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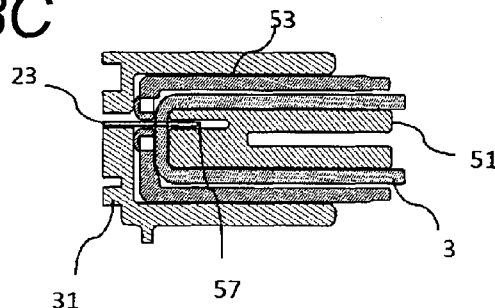
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(54) Title: WIRE HOLDER

FIG. 18C



(57) Abstract: There is provided a wire holder for being inserted in a housing and connecting an electric wire to a press-contact blade provided in the housing. The wire holder includes an inner holder on which the electric wire is disposed and an outer holder to be mounted to the inner holder to hold the electric wire between the inner holder and the outer holder. The outer holder includes an insertion hole which is formed through a front end surface of the outer holder in a position corresponding to the electric wire to insert the press-contact blade into the insertion hole, and a pair of guide pieces which are extended from opposite side parts of the insertion hole to expand a clearance between the pair of guide pieces toward heads of the guide pieces, thereby guiding the press-contact blade in the insertion hole.



DESCRIPTION

WIRE HOLDER

5 Technical Field

The present invention relates to a wire holder, in particular, to a wire holder that holds an electric wire to be connected to a press-contact blade.

10 Background Art

For example, Patent Literature 1 proposes a press-contact connector using a press-contact blade including two blades which are oppositely provided with a clearance, in which an electric wire is press-fitted into the clearance of the press-contact blade and an insulating cover of the electric
15 wire is cut with each blade, thereby electrically connecting the electric wire to the press-contact blade. The press-contact blade described in Patent Literature 1 connects the electric wire to the press-contact blade by engaging a press-contact cover (a wire holder) that holds the electric wire to a connector body which is provided with the press-contact blade.

20 Especially, Patent Literature 1 forms a plurality of protrusions on a surface of the press-contact cover that faces the press-contact blade, and inserts the electric wire between the protrusions, thereby holding the electric wire holder in the press-contact cover

25 Citation List

Patent Literature

Patent Literature 1: JP-A-6-76868

Summary of Invention

5 Technical Problem

When the electric wire is to be connected to the press-contact blade, the electric wire must be press-fitted into the clearance of the press-contact blade while aligning the position and the balance of the electric wire and the press-contact blade. Since Patent Literature 1 does not consider to
10 improve the workability concerning the alignment work, and there is a place to improve the workability.

An object of the present invention is to improve the workability in connecting the electric wire and the press-contact blade.

15 Solution to Problem

An aspect of the invention provides a wire holder for being inserted in and engaged to a housing and connecting an electric wire to a press-contact blade provided in the housing, the wire holder including: an inner holder having an outer surface on which the electric wire is disposed;
20 and an outer holder to be mounted to the inner holder to hold the electric wire between the outer surface of the inner holder and an inner surface of the outer holder, wherein the outer holder includes an insertion hole which is formed through a front end surface of the outer holder in a position corresponding to the electric wire to insert the press-contact blade into the
25 insertion hole, and a pair of guide pieces which are extended from opposite

side parts of the insertion hole to expand a clearance between the pair of guide pieces toward heads of the guide pieces, thereby guiding the press-contact blade in the insertion hole.

According to the configuration, when the wire holder is inserted in
5 the housing provided with the press-contact blade inside, the head of the press-contact blade contacts opposing head surfaces of the pair of guide pieces, and the press-contact blade is guided between the guide pieces. When the wire holder is further pressed, the press-contact blade is naturally inserted into the insertion hole at a position corresponding to the
10 electric wire. That is, even if the insertion position or the balance of the wire holder is not accurate, when the press-contact blade is located between the pair of guide pieces, the pair of guide pieces guides the press-contact blade in the insertion hole. Consequently, since it becomes simple to set the insertion position and the insertion balance of the wire holder, the
15 workability of connecting the electric wire to the press-contact blade can be improved.

Further, when there is a clearance between the front end surface of the outer holder of the wire holder and the inner surface of the housing, incomplete engagement of the housing and the wire holder may occur due to
20 the clearance. To avoid the incomplete engagement, the heads of the pair of guide pieces is caused to contact the inner surface of the housing to be elastically deformed. In this way, even if there is a clearance between the front end surface of the outer holder of the wire holder and the inner surface of the housing, the elastic deformation of the pair of guide pieces absorbs
25 the clearance. Accordingly, the occurrence of the incomplete engagement

of the housing and the wire holder is avoided.

The pair of guide pieces may be configured so as to expand the clearance between the pair of guide pieces toward heads of the guide pieces and the heads of the pair of guide pieces may include rounded surfaces.

5 For example, the shape of the heads of the pair of guide pieces may include a shape in which heads of the pair of guide pieces are folded or rounded in separate directions or in facing directions. According to the configuration, the press-contact blade is guided into the insertion hole along the rounded surfaces of the pair of guide pieces.

10 A holding part may be formed on the outer surface of the inner holder to hold the electric wire by the holding part. A groove may be formed to serve as the holding part on the outer surface of the inner holder to receive the electric wire in the groove. According to the configuration, the electric wire is positioned in a position of the insertion hole in which the
15 press-contact blade is inserted.

The inner holder may include a slot in which the press-contact blade is to be inserted. According to the configuration, since the head of the press-contact blade is inserted in the slot of the inner holder, the electric wire can be press-fitted into the deeper side of the clearance of the
20 press-contact blade, and the connection of the press-contact blade and the electric wire is stabilized.

The pair of guide pieces may be integrally formed with the outer holder. Accordingly, the number of components and the steps of working can be reduced.

Advantageous Effects of Invention

The aspects of the present invention improve the workability in connecting the electric wire and the press-contact blade.

5 Brief Description of Drawings

Fig. 1 is a perspective view showing a state where a wire holder according to an embodiment of the invention is engaged with an illumination apparatus.

Fig. 2 is an exploded view of the illumination apparatus of Fig. 1.

10 Fig. 3A is a perspective view of bus bars.

Fig. 3B is an enlarged view of press-contact blades provided in the bus bars.

Fig. 4A is a perspective view showing a direction for attaching the bus bars and a metal clip to a base member.

15 Fig. 4B is a perspective view showing a state where the bus bars and the metal clip are attached to the base member.

Fig. 4C is an enlarged view in which pins of the base member are inserted into holes of the bus bars.

20 Fig. 5A is a perspective view showing a direction for attaching a switch to the base member.

Fig. 5B is a perspective view in which the switch is attached to the base member.

