contact cavity interior 202.

The first lateral surface 310 has a locking lug 311. The locking lug 311 is arranged near an outer edge of the first lateral surface 310. The locking lug 311 has a locking surface 313 orientated perpendicular to the first lateral surface 310 and a sliding surface 312, which is opposite the locking surface 313, and is inclined at an angle of about 45° to the first lateral surface 310. Furthermore, on the first lateral surface 310 of the contact locking device 300 a rib 314 is arranged. The rib 314 is constructed as an elongated bar or web and is orientated parallel to the direction in which the contact locking device 300 can be inserted into the receiving area 204 of the contact cavity 200. On its upper end the rib 314 has a blocking surface 315 orientated perpendicular to the first lateral surface 310.

The second lateral surface 320 is constructed symmetrical to the first lateral surface 310 and therefore likewise has a locking lug and a rib, which are not visible in the drawings, however.

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Furthermore, the contact locking device 300 has a blocking lug 350 with a contact surface 351 and a chamfered edge 352. The contact surface 351 points away from the base plate 203 of the contact cavity 200 when the contact locking device 300 is arranged inside the receiving area 204.

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Figure 2 shows another view of the connector 100 with the contact cavity 200 and the contact locking device 300. The contact cavity 200 is shown in cross section in Figure 2. In it the section runs perpendicular to the base plate 203 of the contact cavity 200 and parallel to the first leaf 210 of the contact cavity 200 through the first leaf 210 and the contact cavity interior 202 of the contact cavity 200.

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In the view in Figure 2 the contact cavity 200 and the contact locking device 300 of the connector 100 are still separate from one another. However, the contact locking device 300 has already been brought closer to the contact cavity 200 and partly inserted into the receiving area 204 of the contact cavity 200. In the process the contact locking device 300 has been inserted between the first leaf 210 and the second leaf 220 of the contact cavity 200 so that the rib 314 is guided on the first lateral surface 310 of the contact locking device 300 in the second guide groove 216 in the first leaf 210 of the contact cavity 200. Correspondingly the rib on the second lateral surface 320 is also guided in the second guide groove 226 of the second leaf 220 of the contact cavity 200.

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Figure 3 shows another perspective view of the connector 100 with the contact cavity 200 and the contact locking device 300. In the view in Figure 3 the contact locking device 300 has been inserted further into the receiving area 204 of the contact cavity 200 towards the base plate 203 and now occupies an assembly position 102. In the assembly position 102 the rib 314 is still guided on the first lateral surface 310 of the contact locking device 300 in the second guide groove 216 of the first leaf 210. The rib arranged on the second lateral surface 320 of the contact locking device 300 is correspondingly still guided in the second guide groove 226 of the second leaf 220. In addition, the locking lug 311 is now guided on the first lateral surface 310 of the contact locking device 300 in the first guide groove 215 of the first leaf 210. Correspondingly the locking lug on the second lateral surface 320 of the contact locking device 300 is guided in the first guide groove 225 of the second leaf 220 of the contact cavity 200.

Figure 4 shows another view of the connector 100 with the contact cavity 200 and the contact locking device 300, which is in the assembly position 102. In the view in Figure 4 the contact cavity is shown as a cross section through more than one plane parallel to the leaves 210, 220. It can be seen that the rib 314 on the first lateral surface 310 of the contact locking device 300 is arranged in the portion of the second guide groove 216 in the first leaf 210 abutting the recess 217 of the first leaf 210. The rib on the second lateral surface 320 of the contact locking device 300 is arranged correspondingly in a portion of the second guide groove 226 in the second leaf 220 abutting the recess 227 in the second leaf 220.

Figure 4 also shows that by moving the contact locking device 300 towards the base plate 203, the blocking lug 350 with the contact surface 351 orientated parallel to the surface of the base plate 230 has been brought close enough to the base plate 230 that the contact surface 351 of the blocking lug 350 is arranged below the contact surface 231 of the hold-down device 230 of the contact cavity 200. The contact surface 351 of the blocking lug 350 is, however, pushed laterally towards the contact surface 231 of the hold-down device 230 in a direction parallel to the surface of the base plate 203.

From the assembly position 102 shown in Figures 3 and 4 the contact locking device 300 can be taken out of the receiving area 204 of the contact cavity 200 again. In order to do this the contact locking device 300 must simply be raised out of the receiving area 204 in a direction perpendicular to the surface of the base plate 203 of the contact cavity 200. No additional steps are necessary.

Figure 5 shows another perspective view of the connector 100 with the contact cavity 200 and the contact locking device 300. In comparison to the situation shown in Figure 3 the contact locking device 300 has been pushed in a direction parallel to the surface of the base plate 203 between the leaves 210, 220 of the contact cavity 200 towards the contact cavity 200 and now occupies a pre-locked position 103. Figure 6 shows a cross-sectional view of the connector 100 with the contact cavity 200 and the contact locking device 300, which is in the pre-locked position 203. In it the section runs parallel to the first leaf 210 of the contact cavity 200 through the first leaf 210.

During the movement of the contact locking device 300 from its assembly position 102 into its pre-locked position 103 the locking lug 311 was pushed on the first lateral surface 310 of the contact locking device 300 out of the first guide groove 215 in the first leaf 210 of the contact cavity 200 and is now located with its locking surface 313 on the first locking edge 212 of the first leaf 210. The relocation of the locking lug 311 was facilitated by the first chamfer 211 of the first leaf 210 constructed between the first guide groove 215 of the first leaf 210 and the first locking edge 212 and the chamfered sliding surface 312 of the locking lug 311. The locking lug constructed on the second lateral surface 320 of the contact locking device 300 was correspondingly pushed out of the first guide groove 225 in the second leaf 220 of the contact cavity 200 and is now locked onto the first locking edge 222 of the second leaf 220.

During the movement of the contact locking device 300 a clearly audible clicking noise preferably occurs due to the locking of the locking surface 313 of locking lug 311 on the first locking edge 212 of the first leaf 210 and the locking of the locking lug constructed on the second lateral surface 320 of the contact locking device 300 on the first locking edge 222 of the second leaf 220, which has supplied a feedback signal to the person moving the contact locking device 300 indicating that the pre-locked position 103 has been reached.

Through the locking of the locking surface 313 of the locking lug 311 on the first lateral surface 310 of the contact locking device 300 with the first locking edge 212 in the side block 205 constructed in the first leaf 210 and the

corresponding locking of the locking lug arranged on the second lateral surface 320 of the contact locking device 300 on the first locking edge 222 in the second leaf 220 of the contact cavity 200 a movement of the contact locking device 300 back out of the pre-locked position 103 shown in Figures 5 and 6 into the assembly position 102 shown in Figures 3 and 4 is made more difficult or totally prevented. Thus the contact locking device 300 cannot be moved out of the pre-locked position 103 shown in Figures 5 and 6 back into the assembly position 102 without a specific exertion of force parallel to the base plate 203 of the contact cavity 200. As a result an accidental separation of the contact locking device 300 from the contact cavity 200 is made more difficult or totally prevented.

Through the lateral displacement of the contact locking device 300 relative to the contact cavity 200 out of the assembly position 102 into the pre-locked position 103, the rib 314 on the first lateral surface 310 of the contact locking device 300 was also pushed out of the second guide groove 216 in the first leaf 210 of the contact cavity 200 into the recess 217 in the first leaf 210. The rib arranged on the second lateral surface 320 of the contact locking device 300 was correspondingly moved out of the second guide groove 226 in the second leaf 220 into the recess 227 in the second leaf 220 of the contact cavity 200. As a result of the displacement of the rib 314 the blocking surface 315 of the rib 314 is now located on an edge of the recess 217 in the first leaf 210. Correspondingly a blocking surface of the rib on the second lateral surface 220 of the contact locking device 300 is also located on an edge of the recess 227 of the second leaf 220. This prevents the contact locking device 300 being removed from the pre-locked position 103 shown in

Figures 5 and 6 out of the receiving area 204 of the contact cavity 200 in the direction perpendicular to the surface of the base plate 203 of the contact cavity 200. This also makes an accidental separation of the contact locking device 300 from the contact cavity 200 more difficult or prevents it.

Figure 7 shows another cross-sectional view of the connector 100 with the contact cavity 200 and the contact locking device 300 located in its pre-locked position 103. In the view in Figure 7 it can be seen that the lateral displacement of the contact locking device 300 in the receiving area 204 of the contact cavity 200 out of the assembly position 102 into the pre-locked position 103 has led to the contact surface 351 of the blocking lug 350 of the contact locking device 300 now being arranged partially underneath the contact surface 231 of the hold-down device 230 of the contact cavity 200. This also prevents the contact locking device 300 being removed from the pre-locked position 103 shown in Figure 5, 6 and 7 out of the receiving area 204 of the contact cavity 200 in the direction perpendicular to the surface of the base plate 203 of the contact cavity 200.

