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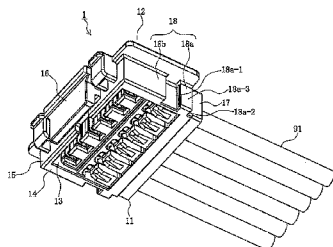


FIG. 1

(57) Abstract: A wire-to-board connector is disclosed. The connector includes a first connector (1) and a second connector (101). The first connector includes a first housing (11), in which electrical wires (91) are inserted in a base end portion thereof, and first terminals connected to electrical wires. The second connector includes a second housing (111), configured to be engaged with the first housing by fitting together, and second terminals connected to the first terminals. The first housing is provided with a lock member (16) and fitting keys (18). The second housing is provided with a locked member (116) and key grooves (118). At least a part of the fitting keys is arranged at a position located in the vicinity of the base end portion of the first housing. At least a part of the key grooves is arranged at a position located in the vicinity of a base end portion of the second housing.

WIRE-TO-BOARD CONNECTOR

REFERENCE TO RELATED APPLICATIONS

[0001] The Present Invention claims priority of prior Japanese Patent Application No. 2008-303456, entitled "Wire-To-Board Connector," and filed 28 November 2008, the contents of which is fully incorporated in its entirety herein.

BACKGROUND OF THE PRESENT INVENTION

[0002] The present invention relates to a wire-to-board connector.

[0003] Hitherto, a wire-to-board connector has been used for connecting electrical wires of a cable and the like to a circuit board such as a printed circuit board (reference should be made to, for example, Japanese Patent Application No. 2004-303554). Such a wire-to-board connector has one connector which is mounted on a circuit board to be engaged with the other connector by fitting together, which is connected to an end portion of a cable.

[0004] Fig. 8 is a perspective view of a wire-to-board connector according to the prior art, illustrating a state where one and the other connectors of the wire-to-board connector are prepared for coming into engagement to be fitted together.

[0005] Referring to Fig. 8, a board connector generally designated by reference numeral 901 is mounted on a non-illustrated circuit board. Moreover, a wire connector generally designated by reference numeral 801 is connected to a termination end of a coaxial cable 891 and is engaged with the board connector 901 to be fitted together. The board connector 901 includes an insulator 911, a terminal 961 attached to the insulator 911, and an outer conductor 971. The outer conductor 971 is formed by bending a metal plate into a generally rectangular shape having one open and formed with concaved latching portions 974, each being provided with a guide groove, at positions located close to a fore end and a base end of the inner face of the planar left and right side walls, respectively. Moreover, the terminal 961 is provided with a rod-shaped base portion 962 formed at a fore end side thereof and a flat plate-like connection portion 964 formed at a base end side thereof.

[0006] On the other hand, the wire connector 801 is provided with non-illustrated terminal connected to a fore end of the coaxial cable 891, an insulator 811 formed outside the terminal, and an outer conductor 871 attached to an outer face of the insulator 811. The outer conductor

871 is formed by bending a metal plate into a generally rectangular shape having one open to thereby cover the upper face and both side walls of the insulator 811, and is provided with planar left and right side walls, respectively, in which latching projections 874 are formed at positions located close to a fore end and a base end of the inner face. Moreover, a groove-shaped
5 clearance 813 is formed in a lower face of the insulator 811 so that the terminal is accommodated in the clearance 813.

[0007] When the wire connector 801 is moved downward relative to the board connector 901, the wire connector 801 is inserted into a space surrounded by the outer conductor 971 to be fitted together. In this way, the terminal of the wire connector 801 comes into contact with the
10 connection portion 964 of the terminal 961 of the board connector 901 to be electrically connected to each other. Moreover, the latching projections 874 of the wire connector 801 are engaged with the concaved latching portions 974 of the board connector 901 and thus, the wire connector 801 is prevented from being removed from the board connector 901.

[0008] However, in the conventional wire-to-board connector, when the coaxial cable 891
15 connected to the wire connector 801 is subjected to a shaking or flapping motion, the latching projection 874 and the concaved latching portion 974 are often disengaged from each other and thus, the wire connector 801 and the board connector 901 are released from their fitting state.

[0009] Nevertheless, since the wire connector 801 is clamped by the outer conductor 971 of the board connector 901 in a sandwich manner and is supported on the lower side thereof by the
20 insulator 911, when the shaking or flapping motion is applied to the coaxial cable 891 in the left-right direction or in a downward direction, the wire connector 801 and the board connector 901 are not likely to be released from their fitting state. However, none of the members of the board connector 901 is provided on the upper side of the wire connector 801. In addition, on the fore end side of the wire connector 801, since the latching projection 874 is engaged with the
25 concaved latching portion 974 of the board connector 901, and moreover, since the terminal of the wire connector 801 clamps the connection portion 964 of the terminal 961 of the board connector 901 in a sandwich manner, the wire connector 801 may be held with a relatively strong force. To the contrary, on the base end side of the wire connector 801, only the latching projections 874 are engaged with the concaved latching portions 974 of the board connector 901.
30 Because of such an engagement configuration, when the shaking or flapping motion in an upward direction is applied to the coaxial cable 891, the wire connector 801 is first turned about

the fore end side thereof, so that the latching projections 874 on the base end side tend to be disengaged from the concaved latching portion 974 of the board connector 901, and subsequently, the whole wire connector 801 is eventually disengaged from the board connector 901.

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SUMMARY OF THE PRESENT INVENTION

[0010] Therefore, it is an object of the present invention to obviate the above-described problems encountered by the conventional wire-to-board connector and to provide a wire-to-board connector having such a configuration that a front end portion of a first connector is locked in a second connector, and that fitting keys formed at positions in the vicinity of a base end portion of side portions of the first connector are fitted in key grooves of the second connector, so that even when electrical wires are subjected to a shaking motion, the first connector is prevented from turning about the front end portion thereof so that the first connector is not removed from the second connector. Accordingly, the wire-to-board connector is able to facilitate an operation of fitting the first connector and the second connector to be engaged with each other, to decrease a space occupied by the wire-to-board connector per se, and to provide high reliability for the wire-to-board connector.

[0011] Therefore, in accordance with the present invention, a wire-to-board connector comprises: a first connector including a first housing in which electrical wires are inserted in a base end portion thereof, and first terminals connected to electrical wires; and a second connector including a second housing configured to be engaged with the first housing by fitting together, and second terminals connected to the first terminals, wherein: the first housing is provided with a lock member formed in a front end portion thereof and fitting keys formed in side portions thereof; the second housing is provided with a locked member formed in a front end portion thereof to be engaged with the lock member and key grooves formed in side portions thereof to be engaged with the fitting keys; at least a part of the fitting keys is arranged at a position located in the vicinity of the base end portion of the first housing; and at least a part of the key grooves is arranged at a position located in the vicinity of a base end portion of the second housing.

