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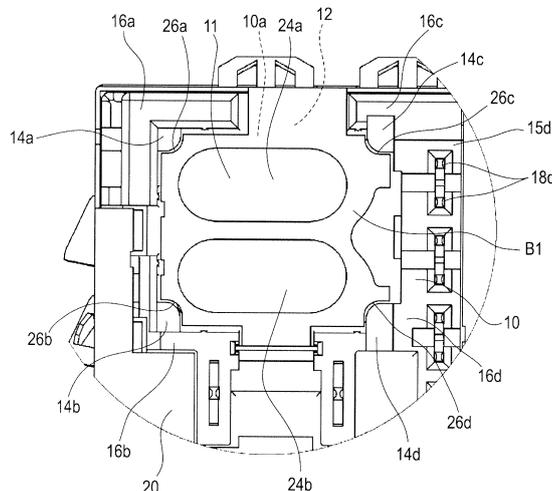
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(54) **SHIELDED CONNECTOR**

(57) A connector housing (10) is provided with: a ferrule insertion hole (11) into which a ferrule is inserted, on one end face (10a) of the housing; and ferrule housing receiving parts (14a-14d) provided protruding in a position that is to the front side, in the mating direction of the ferrule housing, relative to the surface (12) at the periph-

ery of the insertion hole. Notch parts (26a-26d) through which the ferrule housing receiving parts (14a-14d) are inserted are provided in the peripheral edge surface shielding part (B1) of a conductive metal plate shield case (20) that electromagnetically shields the end face (10a) of the housing.

FIG. 5



Description

Technical Field

5 [0001] The present invention relates to a shielded connector.

Background Art

10 [0002] Figs. 8 and 9 illustrate a shielded connector disclosed in Patent Document 1 identified below. This shielded connector 100 is configured such that ferrules supported in a ferrule housing are connectable to the shielded connector 100, and includes a connector housing 110 made of a resin, and a shielding case 210 made from a conductive metal plate and electromagnetically shielding an end surface (a housing end surface) 110a of the connector housing 110.

[0003] The end surface 110a of the connector housing 110 is an end surface that faces the shielding case 210 in the direction X1 in Fig. 8.

15 [0004] The connector housing 110 has, on the end surface 110a, ferrule insertion holes 111 and external connector coupling portions 113.

[0005] A ferrule insertion hole 111 is a hole through which the ferrule supported in the ferrule housing (not shown) is inserted. Although not illustrated in the drawings, an optical connector portion to be butt-joined to the inserted ferrule is provided in a region inward from the ferrule insertion hole 111.

20 [0006] An external connector coupling portion 113 is a terminal receiving portion to which an external connector (not shown) is fitted, the external connector having conductive metal connecting terminals therein. This external connector coupling portion 113 supports terminals 114 to be electrically connected to the connecting terminals provided inside the external connector.

25 [0007] The shielding case 210 includes an end surface shielding plate portion 211 overlying on the end surface 110a, and four side engaging wall portions 212a, 212b, 212c, 212d overlying on four side surfaces of the connector housing 110, the side engaging wall portions 212a, 212b, 212c, 212d being formed by bending along the outer peripheral portion of the end surface shielding plate portion 211.

30 [0008] As illustrated in Fig. 8, the end surface shielding plate portion 211 has an opening 221a for communicating the ferrule insertion hole 111 on the end surface 110a of the connector housing 110 with the outside, and openings 221b, 221c to which protruded portions (e.g., the external connector coupling portions 113 and the like) on the end surface 110a are inserted.

[0009] In the shielding case 210 has a peripheral portion 231 in a region surrounding the openings 221 a, the peripheral portion 231 functioning as a ferrule housing receiving portion which, when contacting a distal end surface of the ferrule housing, positions the ferrule housing in the direction in which the ferrule housing is fitted.

35 [0010] The four side engaging wall portions 212a, 212b, 212c, 212d have engagement protrusions 241 engaging with engagement portions 141 (see Fig. 8) provided on the connector housing 110 when overlying on the four side surfaces of the connector housing 110.

40 [0011] The shielding case 210 is fixed to the connector housing 110 such that the shielding case 210 is attached to the end surface 110a of the connector housing 110 and such that the engagement protrusions 241 on the side engaging wall portions 212a, 212b, 212c, 212d are engaged with the engagement portions 141 on the side surfaces of the connector housing 110.

[0012] The shielding case 210 electromagnetically shields the end surface 110a by covering the connector housing 110 on the side of the end surface 110a so as to allow the ferrule housing and the external connector (not shown) to be fitted.

45 **Prior Art Document**

Patent Document

50 [0013] Patent Document 1: JP 2009-239132 A

Summary of Invention

Problem to be Solved by Invention

55 [0014] In the shielded connector 100 described in Patent Document 1, the shielding case 210 is an article produced by pressing a conductive metal plate, and is a factor in increase of cost and weight. Therefore, for example, under an environment in which there is no leakage of electromagnetic waves affecting an operation from the outside so that electromagnetic shielding is not required, it may be desirable not to use the shielding case 210 so as to reduce the cost

and weight of the connector.

[0015] However, according to the shielded connector 100 of Patent Document 1, the peripheral portion 231 of the shielding case 210 is used as a ferrule housing receiving portion to position the ferrule housing. Therefore, if the shielding case 210 is not used, the ferrule housing having a ferrule fitted in the ferrule insertion hole 111 is uplifted from the end surface 110a of the connector housing 110 by an amount corresponding to the thickness of the peripheral portion 231, whereby a clearance along the fitting direction is increased. Therefore, the shielded connector 100 of Patent Document 1 has a problem in that, in order to avoid an increase in the clearance in the fitting direction, the shielding case 210 is unavoidably used even under an environment not requiring electromagnetic shielding.

[0016] Accordingly, it is an object of the present invention to solve the aforementioned problem, and to provide a shielded connector which allows a ferrule housing to be attached directly to a housing end surface of a connector housing without attaching a shielding case to the housing end surface under an environment not requiring electromagnetic shielding so that the cost and weight can be reduced by not providing the shielding case.

Means for Solving the Problem

[0017] The above object of the present invention is achieved by the following configuration. (1) A shielded connector including a connector housing and a shielding case, the connector housing including, on a housing end surface, a ferrule insertion hole into which a ferrule supported in a ferrule housing is inserted, a ferrule housing receiving portion provided to a location in front of an insertion hole peripheral surface with respect to a fitting direction of the ferrule housing, the insertion hole peripheral surface being a portion of the housing end surface along a periphery of the ferrule insertion hole, so as to contact a distal end surface of the ferrule housing to position the ferrule housing in the fitting direction, and a plurality of external connector coupling portions to which external connectors having conductive metal connecting terminals therein are fitted, and the shielding case being made of a conductive metal plate and covering the connector housing on a side of the housing end surface to electromagnetically shield the housing end surface while allowing the ferrule housing and the external connectors to be fitted, wherein a notch is provided in an peripheral surface shielding portion of the shielding case that covers the insertion hole peripheral surface so as to allow the ferrule housing receiving portion to pass through and to avoid a contact between the ferrule housing receiving portion and the peripheral surface shielding portion when placing the peripheral surface shielding portion over the insertion hole peripheral surface.