Fig. 6 is a circuit diagram of the illumination apparatus of Fig. 1.

25 Fig. 7A is a perspective view showing a direction for attaching a switch knob to the base member.

Fig. 7B is a perspective view in which the switch knob is attached to the base member.

Fig. 8A is a perspective view showing a direction for attaching a bulb to the base member.

5 Fig. 8B is a perspective view in which the bulb is attached to the base member.

Fig. 9A is a perspective view showing a direction for attaching a lens to the base member.

10 Fig. 9B is a perspective view in which the lens is attached to the base member.

Fig. 10A is a perspective view showing an inner holder and an outer holder of the wire holder of Fig. 1.

Fig. 10B is a perspective view in which the inner holder is mounted to the outer holder.

15 Fig. 11 is a perspective view in which the inner holder and the outer holder are fixed on a jig.

Fig. 12A is a perspective view before the jig holds the electric wire.

Fig. 12B is a perspective view in which the jig holds the electric wire and the electric wire is received in a slot of the inner holder.

20 Fig. 13A is a perspective view showing a direction for mounting the outer holder.

Fig. 13B is a perspective view of the wire holder that holds the electric wire.

25 Fig. 14A is a perspective view showing a direction for inserting the wire holder into a housing.

Fig. 14B is a perspective view in which the wire holder is engaged with the housing.

Fig. 15A is a plan view of the illumination apparatus with which the wire holder is engaged, viewed from a rear side.

5 Fig. 15B is a cross-sectional view taken along a line XVB-XVB in Fig. 15A.

Fig. 16 is a perspective view of the wire holder of Fig. 1.

Fig. 17A is a cross-sectional view of the wire holder taken along a line XVII-XVII in Fig. 16 before the electric wire is connected to the
10 press-contact blade.

Fig. 17B is a cross-sectional view of the wire holder taken along the line XVII-XVII in Fig. 16 after the electric wire is connected to the press-contact blade.

Fig. 18A is a cross-sectional view of the wire holder taken along a
15 line XVIII-XVIII in Fig. 16 before the electric wire is connected to the press-contact blade.

Fig. 18B is a cross-sectional view of the wire holder taken along the line XVIII-XVIII in Fig. 16 showing positions of the press-contact blade and a pair of guide pieces.

20 Fig. 18C is a cross-sectional view of the wire holder taken along the line XVIII-XVIII in Fig. 16 after the electric wire is connected to the press-contact blade.

Fig. 19 is a perspective view showing a modified example of the wire holder of Fig. 1.

25 Fig. 20A is a cross-sectional view of the wire holder taken along a

line XX-XX in Fig. 19 before the electric wire is connected to the press-contact blade.

Fig. 20B is a cross-sectional view of the wire holder taken along the line XX-XX in Fig. 19 after the electric wire is connected to the press-contact
5 blade.

Description of Embodiments

A description is made of an embodiment of the invention. First, a description is made of an illumination apparatus 5 in which electric wires 3
10 are connected by a wire holder 1 according to the embodiment with reference to Figs. 1 to 9B. The illumination apparatus 5 is attached, for example, on a ceiling of a vehicle or the like to illuminate in the vehicle. On a rear side of an insulating base member 7 of the illumination apparatus 5 are attached bus bars 9, a metal clip 11 and a switch 13. On a front side
15 of the base member 7 of the illumination apparatus 5 are attached a switch knob 15, a bulb 17 and a lens 19.

On the rear side of the base member 7, the bus bars 9 and the metal clip 11 are attached in a direction of arrows shown in Fig. 4A. The bus bar 9 is an elongated flat plate which is formed of a conductive metal or the like.
20 A plurality of (three in this embodiment) bus bars 9 are provided in correspondence with the number of electric wires 3 in this embodiment. In one end of each bus bar 9, a press-contact blade 23 is formed to be connected to one of the electric wires 3. In the other end of each bus bar 9, a switch-connecting part 25 is formed to be connected to the switch 13. Each
25 bus bar 9 is connectable to the bulb 17 and supplies power to the bulb 17

from the corresponding electric wire 3 in accordance with a manipulation of the switch 13. The press-contact blades 23 are displaced each other in a direction orthogonal to the alignment direction of the press-contact blades 23. Thus, the press-contact blades 23 do not contact each other. Each of the press-contact blades 23 includes a pair of opposite blades with a clearance, for example. When the electric wire 3 is press-fitted into each of the press-contact blades 23, the pair of blades cut in an insulating cover of the electric wire 3 and press-contact and electrically connect to a core wire of the electric wire 3. Each of the bus bars 9 includes a plurality of holes 29 in which a plurality of pins 27 provided in the base member 7 are inserted, respectively. Each of the holes 29 is formed at a position corresponding to the respective one of the pins 27. The pins 27 are inserted in the holes 29, respectively. Each of the bus bars 9 is fixed to the base member 7, for example, by thermal welding. Each of the bus bars 9 is fixed in a position where the corresponding press-contact blade 23 is received in a housing 21, described later, of the base member 7. In this embodiment, the plurality of bus bars 9 are fixed to the base member 7 while interconnecting the bus bars 9 by interconnecting parts 33, and then, the interconnecting parts 33 are removed to release the interconnection of the bus bars 9 and insulate the bus bars 9.

The metal clip 11 is formed by folding a metallic plate in a V-shape, and attachable to a side part opposite to a side part at which the housing 21 is provided in the base member 7.

The switch 13 includes connecting parts 35 to be connected to respective switch connecting parts 25 of the bus bars 9, and a manipulation

part 37 which is manipulated through the switch knob 15 described later. The switch 13 is attached to the base member 7 in a direction of an arrow shown in Fig. 5A. As the switch 13, a known switch can be used in which the bulb 17 is turned on and off in accordance with a changeover of the switch 13 as shown in Fig. 6.

On the front side of the base member 7, the switch knob 15 is attachable in a direction of an arrow shown in Fig. 7A. The switch knob 15 is attached to the base member 7 to transfer the manipulation by the manipulator in the vehicle to a manipulating part 37 of the switch 13.

The bulb 17 is inserted into the base member 7 in a direction of an arrow shown in Fig. 8A and connected to the bus bars 9. The bulb 17 is turned on in accordance with the manipulation of the switch 13.

The lens 19 is mounted on the base member 7 in a direction of an arrow shown in Fig. 9A. The lens 19 includes an opening 39 in which the switch knob 15 is inserted, and a plurality of openings 43 to which a plurality of protrusions 41 of the base member 7 are fitted, respectively. When each of the protrusions 41 is fitted into the respective one of the openings 43, the lens 19 is fixed to the front side (in-vehicle side) of the base member 7.

