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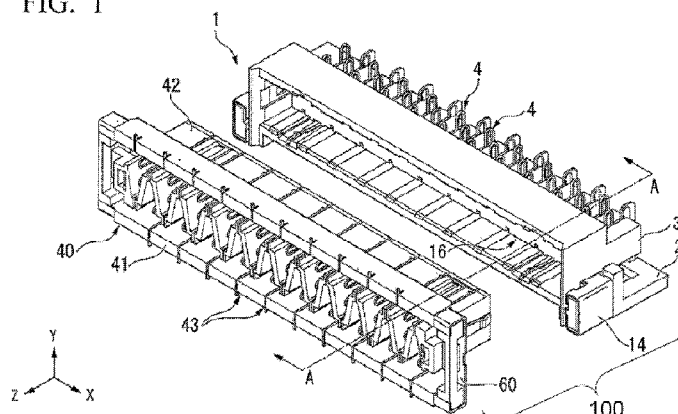
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FIG. 1



(57) Abstract: The present invention provides a receptacle connector and a connector system using the receptacle connector. The receptacle connector comprises a first electrode to be connected to a plug connector, and a second electrode to be connected to a circuit board. The first electrode is connected to the second electrode via a flexible connecting portion which is elastically deformable along the direction of insertion of the plug connector. In one embodiment, an electrical connector has a first housing for mounting to a circuit board and a second housing for mating with a counterpart connector. The connector has terminals each having a first end fixed to the first housing, a second end fixed to the second housing, and a connection portion between the first and second ends. The first and second housings are movable relative to each other along predetermined directions to absorb vibrations and ensure reliable electrical connection.

FLOATING CONNECTOR AND SYSTEM

Technical Field

5 The present invention relates to an electrical connector. In particular, it relates to an electrical connector for connecting circuit boards together and an electrical connector system.

Background

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Electrical connector systems which directly connect circuit boards together have been used to connect circuit boards on which electronic parts are mounted. Such a connector system is constituted such that a receptacle connector is fixed to one of the circuit boards, a counterpart plug connector is fixed to another circuit
15 board, and the circuit boards are connected together by inserting the plug connector into the receptacle connector. By means of such a constitution, electrical connection of the circuit boards is simplified, and costs are reduced since electrical wires are not used.

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In automotive field, electronics circuit boards have many uses due to the digitalization of control circuits and the increased variety of choices of functions such as multimedia systems. Accompanying this, there are more opportunities to use connectors which connect such circuit boards together. In addition, there are many cases where there is little working space when assembling automobiles,
25 and it has been necessary to greatly simplify the operations. It is therefore desirable to have a system which directly connects circuit boards together.

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Circuit boards used in automobiles are generally subject to vibrations resulting in differences in the natural frequencies of the circuit boards, and it is not infrequent for several connected circuit boards to vibrate at different modes of vibration. Electrical contacts of connectors connecting the circuit boards move relative to one another due to the vibration at different modes, and this results in a

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phenomenon where the electrical resistance of the electrical contact portions is increased (fretting corrosion). Therefore, it is necessary to prevent relative movement between contact points of the connectors by either fixing the connected circuit boards together or fixing the circuit boards to a rigid support frame.

Summary of the Invention

The present invention provides contact terminals for electrical connectors, each terminal comprising a first electrode to be connected to an electrode of a plug connector, and a second electrode to be connected to a planar circuit board. The first electrode is connected to the second electrode via an elastically deformable flexible connecting portion, and the flexible connecting portion is provided with one or more straight portions and curved portions within a plane defined by the first electrode and the second electrode. The flexible connecting portion may have the shape of a wave.

The present invention further provides a receptacle connector into which the terminals are disposed. The receptacle connector has a fixed receptacle housing having the second electrode to be connected to a circuit board, and a floating housing having the first electrode to be connected to the electrode of the plug connector. The fixed housing and the floating housing can be coupled so as to be capable of relative movement due to elastic deformation of the flexible connecting portion of the terminals. A stopper provided in the fixed housing and/or the floating housing of the receptacle connector prevents relative movement between the fixed receptacle housing and the floating receptacle housing in a direction orthogonal to the insertion direction of the plug connector.

A channel portion which accommodates the flexible connecting portion is formed in the floating housing of the receptacle, in a direction parallel to the insertion direction of the plug, and the flexible connecting portion is capable of elastic deformation within the channel portion in the insertion direction of the plug.

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The channel portion prevents deformation of the terminals along a direction orthogonal to the insertion direction. The fixed housing of the receptacle connector has a fixing tab which projects in a direction which intersects the insertion direction. The floating housing of the receptacle connector has a floating
5 restriction block which projects toward the fixing tab in the direction orthogonal to the insertion direction.

The floating housing of the receptacle connector is capable of moving in the insertion direction of the plug connector between a position where the floating
10 restriction block makes contact with a floating stopper provided in the fixing tab and a position where the floating housing makes contact with the fixed housing of the receptacle connector. A locking blade having a recess portion forming a recess in a surface parallel to the insertion direction is formed in the receptacle connector. The plug connector has a locking spring at a position corresponding to
15 the locking blade. A projecting portion which engages with the recess portion due to contact with a portion of the receptacle connector is formed in the locking spring, and elastically deforms the locking spring in a direction away from the recess portion by moving toward the insertion direction of the plug.

20 The receptacle connector may have a rotation prevention spring which projects in a direction orthogonal to the insertion direction. The plug connector may have a rotation prevention tab having a surface which faces the direction orthogonal to the direction of projection of the rotation prevention spring at a position corresponding to the rotation prevention spring. When being inserted into
25 the receptacle connector, the plug connector is prevented from rotating by the rotation prevention spring.

The present invention further provides a connector system comprising any of the receptacle connectors described above, and a plug connector to be mated
30 with the receptacle connector. The plug connector has a fixed plug housing and a floating plug housing. The floating plug housing is to be connected to the receptacle connector and capable of relative movement in a direction orthogonal

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to the insertion direction of the plug connector in a predetermined floating range, but not movable in the direction of insertion.

In this connector system, when the plug connector and the receptacle
5 connector are mated, the floating plug housing and the floating receptacle housing are integrally coupled together to form a joint floating housing. The fixed receptacle housing and the joint floating housing can move relative to one another within a prescribed floating range in the insertion direction, they cannot move relative to one another exceeding a prescribed tolerance range in the direction
10 orthogonal to the insertion direction. The fixed plug housing and the joint floating housing can move relative to one another within a prescribed floating range in the direction orthogonal to the insertion direction, they cannot move relative to one another exceeding a prescribed tolerance range in the insertion direction. The prescribed floating range is restricted by a stopper provided in each of the fixed
15 housing and floating housing of the receptacle and the fixed housing and floating housing of the plug.

Brief Description of the Drawings

20 Figure 1 is a perspective view showing an electrical connector system of an embodiment of the present invention.

Figures 2A and 2B are a perspective views showing the receptacle connector of an embodiment of the present application. Figure 2A is a view as
25 seen from the insertion surface P1 side, and Figure 2B is a view as seen from the side of the surface opposite the insertion surface P1.

Figures 3A and 3B are perspective views showing a plug connector of an embodiment of the present invention. Figure 3A is a view as seen from the
30 insertion surface P1 side, and Figure 3B is a view as seen from the side of the surface opposite the insertion surface P1.

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Figure 4 is an enlarged partial perspective view of Fig. 2A.

Figure 4B is an exploded view of Figure 4A and a circuit board on which the receptacle connector is to be mounted.

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Figure 5 is an enlarged partial perspective view Fig. 2A.

Figure 6 is an enlarged partial perspective view of Fig. 3A viewing from a different angle.

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Figures 7A and 7B are perspective views showing terminals of the receptacle connector of an embodiment of the present invention. Figure 7A shows a terminal of a first type, and Figure 7B shows a terminal of a second type.

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Figure 8 is a perspective view showing a terminal of the plug connector of an embodiment of the present invention.