Figure 6 also shows a first contact 400 and a second contact 440. Both contacts 400, 440 consist of electrically conductive material, preferably metal. The first contact 400 comprises a sleeve-shaped portion 410, a blade-shaped portion 420 and a junction portion 430 connecting the sleeve-shaped portion 410 to the blade-shaped portion 420. The sleeve-shaped portion 410 is constructed as a hollow cylinder and provided to accommodate an electrically conductive contact pin. The blade-shaped portion 420 is constructed as a flat plate. The second contact 440 is of identical construction to the first contact 400.

Instead of the sleeve-shaped portion 410 a cable could also be provided, which is crimped onto the junction portion 430. The blade-shaped portion 420 of the contact 400 is then
5 connected to the cable in an electrically conductive manner.

The first contact 400 is intended to be inserted through the first terminal opening 330 into the contact cavity interior 202 of the contact cavity 200. The second contact 440 is
10 correspondingly constructed to be inserted through the second terminal opening 340 of the contact locking device 300 into the contact cavity 200. In their final position the contacts 400, 440 are arranged in the contact cavity 200 in such a way that the blade-shaped portions 420 are arranged in the
15 contact cavity interior 202 and the sleeve-shaped portions 410 protrude into the terminal openings 330, 340 of the contact locking device 300. In the view in Figure 7 the contacts 400, 440 have been inserted into the connector 100 and are located in their final position.

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Figure 8 shows another cross-sectional view of the connector 100 with the contact cavity 200 and the contact locking device 300, which is in its pre-locked position 103. In addition Figure 8 shows part of a connector mating part 500.
25 The connector 100 and the connector mating part 500 together form a connector arrangement 110. The connector 100 and the connector mating part 500 are intended to be plugged together in order to produce an electrical connection between the connector 100 and the connector mating part 500. The
30 connector mating part 500 can, for example, be constructed on an engine of a motor vehicle. The section of the connector mating part 500 shown in Figure 8 can be a wall of this engine.

The section of the connector mating part 500 shown in Figure 8 has an opening 510 with an edge 511 surrounding the opening 510. The opening 510 is provided to receive part of the connector 100.

It can be seen in Figure 8 that the connector 100 with the contact locking device 300 in the pre-locked position 103 cannot be fully plugged together with the connector mating part 500 since the edge 511 of the opening 510 of the connector mating part 500 abuts the blocking lug 350 of the contact locking device 300. Thus the blocking lug 350 prevents a plugging of the connector 100 with the connector mating part 500 when the contact locking device 300 is in the pre-locked position 103.

Figure 9 shows another perspective view of the connector 100 with the contact cavity 200 and the contact locking device 300. In the view in Figure 9 the contact locking device 300 is in a final locked position 104. Figure 10 shows a cross-sectional view of the connector 100 with the contact cavity 200 and the contact locking device 300 arranged in the final locked position 104.

In comparison to the pre-locked position 103 of the contact locking device 300 shown in Figures 5 to 8, the contact locking device 300 in the final locked position 104 has been pushed further in a direction parallel to the surface of the base plate 203 in the receiving area 204 towards the contact cavity 200. As a result of this the locking surface 313 of the locking lug 311 arranged on the first lateral surface 310 of the contact locking device 300 has been released from the first locking edge 212 of the side block 205 of the first

leaf 210 and is now locked on the second locking edge 214 of the side block 205 on the first leaf 210. In this case the movement of the locking lug 311 from the first locking edge 212 to the second locking edge 214 was facilitated by the second chamfer 213 constructed between the first locking edge 212 and the second locking edge 214 of the side block 205 and the chamfered sliding surface 312 of the locking lug 311. The locking lug constructed on the second lateral surface 320 of the contact locking device 300 was correspondingly moved from the first locking edge 222 of the side block 205 on the second leaf 220 to the second locking edge 224. During the movement of the locking lug 311 and the corresponding locking lug on the second lateral surface 320 and the renewed locking of the locking lug 311 and the corresponding locking lug on the second lateral surface 320 on the second locking edges 214, 224 a clearly audible clicking sound has preferably occurred.

Since the second locking edges 214, 224 are chamfered in contrast to the first locking edges 212, 222 the contact locking device 300 of the connector 100 can be pushed out of the final locked position 104 shown in Figures 9 and 10 back into the pre-locked position 103 shown in Figures 5 to 8.

In comparison to the pre-locked position 103 the ribs 314 on the first lateral surface 310 of the contact locking device 300 and the rib constructed on the second lateral surface 320 of the contact locking device 300 in the recesses 217, 227 of the leaf 210, 220 have been laterally displaced. However, even in the final locked position 104 the blocking surfaces 315 of the rib 314 and the corresponding blocking surface of the corresponding rib on the second lateral surface 320 of the contact locking device 300 are still located on the edges

of the recesses 217, 227, whereby even in the final locked position 104 a removal of the contact locking device 300 out of the receiving area 204 of the contact cavity 200 in a direction perpendicular to the surface of the base plate 303 is prevented.

It can also be seen in Figure 10 that the displacement of the contact locking device 300 out of the pre-locked position 103 into the final locked position 104 has caused the contact surface 351 of the blocking lug 350 of the contact locking device 300 to be now fully arranged below the contact surface 231 of the hold-down device 230 of the contact cavity 200. Thus the blocking lug 350 of the contact locking device 300 and the hold-down device 230 of the contact cavity 200 in the final locked position 104 lock flush to each other. As a result of the arrangement of the contact surface 351 of the blocking lug 350 below the contact surface 231 of the hold-down device 230, a removal of the contact locking device 300 from its final locked position 104 out of the receiving area 204 of the contact cavity 200 in a direction perpendicular to the surface of the base plate 203 of the contact cavity 200 is also prevented.

Furthermore, Figure 10 shows that in the final locked position 104 of the contact locking device 300 a fixing element 360 of the first contact 400 arranged inside the first terminal opening 330 of the contact locking device 300 is fixed in the interior of the connector 100. Another fixing element arranged in the second terminal opening 340 of the contact locking device 300 correspondingly fixes the second contact 440 in the interior of the connector 100 in the final locked position 104. The fixing of the contacts 400, 440 prevents the contacts 400, 440 being able to be removed

through the terminal openings 330, 340 of the contact locking device 300 out of the connector 100 when the contact locking device 300 is in its final locked position 104.

5 Figure 11 shows another perspective view of the connector arrangement 110 with the connector 100 and the connector mating part 500. In it the contact locking device 300 of the connector 100 is in its final locked position 104. The connector 100 is fully plugged together with the connector
10 mating part 500 in the view in Figure 11.

In the final locked position 104 of the contact locking device 300 the blocking lug 350 of the contact locking device 300 locks flush with the hold-down device 230 of the contact
15 cavity 200. As a result of this the edge 511 of the opening 510 of the connector mating part 500 does not abut the blocking lug 350 when the connector 100 is plugged together with the connector mating part 500 when the contact locking device 300 is in the final locked position 104. With
20 reference to Figure 8 it was explained that the blocking lug 350 of the contact locking device 300 prevents a plugging of the connector 100 with the connector mating part 500 when the contact locking device 300 is in the pre-locked position 103. In summary this means that the connector 100 can only be
25 fully connected to the connecting mating part 500 when the contact cavity 300 of the connector 100 is in its final locked position 104. This also means that the connector 100 can only be fully connected to the connector mating part 500 when the contacts 400, 440 arranged inside the connector 100
30 are fixed by the contact locking device 300, which is in the final locked position 104. As a result of this the connector arrangement 110 prevents the connector 100 being connected to

the connector mating part 500 before the contacts 400, 440 have been fixed in the connector 100.

In the plugged state of the connector 100 with the connector
5 mating part 500 a movement of the contact locking device 300 of the connector 100 out of the final locked position 104 into the pre-locked position 103 is prevented since in this case the blocking lug 350 of the contact locking device 300 abuts the edge 511 of the opening 510 of the connector mating
10 part 500. As a result of this the contacts 400, 440 arranged inside the connector 100 are advantageously prevented from being released while the connector 100 is still connected to the connector mating part 500.

