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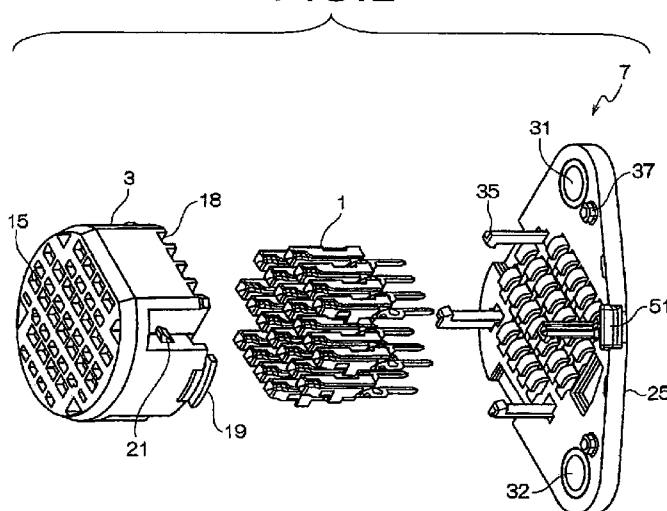
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(54) Title: FIXING STRUCTURE FOR CONNECTOR

FIG.2



(57) Abstract: A fixing structure for a connector includes: a columnar housing which contains respective female terminals; a case which contains an electronic device and includes an opening for inserting the housing from the opening; and a rear holder which fixes the housing by a plurality of screws. The housing includes a projecting piece projected broader than the opening of the case from an outer edge of the surface, and arranged between the base plate of the rear holder and the case. The rear holder includes through holes and terminal pressing members. Screw holes are provided so that a straight line connecting the screw holes is one-sidedly formed on the same side with respect to a center of gravity of an area where the plurality of through holes are formed. A reduced area in thickness is formed on the base plate on a area where the straight line is one-sidedly formed.

DESCRIPTION

FIXING STRUCTURE FOR CONNECTOR

5 Technical Field

The present invention relates to a fixing structure for a connector, and especially, to a fixing structure for a connector in which a female connector including a plurality of female terminals are inserted into and fixed to an opening of a case for containing an electronic device.

10

Background Art

An electronic device mounted on a vehicle and so on is generally protected by containing the electronic device in a case. Typically, the electronic device within the case is electrically connected to external
15 electronic components, etc. by a connector. For example, a configuration is adopted in which a female connector is mounted into an opening provided in the case, and a male connector connected to the internal electronic device is inserted into the female connector. A conductor extended from the female connector that is inserted into and fixed to the opening of the case is
20 connected to the electronic device, etc. disposed outside the case by soldering.

When the male terminal connected to the electronic device disposed inside the case is inserted into the female terminal, however, an insertion force of the male terminal may be exerted through the female terminal onto a soldering connection part of the electronic components disposed outside the
25 case, and there is a possibility that the electronic components are damaged.

Therefore, it is desired to prevent the female terminal from moving by the insertion force of the male terminal.

A technique described in PTL 1 is cited so that circuit-configured components are prevented from moving to be fixed. That is, PTL 1 proposes
5 to hold and fix a circuit board between ribs protruded from an upper face and a lower face of the case in a case where the circuit board is contained in the case of an AC adapter used for the electronic device.

Citation List

10 Patent Literature

[PTL 1] JP-11-204958A

Summary of Invention

Technical Problem

15 The technique described in PTL 1, however, does not consider the problem involved with a damage due to the movement of the female terminal by the insertion force and an external force exerted on a solder connection part connected to the external electronic device, etc. when the male connector is inserted into the female connector.

20

Solution to Problem

A technical problem to be solved by the present invention is to avoid the movement of the female terminal by the insertion force and an external force exerted on a solder connection part connected to the external electronic
25 device, etc. when the male connector is inserted into the female connector.

According to an aspect of the invention, there is provided a fixing structure for a connector, comprising: a columnar housing in which a plurality of terminal containers are arranged in parallel to contain respective female terminals; a case which contains an electronic device and includes an opening for inserting the housing from the opening; and a rear holder which fixes the housing inserted into the case by a plurality of screws, wherein the housing includes: first openings from which respective mating terminals are inserted into heads of the female terminals; second openings into which the respective female terminals are inserted and from which conductors provided at rear ends of the female terminals are extended; and a projecting piece which is projected broader than the opening of the case from an outer edge of an end surface on which the second openings are formed so as to contact an opening edge of the case, the rear holder includes: a base plate opposing the case to arrange and hold the projecting piece of the housing between the base plate and the case; a plurality of through holes which are formed on the base plate corresponding to the second openings of the housing; terminal pressing members which is provided for each of the through holes so as to contact the respective female terminals; and a plurality of screw holes to insert the plurality of screws therein, the plurality of screw holes of the rear holder are provided so that a straight line connecting each pair of the screw holes is one-sidedly formed on the same side with respect to a center of gravity of an area where the plurality of through holes are formed, and a reduced area in thickness is formed on the base plate on a area where the straight line connecting the screw holes is one-sidedly formed.