Figures 9A, 9B and 9C are cross sectional views along A-A of Figure 1. Figure 9A shows the state prior to mating of the plug connector and the receptacle connector, Figure 9B shows the state during mating, and Figure 9C shows the state after mating is completed.

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Detailed description of preferred embodiments

Figures 1 to 9 are diagrams showing a connector system 100 of the embodiments of the present invention. As shown in Figures 1, 2A and 2B, receptacle connector 1 comprises a fixed receptacle housing 2, a floating receptacle housing 3, and terminals 4, 4'. Fixed receptacle housing 2 and floating receptacle housing 3 are formed by resin molding, and the terminals 4, 4' are formed from an electrically conductive material such as a copper alloy.

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Figures 3A and 3B show a plug connector 40 to be connected to receptacle

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connector 1 to form the connector system. Plug connector 40 comprises a fixed plug housing 41, a floating plug housing 42, and terminals 43. Fixed plug housing 41 and floating plug housing 42 are formed by resin molding, and terminals 43 are formed from an electrically conductive material such as a copper alloy.

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As shown in Figure 1, the longitudinal direction of receptacle connector 1, i.e., the direction along which terminals 4 are arranged, is defined as X direction. The direction along which plug connector 40 is inserted into and retracted from receptacle connector 1, is defined as Z direction. The height direction of
10 receptacle connector 1, i.e., the direction orthogonal to X and Z directions, is defined as Y direction. The X, Y, and Z directions are mutually orthogonal.

Figures 7A and 7B show terminals 4 and 4' of receptacle connector 1. Each of terminals 4, 4' comprises a first electrode 6, a second electrode 7, and a
15 flexible connection portion 8 connecting first and second electrodes 6 and 7. When first electrode 6 is coupled with plug connector 40 (refer to Figures 3A and 3B), it forms an electrical connection between receptacle connector 1 and plug connector 40 by making contact with a first electrode 44 of terminal 43 of plug connector 40. Flexible connection portion 8 electrically and mechanically
20 connects first electrode 6 and second electrode 7, and relative displacement is possible between first electrode 6 and second electrode 7 due to flexible connection portion 8 being electrically conductive and elastically deformable.

In this embodiment, terminals 4, 4' are formed when an electrically
25 conductive metal sheet of a prescribed thickness is punched out by press working or the like, and then by bending first electrode 6 at an approximately 90° angle in the thickness direction of the metal sheet. Flexible connection portion 8 is punched in the shape of a wave, thereby becoming elastically deformable in the thickness direction and surface direction of the metal sheet, i.e., along X, Y, and Z
30 directions.

Fixed receptacle housing 2 is of an approximate C shape when viewed

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from the Y direction, and is to be fixed to an underneath circuit board (not shown). A plurality of support channels 10 (Fig. 2B) for supporting second electrodes 7 is formed in fixed receptacle housing 2. Channels 10 are arranged parallel to X direction distally from the insertion surface P1.

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Both ends of fixed receptacle housing 2 in X direction have a shoulder portion 12 (only one is shown in Figs. 4A and 4B) which projects in Z direction toward insertion surface P1. A fixing tab 14 is formed in an approximately C-shaped cross section so as to cover the outer periphery of shoulder portion 12, when shoulder portion 12 is inserted into fixing tab 14. Fixing tab 14 is formed from a material such as a metal sheet. A portion of fixing tab 14 constitutes a floating stopper 13, which cooperates with a floating restriction block 22 (to be described later) of floating receptacle housing 3, and restricts the amount of displacement of floating receptacle housing 3 toward plug connector 40 in the Z direction. Figures 4A and 4B show the state where floating stopper 13 and floating restriction block 22 do not contact with each other, but separated by space z1 in Z direction.

As shown in Fig. 2A, floating receptacle housing 3 has a cavity or opening portion 16 for receiving plug connector 40, and floating housing 3 is connected to fixed receptacle housing 2 via terminals 4, 4'. Opposite walls in X direction which constitute floating receptacle housing 3 extend such that a leg portion 18 (Figs. 4A and 4B) projects toward the bottom side. A plurality of support channels 21 which receives first electrodes 6 is formed parallel to X direction between the inner surfaces of two opposite walls in the Y direction which form opening portion 16. Disposing channels 20 are formed in which flexible connection portion 8 of terminal 4 are arranged. Disposing channel 20 has a width the same or slightly greater than the thickness of flexible connection portion 8, to allow deformation of flexible connection portion 8 in Z direction, while restricting deformation of flexible connection portion 8 in X and Y directions.

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Terminals 4, 4' are fixed to floating receptacle housing 3 by press-fitting

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first electrode 6 into support channel 21. Second electrode 7 is fixed in support channel 10 of fixed receptacle housing 2, whereby an electrical connection is formed between floating receptacle housing 3 and fixed receptacle housing 2. Displacement of floating receptacle housing 3 relative to fixed receptacle housing 2 is possible in Z direction.

As shown in Figs. 4A and 4B, a floating restriction block 22 projects from each side of floating receptacle housing 3 outwardly in X direction. Space z1 is set between floating stopper 13 and floating restriction block 22. Therefore, floating receptacle housing 3 becomes movable relative to fixed receptacle housing 2 until floating restriction block 22 makes contact with floating stopper 13. On the other hand, displacement of floating receptacle housing 3 away from plug connector 40 in Z direction is restricted when leg portion 18 contacts fixed receptacle housing 2.

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In consideration of dimensional tolerances of fixed receptacle housing 2 and floating receptacle housing 3, a predetermined clearance x1 may be set in X direction between floating receptacle housing 3 and shoulder portion 12. Clearance x1 ensures assembly of fixed receptacle housing 2 and floating receptacle housing 3 together and meanwhile, restricts the relative displacement of fixed receptacle housing 2 and floating receptacle housing 3 to the amount of clearance x1 in X direction. In this regard, fixed receptacle housing 2 and floating receptacle housing 3 are considered not movable relative to each other along X direction. Likewise, a clearance y1 is set in Y direction between floating restriction block 22 and shoulder portion 12 for the purpose of assembling fixed receptacle housing 2 and floating receptacle housing 3 together, by which floating receptacle housing 3 can only be displaced with respect to fixed receptacle housing 2 approaching the circuit board in Y direction, referred to in the context as first orthogonal direction 33a, by the amount of clearance y1. Moreover, a prescribed clearance y2 is set in Y direction between floating restriction block 22 and fixing tab 14. Floating receptacle housing 3 can only be displaced with respect to fixed receptacle housing 2 away from the circuit board in the Y direction, referred to in

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the context as second orthogonal direction 33b, by the amount of clearance y2. Clearances x1, y1 and y2 are approximately 10 to 20 times less than the amount of floating displacement in Z direction.

5 A connector system according to embodiments of the present invention may include a rotation-prevention mechanism, one part of which is formed on the inner surface of the two opposing walls in Y direction of floating receptacle housing 3 (refer to Figure 5). A rotation-prevention guide channel 24, a rotation-prevention spring 26, and a channel into which rotation-prevention spring 26 is to
10 be inserted and supported, are provided. Rotation-prevention spring 26 extends in Z direction inside opening portion 16. A projecting portion 27 which projects toward the inside of opening portion 16 is provided at a position inside opening portion 16 up to where projecting portion 27 is inserted inside the opening portion 16, by a prescribed distance from insertion surface P1. Projection portion 27
15 projects from the sliding surface between plug connector 40 and receptacle connector 1. The same number of rotation prevention mechanisms is provided on each of the two opposing walls.

As shown in Fig. 3A, a corresponding part of the rotation-prevention
20 mechanism is provided at a position of plug connector 40, for preventing rotation of plug connector 40 around X axis in the Y-Z plane with respect to receptacle connector 1, by coupling to the rotation-prevention mechanism part of receptacle connector 1 when the plug 40 is displaced in Y direction after coupling the connector (refer to Figure 3). This part of the rotation prevention mechanism is
25 constituted by a rotation prevention projection 48 to be inserted into the rotation prevention guide channel 24 of receptacle connector 1 and a rotation prevention tab 50 which is disposed therein on rotation prevention projection 27 and which slides while making contact with projection 27 of rotation prevention spring 26.