[0018] (2) The shielded connector according to (1) described above, in which the shielding case includes a post-attaching cover that is attachable and removable with respect to the peripheral surface shielding portion and is attached to the peripheral surface shielding portion to close the ferrule insertion hole when the ferrule housing is not attached.

[0019] According to the configuration (1), in the insertion hole peripheral surface corresponding to a part of the housing end surface of the connector housing and corresponding to the edge portion of the ferrule insertion hole, the ferrule housing receiving portion coming into contact with the ferrule housing for positioning the ferrule housing is provided. Even when the shielding case is attached to the housing end surface of the connector housing, the ferrule housing receiving portion is inserted through the notch provided in the peripheral surface shielding portion of the shielding case, and is disposed at the location in front of the peripheral surface shielding portion of the shielding case with respect to the fitting direction, and thus, the ferrule housing can be positioned in the fitting direction.

[0020] In other words, according to the configuration (1), the shielding case does not affect the accuracy in positioning the ferrule housing to be attached to the housing end surface of the connector housing. Therefore, under an environment not requiring electromagnetic shielding, the ferrule housing can be attached directly to the housing end surface of the connector housing without attaching the shielding case to the housing end surface. Since the shielding case is thus not provided, the cost can be reduced and the weight of the connector can be reduced.

[0021] According to the configuration (2), if the ferrule housing is not attached, the ferrule insertion opening is covered by attaching the post-attaching cover to the peripheral surface shielding portion of the shielding case, and thus, dust and the like can be prevented from entering the connector housing. In addition, if the post-attaching cover is made of a conductive metal, the electromagnetic shielding performance can be also improved.

[0022] The present invention has been briefly described above. The present invention will be further apparent by reading through the following description of an embodiment of the present invention (hereinafter "embodiment") with reference to the accompanying drawings.

Brief Description of Drawings

[0023]

Fig. 1 is a perspective view of a state before attaching a post-attaching cover to a shielding case attached to a housing end surface of a connector housing according to an embodiment of the present invention.

Fig. 2 is a perspective view of a state where the post-attaching cover of Fig. 1 is attached to the shielding case.

Fig. 3 is a front view of the housing end surface of the connector housing of Fig. 1.

Fig. 4 is a front view of the shielding case of Fig. 1.

Fig. 5 is an enlarged front view illustrating the positional relationship between a notch provided in an peripheral surface shielding portion of the shielding case of Fig. 1 and a ferrule housing receiving portion of the connector housing.

Fig. 6 is a front view of a reference example of a connector housing to which the shielding case of the embodiment of the present invention can be attached.

Fig. 7 is a cross-sectional view taken on line A-A of Fig. 6.

Fig. 8 is an exploded perspective view of a conventional shielded connector.

Fig. 9 is a perspective view illustrating a structure around a ferrule insertion hole of the shielded connector of Fig. 8.

Embodiments of Invention

[0024] A preferable embodiment of a shielded connector of the present invention will now be described in detail with reference to the accompanying drawings.

[0025] The shielded connector 1 according to one embodiment of the present invention includes, as illustrated in Figs. 1 and 2, a connector housing 10 made of an insulating resin, a shielding case 20 made of a conductive metal plate to be attached to a housing end surface 10a of the connector housing 10, and a post-attaching cover 30 attachable and removable with respect to the shielding case 20.

[0026] As illustrated in Fig. 3, the connector housing 10 includes, on the housing end surface 10a, a ferrule insertion hole 11 through which a ferrule supported in a ferrule housing (not shown) is inserted, a plurality of ferrule housing receiving portions 14a, 14b, 14c, 14d used for positioning a tip of the ferrule housing (not shown), a plurality of external connector coupling portions 15a, 15b, 15c, 15d, and external equipment engagement portions 19a, 19b, 19c.

[0027] In the present embodiment, the ferrule insertion hole 11 is a substantially rectangular opening as illustrated in Fig. 3. Although not illustrated in the drawings, an optical connector portion to be butt-joined to a ferrule inserted into the ferrule insertion hole 11 is provided in an inner portion of the ferrule insertion hole 11.

[0028] The ferrule housing receiving portions 14a, 14b, 14c, 14d are provided to protrude at locations in front of an insertion hole peripheral surface 12 with respect to a fitting direction of the ferrule housing (a direction X2 in Fig. 1), the insertion hole peripheral surface 12 being a portion of the housing end surface 10a of the connector housing 10 along the periphery of the ferrule insertion hole 11.

[0029] Besides, the ferrule housing receiving portions 14a, 14b, 14c, 14d are respectively disposed in the vicinity of four corners of the rectangular opening of the ferrule insertion hole 11 so as to respectively come into contact with the four corners of a distal end surface of the ferrule housing.

[0030] More specifically, the ferrule housing receiving portion 14a is provided on a wall 16a, which is formed to protrude along the fitting direction of the ferrule housing from the insertion hole peripheral surface 12 in a position outside the upper left corner of the ferrule insertion hole 11 in Fig. 3, to be spaced from the insertion hole peripheral surface 12 by a prescribed distance, so as to protrude in a direction perpendicular to the fitting direction. The ferrule housing receiving portion 14b is provided on a wall 16b, which is formed to protrude along the fitting direction of the ferrule housing from the insertion hole peripheral surface 12 in a position outside the lower left corner of the ferrule insertion hole 11 in Fig. 3, to be spaced from the insertion hole peripheral surface 12 by a prescribed distance, so as to protrude in the direction perpendicular to the fitting direction. The ferrule housing receiving portion 14c is provided on a wall 16c, which is formed to protrude along the fitting direction of the ferrule housing from the insertion hole peripheral surface 12 in a position outside the upper right corner of the ferrule insertion hole 11 in Fig. 3, to be spaced from the insertion hole peripheral surface 12 by a prescribed distance, so as to protrude in the direction perpendicular to the fitting direction. The ferrule housing receiving portion 14d is provided on a wall 16d, which is formed to protrude along the fitting direction of the ferrule housing from the insertion hole peripheral surface 12 in a position outside the lower right corner of the ferrule insertion hole 11 in Fig. 3, to be spaced from the insertion hole peripheral surface 12 by a prescribed distance, so as to protrude in the direction perpendicular to the fitting direction.

[0031] When the ferrule supported on the ferrule housing is completely inserted into the ferrule insertion hole 11, the ferrule housing receiving portions 14a, 14b, 14c, 14d are in contact with the four corners of the distal end surface of the ferrule housing for determining the position of the ferrule housing in the fitting direction. In other words, the ferrule housing receiving portions 14a, 14b, 14c, 14d position the ferrule housing at a completely fitted position.

[0032] The external connector coupling portions 15a, 15b, 15c, 15d are portions to which external connectors (not shown) are fitted, each of the external connectors having conductive metal connecting terminals therein. The external connector coupling portions 15a, 15b, 15c, 15d are provided to protrude beyond the housing end surface 10a. The external connector coupling portions 15a, 15b, 15c, 15d respectively support, as illustrated in Fig. 1, connecting terminals 18a, 18b, 18c and 18d made of a conductive metal to be electrically connected to the connecting terminals provided within the external connectors (not shown).