[0012] In accordance with another embodiment of the present invention, the wire-to-board connector has such a configuration that the fitting keys and the key grooves extend in a direction

in which the first housing and the second housing are engaged with each other by fitting together.

[0013] In accordance with a further embodiment of the present invention, the wire-to-board connector has such a configuration that the fitting keys comprise a first fitting key arranged at a position in the vicinity of the base end portion of the first housing and a second fitting key being larger in width thereof than the first fitting key, and that each of the key grooves comprises a first key groove arranged at a position in the vicinity of the base end portion of the second housing and configured to be fitted therein with the first fitting key and a second key groove being larger in width thereof than the first key groove and configured to be fitted therein with the second fitting key.

[0014] In accordance with a still further embodiment of the present invention, the wire-to-board connector has such a configuration that the first fitting key is provided with side walls and an apex wall, one of the side walls being formed at a position located in the vicinity of the base end portion and defining an acute angle with respect to the apex wall, and that the first key groove is provided with side walls and a bottom wall, one of the side walls being formed at a position located in the vicinity of the base end portion and defining an acute angle with respect to the bottom wall.

[0015] In accordance with the present invention, the wire-to-board connector has a configuration in which a front end portion of a first connector is locked at a second connector, and that fitting keys formed at positions in the vicinity of a base end portion of respective one of the side portions of the first connector are engaged in key grooves of the second connector to be fitted together. Owing to this configuration, it is possible to prevent the first connector from turning about the front end portion thereof even when electrical wires are subjected to a shaking motion. Therefore, the first connector is not disengaged from the second connector. Accordingly, it is possible to provide a wire-to-board connector capable of facilitating an operation to fit the first connector and the second connector together to be brought into complete engagement with each other, while decreasing a space occupied by the wire-to-board connector, and providing high reliability thereof.

BRIEF DESCRIPTION OF THE FIGURES

[0016] The organization and manner of the structure and operation of the Present Invention, together with further objects and advantages thereof, may best be understood by reference to the following Detailed Description, taken in connection with the accompanying Figures, wherein like reference numerals identify like elements, and in which:

5 [0017] Fig. 1 is a perspective view of a wire connector of a wire-to-board connector according to an embodiment of the present invention, as viewed from an obliquely downward direction;

[0018] Fig. 2 is a perspective view of a board connector of the wire-to-board connector according to the embodiment of the present invention, as viewed from an obliquely upward direction;

10 [0019] Fig. 3 is a perspective view of the wire-to-board connector according to the embodiment of the present invention, illustrating a state where the connectors are fitted to be engaged with each other;

[0020] Figs. 4A and 4B are top plan views of the board connector of the wire-to-board connector according to the embodiment of the present invention, in which Fig. 4B is an enlarged view of a
15 main portion ("A" portion) of Fig. 4A;

[0021] Fig. 5 is a top plan view of the wire-to-board connector according to the embodiment of the present invention, illustrating a state where the connectors are fitted to be engaged with each other;

[0022] Fig. 6 is a first side sectional view of the wire-to-board connector according to the
20 embodiment of the present invention, illustrating a state where the connectors are fitted to be engaged with each other, taken along the arrows B-B in Fig. 5;

[0023] Fig. 7 is a second side sectional view of the wire-to-board connector according to the embodiment of the present invention, illustrating a state where the connectors are fitted to be engaged with each other, taken along the arrows C-C in Fig. 5; and

25 [0024] Fig. 8 is a perspective view of a wire-to-board connector according to the prior art, illustrating a state where any counterpart connector is not fitted to the wire-to-board connector.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0025] While the Present Invention may be susceptible to embodiment in different forms, there
30 is shown in the Figures, and will be described herein in detail, specific embodiments, with the

understanding that the disclosure is to be considered an exemplification of the principles of the Present Invention, and is not intended to limit the Present Invention to that as illustrated.

[0026] In the embodiments illustrated in the Figures, representations of directions such as up, down, left, right, front, rear and the like, used for explaining the structure and movement of the various elements of the Present Invention, are not absolute, but relative. These representations are appropriate when the elements are in the position shown in the Figures. If the description of the position of the elements changes, however, it is assumed that these representations are to be changed accordingly.

[0027] Description of preferred embodiments of the present invention will be provided below in detail with reference to the accompanying drawings. Fig. 1 is a perspective view of a wire connector of a wire-to-board connector according to an embodiment of the present invention, as viewed from an obliquely downward direction; Fig. 2 is a perspective view of a board connector of the wire-to-board connector according to the embodiment of the present invention, as viewed from an obliquely upward direction; Fig. 3 is a perspective view of the wire-to-board connector according to the embodiment of the present invention, illustrating a state where the connectors are fitted to be engaged with each other; and Figs. 4A and 4B are top plan views of the board connector of the wire-to-board connector according to the embodiment of the present invention. In Figs. 4A and 4B, Fig. 4B is an enlarged view of a main portion ("A" portion) of Fig. 4A.

[0028] In the drawing figures, a board connector as a second connector of a wire-to-board connector according to the present embodiment, generally designated by reference numeral 101, is mounted on a non-illustrated circuit board. Moreover, a wire connector as a first connector of the wire-to-board connector according to the present embodiment, generally designated by reference numeral 1 is used for being connected to a termination end of a cable provided with a plurality of electrical wires 91 to thereby electrically connect the cable to the board connector 101. In the example illustrated in the drawing figures, although the number of electrical wires 91 is six, the number of the electrical wires 91 may be arbitrarily changed and may be one, for example. In the present embodiment, although the wire connector 1 is a connector for connecting cables provided such electrical wires 91 having a circular sectional shape as illustrated in the drawing figures, the wire connector 1 may be a connector for connecting flat plate-like flexible cables such as an FFC (Flexible Flat Cable) or an FPC (Flexible Printed Circuit).

[0029] Here, the board connector 101 is a receptacle connector and includes a board-side housing 111, as a second housing, which is integrally formed of an insulating material such as synthetic resin and is configured to be fitted to the wire-side housing 11 of the wire connector 1, and board-side terminals 161 as second terminals, which are formed of metal and are fitted in the board-side housing 111. The board-side housing 111 is provided with a locked member 116 formed in a front end portion thereof and key grooves 118 formed in side portions thereof. In the example illustrated in Fig. 2, although the number of board-side terminals 161 is six, the number of board-side terminals 161 may be arbitrarily changed to comply with the number of electrical wires 91. The board connector 101 has a generally flat rectangular parallelepiped shape and is attached to a circuit board thereof so that a lower surface thereof faces a front surface of the circuit board, and the wire connector 1 is inserted from above to be fitted thereto.