30 A locking mechanism is provided on the inner surface of the two opposing walls in X direction which form opening portion 16 of floating receptacle housing 3, for preventing plug connector 40 from falling out of receptacle connector 1, and for

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preventing relative displacement between first electrode 6 of receptacle connector 1 and first electrode 44 of plug connector 40, after mating of the plug and receptacle connectors is completed by insertion of plug connector 40 into receptacle connector 1. As shown in Fig. 5, the locking mechanism has a locking
5 blade 30 disposed on the inner surfaces of opening portion 16. Locking blade 30 is an approximately rectangular member which extends in Z direction. Locking blade 30 has a hole or a recess portion 32.

A locking mechanism is provided at a position on plug connector 40
10 corresponding to the locking mechanism of receptacle connector 1, for locking plug connector 40 and receptacle connector 1, by moving together with the locking mechanism of receptacle connector 1. Referring to Figures 3A and 3B, the locking mechanism has a locking spring 52 which extends in Z direction on the outer surface of floating plug housing 42. A projecting portion 54 is provided at a
15 position on locking spring 52 in Z direction toward fixed plug housing 41 away from insertion surface P2 by a prescribed distance. When receptacle connector 1 and plug connector 40 are completely coupled, projecting portion 54 of locking spring 52 enters into hole 32 of locking blade 30. Floating receptacle housing 3 and floating plug housing 42 are locked thereby preventing relative displacement
20 between electrode 5 and the electrode 44.

Figure 8 is a diagram showing terminal 43 which is used in plug connector 40. Terminal 43 has a first electrode 44, a second electrode 45, and a flexible connecting portion 46. When first electrode 44 is coupled to counterpart electrode
25 6 of receptacle connector 1, an electrical connection is established between receptacle connector 1 and the plug connector 40 by the contact of first electrode 6 of the terminal 4 of receptacle connector 1. Second electrode 45 forms an electrical connection between plug connector 40 and the circuit board by mounting or soldering to the circuit board. Flexible connecting portion 46
30 electrically and mechanically connects first electrode 44 and second electrode 45. Relative displacement is possible between first electrode 44 and second electrode 45 since flexible connecting portion 46 is elastically deformable.

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In this embodiment, terminal 43 is formed when an electrically conductive metal sheet of a prescribed thickness is punched out by press working or the like or by bending them by press working or the like. Flexible connecting portion 46 is punched in the shape of a wave, thereby becoming elastically deformable in the thickness direction and surface direction of the metal sheet, i.e., X, Y, and Z directions.

Fixed plug housing 41 is of a shape having an approximately rectangular cross section, viewing from Z direction, and may be mounted to a circuit board (not shown). A plurality of support channels 56 for supporting second electrodes 45 is formed on fixed plug housing 41. Support channels 56 (Fig. 3A) are arranged parallel to X direction on the two opposing walls in Y direction which form fixed plug housing 41.

A shoulder portion 58 (Fig. 6) is formed on both sides of fixed plug housing 41 in X direction. A fixing tab 60 is formed with an approximately C-shaped cross section to cover the outer periphery of shoulder portion 58 by insertion of shoulder portion 58 into the central space of fixing tab 60. Fixing tab 60 is formed from a material such as a metal sheet. Fixing tab 60 restricts the amount of displacement of floating plug housing 42 in X direction and Y direction, due to its structure which will be described below.

As shown in Figs. 1, 3A and 3B, floating plug housing 42 is formed in the shape of a hollow box which has an opening portion facing fixed plug housing 41, and has a complementary plug shape for insertion into opening portion 16 of receptacle connector 1. A floating restriction block 62 having an approximately L-shaped cross section which projects outwardly in X direction is formed in the walls which constitute floating plug housing 42 at both ends in X direction. A plurality of disposing walls 64 is provided inside the hollow box, and a disposing channel 66 is formed between each neighboring disposing wall separated by a prescribed gap. A support channel 68 for supporting first electrode 44 is formed at a position

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corresponding to disposing channel 66 on the opposing walls in Y direction which form floating plug housing 42.

First electrode 44 is fixed inside support channel 68 of floating plug housing 42. Second electrode 45 is fixed inside support channel 56 of fixed housing 41. Accordingly, terminal 43 connects floating plug housing 42 and fixed plug housing 41. Flexible connecting portion 46 of terminal 43 is disposed inside disposing channel 66, and can be elastically deformed in X, Y, and Z directions within the space of disposing channel 66. As such, the floating plug housing 42 can be displaced with respect to fixed plug housing 41 in X, Y, and Z directions.

A space y_3 is set in Y direction between floating restriction block 62 provided in floating plug housing 42 and shoulder portion 58 provided in fixed housing 41. Therefore, floating plug housing 42 can be displaced along Y direction up to each of the positions where floating restriction block 62 makes contact with shoulder portion 58.

Moreover, a space x_3 is set between each of the two opposing walls in X direction which form floating plug housing 42 and fixing tab 60 provided at both ends of fixed plug housing 41 in X direction. Therefore, floating plug housing 42 can be displaced in X direction up to each point where two opposing walls in the X direction make contact with fixing tab 60.

A portion of floating restriction block 62 is disposed between fixing tab 60 and the circuit board. A clearance z_3 is set between floating restriction block 62 and fixing tab 60, and between floating housing 42 and the circuit board.

Therefore, floating plug housing 42 can be displaced in Z direction from the position where floating housing 42 and the circuit board make contact, up to the position where floating restriction block 62 and fixing tab 60 make contact. Clearance z_3 in Z direction is approximately 10 to 20 times less than the amount of displacement in X direction and Y direction.

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Figure 9A is a cross-sectional view of the connector system of the present invention before receptacle connector 1 and plug connector 40 are coupled to each other. Circuit board R to which receptacle connector 1 is attached extends in X-Z plane, and circuit board P to which plug connector 40 is attached extends in X-Y plane. Therefore, Circuit board R and Circuit board P are orthogonal to one another.

In the state shown in Figures 9A and 9B, plug connector 40 is inserted into the opening portion 16 of receptacle connector 1 in Z direction. When starting the insertion, firstly, rotation prevention projection 48 is inserted into rotation prevention guide channel 24, and then first electrode 44 of terminal 43 and first electrode 6 of terminal 4 make contact with one another. When a force is applied on plug connector 40 toward receptacle connector 1 in Z direction, first electrode 44 of terminal 43 elastically deforms toward the inside of plug connector 40 within Y-Z plane, and slides on first electrode 6. When plug connector 40 is inserted into opening portion 16 by a prescribed distance, rotation prevention projection 48 makes contact with the projection of rotation prevention spring 26 (refer to Figure 9B).

When plug connector 40 is inserted in Z direction, flexible connecting portion 46 of terminal 43 elastically deforms in Z direction due to a frictional force generated at the contact point between rotation prevention tab 50 and rotation prevention spring 26 and at the contact point between first electrode 44 and first electrode 6, whereby floating plug housing 42 is pressed against circuit board P. At the same time, flexible connection portion 8 elastically deforms in Z direction, and leg portion 18 of floating receptacle housing 3 is pressed against fixed receptacle housing 2.

Plug connector 40 is inserted into receptacle connector 1 by further application of a force in Z direction. Rotation prevention spring 26 is elastically deformed toward the outside of the opening portion in Y-Z plane, and slides on rotation prevention tab 50 while making contact therewith.

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When plug connector 40 slides in Z direction toward receptacle connector 1, projecting portion 54 of locking spring 52 makes contact with an edge on the inner surface of the two opposing walls in X direction which form opening portion 16 of receptacle connector 1. When plug 40 further slides from that position toward the inside of opening portion 16, locking spring 52 elastically deforms toward the inside of plug connector 40 in the X-Z plane, and projecting portion 54 makes contact with locking blade 30. Plug connector 40 slides in that state thereby causing projecting portion 54 to slide on locking blade 30.