Since the area of the base plate where the screw holes are one-sidedly formed with respect to the area of the through holes group is reduced in thickness and its rigidity is lowered, the fastening force by screw is distributed in the area of the through holes group, and the variation in the terminal pressing force for pressing the female terminals by the terminal pressing members is suppressed. As a result, since the terminal pressing force for applied on each of the female terminals becomes uniform, it is possible to prevent the damage of the external electronic component, etc. caused by moving the female terminals due to the insertion force of the male terminals when the male connector is to be inserted into the female terminal.

For example, when the screw holes are formed in two on the rear holder, and a straight line connecting the two screw holes is apart away from the center of gravity of the area of the through holes group, the reduced area in thickness is formed on an area where the two screw holes are formed.

Each of the terminal pressing members may be formed of a substantially L-shape having a leg portion cantilevered on the base plate and an arm portion extended from the leg portion substantially at a right angle to contact the rear end of the female terminal.

A recess part may be formed on the rear holder to insert the projecting piece of the housing into the recess part.

Advantageous Effects of Invention

According to the invention, when the male terminals are to be inserted into the female terminals, it is possible to prevent the female terminals from moving and the external force from applying to the soldering

connection part with the external electronic component, etc.

Brief Description of Drawings

Fig. 1 is a cross-section view showing a fixing structure for a
5 connector according to an embodiment of the invention.

Fig. 2 is an exploded view showing the connector according to the
embodiment of the invention.

Fig. 3 is a plan view showing a rear holder described in Fig. 1.

Fig. 4 is an enlarged view showing an elastic member of the rear
10 holder described in Fig. 3.

Fig. 5 is a plan view showing a rear holder in which an area where
screw holes of the base plate are one-sidedly formed is not reduced in
thickness.

15 Description of Embodiments

First, in a configuration in which a female connector is inserted and
fixed into an opening provided on a case in which an electronic device is
contained, and the male connector to which an internal electronic device is
connected is inserted into the female connector, inventors of the present
20 invention have studied a fixing structure for fixing the female connector in
the case in which the electronic device is contained.

[0016] The inventor proposes a fixing structure for a connector, including a
columnar housing in which a plurality of terminal containers are arranged in
parallel to contain respective female terminals; a case which contains an
25 electronic device and includes an opening for inserting the housing from the

opening; and a rear holder which fixes the housing inserted into the case by a plurality of screws. Here, the housing includes: first openings from which respective mating terminals are inserted into heads of the female terminals; second openings into which the respective female terminals are inserted and
5 from which conductors provided at rear ends of the female terminals are extended; and a projecting piece which is projected broader than the opening of the case from an outer edge of an end surface on which the second openings are formed so as to contact an opening edge of the case. Further, the rear holder includes: a base plate opposing the case to arrange and hold
10 the projecting piece of the housing between the base plate and the case; a plurality of through holes which are formed on the base plate corresponding to the second openings of the housing; terminal pressing members which is provided for each of the through holes so as to contact the respective female terminals; and a plurality of screw holes to insert the plurality of screws
15 therein.

As configured in this way, the base plate of the rear holder is fixed on the case by screw, and the housing of the female connector is fixed in the opening of the case while arranging and holding the projecting piece between the base plate and the opening edge of the case.

20 When the female terminal is formed in a straight shape and contained in the terminal container, the female terminal is inserted from one end of the terminal container and fixed in the terminal container. In this case, an engaging step is formed on the other end of the terminal container on the insertion side of the male terminal connected to the female terminal,
25 to position an insertion head of the female terminal. Further, a terminal

pressing member which is extended from the rear holder and formed of an elastic member to be inserted into the terminal container is provided. The terminal pressing member presses an insertion rear end of the female terminal to restrict the escape of the female terminal from the terminal
5 container.

When the female connector having a plurality of female terminals is to be fixed by the rear holder on the case in which the electronic device is contained, the shape of the base plate of the rear holder may be constrained, and the location and the number of screw holes used for fixing the base plate
10 to the case by screw may also be constrained due to the various factors such as the arrangement of the electronic device contained inside the case, connection design with the electronic components, etc., constraints by the location of manufacturing and arranging the fixing structure for the connector, and the workability. For example, the plurality of screw holes for
15 fixing the base plate on the case by screw may be required at a one-sided position with respect to an area of through holes group formed to receive each conductor extended from the rear end of the female terminals. Especially, if a straight line connecting each pair of the screw holes is one-sided on the same side with respect to the center of gravity of the area
20 where the through holes group is formed, the following problems may be occurred.