[0033] Each of the external equipment engagement portions 19a, 19b, 19c is a portion used as engaging means for equipment or the like provided outside the housing end surface 10a of the connector housing 10, and is provided to protrude on the housing end surface 10a.

5 [0034] The shielding case 20 is an article produced by pressing a conductive metal plate, and includes, as illustrated in Figs. 1 and 4, a substantially rectangular end surface opposing plate portion 21 covering the housing end surface 10a of the connector housing 10, and four side engaging plate portions 22a, 22b, 22c, 22d respectively extending from the peripheral four sides of the end surface opposing plate portion 21 to be engaged with the four side surfaces of the connector housing 10.

10 [0035] The end surface opposing plate portion 21 of the shielding case 20 overlays, as illustrated in Fig. 1, the housing end surface 10a of the connector housing 10 to cover the housing end surface 10a. This end surface opposing plate portion 21 includes, as illustrated in Fig. 4, various insertion openings 23a, 23b, 23c for respectively inserting portions protruding on the housing end surface 10a, and ferrule insertion openings 24a, 24b provided in a position corresponding to the ferrule insertion hole 11.

15 [0036] The portions protruding on the housing end surface 10a refer to the external connector coupling portions 15a, 15b, 15c, 15d, the external equipment engagement portions 19a, 19b, 19c and the like.

[0037] The ferrule insertion openings 24a, 24b are openings for inserting the ferrule supported on the ferrule housing (not shown).

20 [0038] A portion B1 corresponding to a region, on the end surface opposing plate portion 21 of the shielding case 20, around the ferrule insertion openings 24a, 24b is a peripheral surface shielding portion covering the insertion hole peripheral surface 12. This peripheral surface shielding portion B1 electromagnetically shields the surrounding region of a ferrule insertion portion.

25 [0039] In the present embodiment, since the shielding case 20 includes, on the end surface opposing plate portion 21, the various insertion openings 23a, 23b, 23c and the ferrule insertion openings 24a, 24b, the housing end surface 10a of the connector housing 10 can be electromagnetically shielded by covering the connector housing 10 on the side of the housing end surface 10a such that the ferrule housing and the external connectors can be fitted therein.

30 [0040] Besides, as illustrated in Figs. 4 and 5, the shielding case 20 of the present embodiment includes, in the peripheral surface shielding portion B1 covering the insertion hole peripheral surface 12, notches 26a, 26b, 26c, 26d through which the ferrule housing receiving portions 14a, 14b, 14c, 14d pass when placing the peripheral surface shielding portion B1 over the insertion hole peripheral surface 12. Here, the notch 26a is a notch for inserting the ferrule housing receiving portion 14a, the notch 26b is a notch for inserting the ferrule housing receiving portion 14b, the notch 26c is a notch for inserting the ferrule housing receiving portion 14c, and the notch 26d is a notch for inserting the ferrule housing receiving portion 14d.

35 [0041] Since the shielding case 20 of the present embodiment includes the notches 26a, 26b, 26c, 26d, when it is attached to the housing end surface 10a of the connector housing 10, as illustrated in Fig. 5, the ferrule housing receiving portions 14a, 14b, 14c, 14d are located in front of the peripheral surface shielding portion B1 with respect to the fitting direction.

40 [0042] The post-attaching cover 30 is configured to be detachable attached to the peripheral surface shielding portion B1. This post-attaching cover 30 is attached to the peripheral surface shielding portion B1 as illustrated in Fig. 2 when a ferrule housing is not attached to the connector housing 10 as illustrated in Fig. 1, and thus, the ferrule insertion openings 24a, 24b of the shielding case 20 can be covered. The post-attaching cover 30 is preferably made of a conductive metal plate to achieve an electromagnetic shielding function.

45 [0043] In the shielded connector 1 of the present embodiment described so far, the ferrule housing receiving portions 14a, 14b, 14c, 14d to be brought into contact with a ferrule housing for positioning the ferrule housing are provided in the insertion hole peripheral surface 12 that is a part of the housing end surface 10a of the connector housing 10 and corresponds to the edge portion of the ferrule insertion hole 11. Even when the shielding case 20 is attached onto the housing end surface 10a of the connector housing 10, these ferrule housing receiving portions 14a, 14b, 14c, 14d are respectively inserted through the notches 26a, 26b, 26c, 26d provided on the peripheral surface shielding portion B1 of the shielding case 20, so as to be disposed at locations in front of the peripheral surface shielding portion B1 of the shielding case 20 with respect to the fitting direction,, and thus, the ferrule housing can be positioned in the fitting direction.

50 [0044] In other words, in the shielded connector 1 of the present embodiment, the accuracy in positioning a ferrule housing to be attached to the housing end surface 10a of the connector housing 10 is not affected by the shielding case 20. Therefore, under an environment not requiring electromagnetic shielding, a ferrule housing can be attached directly to the housing end surface 10a without attaching the shielding case 20 to the housing end surface 10a of the connector housing 10. Thus, the shielding case 20 is not provided, so that the cost can be reduced and the weight of the connector can be reduced.

55 [0045] Besides, in the shielded connector 1 of the present embodiment, if a ferrule housing is not attached, the ferrule insertion openings 24a, 24b are covered by attaching the post-attaching cover 30 to the peripheral surface shielding portion B1 of the shielding case 20 as illustrated in Fig. 2, and thus, dust and the like can be prevented from entering

the connector housing 10.

[0046] In addition, if the post-attaching cover 30 is made of a conductive metal, the electromagnetic shielding performance can be also improved.

[0047] Figs. 6 and 7 are a front view and a cross-sectional view of a reference example of a connector housing to which the shielding case according to an embodiment of the present invention can be attached.

[0048] The connector housing 10A is obtained by partially changing the structure of the connector housing 10 of the aforementioned embodiment, and has the same structure as the connector housing 10 of the aforementioned embodiment except for the changes. With respect to the same structure as the connector housing 10 of the aforementioned embodiment, the same reference numerals are used and the description thereof will be omitted.

[0049] In the connector housing 10A of the reference example, the change from the connector housing 10 of the aforementioned embodiment is that the ferrule insertion hole 11 is not provided and, instead, a closing wall 40 is formed integrally with the housing end surface 10a.

[0050] The connector housing 10A of the reference example is produced by diverting a mold used for molding the connector housing 10 of the aforementioned embodiment. The closing wall 40 of the connector housing 10A is molded integrally with the housing end surface 10a by putting a metal piece in the mold used for molding the connector housing 10 so as to additionally form a cavity for forming the closing wall 40 by the metal piece.

[0051] The connector housing 10A of the reference example is used instead of the connector housing 10 when it is determined in advance that a ferrule housing is not connected. By using the connector housing 10A of the reference example in such a case, there is no need to perform an operation of attaching the post-attaching cover 30, and hence the working efficiency can be improved.

[0052] The present invention is not limited to the aforementioned embodiments, but modifications, improvements and the like can be appropriately made. In addition, the materials, the shapes, the dimensions, the numbers, the positions and the like of the respective elements described in the aforementioned embodiments are optional and non-limiting as long as the present invention can be accomplished.