When projecting portion 54 is disposed at the position corresponding to hole 32 formed in the locking blade 30, a force acts so as to restore elastically deformed locking spring 52 to return it to its original shape, and projecting portion 54 is disposed within the hole 32. As a result, floating receptacle housing 3 and floating plug housing 42 are locked together, hence a stable electrical connection is established between first electrode 6 of receptacle connector 1 and first electrode 44 of plug connector 40 (refer to Figure 9C). By making the locking force between projecting portion 54 and hole 32 and the frictional force on the first electrode greater than the force acting in Z direction, it becomes possible to prevent relative displacement of the electrical contacts. Furthermore, by making the locking force between projecting portion 54 and hole 32 and the frictional force on the first electrode greater than the force acting in X direction, it becomes possible to prevent relative displacement of the electrical contacts.

After coupling receptacle connector 1 and plug connector 40, circuit board R and circuit board P can be displaced relative to each other via joined floating housings 3, 42 and flexible connecting portions 8, 46 of the respective terminals. In this embodiment, flexible connection portion 8 of terminal 4 on receptacle connector 1 can be displaced in Z direction, and flexible connecting portion 46 of terminal 43 of plug connector 40 can be displaced in X and Y directions.

In contrast, with regard to the joined floating housings, relative

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displacement does not occur between floating receptacle housing 3 and floating receptacle housing 42 due to the locking mechanism. As a result, relative displacement also does not occur between first electrode 6 of terminal 4 and first electrode 44 of terminal 43. Fretting corrosion can be prevented in this regard.

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When circuit board P is displaced in Y direction, a force accompanying the displacement of the circuit board is applied, via terminal 43, to floating plug housing 42 which may be rotated in Y-Z plane within the range of the clearance present between floating plug housing 42 and opening portion 16. Due to this rotation, a force which causes sliding in the opposite direction in Z direction is generated on the two opposing walls in Y direction which form floating plug housing 42 and on the walls of opening portion 16. However, by setting the spring force of rotation prevention spring 26 with an appropriate strength, sliding can be prevented due to the frictional resistance between rotation prevention spring 26 and rotation prevention tab 50. As a result, it becomes possible to prevent relative displacement between the electrical contacts.

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Claims

1. A receptacle connector for mating with a plug connector, the receptacle connector comprising:
 - 5 a fixed receptacle housing;
 - a floating receptacle housing, and
 - a plurality of terminals each having a first electrode attached to the floating receptacle housing, a second electrode attached to the fixed receptacle housing, and a flexible connection portion connecting the
 - 10 first and second electrodes;wherein the floating receptacle housing is movable relative to the fixed receptacle housing by elastically deforming the flexible connecting portion.
- 15 2. The receptacle connector of claim 1, wherein the fixed receptacle housing and the floating receptacle housing having stoppers to prevent relative movement therebetween along first and second orthogonal directions which are orthogonal to an insertion direction of the plug connector, wherein the second orthogonal direction is opposite to the first orthogonal
- 20 direction.
3. The receptacle connector of claim 2, wherein the stoppers includes a pair of shoulder portions formed on the fixed receptacle housing and a pair of floating restriction blocks formed on the floating receptacle housing,
- 25 wherein the pairs of shoulder portions and the pair of floating restriction blocks are engagable to each other to prevent movement of the floating receptacle housing relative to the fixed receptacle housing along the first orthogonal direction.
- 30 4. The receptacle connector of claim 3, further comprising a pair of fixing tabs each attached to a corresponding shoulder portion, wherein the pair of fixing tabs are engagable with the pair of shoulder portions to prevent

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movement of the floating receptacle housing relative to the fixed receptacle housing along the second orthogonal direction.

5. The receptacle connector of claim 4, wherein the fixing tabs are detachable from the shoulder portions.
6. The receptacle connector of claim 1, wherein the floating receptacle housing comprises a plurality of grooves parallel to the insertion direction, each groove receives the flexible connecting portion of a terminal, wherein the flexible connection portion is deformable along the insertion direction within the groove.
7. The receptacle connector of claim 6, wherein the groove has a width the same as the thickness of the flexible connection portion to prevent relative movement of the flexible connection portion in the groove.
8. An electrical connector system comprising:
a first fixed housing;
a second fixed housing aligned with the first fixed housing along a first direction;
a floating housing disposed between the first and second fixed housings;
a first set of terminals coupling the first fixed housing and the floating housing;
a second set of terminals coupling the second fixed housing and the floating housing and electrically connecting the first set of terminals; wherein the floating housing is movable relative to the first fixed housing by elastically deforming the first set of terminals, and wherein the floating housing is movable relative to the second fixed housing by elastically deforming the second set of terminals.
9. The electrical connector system of claim 8, wherein the first fixed housing

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having a pair of first stoppers aligned along a second direction orthogonal to the first direction, and wherein the floating housing is disposed between the pair of first stoppers such that movement of the floating housing relative to the first fixed housing along the second direction is limited by the pair of first stoppers.

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10. The electrical connector system of claim 9, wherein the second fixed housing having a pair of second stoppers aligned along a third direction orthogonal to both the first direction and the second direction, and wherein the floating housing is disposed between the pair of second stoppers such that movement of the floating housing relative to the second fixed housing is limited by the pair of second stoppers.

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11. The electrical connector system of claim 8, wherein the floating housing comprises a first floating housing member and a second floating housing member, wherein the first floating housing member and the second floating housing are detachable from each other.

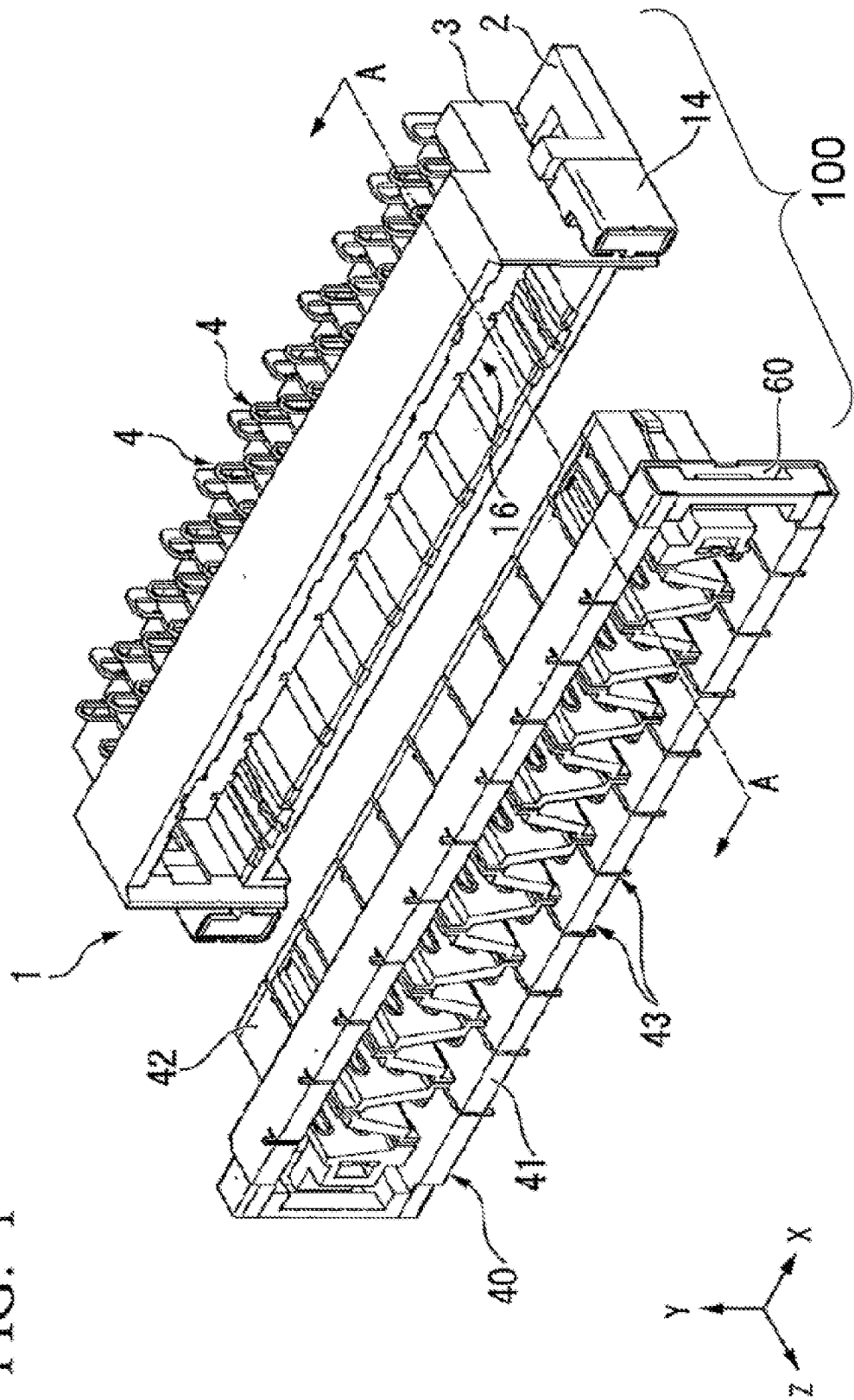
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12. The electrical connector system of claim 11, wherein the floating housing comprises a locking mechanism to lock the first floating housing member and second floating housing member together.