15 In a preferred embodiment of the connector arrangement 110 the chamfer 352 on the blocking lug 350 of the contact locking device 300 causes an automatic movement of the contact locking device 300 out of its pre-locked position 103 into its final locked position 104, when an attempt is made
20 to plug the connector 100 with the connector mating part 500 while the contact locking device 300 of the connector 100 is in the pre-locked position 103. In this case the chamfer 352 of the blocking lug 350 of the contact locking device 300, which is in the pre-locked position 103, abuts the edge 511
25 of the opening 510 when the connector 100 is plugged together with the connector mating part 500, resulting in a force being exerted in a direction parallel to the surface of the base plate 203 onto the contact locking device 300, causing a movement of the contact locking device 300 out of the pre-
30 locked position 103 into the final locked position 104.

Thus, to assemble the connector 100 firstly the contact locking device 300, which is initially separate from the

contact cavity 200 of the connector 100, is arranged in an assembly position 102 in the receiving area 204 of the contact cavity 200. Then the contact locking device 300 is pushed laterally towards the contact cavity 200, thus moving
5 the contact locking device 300 out of the assembly position 102 into its pre-locked position 103. In the process a clicking sound preferably occurs that is audible to the assembly operator. In the pre-locked position 103 the contact locking device 300 is connected to the contact cavity 200 in
10 such a manner that an unintentional separation of the contact locking device 300 from the contact cavity 200 is prevented. In this pre-locked position 103 the connector 100 can now, for example, be delivered by a manufacturer of the connector 100 to a user of the connector 100.

15 In a further assembly step the user of the connector 100 inserts the contacts 400, 440 into the connector 100. Then the contact locking device 300 is pushed laterally towards the contact cavity 200, thus moving the contact locking
20 device 300 out of its pre-locked position 103 into its final locked position 104. Another clearly audible clicking sound preferably occurs in the process. In the final locked position 104 the contacts 400, 440 are fixed in the interior of the connector 100. Then the connector 100 can be plugged
25 together with the connector mating part 500.

If the contacts 400, 440 and/or cables connected to the contacts 400, 440 are to be replaced later, the connector 100 must first be separated from the connector mating part 500.
30 Then the contact locking device 300 of the connector 100 can be moved out of its final locked position 104 into its pre-locked position 103. Now the contacts 400, 440 and/or cables

connected to the contacts 400, 440 can be removed from the connector 100.

List of Reference Numerals

	100	connector
5	101	separated state
	102	assembly position
	103	pre-locked position
	104	final locked position
	110	connector arrangement
10		
	200	contact cavity
	201	contact cavity body
	202	contact cavity interior
	203	base plate
15	204	receiving area
	205	side block
	210	first leaf
	211	first chamfer
	212	first locking edge
20	213	second chamfer
	214	second locking edge
	215	first guide groove
	216	second guide groove
	217	recess
25	220	second leaf
	221	first chamfer
	222	first locking edge
	223	second chamfer
	224	second locking edge
30	225	first guide groove
	226	second guide groove
	227	recess
	230	hold-down device
	231	contact surface
35	300	contact locking device
	310	first lateral surface
	311	locking lug

	312	sliding surface
	313	locking surface
	314	rib
	315	blocking surface
5	320	second lateral surface
	330	first terminal opening
	340	second terminal opening
	350	blocking lug
	351	contact surface
10	352	chamfered edge
	360	fixing element
	400	first contact
	410	sleeve-shaped portion
15	420	blade-shaped portion
	430	junction portion
	440	second contact
	500	connector mating part
20	510	opening
	511	edge

Claims

1. Electrical connector (100)

having a contact cavity (200) and a contact locking
5 device (300), which are constructed as separate parts,

wherein the contact locking device (300) can be arranged
in a receiving area (204), which has a side block (205),
of the contact cavity (200) and can occupy a pre-locked
10 position (103) and a final locked position (104) in the
side block (205),

wherein the contact locking device (300) has a fixing
element (360), which is provided to fix a contact (400)
15 in the connector (100) when the contact locking device
(300) is in the final locked position (104),

wherein the contact locking device (300) has a blocking
lug (350), which is provided to prevent a full connection
20 of the connector (100) with a connector mating part (500)
when the contact locking device (300) is in the pre-
locked position (103).

2. Electrical connector (100) according to claim 1,

25 wherein the blocking lug (350) has a chamfered edge
(352), which is constructed to move the contact locking
device (300) from the pre-locked position (103) into the
final locked position (104) when the connector (100) is
connected with a connector mating part (500), while the
30 contact locking device (300) is in the pre-locked
position (103).

3. Electrical connector (100) according to any of the preceding claims,
wherein the contact locking device (300) has a locking lug (311),
5 wherein the side block (205) has a first locking edge (212) and a second locking edge (214),
wherein the locking lug (311) locks onto the first locking edge (212) in the pre-locked position (103),
wherein the locking lug (311) locks onto the second
10 locking edge (214) in the final locked position (104).
4. Electrical connector (100) according to claim 3,
wherein the side block (205) has a first guide groove (215),
15 wherein the contact locking device (300) can occupy an assembly position (102) in the side block (205),
wherein the locking lug (311) is arranged in the first guide groove (215) in the assembly position (102).
- 20 5. Electrical connector (100) according to claim 4,
wherein the contact locking device (300) can be moved out of the assembly position (102) into the pre-locked position (103),
wherein the contact locking device (300) can be moved
25 between the pre-locked position (103) and the final locked position (104).
6. Electrical connector (100) according to any of the preceding claims,
30 wherein the contact locking device (300) has a rib (314),
wherein the side block (205) has a recess (217),
wherein the rib (314) is arranged in the recess (217) in

the pre-locked position (103) and in the final locked position (104).

7. Electrical connector (100) according to claim 6 and
5 either one of claims 4 or 5,
wherein the side block (205) has a second guide groove (216),
wherein the rib (314) is arranged in the second guide groove (216) in the assembly position (102).

10

8. Electrical connector (100) according to any of the preceding claims,
wherein the connector (100) is constructed so that a contact (400) is inserted into the connector (100) and
15 can be removed from the connector (100) when the contact locking device (300) is in the pre-locked position (103).

9. Electrical connector (100) according to any of the preceding claims,
20 wherein the contact locking device (300) cannot be separated from the contact cavity (200) without deforming the contact cavity (200) when the contact locking device (300) is in the pre-locked position (103).

- 25 10. Electrical connector (100) according to any of the preceding claims,
wherein the contact cavity (200) has a hold-down device (230) with a contact surface (231),
wherein the contact locking device (300) has a blocking lug (350) with a contact surface (351),
30 wherein the contact surface (351) of the blocking lug (350) is engaged with the contact surface (231) of the hold-down device (230) when the contact locking device

(300) is in the pre-locked position (103) or the final locked position (104).

11. Electrical connector (100) according to any of the
5 preceding claims,
wherein the connector (100) is a high-voltage connector.

12. Connector arrangement (110)
having a connector (100) according to any of claims 1 to
10 11,
and having a connector mating part (500),
wherein the connector (100) can be connected to the
connector mating part (500) when the contact locking
device (300) is in the final locked position (104),
15 wherein the connector (100) cannot be fully connected to
the connector mating part (500) when the contact locking
device (300) is in the pre-locked position (103).

13. Connector arrangement (110) according to claim 12,
20 wherein the contact locking device (300) cannot be moved
out of the final locked position (104) into the pre-
locked position (103) when the connector (100) is
connected to the connector mating part(500).

25 14. Connector arrangement (110) according to one of claims 12
or 13,
wherein the connector mating part (500) is constructed on
the engine unit of a motor vehicle.

30 15. Method for assembling a connector (100),
comprising a contact cavity (200) and a contact locking
device (300), which are constructed as separate parts,
wherein the method comprises the following steps:

- Arrangement of the contact locking device (300) in a receiving area (204), which has a side block (205), of the contact cavity (200) in an assembly position (102);
- Movement of the contact locking device (300) out of the assembly position (102) into a pre-locked position (103);
- Insertion of a contact (400) into the connector (100);
- Movement of the contact locking device (300) out of the pre-locked position (103) into a final locked position (104).