[0030] As illustrated in Fig. 2, the board-side housing 111 is provided with a bottom wall portion 112 having a generally rectangular flat-plate shape, a front-end wall portion 115 which erects from the bottom wall portion 112 so as to extend along an edge on a front end side (the left lower side in Fig. 2, corresponding to a front end side of the fitted wire connector 1) of the bottom wall portion 112, and side wall portions 117 which are erected from the bottom wall portion 112 so as to extend along both side edges of the bottom wall portion 112. The board-side housing 111 is further provided with a terminal support portion 113 which is disposed at a position closer to a base end side (the right upper side in Fig. 2, corresponding to a base end side of the fitted wire connector 1) than the front-end wall portion 115 and is erected from the bottom wall portion 112 so as to extend in parallel with the front-end wall portion 115.

[0031] Moreover, contact portions 164 of the board-side terminals 161 extend in a direction where they are erected from the bottom wall portion 112 and are supported by the terminal support portion 113. Furthermore, solder tail portions 162 of the board-side terminals 161 have respectively a fore end thereof which extends from a lower end of the front-end wall portion 115 toward the forward end so as to be electrically connected to signal lines, contact pads, terminals, or the like, formed in the circuit board, namely, counterpart terminal members, by means of soldering or the like.

[0032] Moreover, in the side wall portions 117, bracket accommodation grooves 117a are formed so that an attachment auxiliary bracket 181 is accommodated in the bracket accommodation grooves 117a. Moreover, a connection portion 183 formed in a lower end of the

attachment auxiliary bracket 181 is fixedly secured to a connector fixing portion such as solder pads formed in the circuit board by means of soldering or the like. In this way, the board connector 101 can be firmly secured to the circuit board.

[0033] Furthermore, in an inner surface of each of the side wall portions 117, a first key groove 118a and a second key groove 118b are formed so as to extend in a fitting direction, that is, in a direction perpendicular to the bottom wall portion 112. When the first key groove 118a and the second key groove 118b are collectively described, they will be referred to as key grooves 118.

When the wire connector 1 is fitted to the board connector 101, a first fitting key 18a and a second fitting key 18b of the wire connector 1 are fitted to the first key groove 118a and the second key groove 118b, respectively. In addition, the first key groove 118a is formed at a position close to a base end side of each side wall portion 117, that is, in the vicinity of a base end portion of each side portion, while the second key groove 118b being larger in width than the first key groove 118a is formed in a position on a fore end side of each side wall portion 117, that is, a position in the vicinity of a fore end portion of each side portion.

[0034] The first key groove 118a has a generally trapezoidal sectional shape, not a rectangular shape, as best shown in Figs. 4A and 4B, where a width on an opening side thereof is narrower than a width on a bottom side thereof. That is, the first key groove 118a is a generally trapezoidal groove which is defined by a side wall 118a-1 near the front end portion, a side wall 118a-2 near the base end portion, and a bottom wall 118a-3, in which a gap between the side wall 118a-1 near the front end portion and the side wall 118a-2 near the base end portion widens as it goes from the opening side toward the bottom wall 118a-3.

[0035] More specifically, the side wall 118a-1 near the front end portion is substantially perpendicular to the bottom wall 118a-3 extending in parallel with each side wall portion 117. To the contrary, the side wall 118a-2 near the base end portion is inclined with respect to the bottom wall 118a-3, and an angle defined between the side wall 118a-2 near the base end portion and the bottom wall 118a-3 is an acute angle.

[0036] Furthermore, a locked member 116 is formed in an outer surface of the front-end wall portion 115. When the wire connector 1 is fitted to the board connector 101, a lock member 16 of the wire connector 1 is locked by being engaged with the locked member 116.

[0037] On the other hand, the wire connector 1 is a plug connector and includes a wire-side housing 11, as a first housing, which is integrally formed of an insulating material such as

synthetic resin and is configured to be fitted to the board-side housing 111 of the board connector 101, and non-illustrated wire-side terminals, as first terminals, which is formed of metal and is fitted in the wire-side housing 11. Moreover, the wire-side housing 11 is provided with a lock member 16 formed in a front end portion thereof and fitting keys 18 formed in side portions thereof. Furthermore, the wire connector 1 has a generally flat rectangular parallelepiped shape and is inserted from above to be fitted to the board connector 101 in a posture wherein a lower surface thereof faces an upper surface of the board connector 101. That is, the wire connector 1 is perpendicularly fitted to the board connector 101.

[0038] As illustrated in Figs. 1 and 3, the wire-side housing 11 is provided with a top plate portion 12 having a generally rectangular flat-plate shape and a body portion 14 having a parallelepiped shape connected to a lower surface of the top plate portion 12. A front end side (the left upper side in Fig. 1) of the body portion 14 is a front-end wall portion 15 which extends in parallel with an edge on a front end side of the top plate portion 12 and is perpendicular to the top plate portion 12. Both sides of the body portion 14 are side wall portions 17 which extend in parallel with both side edges of the top plate portion 12 and are perpendicular to the top plate portion 12. In addition, the body portion 14 includes a slit-shaped terminal support opening 13 at a position located closer to the base end side (the right lower side in Fig. 1) than the front-end wall portion 15, which extends in parallel with the front-end wall portion 15 and opened to a lower surface of the body portion 14.

[0039] Moreover, the front end portions of the wire-side terminals are arranged in the terminal support opening 13, and when the wire connector 1 is fitted to the board connector 101, make contact with the contact portions 164 of the board-side terminals 161 which are supported by the terminal support portion 113 coming into the terminal support opening 13. Furthermore, the base end portions of the wire-side terminals are electrically connected to conductive wires of the electrical wires 91. Furthermore, the foremost ends of the respective electrical wires 91 are held in the wire-side housing 11.

[0040] Furthermore, in an outer surface of each of the side wall portions 17, a first fitting key 18a and a second fitting key 18b are formed so as to outwardly protrude from the outer surface and to extend in the fitting direction, that is, in a direction perpendicular to the top plate portion 12. When the first fitting key 18a and the second fitting key 18b are collectively described, they will be referred to as fitting keys 18. When the wire connector 1 is fitted to the board connector

101, the first fitting key 18a and the second fitting key 18b are fitted to the first key groove 118a and the second key groove 118b of the board connector 101, respectively. In addition, the first fitting key 18a is formed at a position on a base end side of each side wall portion 17, that is, a position in the vicinity of a base end portion of each side portion, while the second fitting key 18b being larger in width than the first fitting key 18a is formed at a position on a fore end side of each side wall portion 17, that is, a position in the vicinity of a fore end portion of each side portion.