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FIG. 1



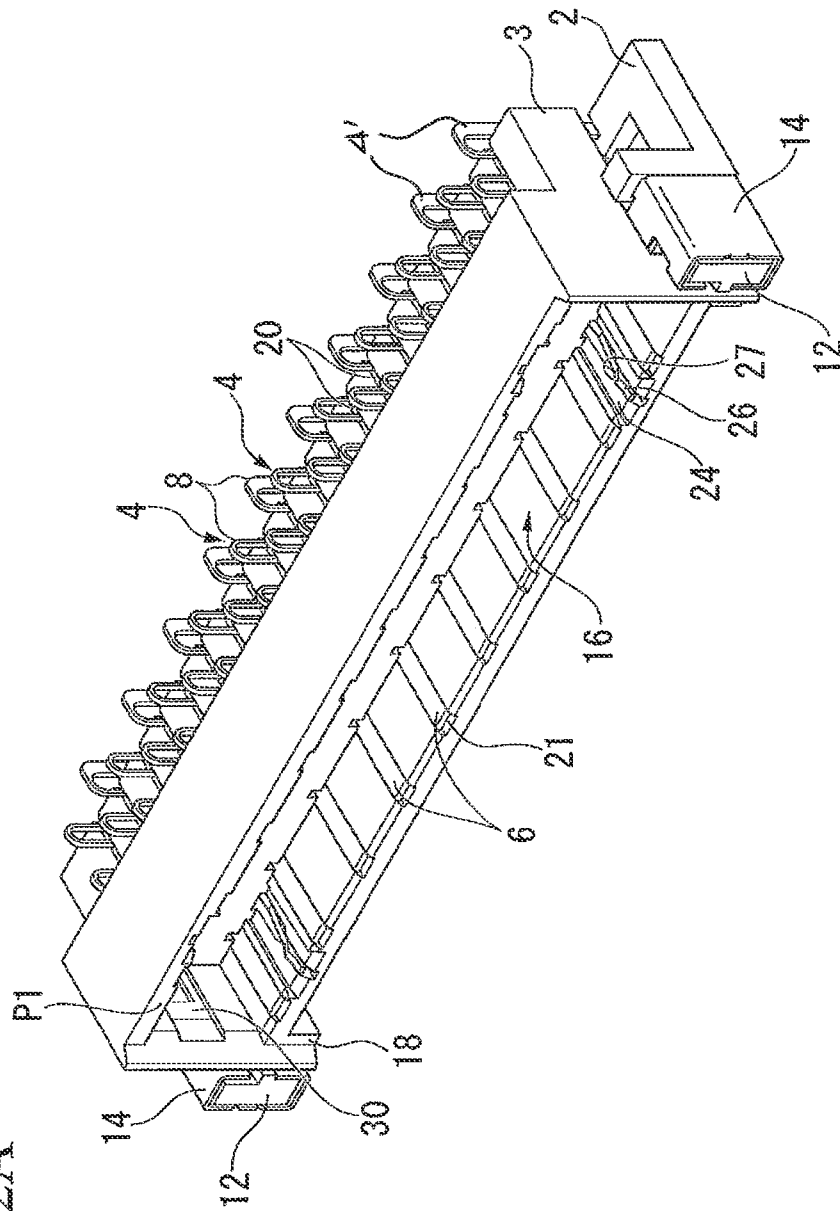


FIG. 2A

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