In the base member 7 is formed the housing 21 in which the wire holder 1 is inserted and engaged. The housing 21 is formed in a shape in which the wire holder 1 can be inserted, for example, in a rectangular tube. The housing 21 includes an engagement part 45 to be engaged with the wire holder 1. The engagement part 45 includes an opening 46 to which a protrusion 59 of the wire holder 1 is engaged as described later.

Next, a description is made of the wire holder 1 according to the embodiment with reference to Figs. 10A and 10B. The wire holder 1 includes an inner holder 51 having an outer surface on which a plurality of (three in this embodiment) electric wires 3 (unbundled electric wires) are disposed, and an outer holder 53 which is mounted to the outer surface of the inner holder 51 on which the plurality of electric wires 3 are disposed. The inner holder 51 and the outer holder 53 are interconnected via a flexible hinge 54, and the outer holder 53 is mountable to the inner holder 51 in a direction of an arrow shown in Fig. 10A. The inner holder 51 is formed, for example, in a columnar shape having a rectangular cross-section, made of resin. The inner holder 51 includes a plurality of (three in this embodiment) grooves 55 to receive respective electric wires 3 therein, slots 57 in which the respective press-contact blades 23 are inserted, and the protrusion 59 which is inserted into the opening 46 of the engagement part 45 of the housing 21. Each of the grooves 55 is formed, for example, on outer surfaces excluding a pair of opposite surfaces to receive and hold the respective one of the electric wires 3. The slots 57 are provided at a longitudinal end of the inner holder 51 so that heads of the press-contact blades 23 can be inserted in the respective slots 57. The protrusion 59 is formed, for example, in triangular cross-section, and the rear end of the protrusion 59 contacts with an inner surface of the opening 46 when the protrusion 59 is inserted in the opening 46 of the engagement part 45 of the housing 21 to regulate a movement of the wire holder 1 in a detachment direction. A holding part 60 is formed at a rear side of the inner holder 51 so that a step 67 of the outer holder 53 is inserted into the holding part 60.

The outer holder 53 is formed of a resin, for example, and includes a pair of opposite walls 61 provided with a clearance, a front end wall 63 which connects front ends of the opposite walls 61, and a rib 65 which is formed on side surfaces of the opposite walls 61. The outer holder 53 receives the inner holder 51 in a space surrounded by the opposite walls 61 and the front end wall 63, and holds the electric wires 3 between the inner surfaces of the outer holder 53 and the outer surfaces of the inner holder 51. The step 67 is formed at a rear side of each of the opposite walls 61 to be inserted in the holding part 60 of the inner holder 51. The rib 65 contacts the inner holder 51 to regulate the movement of the outer holder 53 or the inner holder 51 in the detachment direction. A plurality of (three in this embodiment) insertion holes 69 are formed at positions corresponding to the respective electric wires 3 on a front end surface (a surface facing the housing 21) of the front end wall 63 so that the press-contact blades 23 are inserted into the plurality of insertion holes 69, respectively. A pair of guide pieces 71 extends from opposite side parts of each of the insertion holes 69 and expands a clearance between the guide pieces 71 towards the heads of the guide pieces 71. Each pair of guide pieces 71 is formed in a folded shape so that heads of the pair of guide pieces 71 are separate away from each other. The pair of guide pieces 71 is integrally formed with the outer holder 53, for example, by the same resin as the outer holder 53. The heads of the pair of guide pieces 71 can contact with the inner surface of the housing 21 that is opposite to the front end surface of the outer holder 53.

A description is made of assembling the wire holder 1 with reference to Figs. 11 to 13B. The inner holder 51 and the outer holder 53 as

configured in Fig. 10A are fixed to a jig 73 for assembling. Next, the plurality of electric wires 3 connected to a connector 75 which is connectable to another device are received in the grooves 55 of the inner holder 51, respectively and bridged with a plurality of pins 77 standing on the jig 73 to
5 fix the electric wires 3. In this state, the outer holder 53 is rotated around the hinge 54 and mounted to the inner holder 51. In this way, the inner holder 51 is mounted to the outer holder 53, and the electric wires 3 are held by the wire holder 1.

An action of the wire holder 1 as configured above is described along
10 the working for engaging the wire holder 1 to the housing 21 of the illumination apparatus 5. The protrusion 59 of the wire holder 1 and the opening 46 of the engagement part 45 of the housing 21 are aligned, and the wire holder 1 is inserted into the housing 21 along a direction of an arrow shown in Fig. 14A. When the wire holder 1 starts to be inserted, an
15 inclined surface of the protrusion 59 of the wire holder 1 contacts the engagement part 45 of the housing 21, and elastically deforms the engagement part 45 in an outer direction of the housing 21. Then, when the protrusion 59 is inserted into the opening 46 of the engagement part 45, the engagement part 45 returns to the initial position, and a rear end
20 surface of the protrusion 59 contacts the inner surface of the opening 46 of the engagement part 45 to regulate the movement of the wire holder 1 in the detachment direction. In this way, as shown in Figs. 15A and 15B, the wire holder 1 is engaged to the housing 21.

In this case, as shown in Figs. 17A and 17B, each of the electric
25 wires 3 is press-fitted into the clearance between the pair of blades of the

press-contact blade 23. Since the clearance between the pair of blades of the press-contact blade 23 is formed to be smaller than a diameter of the electric wire 3, an insulating cover of the electric wire 3 is cut out by the pair of blades, and a core wire of the electric wire 3 can be connected to the press-contact blade 23. Further, since the inner holder 51 includes the slot 57 for receiving the press-contact blade 23, the electric wire 3 can be press-fitted into the deeper side of the clearance of the press-contact blade 23, and the press-contact blade 23 can cut out the insulating cover of the electric wire 3 surely. Figs. 17A and 17B are cross-sectional views of the wire holder 1 taken along a line XVII-XVII (along a plane which passes the clearance between the pair of guide pieces 71) in Fig. 16.

An action of the pair of guide pieces 71 is explained with reference to Figs. 18A to 18C. Figs. 18A to 18C are cross-sectional views of the wire holder 1 taken along a line XVIII-XVIII (along a plane which passes the pair of guide pieces 71) in Fig. 16. The wire holder 1 is inserted into the housing 21 along a direction of an arrow shown in Fig. 18A. In this case, as shown in Fig. 18B, if each of the press-contact blades 23 is located in a range of the pair of guide pieces 71, the head of the each of the press-contact blades 23 contacts with the opposed head surface of the pair of guide pieces 71. In this state, when the wire holder 1 is further pressed into the housing 21, the press-contact blade 23 is naturally inserted into the insertion hole 69 of the outer holder 53 along a rounded surface of the pair of guide pieces 71. As a result, as shown in Fig. 18C, each of the electric wires 3 is press-fitted into the clearance of respective one of the press-contact blades 23, the press-contact blade 23 cuts out the insulating

cover of the electric wire 3 and the press-contact blade 23 press-contacts and connects to the core wire of the electric wire 3. Further, since the pair of guide pieces 71 contacts the inner surface 79 of the housing 21 to be elastically deformed, the elastically deformation absorbs the clearance
5 between the front end surface of the outer holder 53 and the inner surface 79 of the housing 21.