[0041] The first fitting key 18a has a generally trapezoidal sectional shape, similar to the sectional shape of the first key groove 118a, not a rectangular shape, where a width on a portion corresponding to the bottom wall 118a-3 of the first key groove 118a is larger than a width on a root side thereof. That is, the first fitting key 18a is a generally trapezoidal-shaped key which is defined by a side wall 18a-1 near the fore end portion, a side wall 18a-2 near the base end portion, and an apex wall 18a-3, in which a gap between the side wall 18a-1 near the fore end portion and the side wall 18a-2 near the base end portion widens as it goes from the root side thereof toward the apex wall 18a-3.

[0042] More specifically, the side wall 18a-1 near the fore end portion is substantially perpendicular to the apex wall 18a-3 extending in parallel with each side wall portion 17. To the contrary, the side wall 18a-2 near the base end portion is inclined with respect to the apex wall 18a-3, and an angle defined between the side wall 18a-2 near the base end portion and the apex wall 18a-3 is an acute angle.

[0043] Furthermore, a lock member 16 is formed in an outer surface of the front-end wall portion 15. When the wire connector 1 is fitted to the board connector 101, the lock member 16 is locked by being engaged with the locked member 116 of the board connector 101.

[0044] Next, a description of an operation of fitting the wire connector 1 to be engaged with the board connector 101 will now be provided herein below. Fig. 5 is a top plan view of the wire-to-board connector according to the embodiment of the present invention, illustrating a state where the connectors are fitted to be engaged with each other; Fig. 6 is a first side sectional view of the wire-to-board connector according to the embodiment of the present invention, illustrating a state where the connectors are fitted to be engaged with each other, taken along the arrows B-B in Fig. 5; and Fig. 7 is a second side sectional view of the wire-to-board connector according to the

embodiment of the present invention, illustrating a state where the connectors are fitted to be engaged with each other, taken along the arrows C-C in Fig. 5.

[0045] When the wire connector 1 is fitted to the board connector 101 mounted on the circuit board, an operator operates the wire connector 1 by the operator's fingers or the like so that the lower surface of the body portion 14 of the wire connector 1 is positioned to face the bottom wall portion 112 of the board connector 101. Moreover, the direction of the wire connector 1 is adjusted so that the front-end wall portion 15 formed in the lock member 16 is directed to the same direction as the front-end wall portion 115 formed in the locked member 116 of the board connector 101. Then, the wire connector 1 is moved to be perpendicular to the circuit board so that the body portion 14 of the wire connector 1 is inserted from above in a concave portion having a perimeter thereof being defined by the bottom wall portion 112, the front-end wall portion 115, and the side wall portions 117 of the board-side housing 111 of the board connector 101, whereby the wire connector 1 is fitted to the board connector 101 as illustrated in Fig. 5.

[0046] At this time, as illustrated in Fig. 6, the terminal support portion 113 of the board connector 101 comes into the terminal support opening 13 of the body portion 14 of the wire connector 1. Moreover, the tip end portions of the wire-side terminals arranged in the terminal support opening 13 are brought into contact with the contact portions 164 of the board-side terminals 161 which are supported by the terminal support portion 113. In this way, the conductive wires of the electrical wires 91 are electrically connected to the counterpart terminal members formed in the circuit board via the wire-side terminals and the board-side terminals 161.

[0047] Furthermore, as illustrated in Fig. 6, the lock member 16 of the wire connector 1 is locked by being engaged with the locked member 116 of the board connector 101. As a result, the wire connector 1 is prevented from being removed from the board connector 101. Moreover, since the operator needs not operate the lock member 16 or the locked member 116 when they are locked, the fitting engagement between the wire connector 1 and the board connector 101 can be carried out in an easy manner. Furthermore, since it is possible to sufficiently perceive the engagement between the lock member 16 and the locked member 116 by a sense of click-feeling, the operator is able to correctly recognize the completion of the fitting engagement between the wire connector 1 and the board connector 101.

[0048] Furthermore, as illustrated in Fig. 7, the first fitting key 18a and the second fitting key 18b of the wire connector 1 are fitted to the first key groove 118a and the second key groove 118b of the board connector 101, respectively. Therefore, the wire connector 1 can be fitted to the board connector 101 in a state where the positioning of the wire connector 1 with respect to the board connector 101 is carried out in an accurate manner. That is, the operator is able to perform a fitting operation in an easy manner because the determining the position of the wire connector 1 with respect to the board connector 101 can be performed in an accurate manner by only fitting the first fitting key 18a and the second fitting key 18b to the first key groove 118a and the second key groove 118b, respectively.

[0049] Moreover, the second fitting key 18b is larger in width than the first fitting key 18a, and similarly, the second key groove 118b is larger in width than the first key groove 118a. Therefore, when the fore end of the wire connector 1 is oriented to face the base end of the board connector 101, that is, when the wire connector 1 is reversely oriented to the board connector 101, it might not be able to fit the first fitting key 18a and the second fitting key 18b to the first key groove 118a and the second key groove 118b, respectively. In other words, since the second fitting key 18b is larger in width than the first fitting key 18a and the second key groove 118b is larger in width than the first key groove 118a, it is possible to certainly prevent misengagement between the wire connector 1 and the board connector 101.

[0050] Furthermore, at least a part of the fitting keys 18 of the wire connector 1, namely, the first fitting key 18a is formed at a position in the vicinity of the base end portion of each side portion of the wire-side housing 11, and similarly, at least a part of the key grooves 118 of the board connector 101, namely, the first key groove 118a is formed at a position in the vicinity of the base end portion of each side portion of the board-side housing 111. Therefore, even when the electrical wires 91 are shaken, the wire-side housing 11 and the board-side housing 111 might not be released from their fitting state. Since the lock member 16 formed in the fore end portion of the wire-side housing 11 is locked by being engaged with the locked member 116 formed in the fore end portion of the board-side housing 111, when the electrical wires 91 inserted into the base end portion of the wire-side housing 11 are shaken, as described above in "SUMMARY OF THE INVENTION," a force acts on the wire-side housing 11 in a direction where the wire-side housing 11 is rotated about the fore end portion. However, since the first fitting key 18a and the first key groove 118a which are arranged to extend in the up-down direction are fitted to each

other at a position in the vicinity of the base end portion which is furthest from the front end portion, it is possible to effectively prevent the rotation of the wire-side housing 11.

[0051] This is because when the wire-side housing 11 begins to turn about the fore end portion thereof with respect to the board-side housing 111, since the first fitting key 18a is inclined with respect to the first key groove 118a, it becomes difficult for the first fitting key 18a to be removed from the first key groove 118a. More specifically, since the first fitting key 18a and the first key groove 118a are distant from the turning point, even though an amount of upward displacement of the first fitting key 18a with respect to the first key groove 118a is small, the angle between the first fitting key 18a and the first key groove 118a becomes large, and thus, it becomes very difficult for the first fitting key 18a to be removed from the first key groove 118a.