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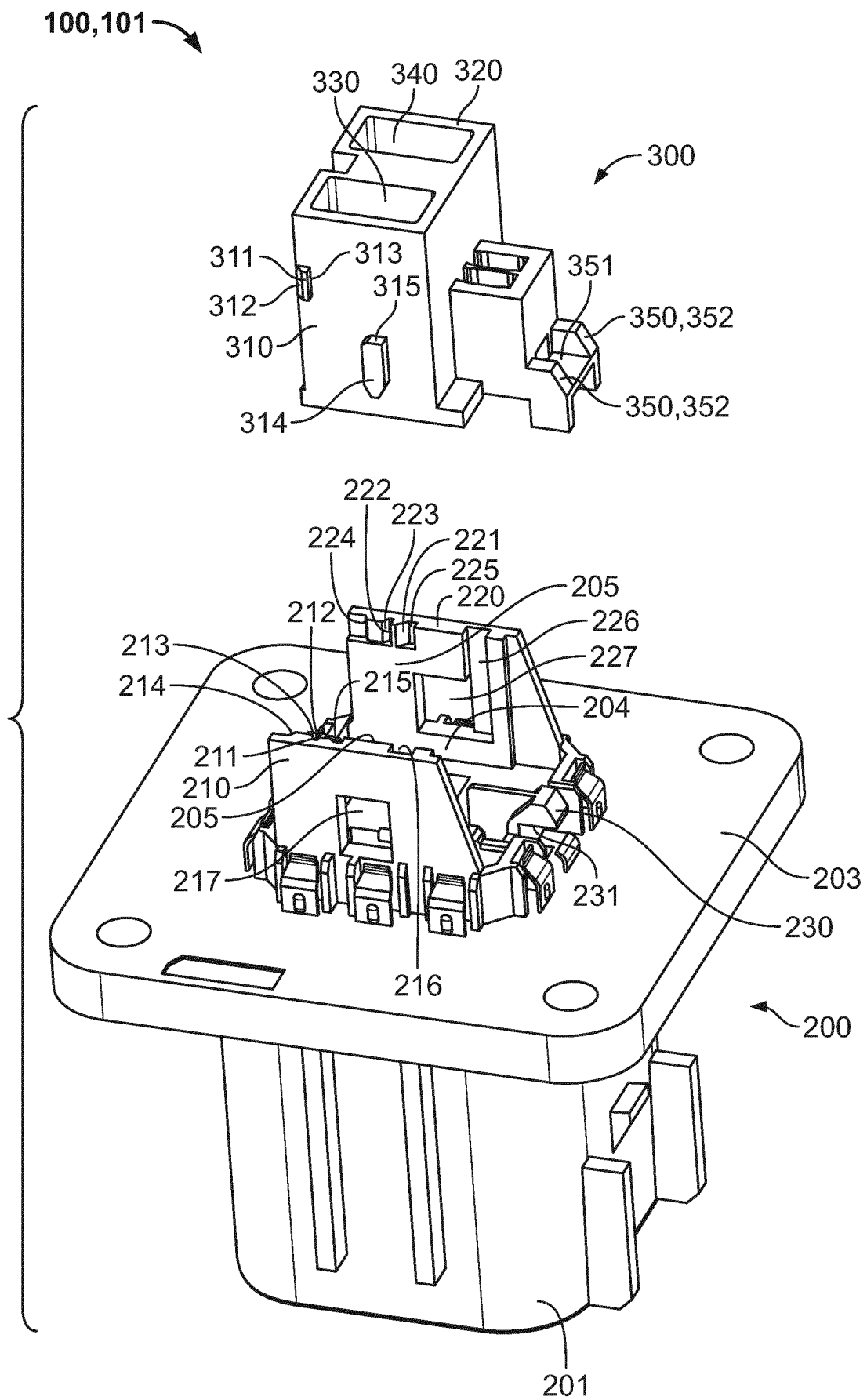