According to the configuration, even if the insertion position or the balance of the wire holder 1 is not accurate, when the press-contact blade 23 is located between the pair of guide pieces 71, the pair of guide pieces 71
10 guides the press-contact blade 23 in the insertion hole 69, and the electric wire 3 is connected to the press-contact blade 23. Consequently, since it becomes simplified to set the insertion position and the insertion balance of the wire holder 1, the workability of connecting the electric wires 3 to the press-contact blades 23 can be improved.

15 Further, when there is a clearance between the front end surface of the outer holder 53 of the wire holder 1 and the inner surface 79 of the housing 21, incomplete engagement of the housing 21 and the wire holder 1 may occur due to the clearance. In the wire holder 1 according to this embodiment, however, the pair of guide pieces 71 which guides the
20 press-contact blade 23 is caused to be elastically deformed, and the elastic deformation absorbs the clearance between the front end surface of the outer holder 53 of the wire holder 1 and the inner surface 79 of the housing 21. Accordingly, the occurrence of the incomplete engagement of the housing 21 and the wire holder 1 is avoided. That is, since the incomplete
25 engagement is suppressed by using the pair of guide pieces 71, it is not

necessary to provide other means for suppressing the incomplete engagement, and the structure of the wire holder 1 and the housing 21 is simplified.

According to the embodiment, since the electric wire 3 and the
5 press-contact blade 23 are easily connected, it is unnecessary to provide a specific device such as a press-contact machine that is used conventionally to connect the electric wire 3 and the press-contact blade 23.

The shape of the pair of guide pieces 71 is not limited to that as described in this embodiment, and it is possible to arbitrarily select the
10 shape for guiding the press-contact blade to the electric wire 3 and also absorbing the clearance between the front end surface of the outer holder 53 of the wire holder 1 and the inner surface 79 of the housing 21. As shown in Fig. 19, for example, the shape may include a shape in which heads of the pair of guide pieces 91 in plate shape are folded or rounded in facing
15 directions. Even in this configuration, as shown in Figs. 20A and 20B, the pair of guide pieces 91 guides the press-contact blade 23 in the insertion hole 69, and the electric wire 3 is connected to the press-contact blade 23. Further, the pair of guide pieces 91 is caused to be elastically deformed, and the elastic deformation absorbs the clearance between the front end surface
20 of the outer holder 53 of the wire holder 1 and the inner surface 79 of the housing 21. Accordingly, the occurrence of the incomplete engagement of the housing 21 and the wire holder 1 is avoided.

The number of electric wires 3 and the number of press-contact blades 23 are not limited to three as described in this embodiment. The
25 wire holder may be arbitrarily designed so that, for example, only one

electric wire is connected to one press-contact blade.

Although the embodiment describes that the grooves 55 are formed on the inner holder 51 to receive the electric wires 3, a holding part for holding the electric wires 3 is not limited thereto. It may be arbitrarily
5 selected, for example, such that a pair of protrusions is formed to hold the electric wire therebetween. Further, any holding parts for holding the electric wire 3 may not be provided in the inner holder 51.

Further, although the embodiment describes an example in which the electric wire 3 is connected to the press-contact blade 23 of the
10 illumination apparatus 5 using the wire holder 1, the connection is not limited thereto. For example, the electric wire may be connected to the press-contact blade provided in a housing of a connector using the wire holder 1. That is, only if the configuration includes a connection of the electric wire and the press-contact blade by inserting the wire holder into
15 the housing provided with the press-contact blade inside, the target on which the housing into which the wire holder is inserted and engaged should be formed is not limited.

Reference Signs List

- 20 1: wire holder
 3: electric wire
 5: illumination apparatus
 21: housing
 23: press-contact blade
25 51: inner holder

53: outer holder

55: groove

57: slot

69: insertion hole

5 71: pair of guide pieces

79: inner surface

CLAIMS

1. A wire holder for being inserted in and engaged to a housing and connecting an electric wire to a press-contact blade provided in the housing,

5 the wire holder comprising:

an inner holder having an outer surface on which the electric wire is disposed; and

an outer holder to be mounted to the inner holder to hold the electric wire between the outer surface of the inner holder and an inner

10 surface of the outer holder, wherein

the outer holder includes an insertion hole which is formed through a front end surface of the outer holder in a position corresponding to the electric wire to insert the press-contact blade into the insertion hole, and a pair of guide pieces which are extended from opposite side parts of the

15 insertion hole to expand a clearance between the pair of guide pieces toward heads of the guide pieces, thereby guiding the press-contact blade in the insertion hole.

2. The wire holder according to claim 1, wherein

20 the inner holder includes a slot in which the press-contact blade is to be inserted.

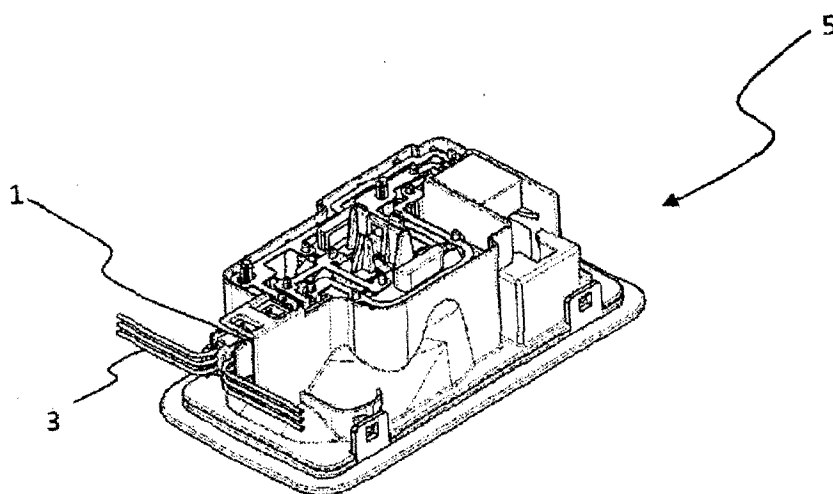
3. The wire holder according to claim 1 or 2, wherein

the pair of guide pieces is integrally formed with the outer holder.