That is, since the projecting piece of the housing of the female connector is held between the rear holder and the case, there is a possibility that a clearance is formed between the case and a periphery edge of the rear
25 holder on which the screw holes are formed due to the manufacturing

tolerance of the housing and the rear holder even if a recess part is formed on the rear holder to receive the projecting piece. Further, the rigidity of the base plate in a area where the through holes group is formed is low, and in the other area, i.e., the rigidity of the periphery edge of the base plate is kept

5 high. Therefore, if the rear holder is fixed on the case by screw while providing the screw holes on the periphery edge of the base plate, the fastening force by screw reaching on the terminal pressing members formed near the through holes close to the screws is made large. On the contrary, the fastening force by screw reaching on the terminal pressing members

10 formed near the through holes apart away from the screws is made small depending on lowering the rigidity of the base plate. That is, since the terminal pressing force is given by pressing the terminal pressing members on the female terminals, there is a variation in the terminal pressing force depending on the difference in distance from the location of the through hole

15 to the location of the screw hole. Thus, the female terminal provided at a position where the terminal pressing force is lowered may be moved due to the insertion force of the male terminals. Especially, if the straight lines connecting the screw holes are one-sided with respect to the center of gravity of the area where the through holes group is formed, the range of the

20 differences in distance from the respective through holes to the screw holes is large, so the variation in the terminal pressing force is large. Therefore, the female terminal can be moved toward the rear holder (in an axial direction) due to the insertion force of the male terminal, thereby applying the external force on the soldering connection part with the external electronic component

25 to be damaged.

The present invention focuses on the structure in which the area where the plurality of screw holes of the base plate are one-sidedly formed, i.e., the base plate on the area where the through holes are not formed is reduced in thickness.

5 (Embodiment)

An embodiment of the present invention is described with reference to the accompanying drawings. As shown in Figs. 1 to 3, a female connector according to the embodiment includes a columnar housing 3 in which a plurality of female terminals 1 are contained, and a rear holder 7 which is
10 fixed by a plurality of screws on an outer surface of a case wall 5 of a case in which an electronic device such as a vehicle transmission is contained. Each female terminal 1 is made, for example, of a metallic member and formed of a tubular shape being rectangular in cross-section. A male terminal is inserted into the female terminal 1 from an opening of a head of
15 the female terminal 1. A convex elastic piece 9 is formed inside the tube of the female terminal 1 to contact the male terminal. At a rear end of the female terminal 1 is extended a conductor 11, for example, to be connected by soldering etc. to a circuit board which is located on the back side of the rear holder 7.

20 The housing 3 is made, for example, of a resin. The housing 3 includes straight-shaped terminal containers 13, each containing the plurality of female terminals 1 respectively, first openings 15 from which respective mating terminals are inserted into heads of the female terminals 1, second openings 17 into which the respective female terminals 1 are
25 inserted and from which conductors 11 provided at rear ends of the female

terminals are extended, a projecting piece 19 which is arranged and held between the case wall 5 and the rear holder 7, and projections 21 to be engaged with engaging members 35 of the rear holder 7. The terminal container 13 is formed in a straight shape having a rectangle in cross-section.

5 At one end of the terminal container 13 is formed the opening 15, and at the other end is formed the opening 17. The opening 15 is formed to insert therein the male terminal connected to the electronic device inside the case 5 from the head of the female terminal 1 in the terminal container 13. The opening 17 is formed in a rectangle in cross-section to insert the female
10 terminal 1 therein. An engaging step 16 is formed on an inner surface at a side of the opening 15 of the terminal container 13 to contact the head of the female terminal 1, thereby positioning the female terminal 1 inside the terminal container 13. The projecting piece 19 is projected broader than the opening 12 of the case from an outer edge of an end surface 18 on which the
15 openings 17 are formed so as to contact an edge of the opening 12 of the case wall 5. The projecting piece 19 is flattened in shape. In the embodiment, three projecting pieces 19 are formed: two projecting pieces 19 are symmetrically provided about a center axis of the housing 3; and one projecting piece 19 is provided at a position where a line orthogonal to the
20 straight line connecting the two projecting pieces 19 crosses an outer edge of the housing 3. The projection 21 is formed in an upstanding manner from an outer surface of the housing 3, and is engaged with the engaging member 35 of the rear holder 7.