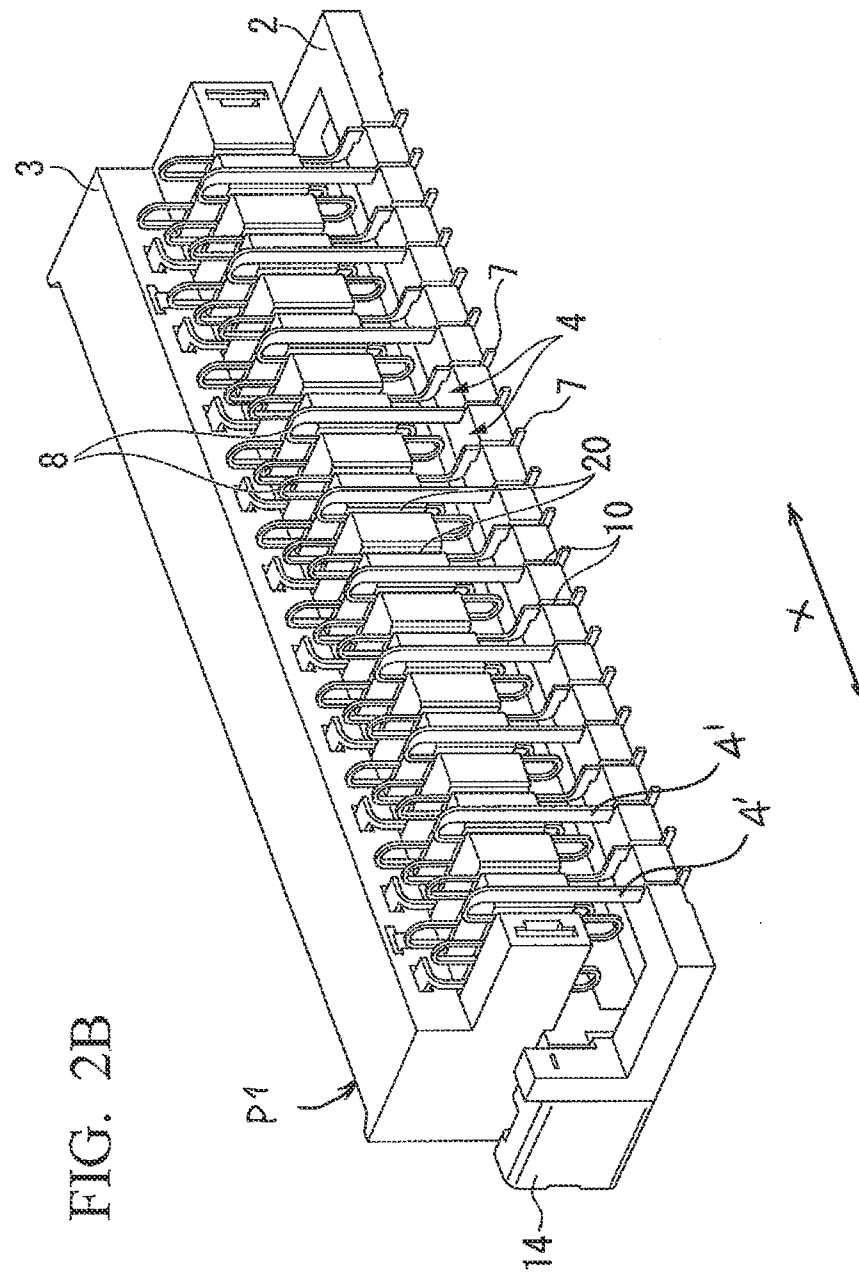
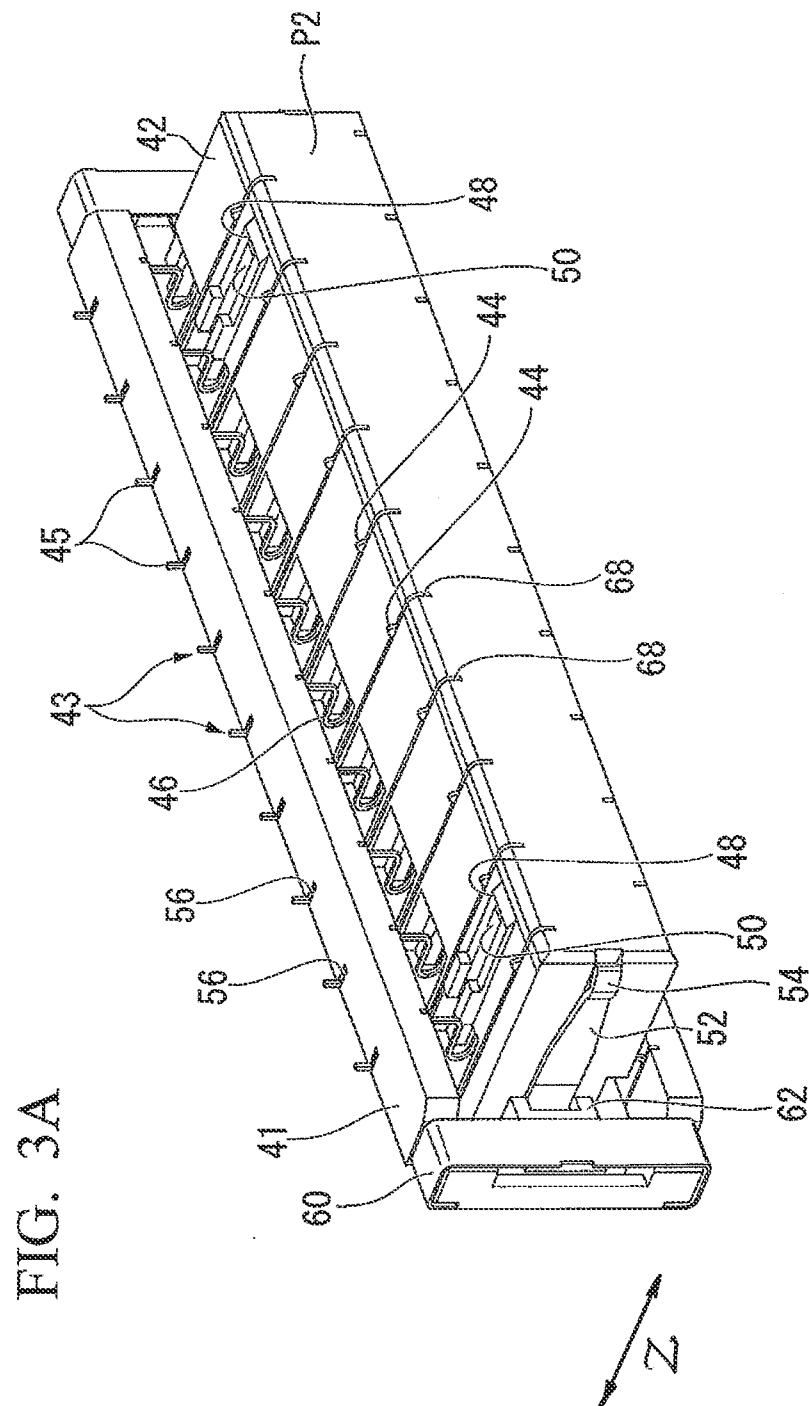


FIG. 2B

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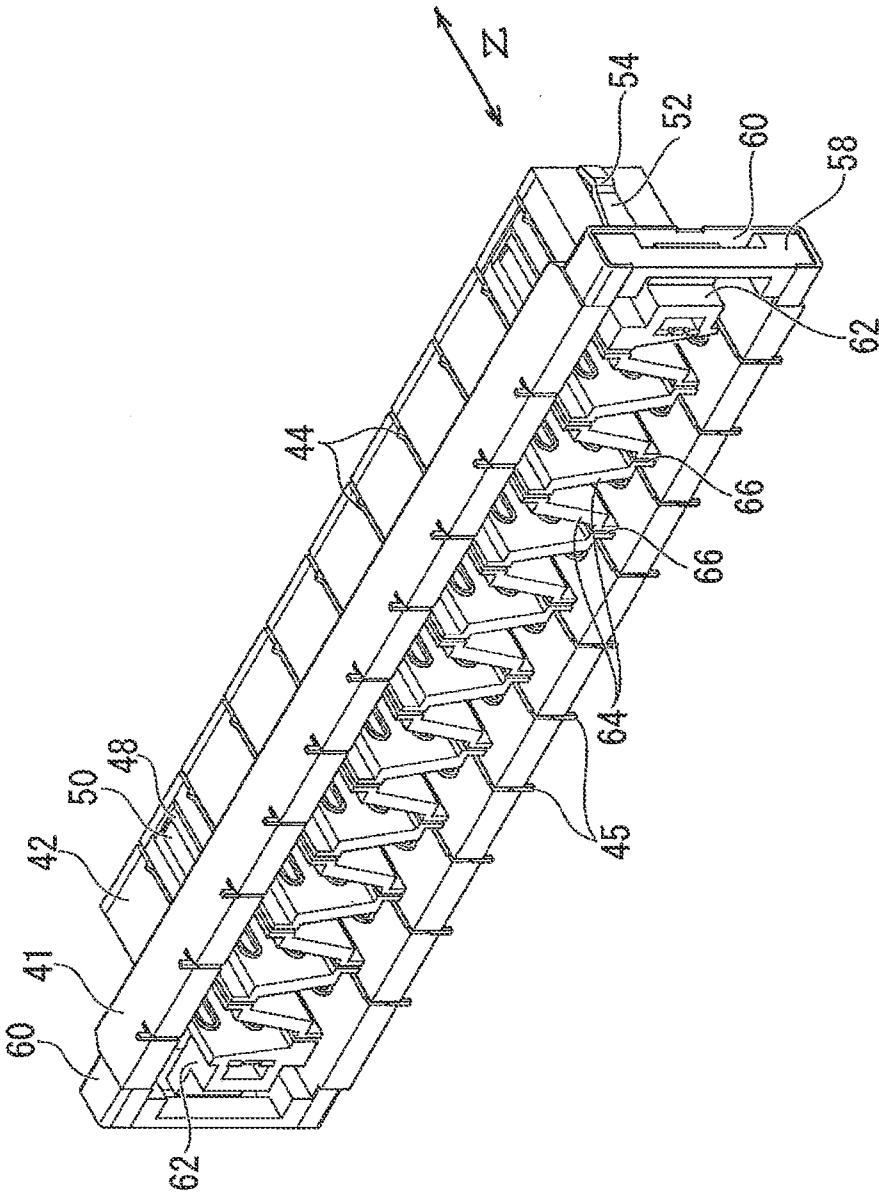