[0052] Furthermore, in the first fitting key 18a, the side wall 18a-2 which is located in the vicinity of the base end portion and which is located farthest from the front end portion defines an acute angle with respect to the apex wall 18a-3, and similarly, the first key groove 118a defines an acute angle at the side wall 118a-2 located in the vicinity of the base end portion which is farthest from the front end portion, with respect to the bottom wall 118a-3. Therefore, when the wire-side housing 11 begins to turn about the fore end portion thereof with respect to the board-side housing 111, the side wall 18a-2 being in the vicinity of the base end portion of the first fitting key 18a is inclined with respect to the side wall 118a-2 being in the vicinity of the base end portion of the first key groove 118a to be interlocked with the side wall 118a-2 being in the vicinity of the base end portion, and thus, it becomes more difficult for the first fitting key 18a to be removed from the first key groove 118a. Accordingly, it is possible to more effectively prevent the rotation of the wire-side housing 11.

[0053] As described above, since the first fitting key 18a formed at a position in the vicinity of the base end portion in each side portion of the wire-side housing 11 is fitted to the first key groove 118a formed at a position in the vicinity of the base end portion in each side portion of the board-side housing 111, even when the electrical wires 91 are shaken, the wire connector 1 and the board connector 101 might not be released from their fitting state.

[0054] Among other things, in order to maintain secure fitting engagement between the wire connector 1 and the board connector 101, in lieu of a combination of the fitting keys 18 and the key grooves 118, it may be helpful to use a lock mechanism formed of combinations of the lock member 16 and the locked member 116. However, in such a case, since a plurality of lock

mechanisms is needed, the operator needs to exert a large force in order that all lock mechanisms are substantially simultaneously locked in the fitting operation between the wire connector 1 and the board connector 101, and thus, the operability of the fitting operation is deteriorated.

Moreover, when some of the lock mechanisms are not locked, the wire connector 1 may be in a state where it is inclined with respect to the board connector 101, so that contact failures between the wire-side terminals and the board-side terminals 161 might occur. In addition, since a plurality of lock mechanisms is needed, the structure may be complicated and the cost may increase.

[0055] To the contrary, in the present embodiment, since a single lock mechanism is needed, the fitting operation can be performed with high operability. Moreover, the determining position of the wire connector 1 with respect to the board connector 101 can be carried out in an accurate manner with a simple structure by fitting the fitting keys 18 and the key grooves 118 together, and thus, it is possible to certainly prevent misengagement between them. Furthermore, it is possible to maintain secure fitting engagement between the wire connector 1 and the board connector 101.

[0056] As described above, the wire-to-board connector according to the present embodiment includes the wire connector 1 including the wire-side housing 11 in which the electrical wires 91 are inserted in the base end portion thereof and the wire-side terminals connected to the electrical wires 91; and the board connector 101 including the board-side housing 111 configured to be fitted to the wire-side housing 11 and the board-side terminals 161 connected to the wire-side terminals. Moreover, the wire-to-board connector has such a configuration that the wire-side housing 11 is provided with the lock member 16 formed in the front end portion thereof and the fitting keys 18 formed in the side portions thereof, that the board-side housing 111 is provided with the locked member 116 formed in the front end portion thereof to be engaged with the lock member 16 and the key grooves 118 formed in the side portions thereof to be fitted to the fitting keys 18, that at least parts of the fitting keys 18 are arranged at positions located in the vicinity of the base end portion of the wire-side housing 11, and that at least parts of the key grooves 118 are arranged at positions located in the vicinity of the base end portion of the board-side housing 111.

[0057] Owing to such a configuration, it is possible to prevent the wire-side housing 11 from turning about the fore end portion even when the electrical wires 91 are subjected to shaking

motion, to thereby prevent the wire connector 1 from being disengaged from the board connector 101, and to improve the reliability thereof. Moreover, it is possible to facilitate the operation to engage the wire connector 1 with the board connector 101 to be fitted together.

[0058] Moreover, each of the fitting keys 18 comprises the first fitting key 18a arranged at a position in the vicinity of the base end portion of the wire-side housing 11 and the second fitting key 18b being larger in width than the first fitting key 18a, and each of the key grooves 118 comprises the first key groove 118a arranged at a position in the vicinity of the base end portion of the board-side housing 111 and configured to be fitted to the first fitting key 18a and the second key groove 118b being larger in width than the first key groove 118a and configured to be fitted to the second fitting key 18b. Owing to such a configuration, it is possible to certainly prevent misengagement between the wire connector 1 and the board connector 101. The present embodiment has been described with respect to a case where the second fitting key 18b is larger in width than the first fitting key 18a and the second key groove 118b is larger in width than the first key groove 118a. However, the first fitting key 18a may be larger in width than the second fitting key 18b and the first key groove 118a may be larger in width than the second key groove 118b. Alternatively, the first fitting key 18a and the second fitting key 18b may be identical in width and the first key groove 118a and the second key groove 118b may be identical in width.

[0059] Furthermore, the first fitting key 18a is at an acute angle with respect to an apex wall 18a-3 of a side wall 18a-2 which is in the vicinity of the base end portion, and the first key groove 118a is at an acute angle with respect to a bottom wall 118a-3 of a side wall 118a-2 which is in the vicinity of the base end portion. Owing to such a configuration, the first fitting key 18a becomes more unlikely to be removed from the first key groove 118a, so that it is possible to further efficiently prevent the rotation of the wire-side housing 11. The present embodiment has been described with respect to a case where the first fitting key 18a and the first key groove 118a are at an acute angle with respect to the apex wall 18a-3 of the side wall 18a-2 being in the vicinity of the base end portion and to the bottom wall 118a-3 of the side wall 118a-2 being in the vicinity of the base end portion, respectively. Such an angle may be an obtuse angle or a right angle.

[0060] While a preferred embodiment of the Present Invention is shown and described, it is envisioned that those skilled in the art may devise various modifications without departing from the spirit and scope of the foregoing Description and the appended Claims.

CLAIMS**WHAT IS CLAIMED IS:**

- 5 1. A wire-to-board connector comprising:
 a first connector (1) including a first housing (11) in which electrical wires (91)
are inserted in a base end portion thereof, and first terminals connected to electrical wires (91);
and
 a second connector (101) including a second housing (111) configured to be
10 engaged with the first housing (11) by fitting together, and second terminals (161) connected to
the first terminals;
 wherein:
 the first housing (11) is provided with a lock member (16) formed in a front
 end portion thereof and fitting keys (18) formed in side portions thereof;
15 the second housing (111) is provided with a locked member (116) formed in a
 front end portion thereof to be engaged with the lock member (16) and key
 grooves (118) formed in side portions thereof to be engaged with the
 fitting keys (18);
 at least a part of the fitting keys (18) is arranged at a position located in the
20 vicinity of the base end portion of the first housing (11); and
 at least a part of the key grooves (118) is arranged at a position located in the
 vicinity of a base end portion of the second housing (111).
- 25 2. The wire-to-board connector according to Claim 1, wherein the fitting keys (18)
and the key grooves (118) extend in a direction in which the first housing (11) and the second
housing (111) are engaged with each other by fitting together.
- 30 3. The wire-to-board connector according to Claim 2, wherein:
 the fitting keys (18) comprise a first fitting key (18a) arranged at a position in the
vicinity of the base end portion of the first housing (11) and a second fitting key (18b) being
larger in width thereof than the first fitting key (18a); and

each of the key grooves (118) comprises a first key groove (118a) arranged at a position in the vicinity of the base end portion of the second housing (111) and configured to be fitted therein with the first fitting key (18a) and a second key groove (118b) being larger in width than the first key groove (118a) and configured to be fitted therein with the second fitting key (18b).