The rear holder 7 includes a base plate 25 opposing the case wall 5 to
25 arrange and hold the projecting piece 19 of the housing 3 between the base

plate 25 and the case wall 5. On the base plate 25, there are formed a plurality of through holes 27 corresponding to the openings 17 of the housing 3, terminal pressing members 41 which is provided for each of the through holes 27 so as to contact, for example, the rear ends of the respective female terminals 1, two screw holes 31, 32 in which two screws are inserted to fix the rear holder 7 to the case wall by the screws, for example, a plurality of recess parts 33 in which the projecting pieces 19 of the housing 3 are inserted, engaging members 35 which engages with the projections 21 of the housing 3 to fix the housing 3 onto the rear holder 7, and projections 37 which are inserted into recess parts of the case wall 5 to position the female connector.

The conductors 11 of the female terminals 1 are inserted into the plurality of through holes 27 and projected from a back side of the rear holder 7. The plurality of terminal pressing members 41 are provided for each through hole 27 to fix the female terminals 1. The terminal pressing member 41 is deformed elastically by contact with the rear end of the female terminal 1 when the rear holder 7 is fixed by the screws, and presses the female terminal 1 against the engaging step 16. As shown in Fig. 4, the terminal pressing member 41 is formed of a substantially L-shape having a leg portion 43 cantilevered on the base plate 25 and an arm portion 45 extended from the leg portion 43 substantially at a right angle to contact the rear end of the female terminal 1. An area 30 of a through holes group is formed on the base plate 25 by the plurality of through holes 27 and the terminal pressing members 41.

The screws are inserted into the screw holes 31, 32, and the rear holder 7 is fixed on the case wall 5 by the inserted screws. The recess part

33 is formed corresponding to the projecting piece 19, and is made smaller in depth than the thickness of the projecting piece 19. The projection 37 is inserted into the recess part provided on the case wall 5 to position the rear holder 7.

5 Next, the characteristic configuration of the connector according to the embodiment is described. The screw holes 31, 32 of the rear holder 7 are arranged so that a straight line connecting the screw holes 31, 32 is apart away with respect to a center of gravity 47 of the area 30 of the through holes group, i.e., to a center of axis of the area 30 of the through holes group in a
10 direction pressing the female terminals 1 by the terminal pressing members 41. Further, a reduced area 51 in thickness is formed on a part of an outer edge of an area 49 where the screw holes 31, 32 are formed by reducing the base plate 25 in thickness. That is, the reduced area 51 in thickness is
15 formed on an edge of the base plate 25 opposing the center of gravity 47 with respect to the straight line connecting the screw holes, and is formed
opposing a substantial center of the straight line connecting the screw holes 31, 32.

A description is made of a structure for fixing the female connector as configured on the case wall 5 of the case in which the electronic device is
20 contained. As shown in Fig. 1, the rear holder 7 is positioned on a side of the opening 17 of the housing 3, and the conductors 11 are inserted into the respective through holes 27 of the rear holder 7 to project from the back side of the rear holder 7. At this time, the engaging members 35 of the rear holder 7 are engaged with the projections 21 of the housing 3, to fix the
25 housing 3 and the rear holder 7. The housing 3 fixed on the rear holder 7 is

inserted into the opening 12 of the case wall 5 of the case in which the electronic device is contained. Each of the projecting pieces 19 contacts the edge of the opening 12. In this state, the screws are inserted into the screw holes 31, 32 of the rear holder 7 and screwed in the screw holes formed on the case wall 5 to fix the rear holder 7 on the case wall 5. Thus, each projecting piece 19 is pressed against each recess part 33 of the rear holder 7, and the housing 3 is fixed in the opening 12 of the case wall 5. In this case, fixing by screw is carried out in a state where the arm portions 45 of the terminal pressing members 41 of the base plate 25 contact the rear ends of the female terminals 1. Thus, the terminal pressing members 41 are elastically deformed, and the female terminals 1 are pressed in the terminal containers 13 by an elastic force exerted from the terminal pressing members 41. Note that a clearance is formed between the case wall 5 and the rear holder 7 since each projecting piece 19 is formed larger in thickness than the depth of each recess part 33 in consideration with the manufacturing tolerance of each projecting piece 19 and each recess part 33.