Fig. 1

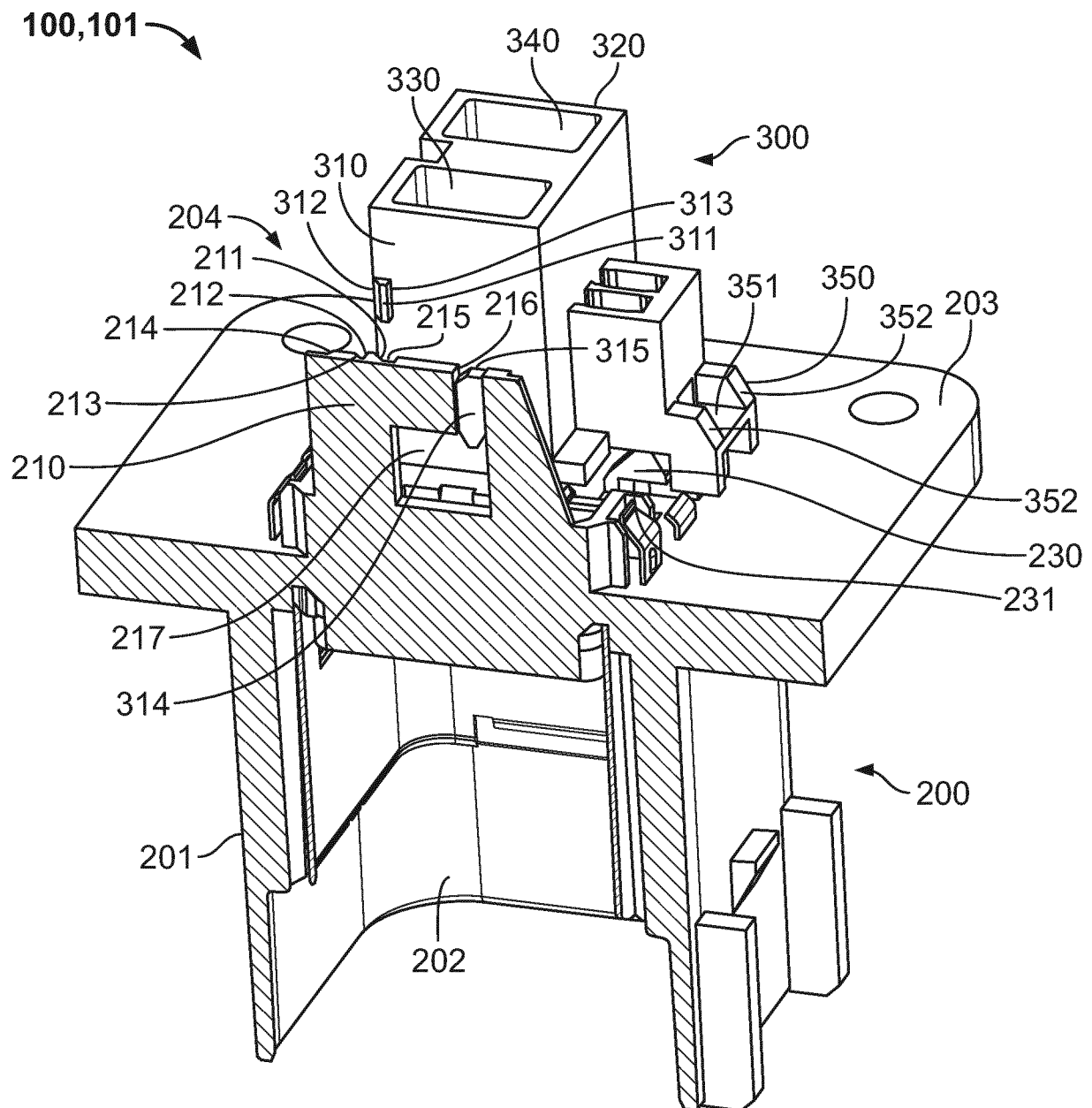


Fig. 2

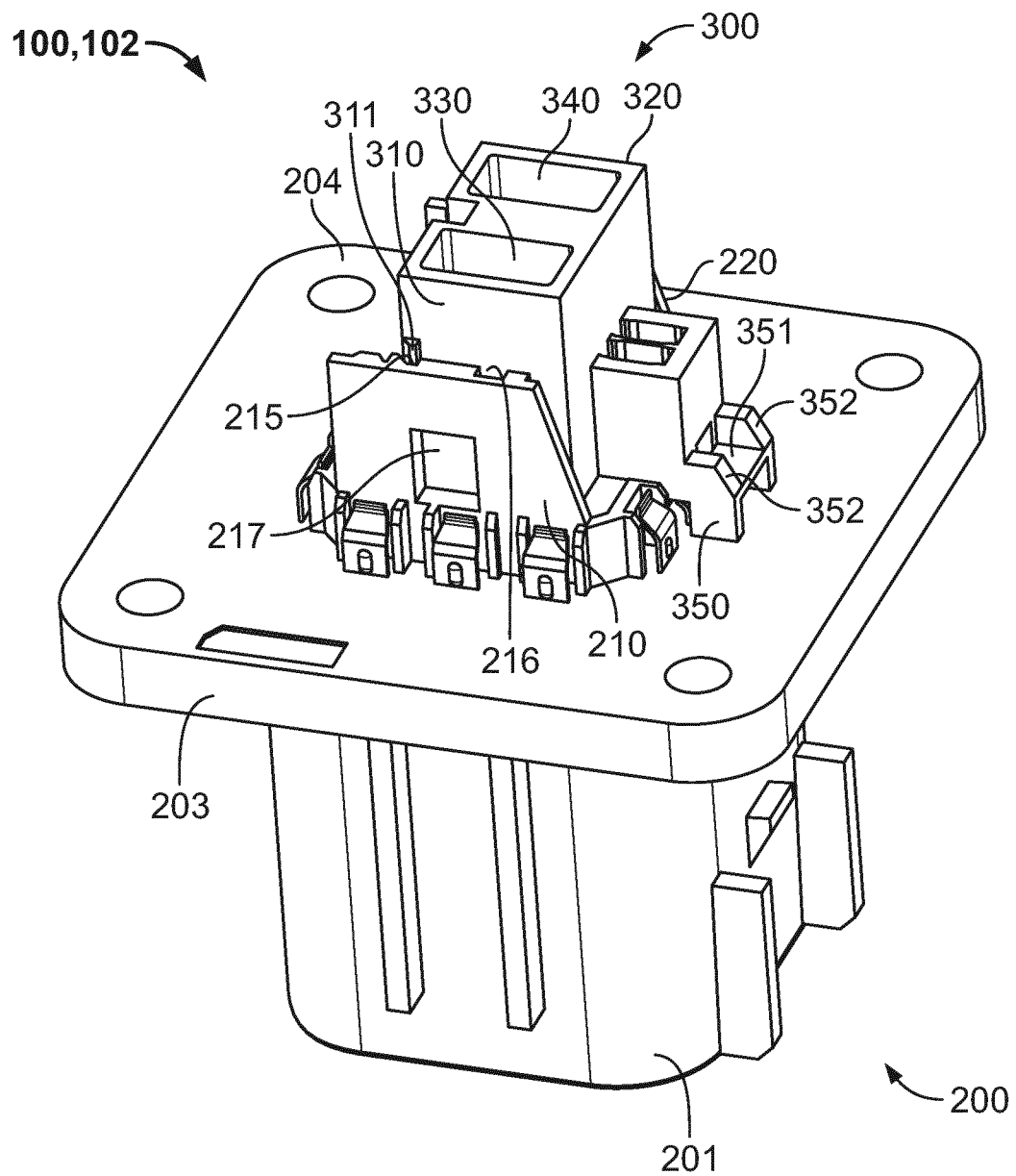


Fig. 3

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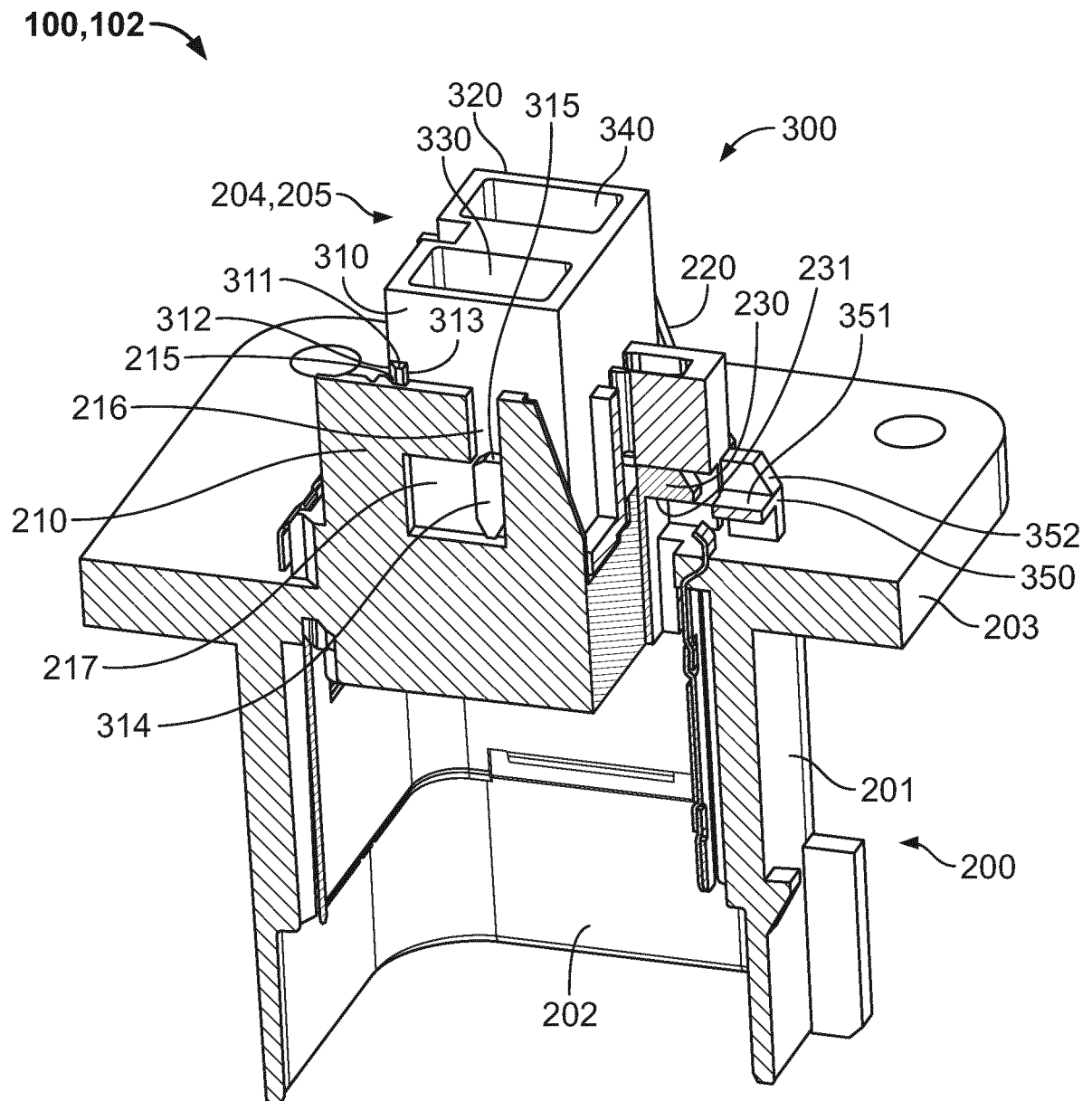


Fig. 4

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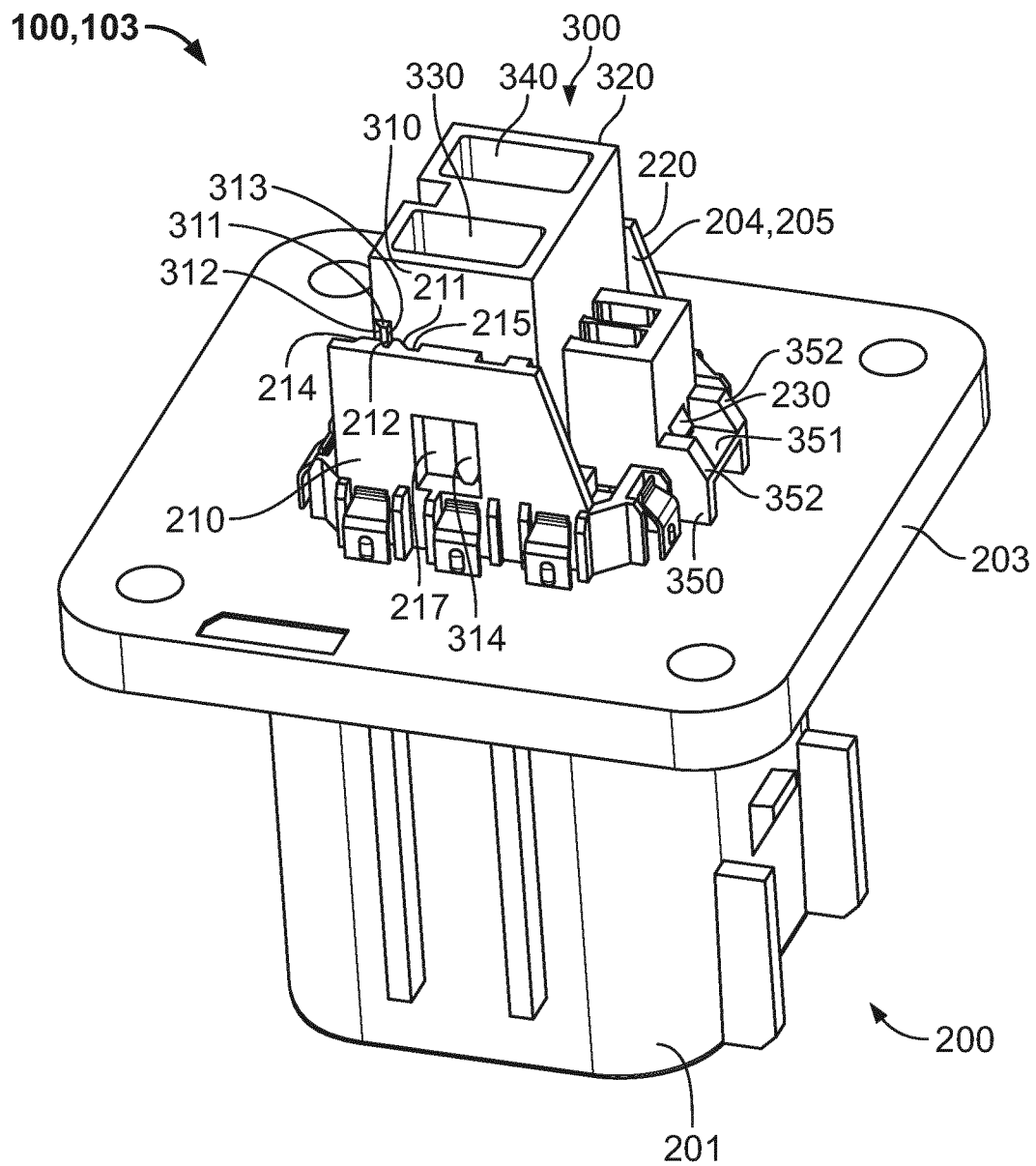