FIG. 3B

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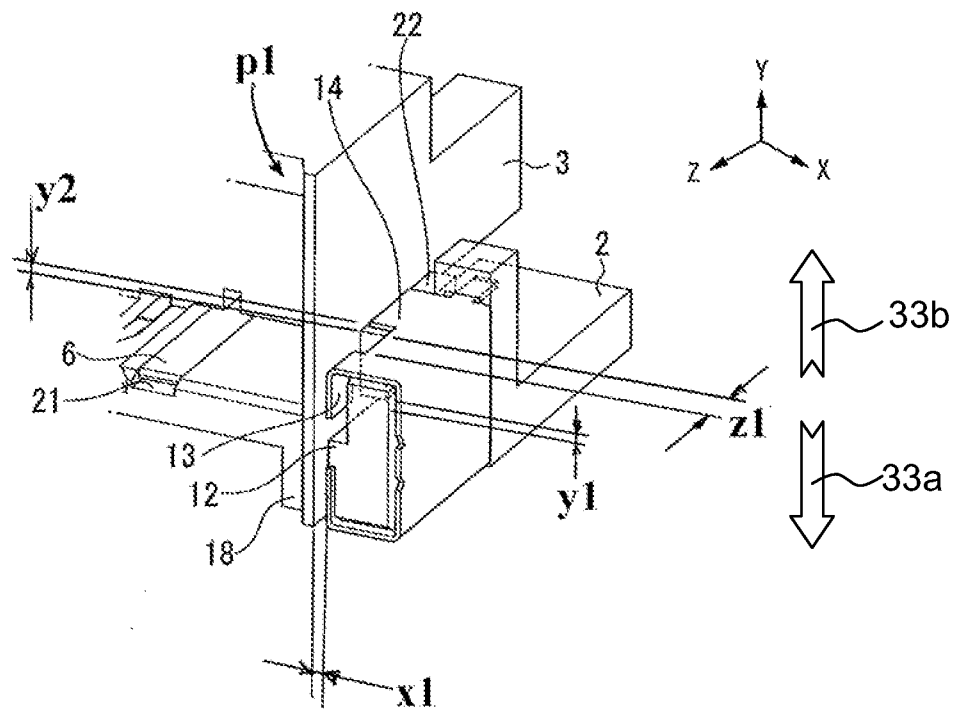


FIG. 4A

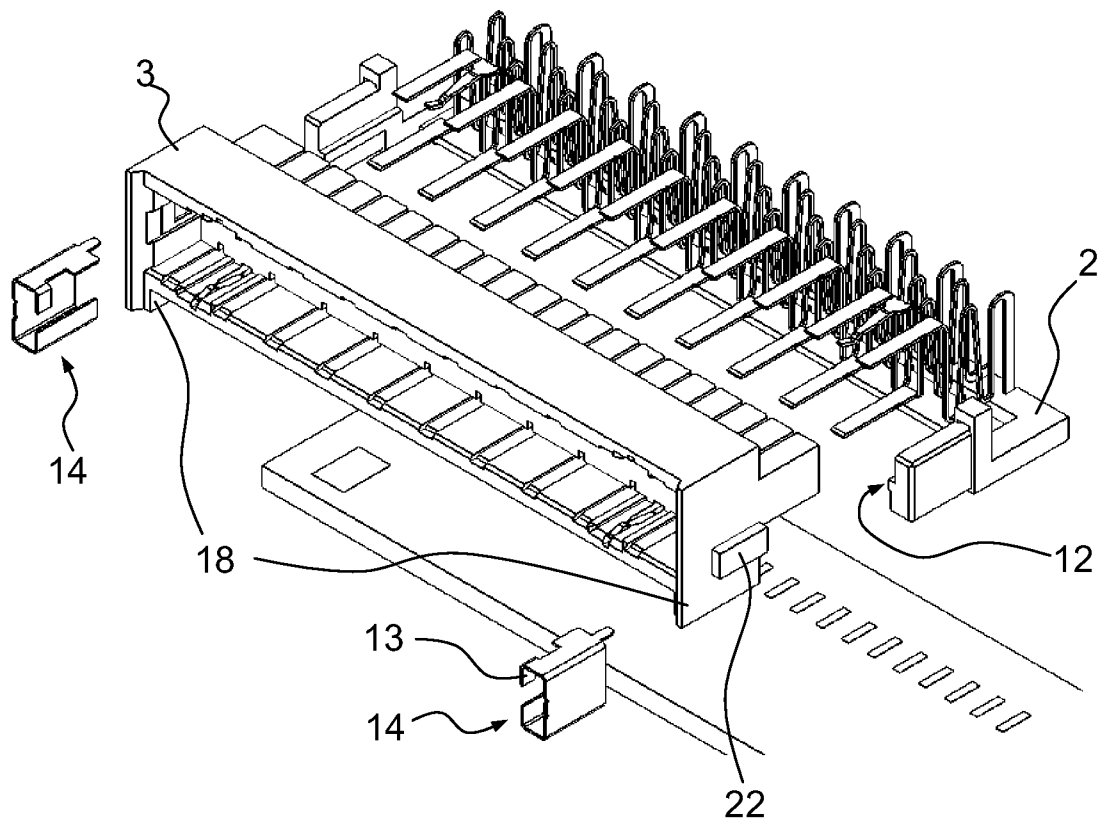
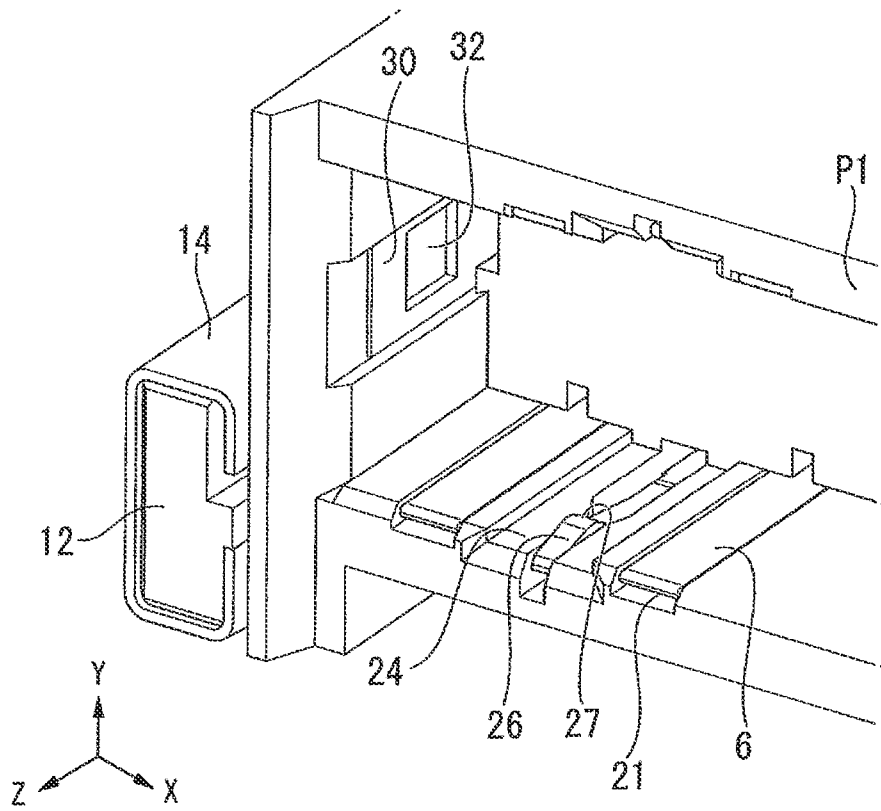


FIG. 4B

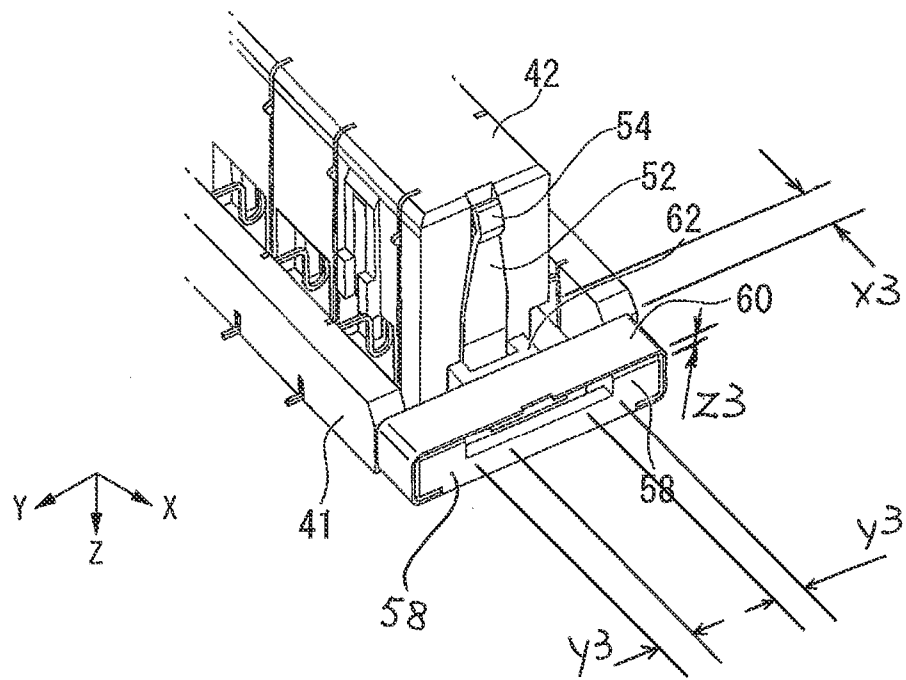
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FIG. 5