Next, the characteristic function of the connector according to the embodiment is described. Since the plurality of through holes 27 are formed on the area 30 of the through holes group, the rigidity of the area 30 is lower than that of the area 49 on which the screw holes 31, 32 are formed. Therefore, if the screw holes are formed so that the straight line connecting the screw holes 31, 32 is apart away from the center of gravity 47 of the area 30 of the through holes group, there occurs a variation in the fastening force by screw reaching to the area 30 of the through holes group depending on the distance from the screw holes 31, 32. That is, the fastening force by screw

reaching to the terminal pressing member 41 formed by the through hole 27 placed at a boundary of the area 30 of the through holes group and facing the screw hole 31 or the screw hole 32 becomes large, and the fastening force by screw reaching to the terminal pressing member 41 becomes smaller as the position of the terminal pressing member 41 is apart away from the screw hole 31 or the screw hole 32. In this way, when the fastening force by screw reaching to the terminal pressing member 41 is different depending on the position, there can occur a variation in the force pressing the female terminal 1 exerted on the terminal pressing member 41. The female terminal 1 can be moved toward the rear holder 7 by the insertion force of the male terminal. It becomes possible to damage the soldering connection part with the external electronic component due to the applied external force.

In the embodiment, the reduced area 51 in thickness is formed on the base plate by reducing in thickness the area 49 of the base plate 25 where the screw holes 31, 32 are formed. Since the rigidity of the area 49 where the screw holes 31, 32 are formed is lowered, the fastening force by screw reaching to the area 30 of the through holes group from the area 49 when screwed is distributed. As a result, since the fastening force by screw reaching to the area 30 of the through holes group becomes uniform, and the variation in the terminal pressing force is suppressed, the female terminal 1 is prevented from moving toward the rear holder 7 due to the insertion force of the male terminal.

On the contrary, as shown in Fig. 5, if an area where screw holes 61, 62 of a rear holder 60 are one-sidedly formed is not reduced in thickness, the fastening force by screw reaching to the terminal pressing member formed

by the through hole placed at a boundary of an area 65 of the through holes group and facing the screw hole 61 or the screw hole 62 becomes large, and the fastening force by screw reaching to the terminal pressing member becomes smaller as the position of the terminal pressing member is apart
5 away from the screw hole 61 or the screw hole 62 when screwed. In other words, the fastening force by screw reaching to areas 67, 69 close to the screw holes 61, 62 shown by slanting lines in Fig. 5 is large, while the fastening force by screw reaching to the other area 65 of the through holes group is small. As a result, in the terminal pressing member placed apart
10 away from the screw holes 61, 62, the force pressing the female terminal becomes insufficient. Thus, the female terminal can move due to the insertion force of the male terminal, and the soldering connection part with the electronic component, etc. may be damaged due to the applied external force.

15 As described above, according to the fixing structure for the female connector of the embodiment, when the male terminals are to be inserted into the female terminals 1, it is possible to prevent the female terminals 1 from moving and the external force from applying to the soldering connection part with the external electronic component, etc. Especially, even if the
20 straight line connecting the screw holes 31, 32 is apart away from the center of gravity 47 of the area 30 of the through holes group, it is possible to suppress the variation in the force pressing each female terminal 1 by each terminal pressing member 41. Thus, the positional constraint of the screw holes 31, 32, etc. is alleviated and the fixing structure for the female
25 connector is easily manufactured.

Although the embodiment shows the configuration in which two screw holes are formed on the rear holder 7, the location and the number of the screw holes are not limited to this configuration. When the number of the screw holes is more than two, and the plurality of straight lines, each
5 connecting each pair of the screw holes are one-sidedly provided on the same side with respect to the center of gravity of the area of the through holes group, the reduced area in thickness of the base plate is formed on a area where the plurality of straight lines, each connecting each pair of the screw holes are one-sidedly provided.

10 The shape of the base plate 25 is not limited to the shape described in the above embodiment. Alternatively, the base plate 25 can be designed arbitrarily in shapes such as rectangle, or circle, depending on the arrangement of the electronic device contained inside the case.

The projections 21 of the housing 3 and the engaging members 35 of
15 the rear holder 7 can be omitted. However, if they are provided, the operation of insertion and fixing becomes easier by fixing the housing 3 and the rear holder 7 by the projections 21 and the engaging member 35 before inserting the fixing them on the case wall 5.