4. The wire holder according to any one of claims 1 to 3, wherein
the heads of the pair of guide pieces include rounded surfaces.
5. The wire holder according to any one of claims 1 to 4, wherein
5 a holding part is formed on the outer surface of the inner holder to
hold the electric wire by the holding part.
6. The wire holder according to claim 5, wherein
a groove is formed to serve as the holding part on the outer surface
10 of the inner holder to receive the electric wire in the groove.

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FIG. 1



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FIG.2

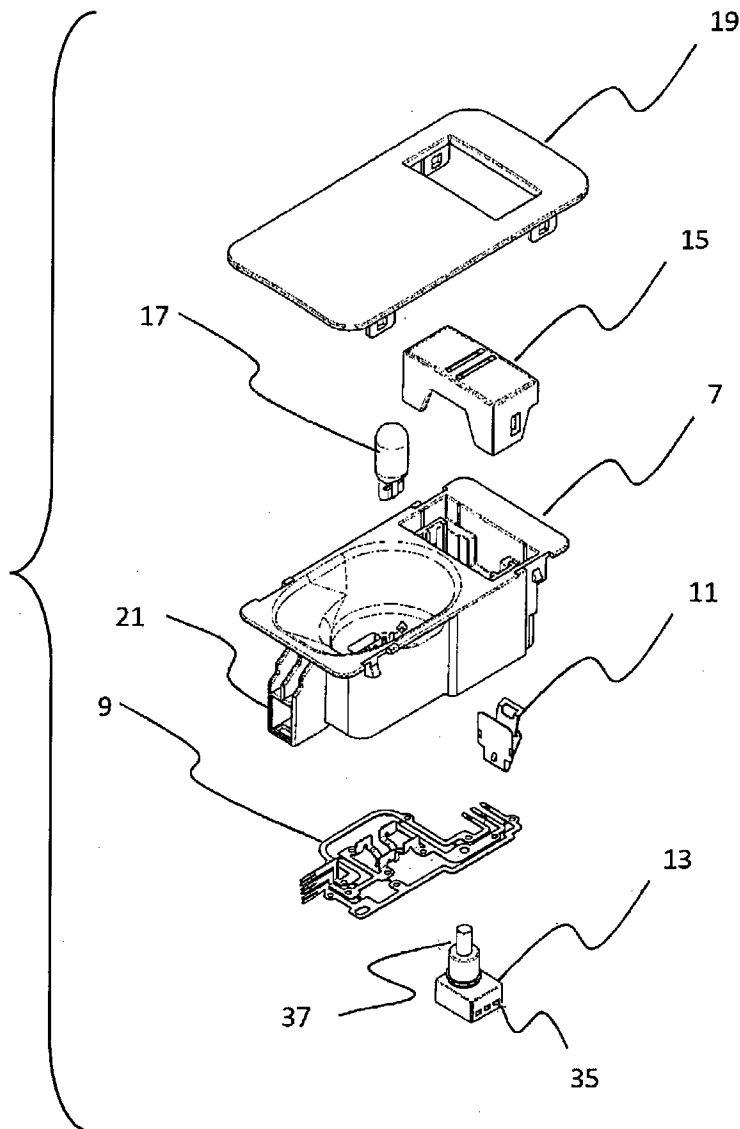
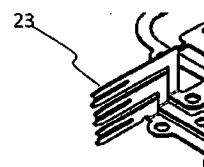
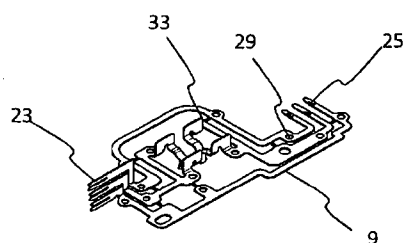


FIG.3A

FIG.3B



3 / 12

FIG.4A

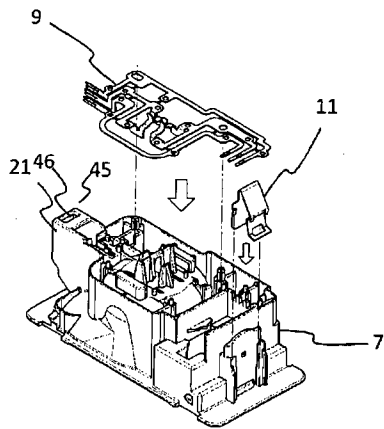


FIG.4B

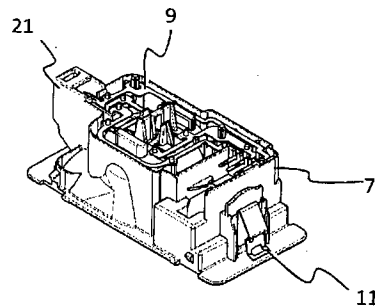


FIG.4C



FIG.5A

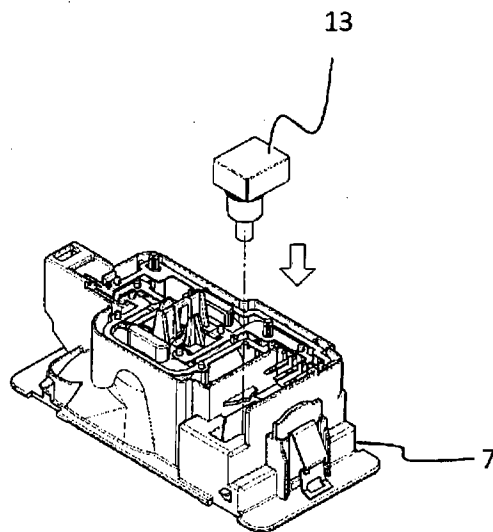
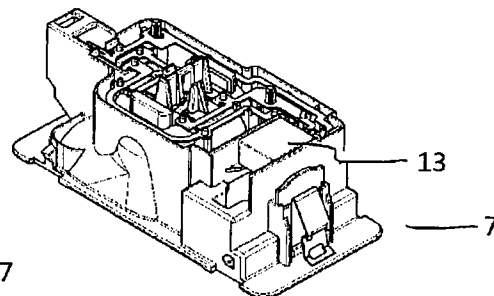