Fig. 5

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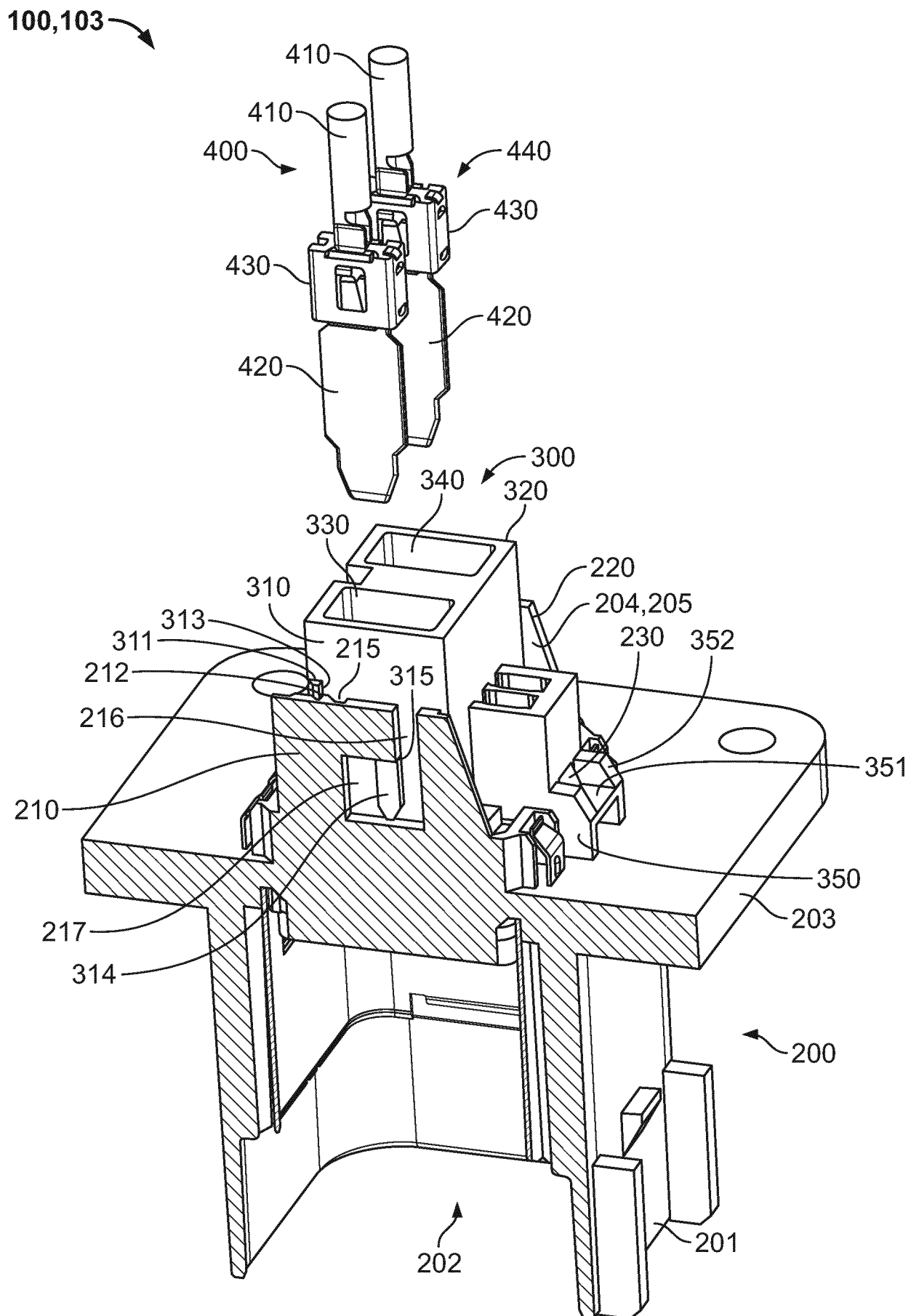