CLAIMS

1. A fixing structure for a connector, comprising:

a columnar housing in which a plurality of terminal containers are

5 arranged in parallel to contain respective female terminals;

a case which contains an electronic device and includes an opening
for inserting the housing from the opening; and

a rear holder which fixes the housing inserted into the case by a
plurality of screws, wherein

10 the housing includes:

first openings from which respective mating terminals are
inserted into heads of the female terminals;

second openings into which the respective female terminals are
inserted and from which conductors provided at rear ends of the female
15 terminals are extended; and

a projecting piece which is projected broader than the opening of
the case from an outer edge of an end surface on which the second openings
are formed so as to contact an opening edge of the case,

the rear holder includes:

20 a base plate opposing the case to arrange and hold the projecting
piece of the housing between the base plate and the case;

a plurality of through holes which are formed on the base plate
corresponding to the second openings of the housing;

terminal pressing members which is provided for each of the
25 through holes so as to contact the respective female terminals; and

a plurality of screw holes to insert the plurality of screws therein,
the plurality of screw holes of the rear holder are provided so that a
straight line connecting each pair of the screw holes is one-sidedly formed on
the same side with respect to a center of gravity of an area where the
5 plurality of through holes are formed, and

a reduced area in thickness is formed on the base plate on a area
where the straight line connecting the screw holes is one-sidedly formed.

2. The fixing structure according to claim 1, wherein

10 the plurality of screw holes are formed in two on the rear holder,
a straight line connecting the two screw holes is apart away from the
center of gravity of the area where the plurality of through holes are formed,
and

the reduced area in thickness is formed on an area where the straight
15 line connecting the two screw holes is formed.

3. The fixing structure according to claim 1, wherein

each of the terminal pressing members is formed of a substantially
L-shape having a leg portion cantilevered on the base plate and an arm
20 portion extended from the leg portion substantially at a right angle to
contact the rear end of the female terminal.

4. The fixing structure according to claim 1, wherein

a recess part is formed on the rear holder to insert the projecting
25 piece of he housing into the recess part.