FIG.5B



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FIG.6

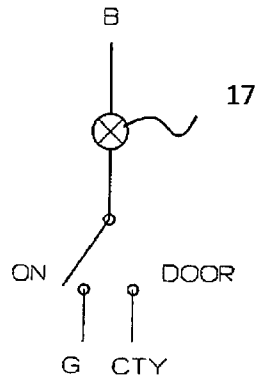


FIG.7A

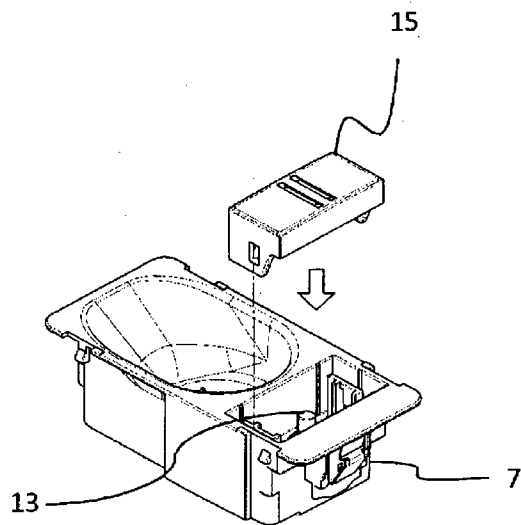
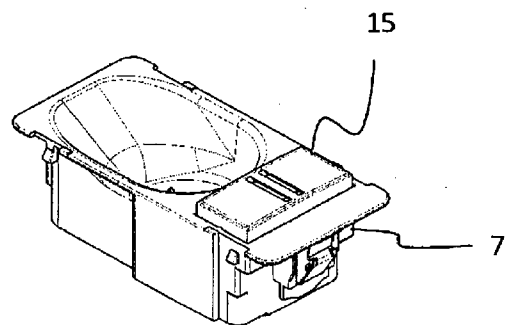


FIG.7B



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FIG. 8A

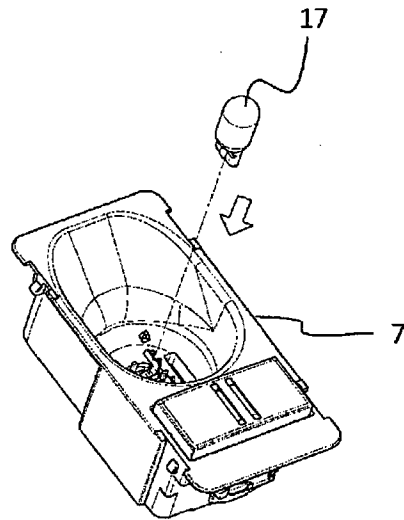


FIG. 8B

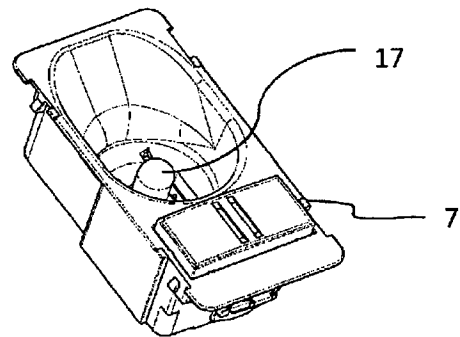


FIG. 9A

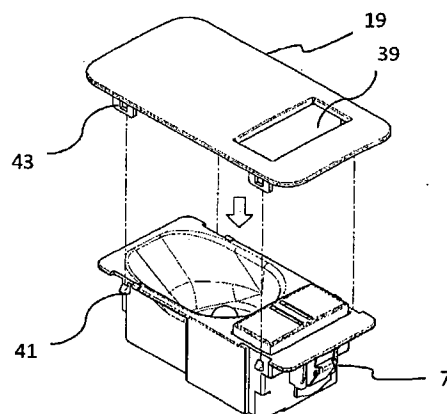
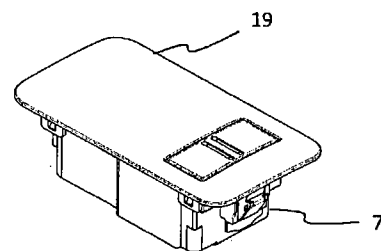


FIG. 9B



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FIG.10A

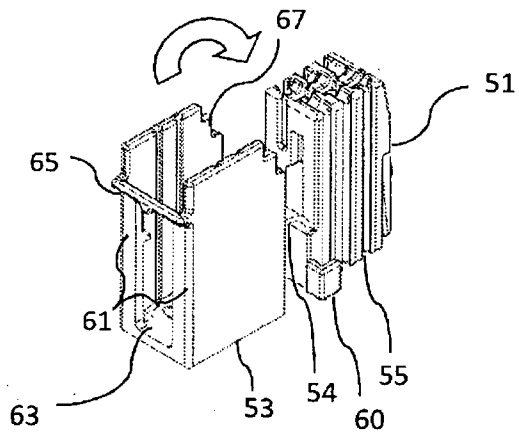


FIG.10B

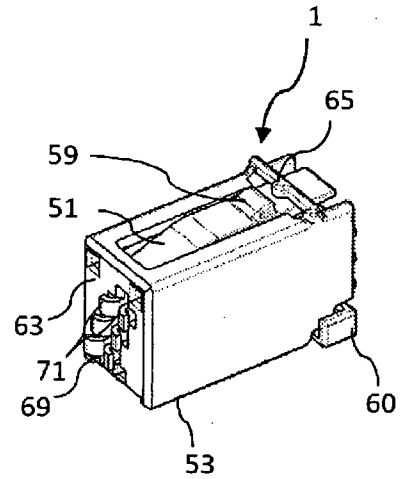
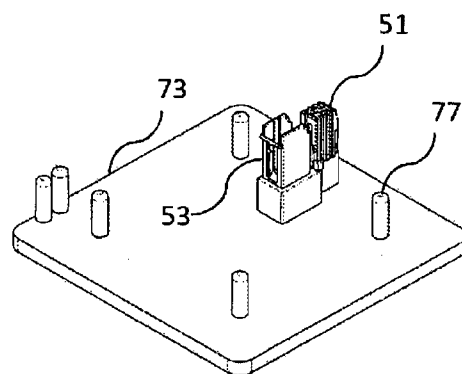