Fig. 6

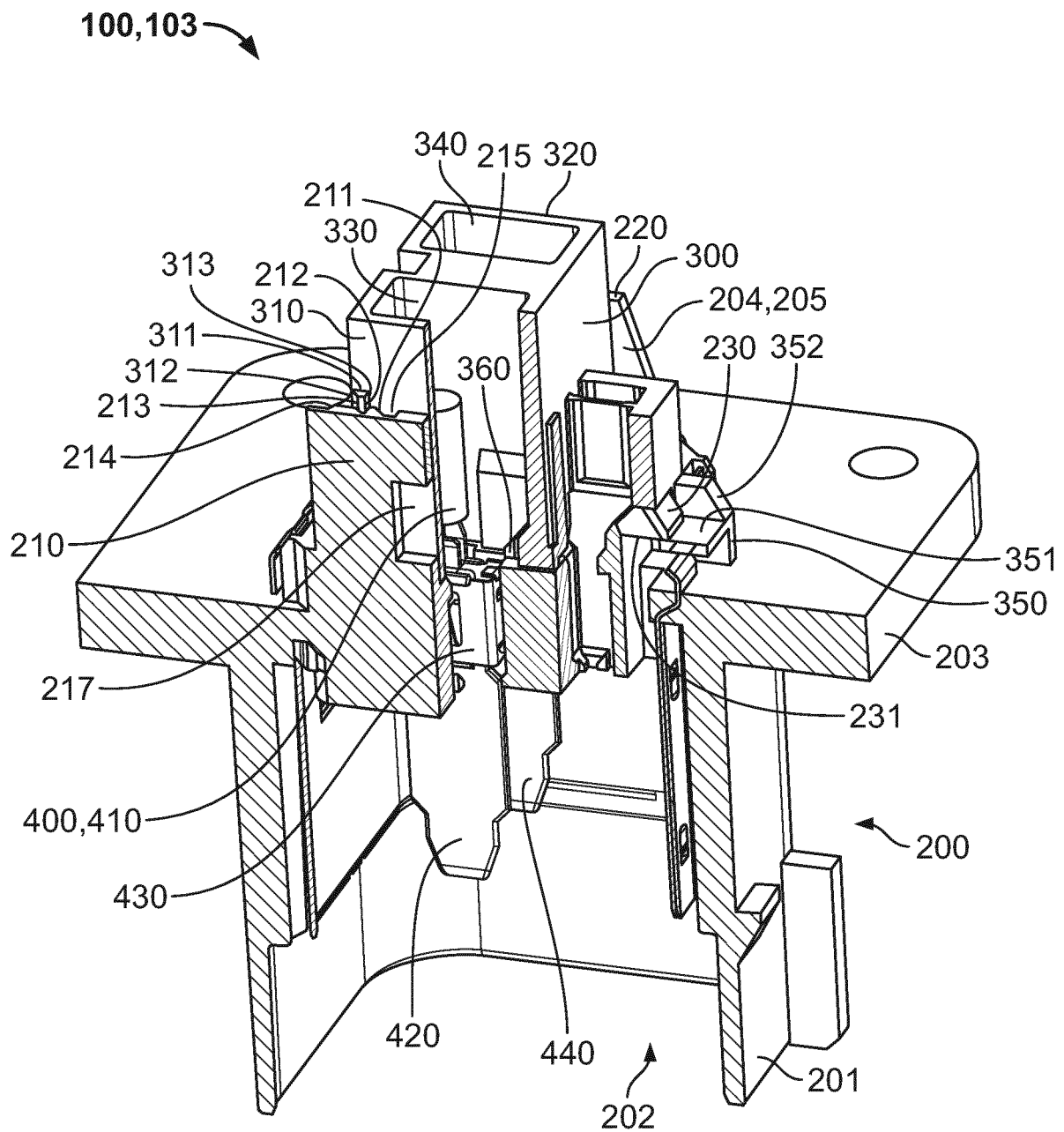


Fig. 7

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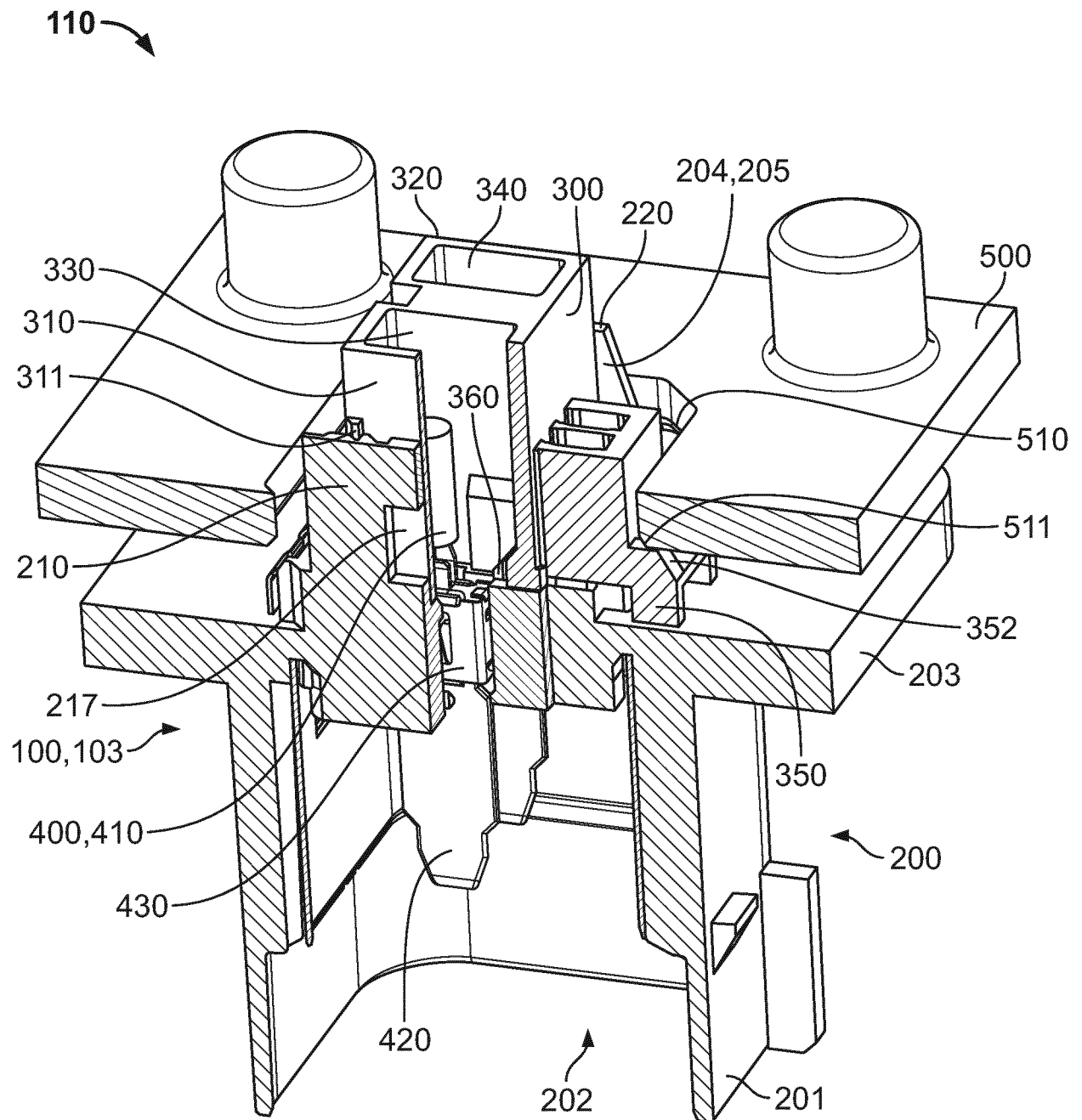


Fig. 8

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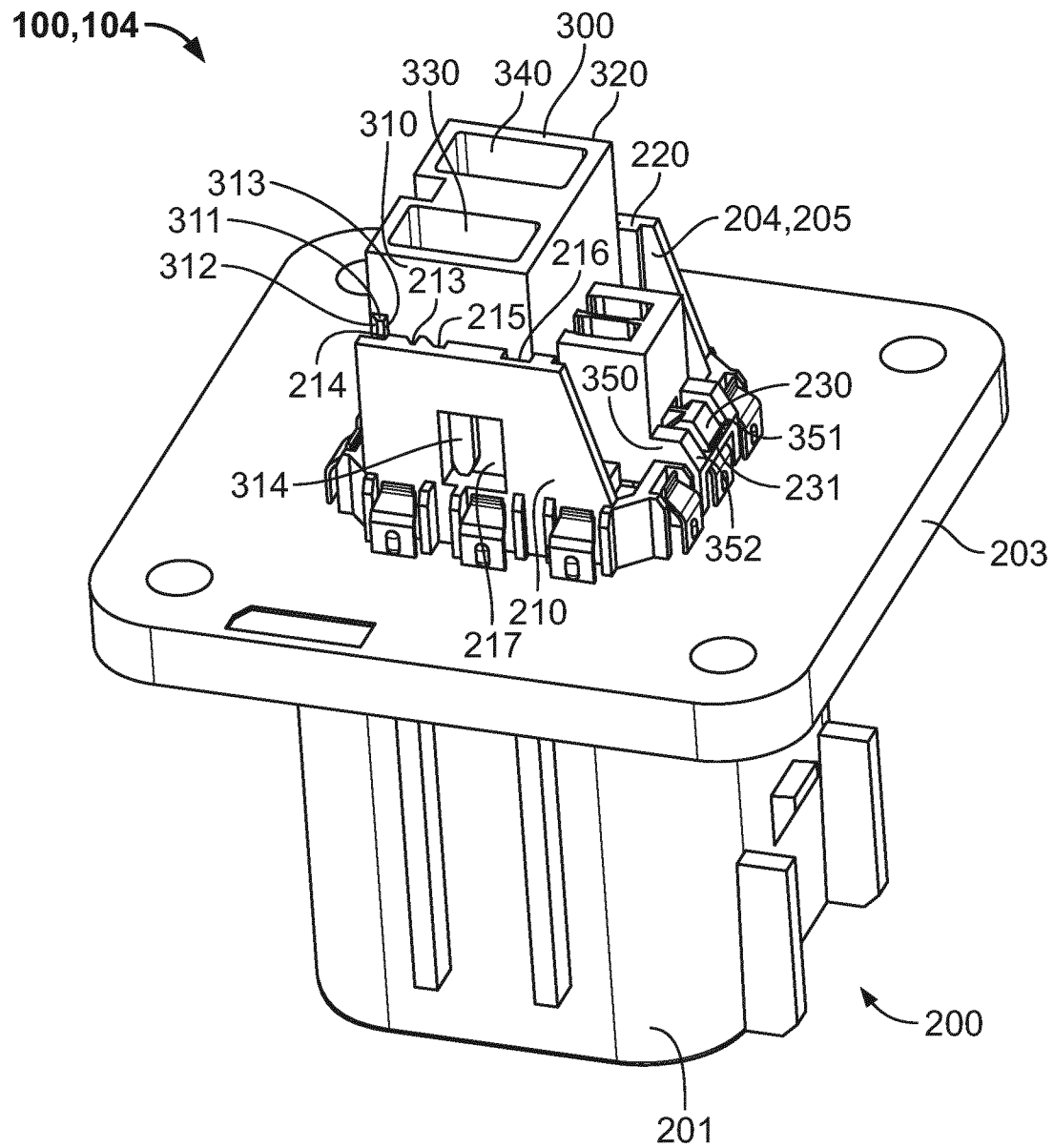