4. The wire-to-board connector according to Claim 3, wherein:

the first fitting key (18a) is provided with side walls and an apex wall (18a-3), one of the side walls (18a-2) being formed at a position located in the vicinity of the base end portion and defining an acute angle with respect to the apex wall (18a-3); and

the first key groove (118a) is provided with side walls and a bottom wall (118a-3), one of the side walls (118a-2) being formed at a position located in the vicinity of the base end portion and defining an acute angle with respect to the bottom wall (118a-3).

5. The wire-to-board connector according to Claim 1, wherein:

the fitting keys (18) comprise a first fitting key (18a) arranged at a position in the vicinity of the base end portion of the first housing (11) and a second fitting key (18b) being larger in width thereof than the first fitting key (18a); and

each of the key grooves (118) comprises a first key groove (118a) arranged at a position in the vicinity of the base end portion of the second housing (111) and configured to be fitted therein with the first fitting key (18a) and a second key groove (118b) being larger in width than the first key groove (118a) and configured to be fitted therein with the second fitting key (18b).

6. The wire-to-board connector according to Claim 5, wherein:

the first fitting key (18a) is provided with side walls and an apex wall (18a-3), one of the side walls (18a-2) being formed at a position located in the vicinity of the base end portion and defining an acute angle with respect to the apex wall (18a-3); and

the first key groove (118a) is provided with side walls and a bottom wall (118a-3), one of the side walls (118a-2) being formed at a position located in the vicinity of the base end portion and defining an acute angle with respect to the bottom wall (118a-3).