FIG.11



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FIG.12A

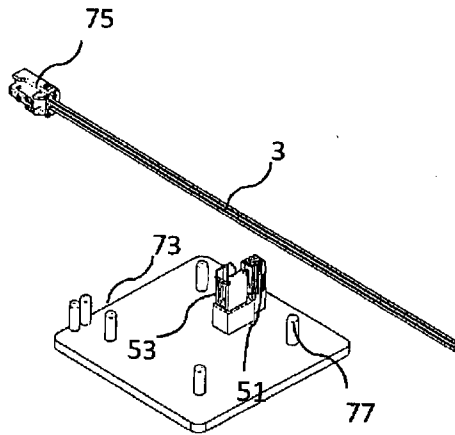


FIG.12B

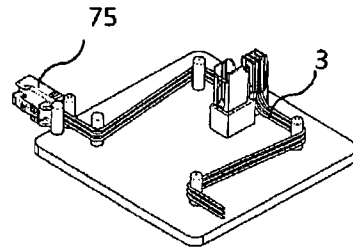


FIG.13A

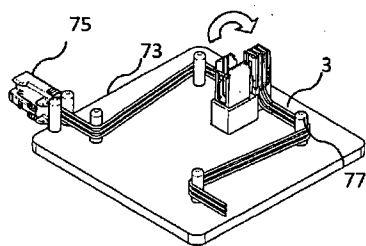
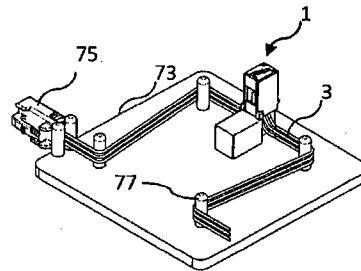


FIG.13B



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FIG.14A

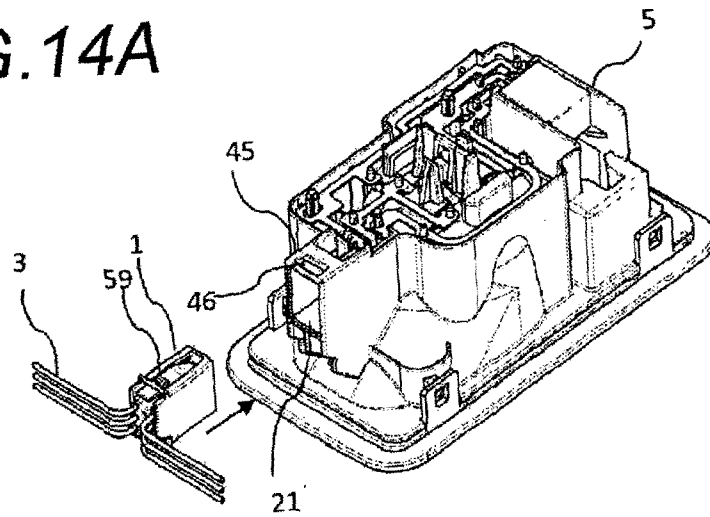


FIG.14B

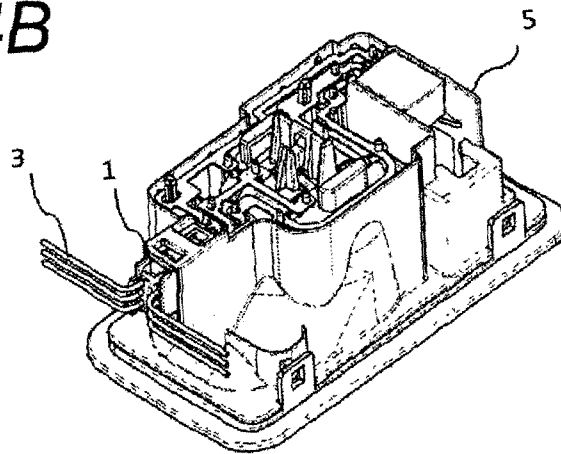


FIG.15A

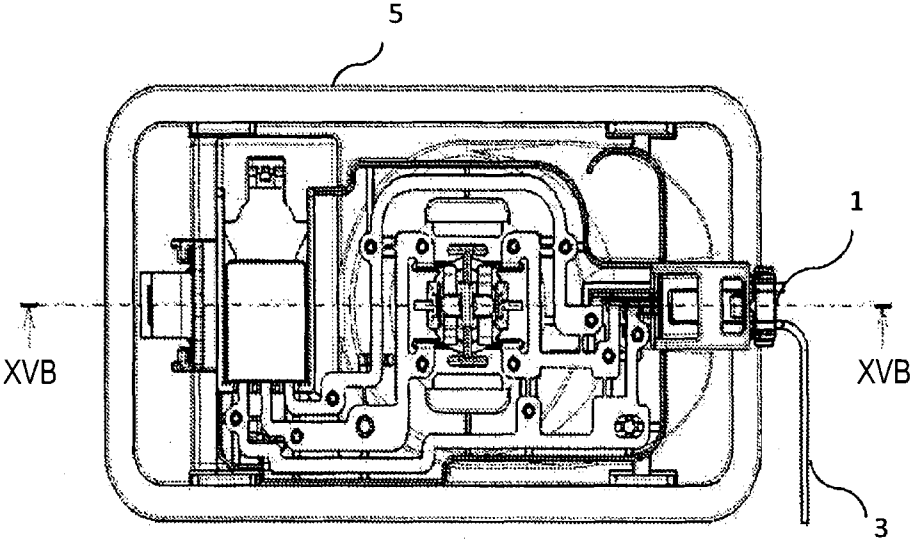
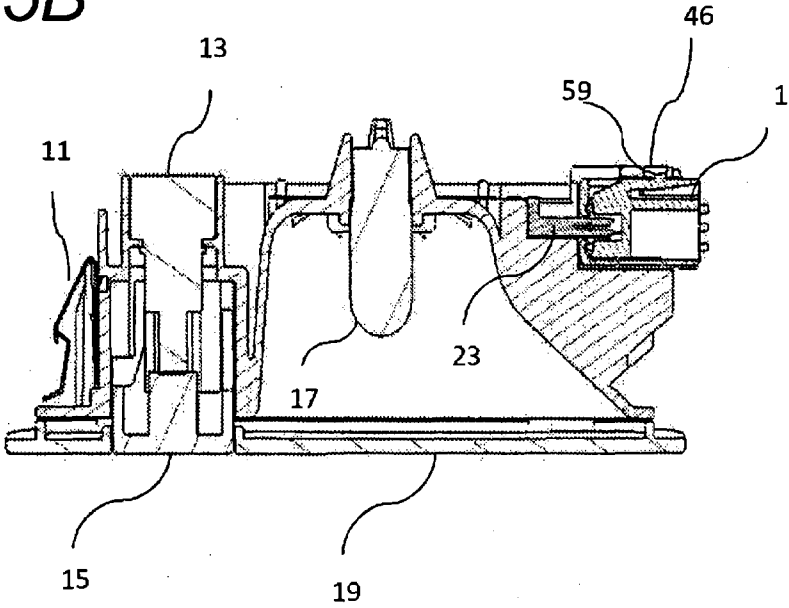