Fig. 9

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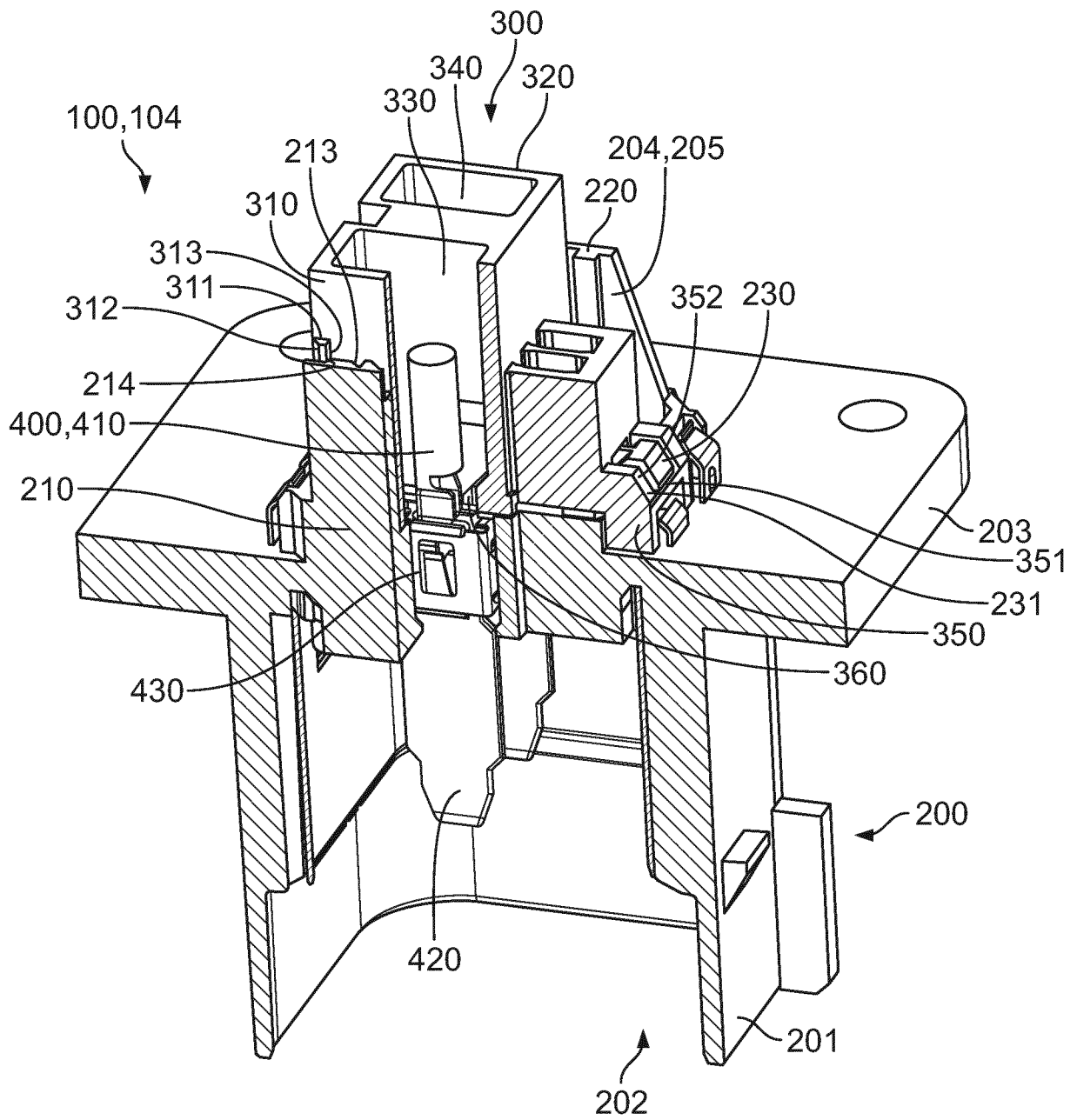


Fig. 10

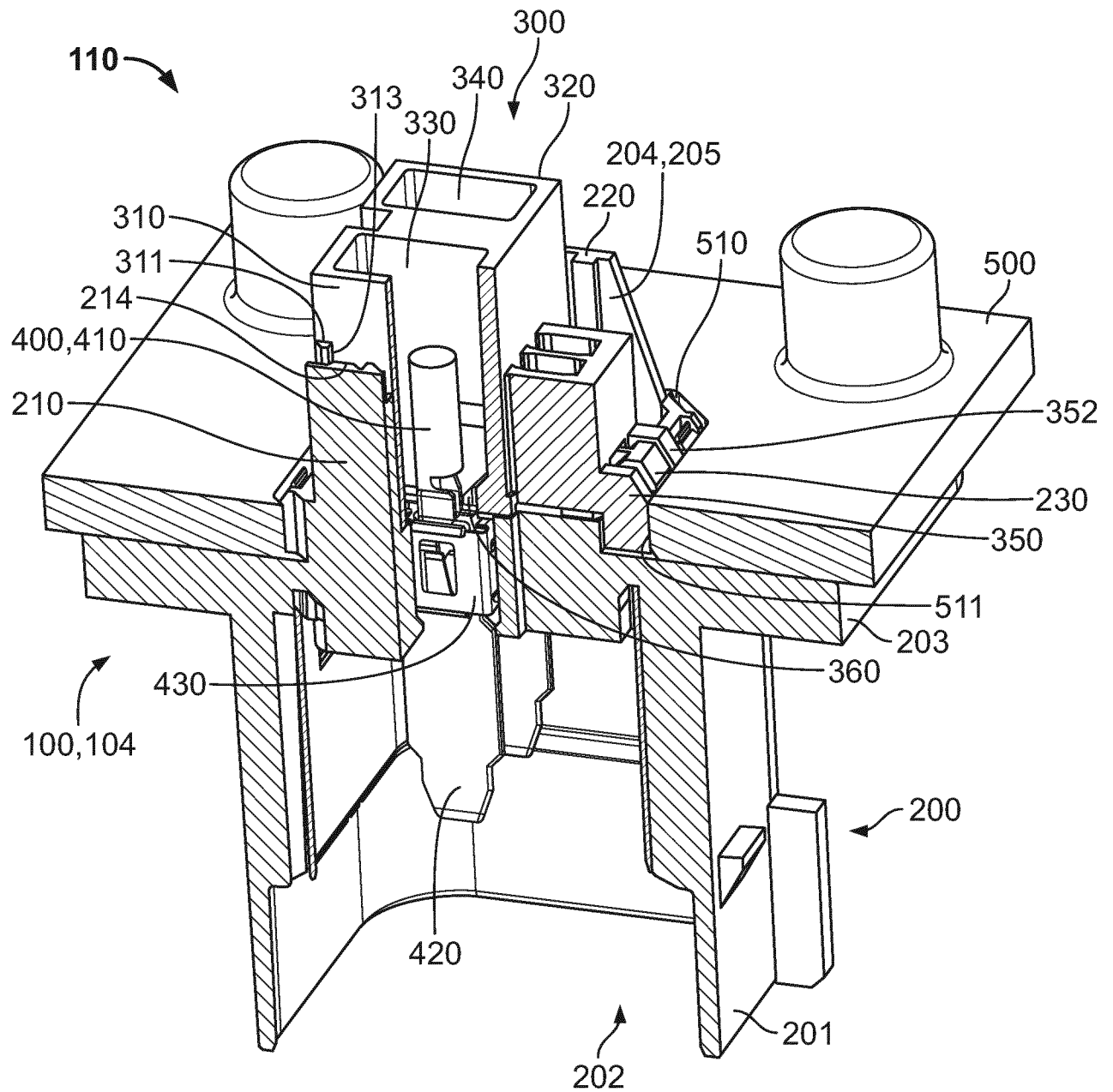


Fig. 11

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/061232

A. CLASSIFICATION OF SUBJECT MATTER
INV. H01R13/436 H01R13/641
ADD. H01R13/639

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

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X Y	US 2009/053916 A1 (TAKAHASHI TOSHIHARU [JP] ET AL) 26 February 2009 (2009-02-26) the whole document -----	1,3-9, 12,13,15 10,11,14
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X	GB 2 364 833 A (YAZAKI CORP [JP]) 6 February 2002 (2002-02-06) the whole document ----- -/-	1



Further documents are listed in the continuation of Box C.



See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

14 August 2013

Date of mailing of the international search report

26/08/2013

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No

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