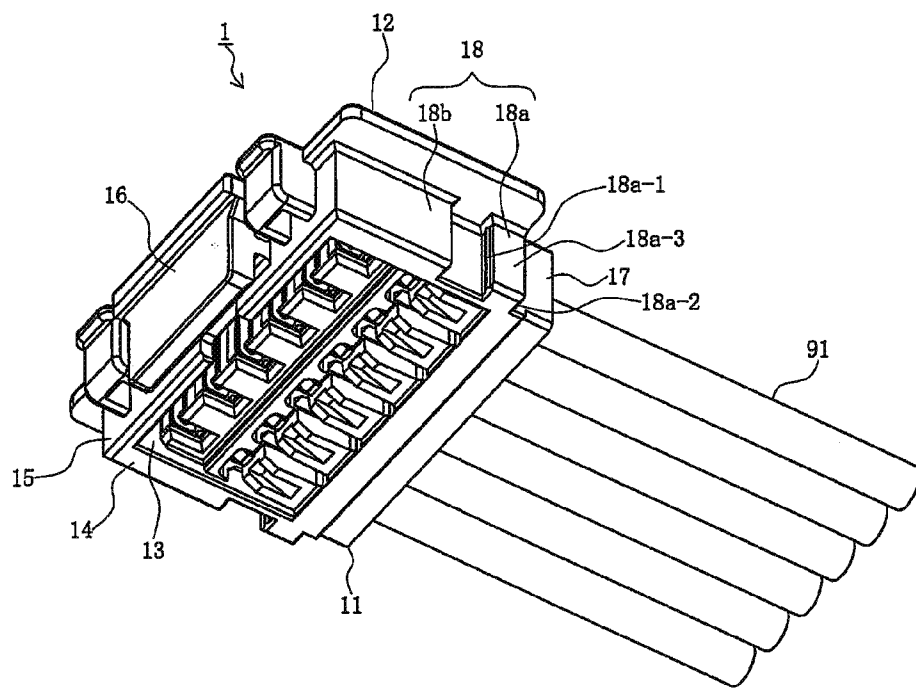


FIG. 1

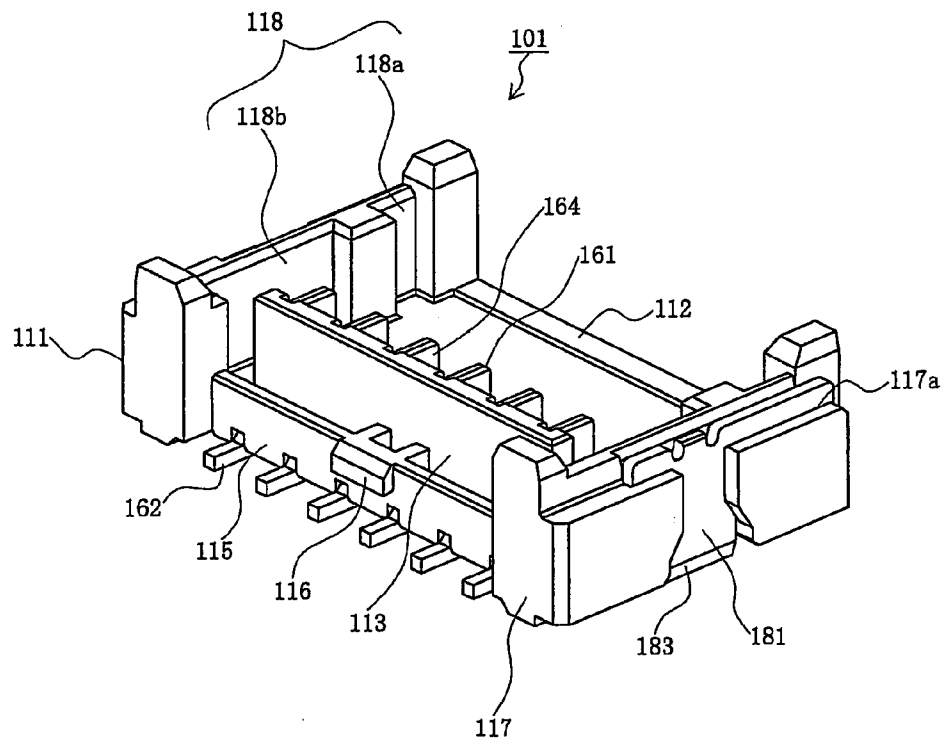


FIG. 2

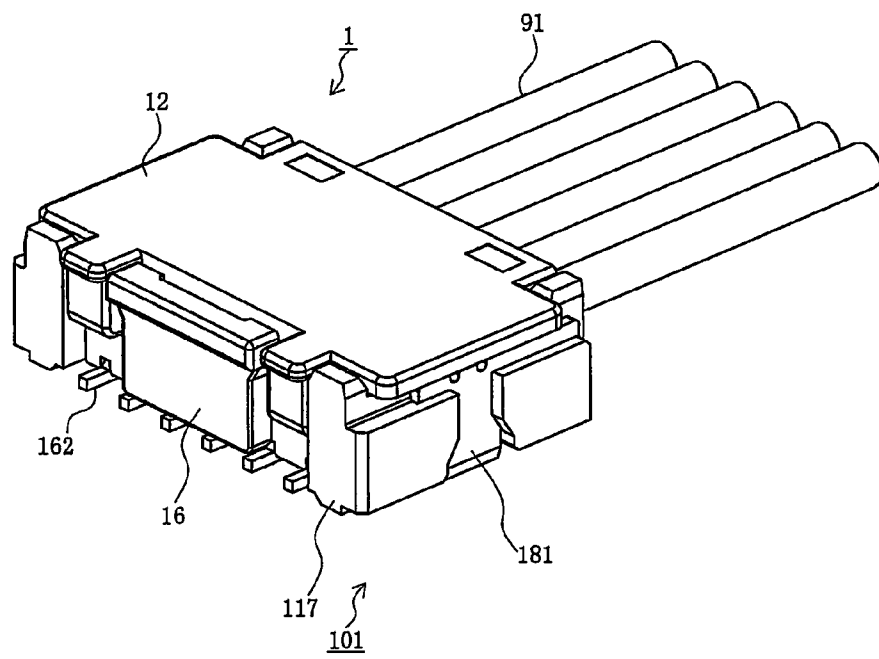


FIG. 3

FIG. 4A

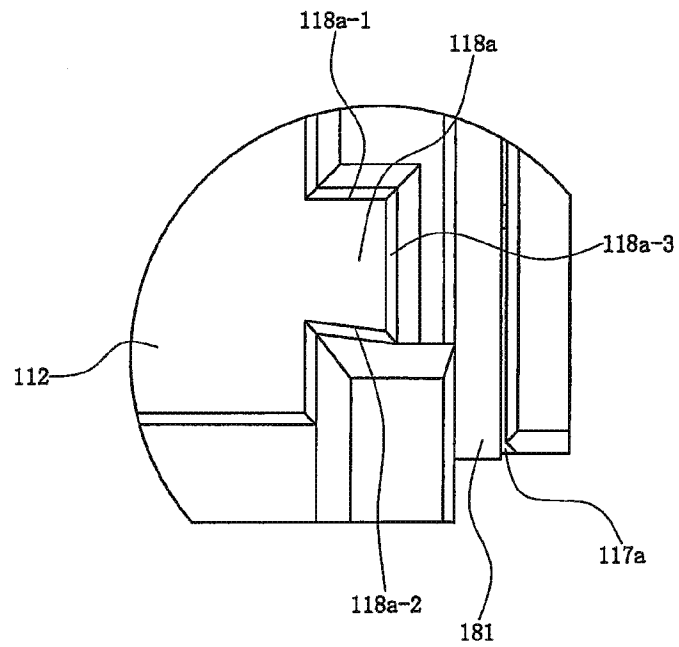
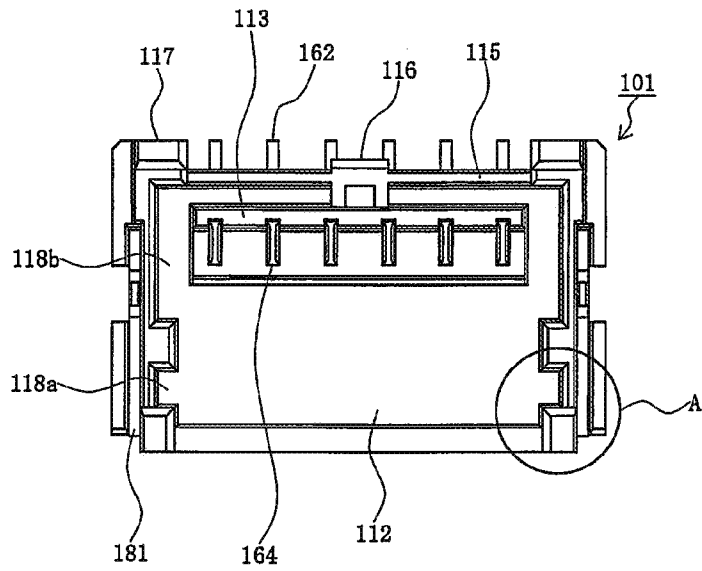