[0053] For example, the shape and the number of ferrule insertion holes, and the shape and the number of external connector coupling portions provided on the housing end surface of the connector housing can be appropriately changed in the design. When the shape or the number of ferrule insertion holes or external connector coupling portions provided on the housing end surface of the connector housing is changed, the shape or the number of insertion openings or ferrule insertion openings provided on the end surface opposing plate portion of the shielding case may of course be changed correspondingly.

[0054] Here, features of the shielded connector according to the embodiment of the present invention described above are briefly summarized in the following [1] and [2]:

[0055] [1] A shielded connector (1), including: a connector housing (10) including, on a housing end surface (10a), a ferrule insertion hole (11) into which a ferrule supported in a ferrule housing is inserted, a ferrule housing receiving portion (14a, 14b, 14c, 14d) provided to protrude to a location in front of an insertion hole peripheral surface (12) with respect to a fitting direction of the ferrule housing, the insertion hole peripheral surface (12) being a portion of the housing end surface (10a) along a periphery of the ferrule insertion hole (11), so as to contact a distal end surface of the ferrule housing to position the ferrule housing in the fitting direction, and a plurality of external connector coupling portions (15a, 15b, 15c, 15d) to which which external connectors having conductive metal connecting terminals therein are fitted; and a shielding case (20) made of a conductive metal plate, the shielding case (20) covering the connector housing on a side of the housing end surface (10a) to electromagnetically shield the housing end surface (10a) while allowing the ferrule housing and the external connectors to be fitted, wherein a notch (26a, 26b, 26c or 26d) is provided in an peripheral surface shielding portion (B1) of the shielding case (20) that covers the insertion hole peripheral surface (12) so as to allow the ferrule housing receiving portion (14a, 14b, 14c, 14d) to pass through and to avoid a contact between the ferrule housing receiving portion (14a, 14b, 14c, 14d) and the peripheral surface shielding portion (B1) when placing the peripheral surface shielding portion (B1) over the insertion hole peripheral surface (12).

[0056] [2] The shielded connector (1) according to [1] above, in which the shielding case (20) includes a post-attaching cover (30) that is attachable and removable with respect to the peripheral surface shielding portion (B1) and is attached to the peripheral surface shielding portion (B1) to close the ferrule insertion hole (11) when the ferrule housing is not attached.

[0057] This application is based on Japanese Patent Application No. 2012-254258 filed on November 20, 2012, the content of which is incorporated herein by reference.

Industrial Applicability

[0058] According to the shielded connector of the present invention, since the shielding case does not affect the accuracy in positioning a ferrule housing in the fitting direction, and therefore, under an environment not requiring electromagnetic shielding, the ferrule housing is attached directly to the housing end surface without attaching the

shielding case to the housing end surface of the connector housing, and thus, the cost and weight can be reduced.

List of Reference Signs

5	[0059]	
	1	shielded connector
	10	connector housing
	10a	housing end surface
10	11	ferrule insertion hole
	12	insertion hole peripheral surface
	14a, 14b, 14c, 14d	ferrule housing receiving portions
	15a, 15b, 15c, 15d	external connector coupling portions
	20	shielding case
15	26a, 26b, 26c, 26d	notches
	30	post-attaching cover
	B1	peripheral surface shielding portion

20 **Claims**

1. A shielded connector comprising:

25 a connector housing including, on a housing end surface thereof, a ferrule insertion hole into which a ferrule supported in a ferrule housing is inserted, a ferrule housing receiving portion provided to protrude to a location in front of an insertion hole peripheral surface with respect to a fitting direction of the ferrule housing, the insertion hole peripheral surface being a portion of the housing end surface along a periphery of the ferrule insertion hole, so as to contact a distal end surface of the ferrule housing to position the ferrule housing in the fitting direction, and a plurality of external connector coupling portions to which external connectors having conductive metal connecting terminals therein are fitted; and

30 a shielding case made of a conductive metal plate, the shielding case covering the connector housing on a side of the housing end surface to electromagnetically shield the housing end surface while allowing the ferrule housing and the external connectors to be fitted,

35 wherein a notch is provided in an peripheral surface shielding portion of the shielding case that covers the insertion hole peripheral surface so as to allow the ferrule housing receiving portion to pass through and to avoid a contact between the ferrule housing receiving portion and the peripheral surface shielding portion when placing the peripheral surface shielding portion over the insertion hole peripheral surface.

40 2. The shielded connector according to claim 1, wherein the shielding case includes a post-attaching cover that is attachable and removable with respect to the peripheral surface shielding portion and is attached to the peripheral surface shielding portion to close the ferrule insertion hole when the ferrule housing is not attached.