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FIG. 6



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FIG. 7A

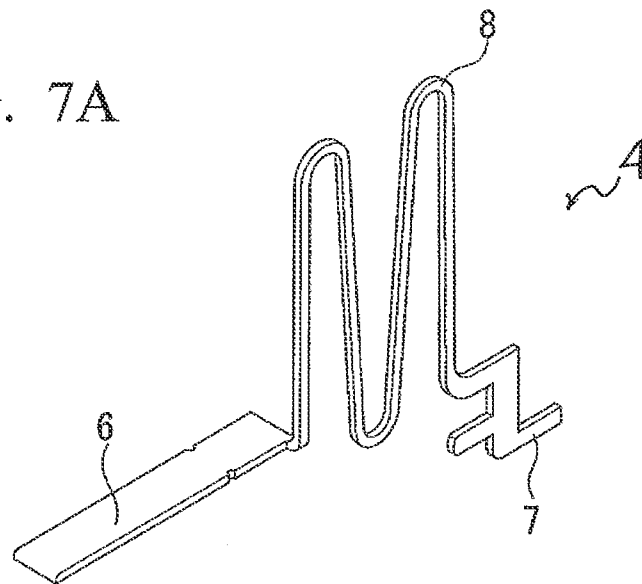


FIG. 7B

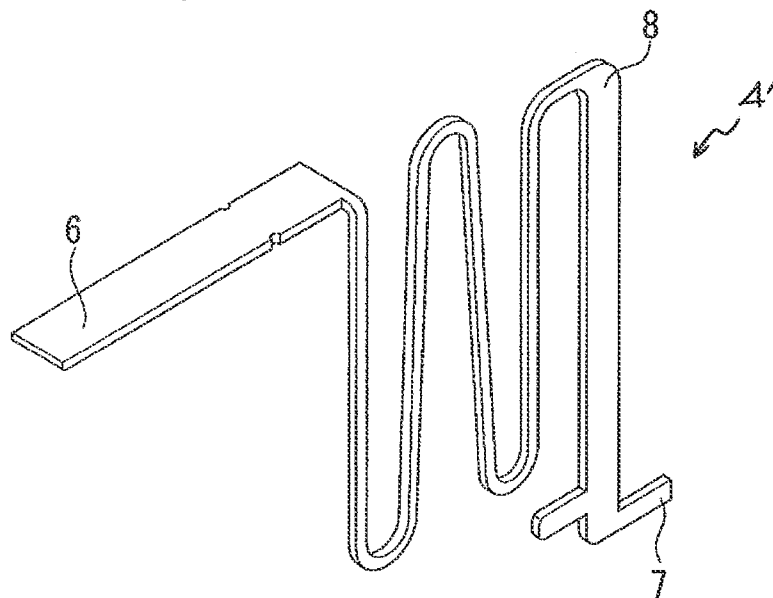
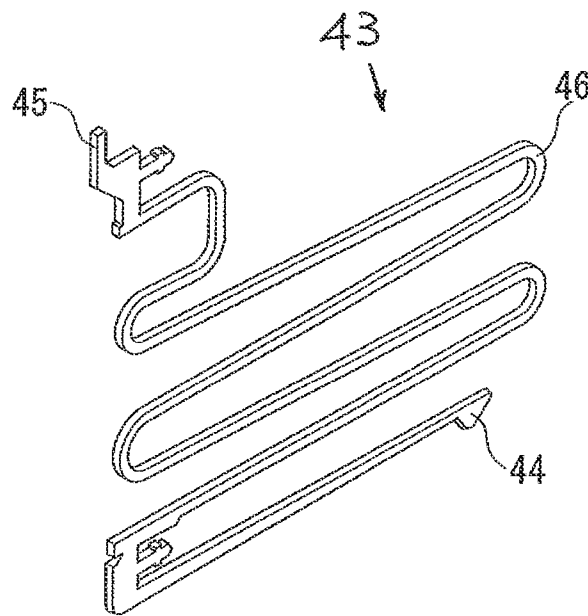


FIG. 8



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FIG. 9A

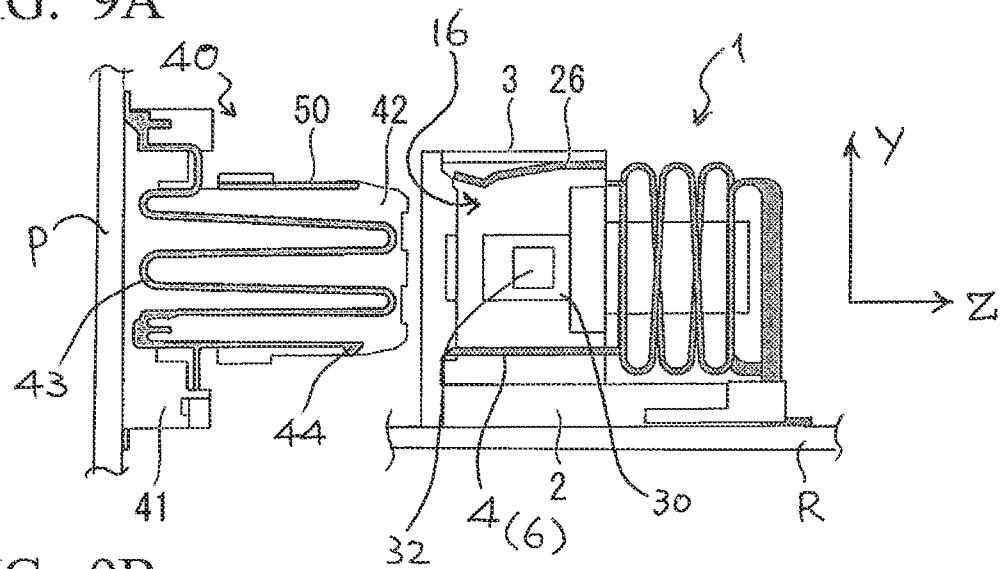


FIG. 9B

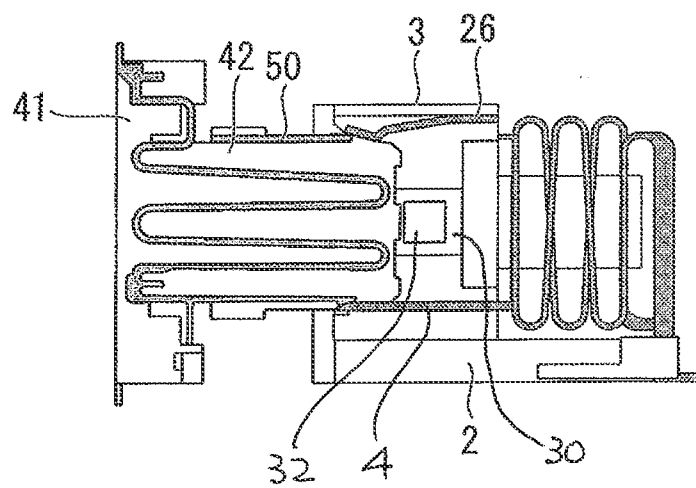


FIG. 9C