FIG. 4B

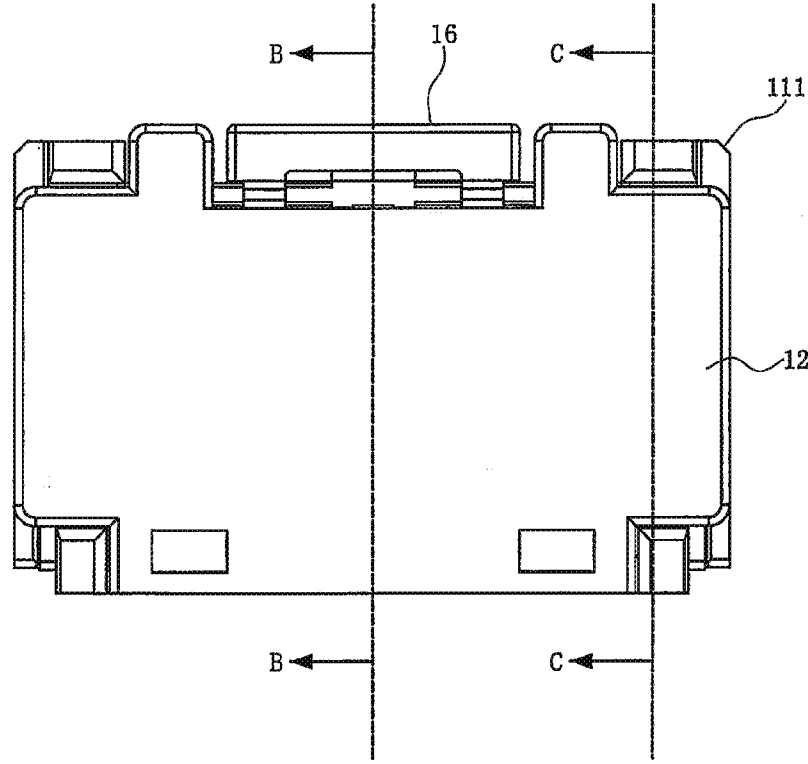


FIG. 5

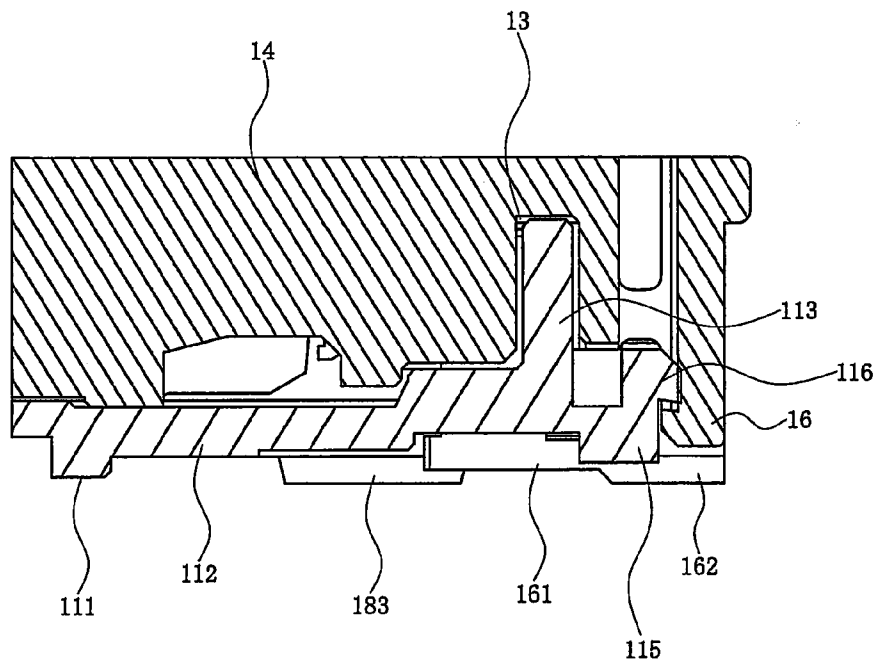


FIG. 6

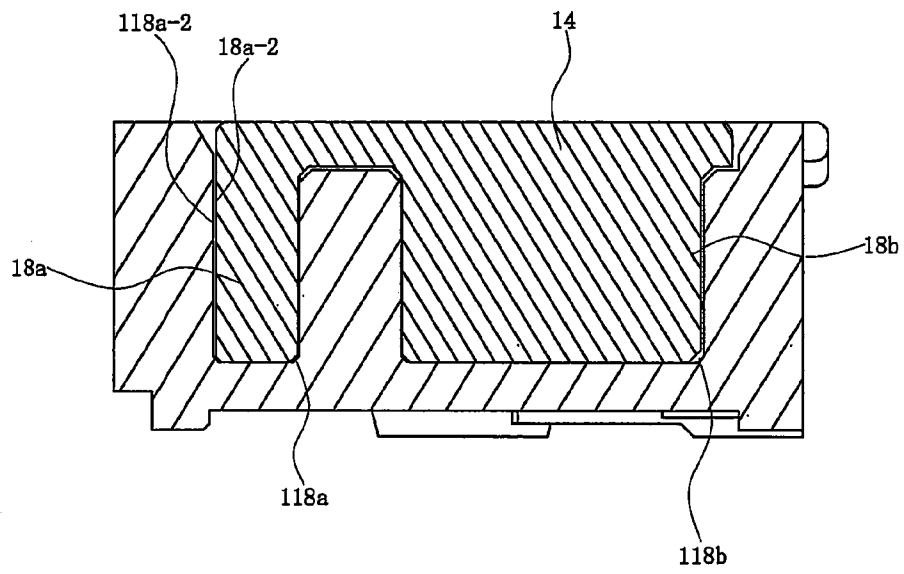


FIG. 7

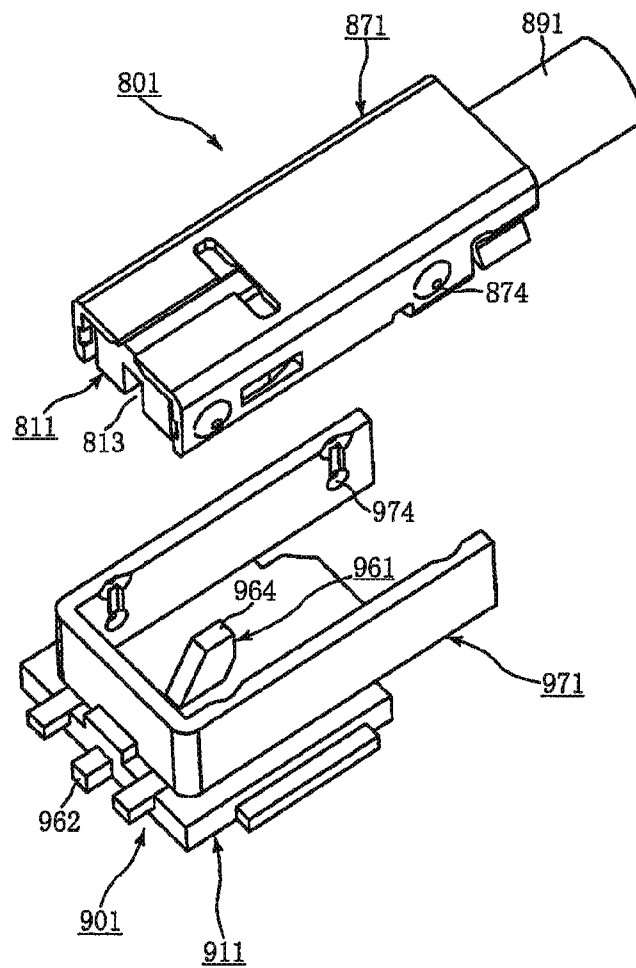


FIG. 8
PRIOR ART

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2009/066052

A. CLASSIFICATION OF SUBJECT MATTER
 INV. H01R13/64 H01R12/28

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 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	US 2008/293286 A1 (DENPOUYA IKUO [JP]) 27 November 2008 (2008-11-27) abstract paragraph [0051] - paragraph [0069]; figure 1	1-6
A	WO 2007/110699 A2 (MOLEX INC [US]; KANEKO TOMONARI [JP]; YONEYAMA SEIGO [JP]) 4 October 2007 (2007-10-04) abstract claim 1; figures 1-2	1-6
A	US 2005/037653 A1 (COMERCI JOSEPH D [US]) 17 February 2005 (2005-02-17) abstract paragraph [0022] - paragraph [0029]; figures 1,2	1-6



Further documents are listed in the continuation of Box C.



See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

8 February 2010

Date of mailing of the international search report

15/02/2010

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Authorized officer

Warneck, Nicolas

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2009/066052

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