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FIG. 1

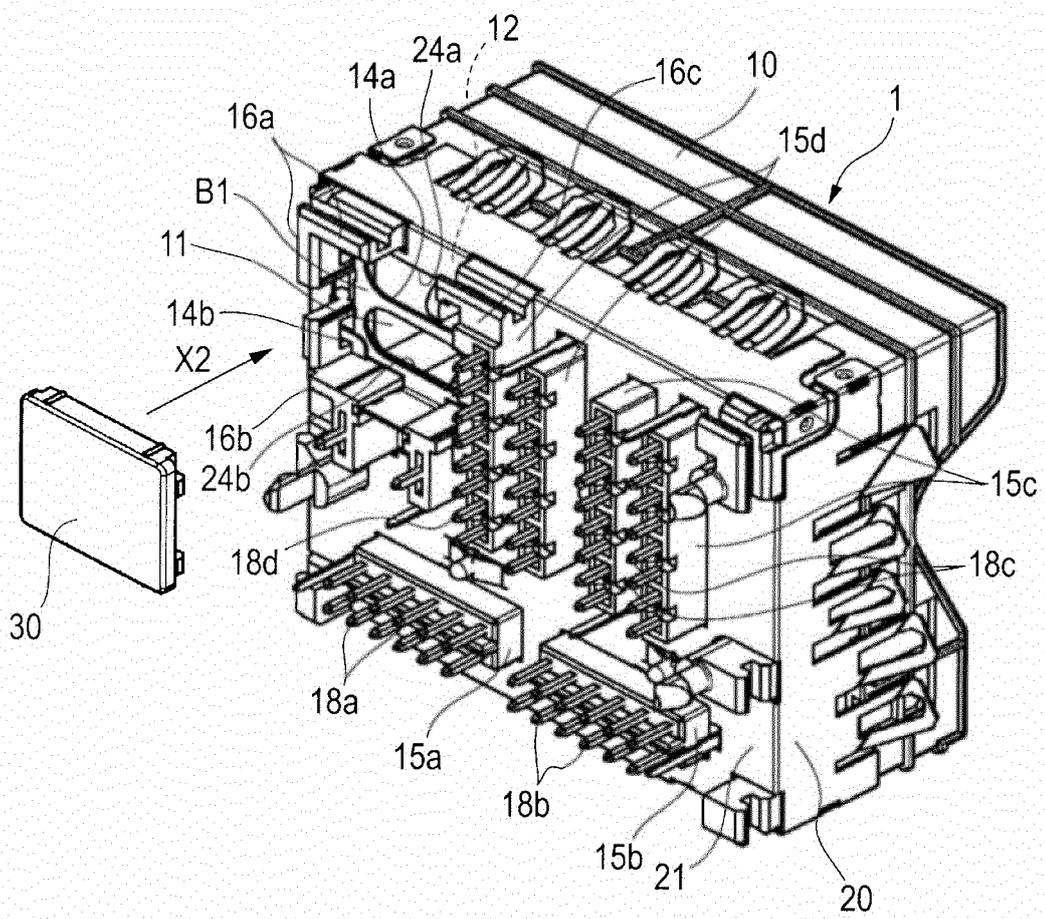


FIG. 2

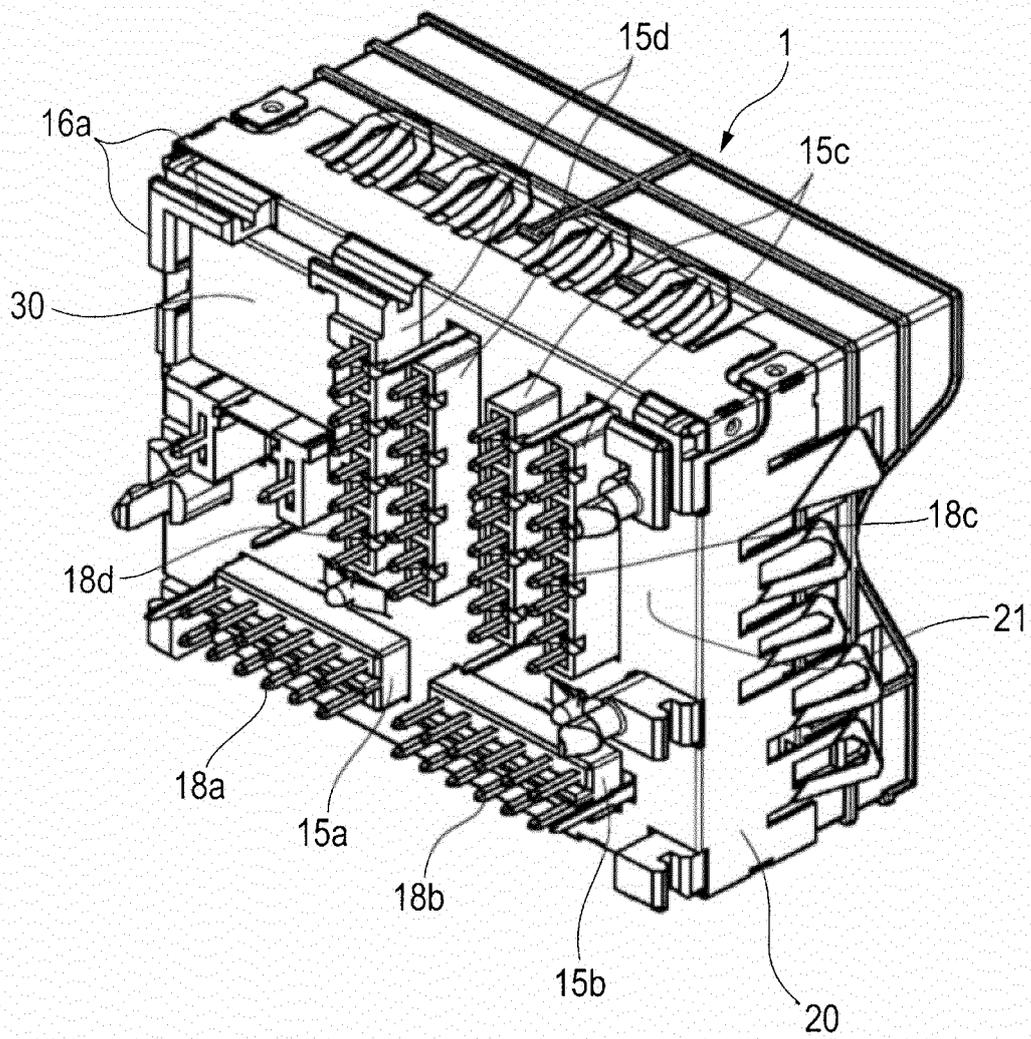


FIG. 3

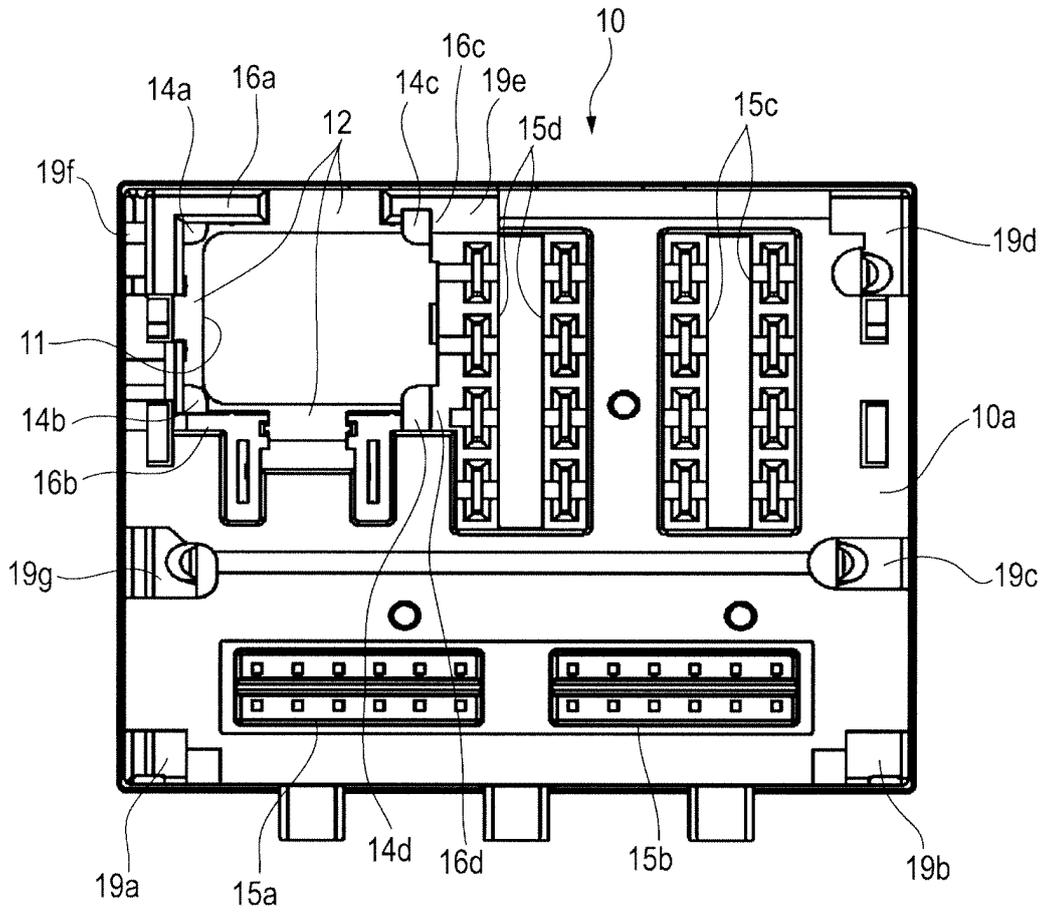


FIG. 4

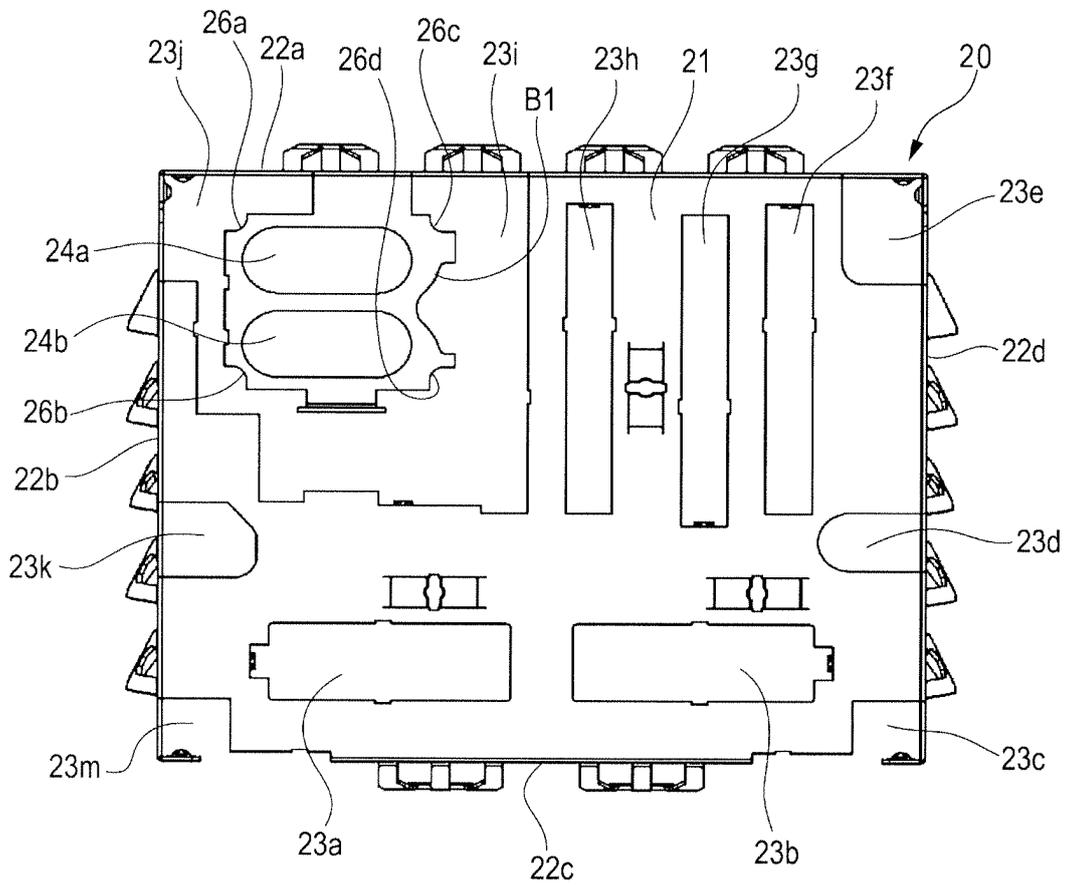


FIG. 5

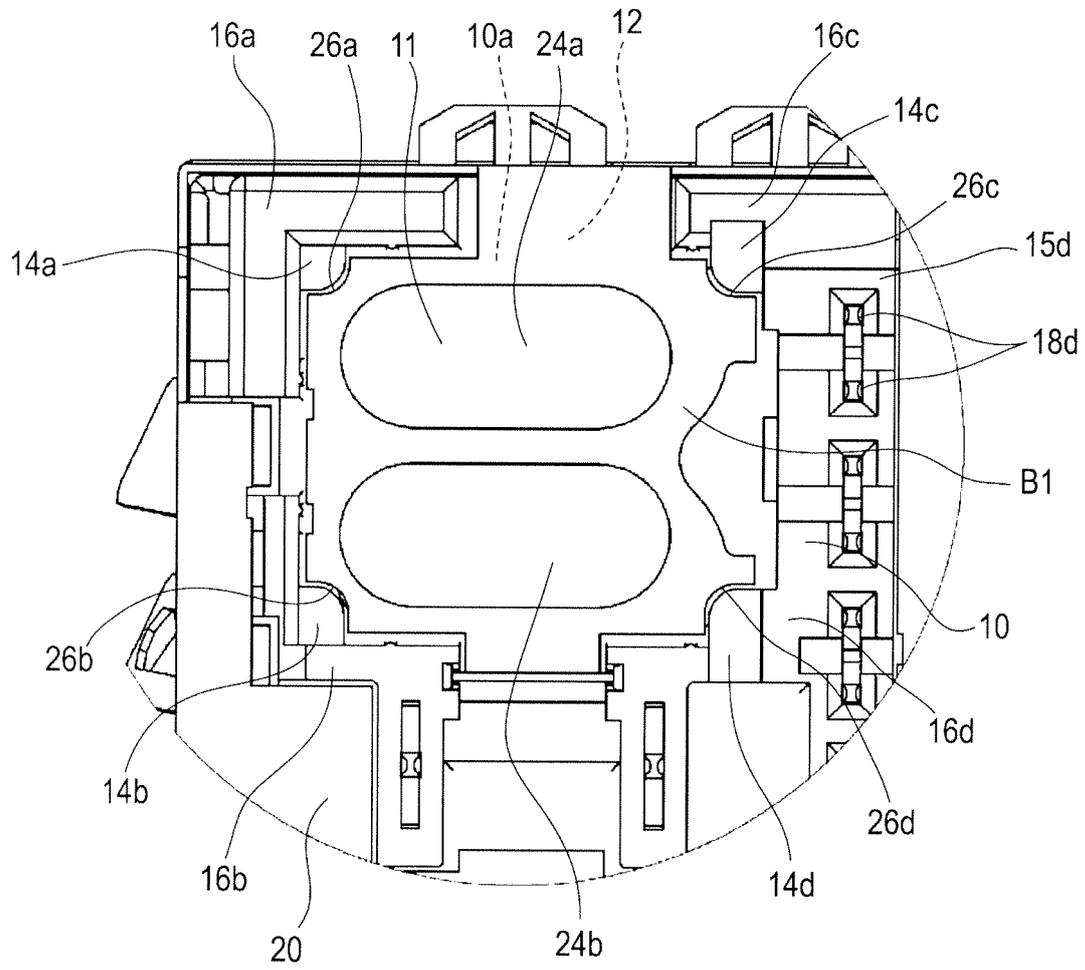


FIG. 6

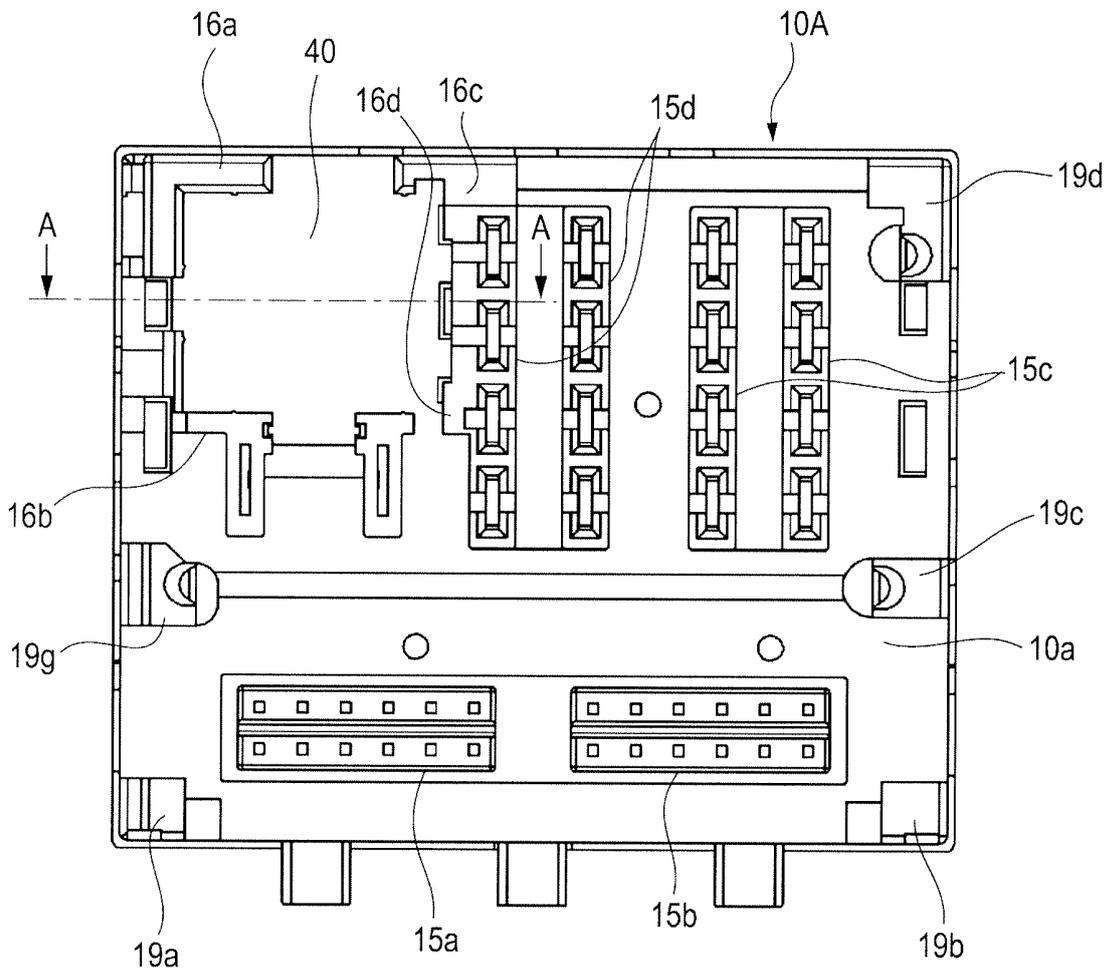


FIG. 7

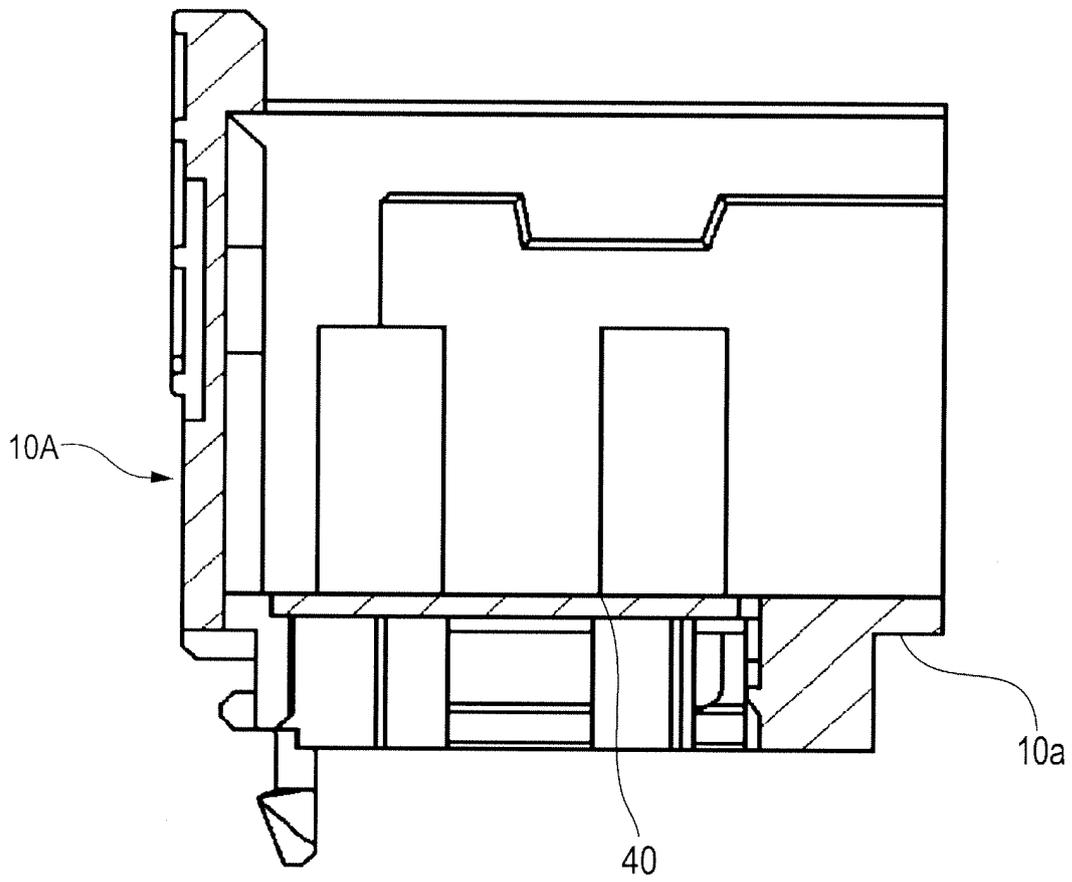


FIG. 8