FIG.15B



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FIG.16

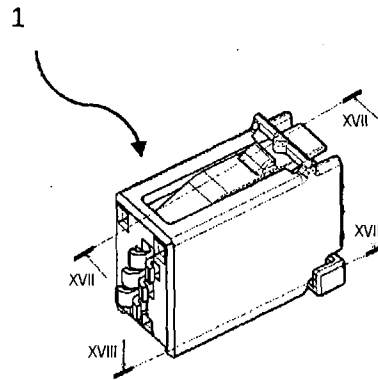


FIG.17A

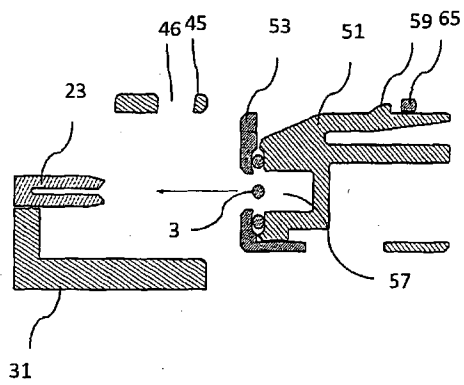


FIG.17B

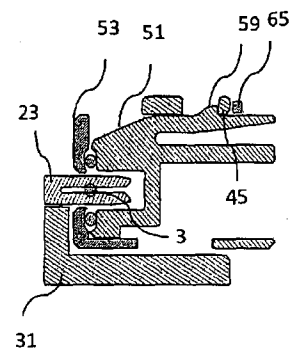


FIG.18A

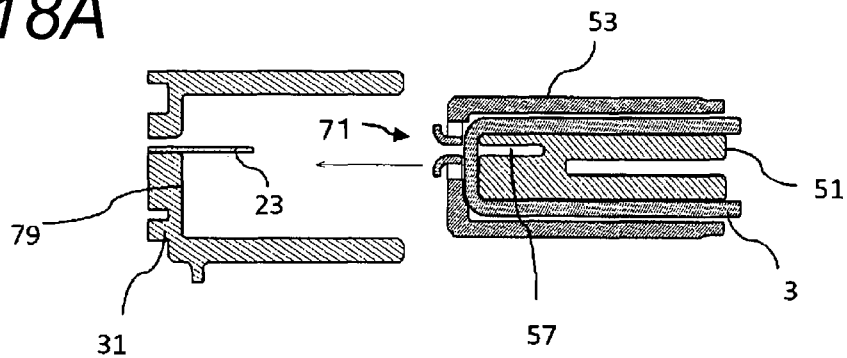


FIG.18B

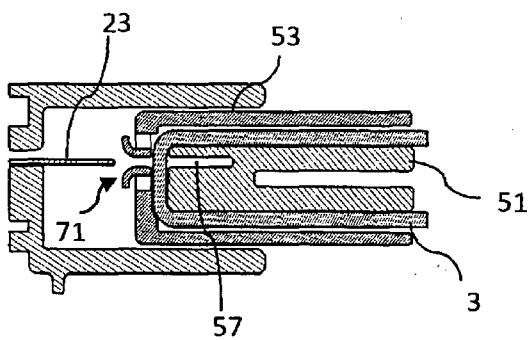
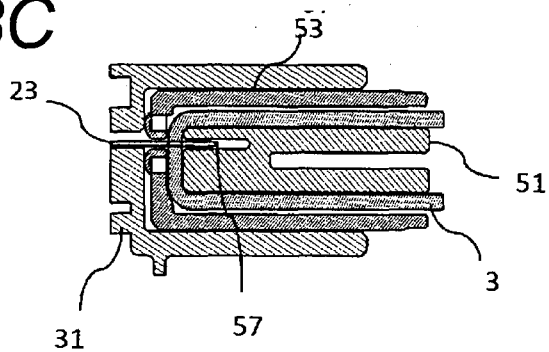


FIG.18C



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FIG.19

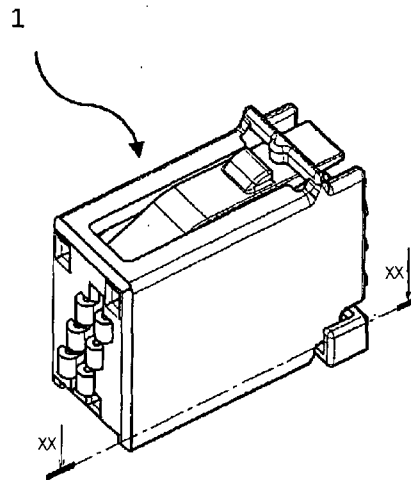


FIG.20A

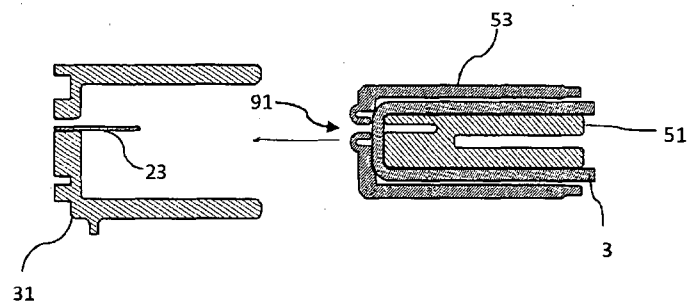
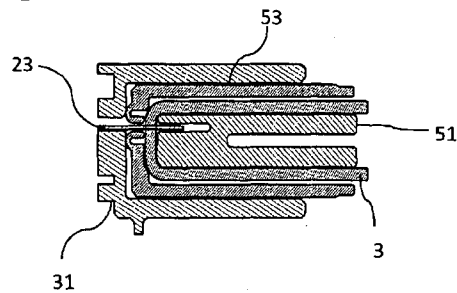


FIG.20B



INTERNATIONAL SEARCH REPORT

International application No

PCT/JP2012/057411

A. CLASSIFICATION OF SUBJECT MATTER
 INV. H01R4/24 H01R13/502
 ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 H01R

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2006/090296 A2 (MATSUSHITA ELECTRIC WORKS LTD [KR]; YAMAMOTO TOSHIHIRO [JP]; KAJI NORI) 31 August 2006 (2006-08-31) paragraphs [0053] - [0054]; figures 3,7 -----	1
A	FR 2 854 740 A1 (YAZAKI CORP [JP]) 12 November 2004 (2004-11-12) claim 1; figures 5,6,10,11,13 -----	1
A	WO 2008/024916 A1 (3M INNOVATIVE PROPERTIES CO [US]; HAYAUCHI TAKAYUKI [JP]) 28 February 2008 (2008-02-28) abstract; figures 1-10 -----	1
A	JP 2005 149935 A (FUJIKURA LTD) 9 June 2005 (2005-06-09) abstract; figures 1,10 -----	1



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

11 June 2012

Date of mailing of the international search report

19/06/2012

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Jiménez, Jesús

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/JP2012/057411

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