FIG. 1

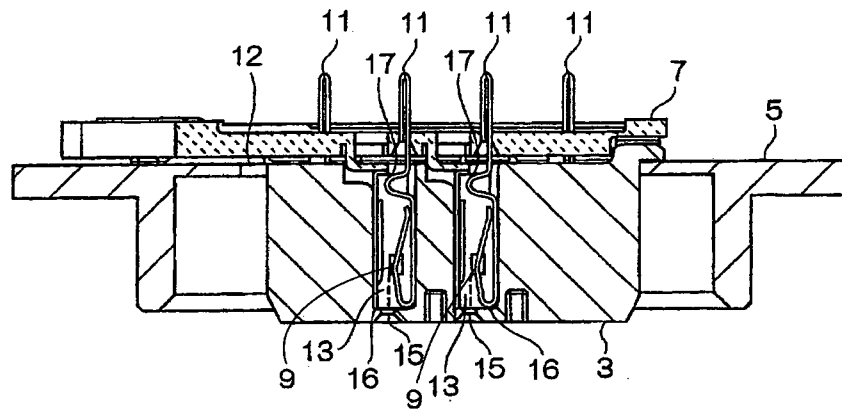


FIG. 2

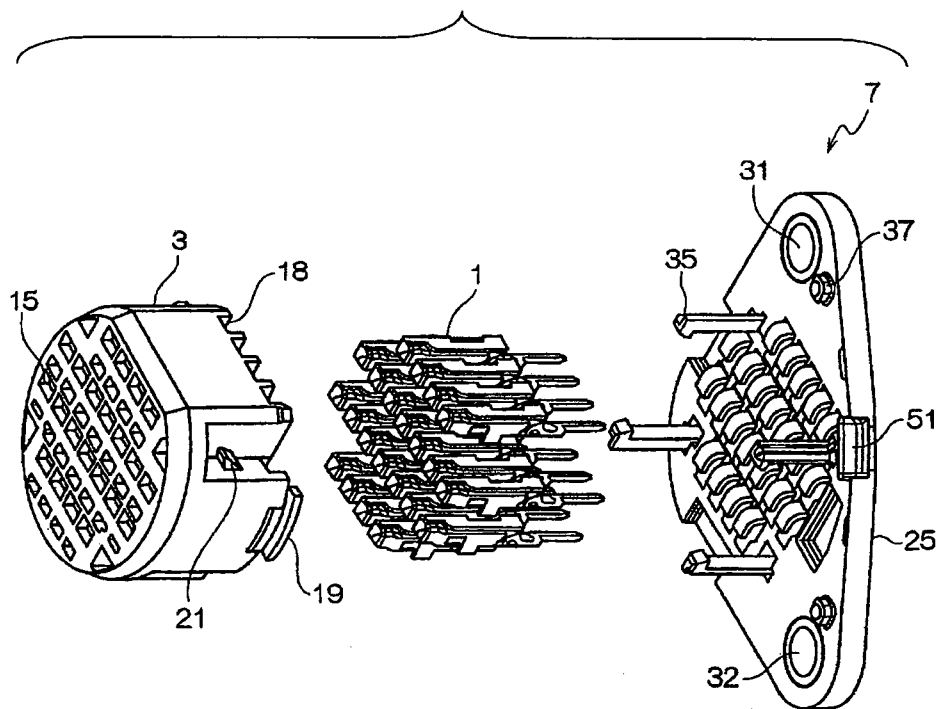


FIG.3

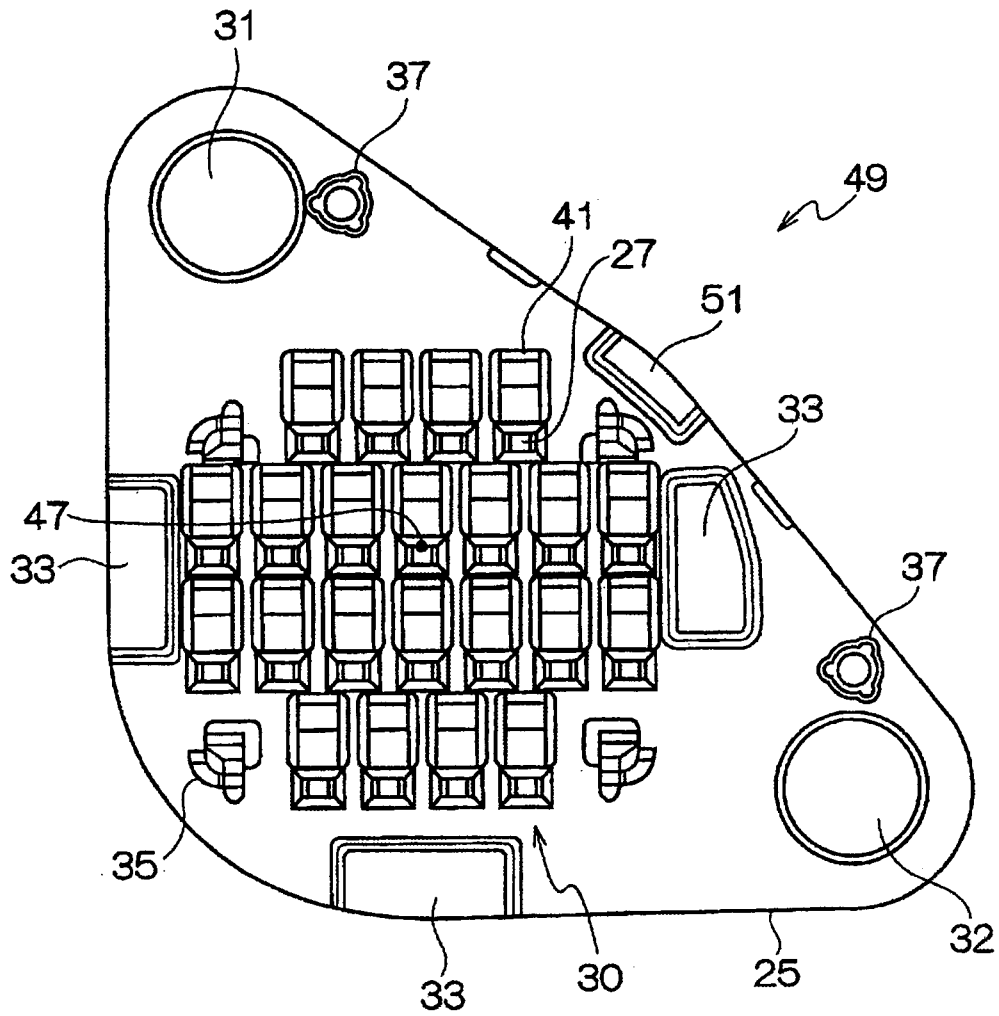


FIG. 4

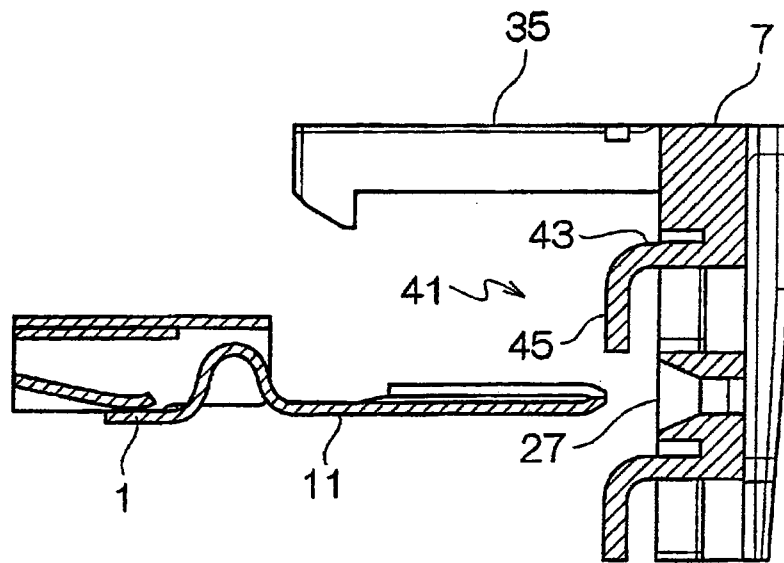
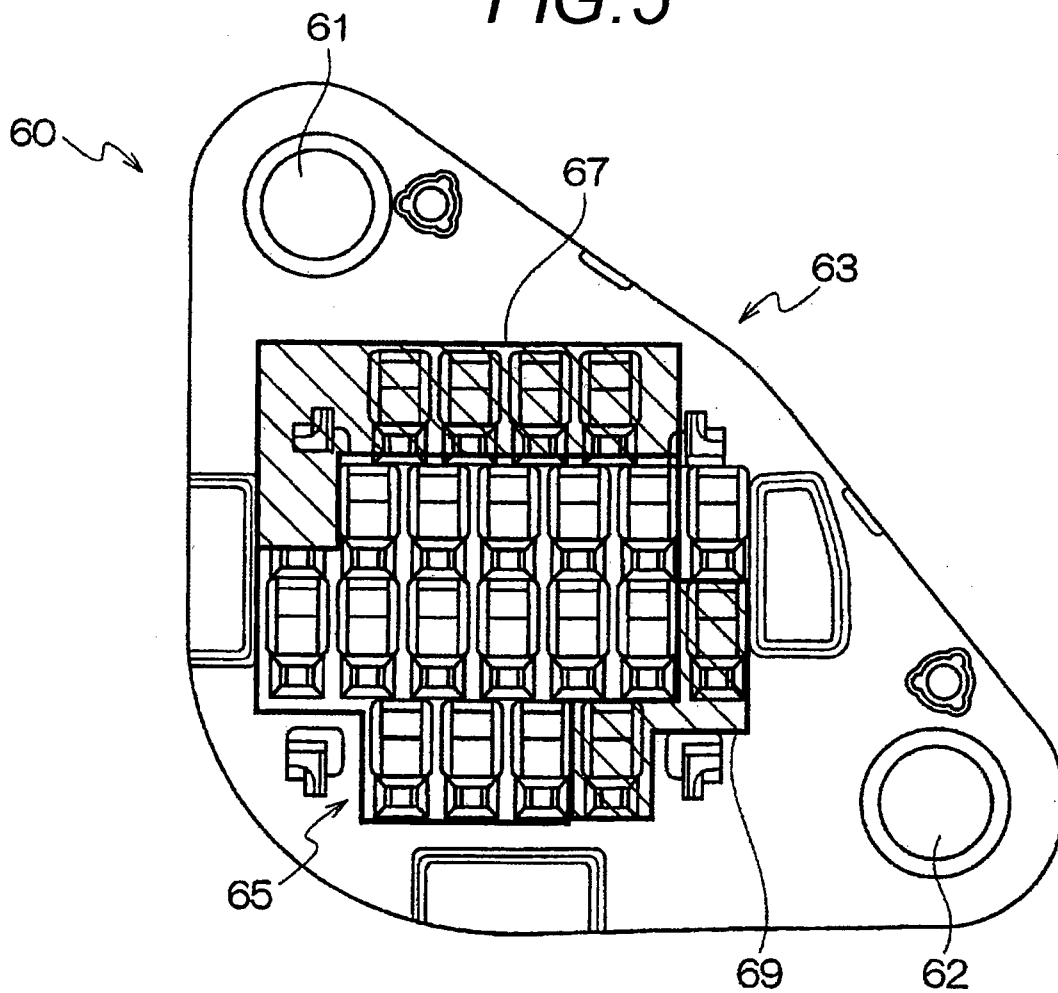


FIG. 5



INTERNATIONAL SEARCH REPORT

International application No
PCT/JP2010/073057

A. CLASSIFICATION OF SUBJECT MATTER
INV. H01R13/436 H01R13/506 H01R13/514 H01R13/74 H01R13/42
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 H05K

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 practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2009 199992 A (YAZAKI CORP) 3 September 2009 (2009-09-03) paragraph [0041]; figures 1-4 -----	1-4
X	JP 2009 199993 A (YAZAKI CORP) 3 September 2009 (2009-09-03) figures 9,10 -----	1-4
X	JP 2009 252699 A (YAZAKI CORP; AISIN AW CO) 29 October 2009 (2009-10-29) the whole document -----	1-4



Further documents are listed in the continuation of Box C.



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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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