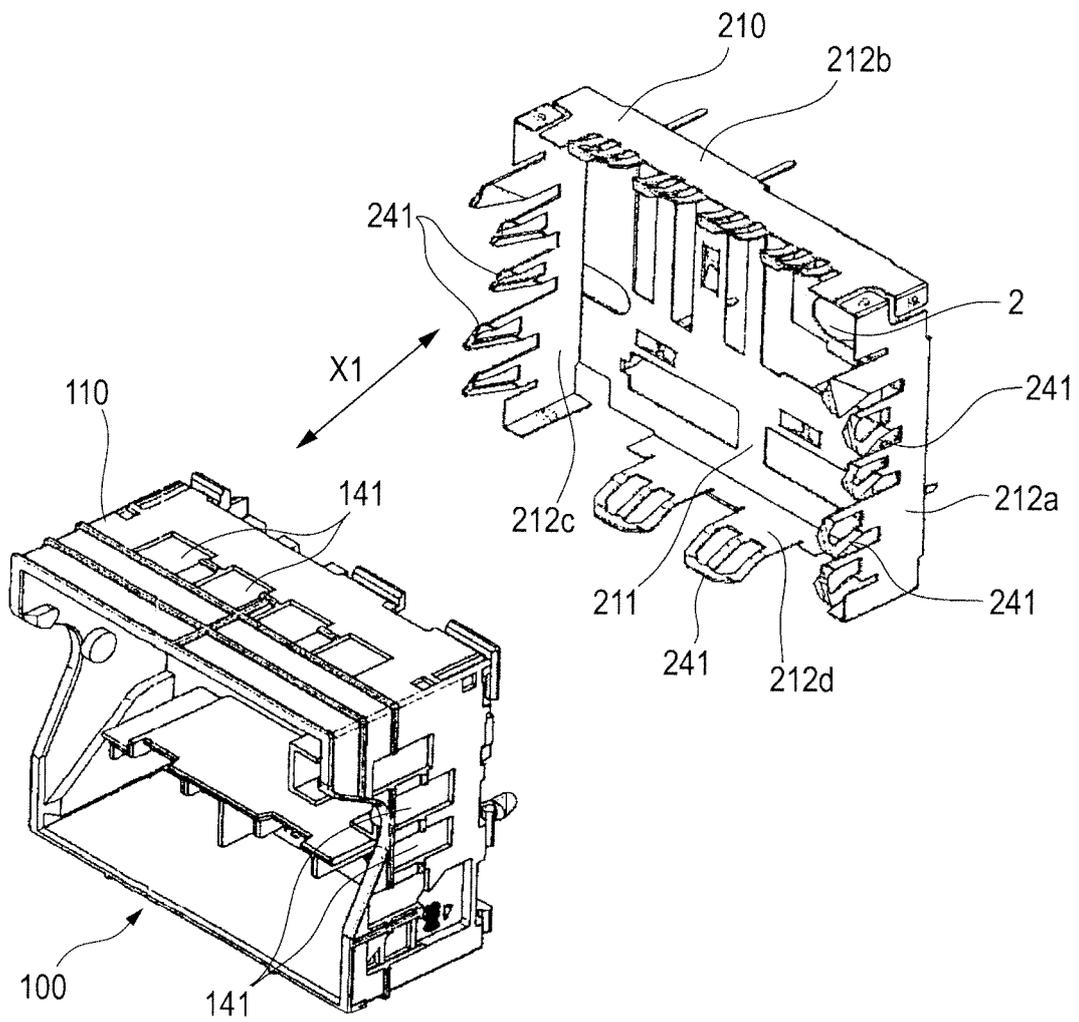
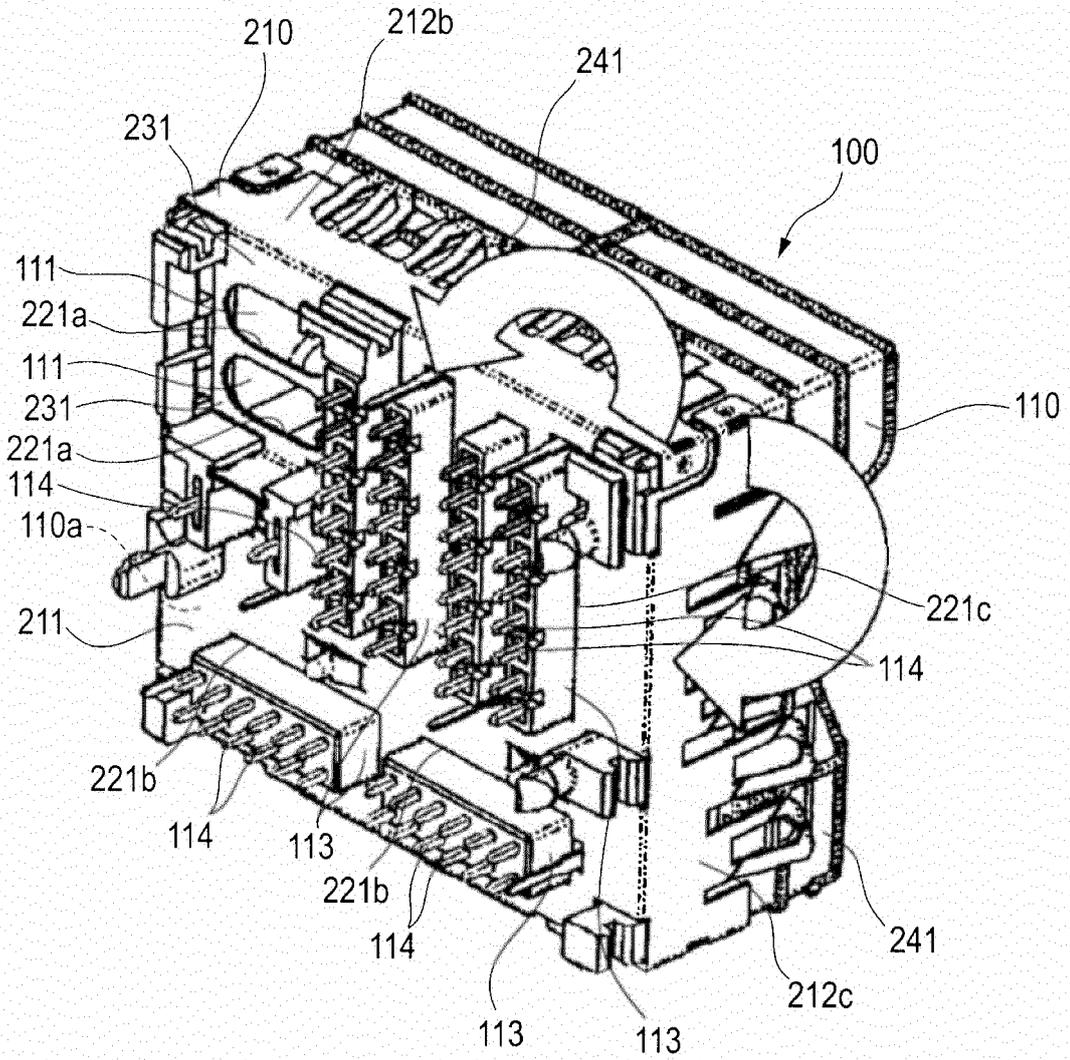


FIG. 9



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/081184

5	A. CLASSIFICATION OF SUBJECT MATTER H01R13/658(2011.01) i	
	According to International Patent Classification (IPC) or to both national classification and IPC	
10	B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) H01R13/658	
15	Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2014 Kokai Jitsuyo Shinan Koho 1971-2014 Toroku Jitsuyo Shinan Koho 1994-2014	
20	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)	
	C. DOCUMENTS CONSIDERED TO BE RELEVANT	
	Category*	Citation of document, with indication, where appropriate, of the relevant passages
25	Y	JP 2009-239132 A (Yazaki Corp.), 15 October 2009 (15.10.2009), paragraphs [0014] to [0028]; fig. 1 to 4 & DE 102009015309 A1
30	Y	JP 3016128 U (Molex Inc.), 26 September 1995 (26.09.1995), paragraphs [0010] to [0017]; fig. 1 to 7 & US 5547398 A & EP 729203 A2 & SG 52235 A & KR 20-0146618 Y & CN 2257089 Y
35	Y	JP 9-45423 A (Sanwa Denki Kogyo Co., Ltd.), 14 February 1997 (14.02.1997), paragraphs [0012] to [0030]; fig. 1 to 5 (Family: none)
40	<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.	
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