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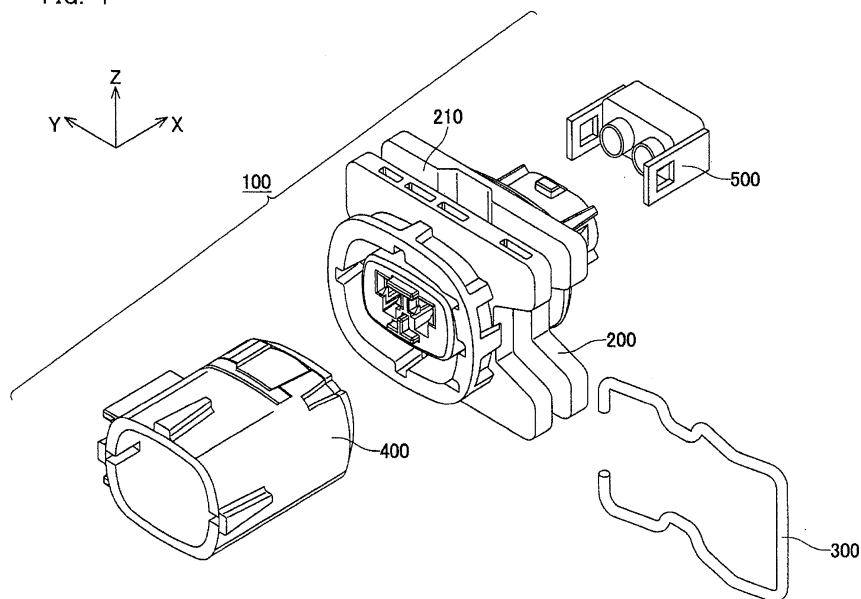
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(54) **Electrical connector housing including latching member, and electric connector**

(57) The latching member 300 is inserted into the guiding groove 210 of the female housing 200. The latching member 300 is made into a preload-applied state in the direction, along which the female housing 200 and the male housing 400 are inserted into and fitted to each other, in a state where the latching member 300 is held

in the guiding groove 210 of the female housing 200. By inserting the male housing 400 into the female housing 200 and fitting to each other, the latching portion secured at the spring portion of the latching member 300 is fitted to the fixing groove via the leading guide of the male housing 400.

FIG. 1



Description

Field of the invention

[0001] The present invention relates to a housing including a latching member, which enables electric conductivity under severe conditions, and an connector.

Background arts

[0002] In recent years, types of electronic controls have been used in a power source (for example, engine) employed for automobiles, etc., in order to respond to a lowering in fuel consumption and gas exhaust regulations. To perform these electronic controls, cables and electric connectors are required to connect mainly between sensors, actuators, control units (for example, electronic control unit: ECU), and devices.

[0003] However, electronic connectors are placed under a severe environment in the vicinity of a power source, in particular, a direct injection engine. That is, since high acceleration vibrations occur in the vicinity of the power source, the housing of an electric connector is liable to wear or damage, therefore it was difficult to maintain the durability of the electric connectors. Also, where high acceleration vibrations of the power source are coincident with the frequency of inherent vibrations of the electric connector itself, the electric connector is brought into mechanical resonance state, therefore it was further difficult to maintain the durability thereof.

[0004] For this reason, where an electric connector is used under an environment where high acceleration vibrations occur, such a method has been employed, in which a lead-out cable is routed to a portion less influenced by high acceleration vibrations, and an electric connector is used there, and signals are fed back by the lead-out cable under the environment in which high acceleration vibrations occur.

SUMMARY OF THE INVENTION

[0005] However, if an electric connector is provided by using a lead-out cable, the number of components is increased. As a result, clearance is brought about at conjunction parts of respective components, which becomes a factor by which the vibration-resisting property of the electric connector is lowered.

[0006] Also, since, in a disclosed connector (Japanese Patent Laid-Open No. 2004-171911 bulletin), it is necessary to insert a spacer after a connector is fitted, a plurality of connection processes are required to connect a connector. Therefore, the greater the number of points where connectors are installed, the greater the number of processes pertaining to connectors is increased.

[0007] It is therefore an object of the invention to provide an electric connector that can be simply and easily connected without any electric conductivity under a severe environment.

[0008] It is another object of the invention to provide a housing including a latching member that has a resistance property against high acceleration vibrations, is light in weight and can be made small-sized, and an electric connector employing the same.

[0009] (1) An electric connector according to the invention comprises: a female first housing for supporting a first connection terminal; a male second housing for supporting a second connection terminal electrically connected to the first connection terminal, and simultaneously being inserted into the first housing and fitted thereto; and a latching member having a latch portion to be latched to the second housing at a spring portion being pressed in the fitting direction and at a part of the spring portion, and extending in a direction orthogonal to the fitting direction of the first housing and the second housing; wherein the first housing includes a guiding groove for slidably holding the latching member in the orthogonal direction against pressing of the spring portion in the fitting direction in a preload-applied state and an opening portion for releasing the preload-applied state and causing the latching member to be operably opened toward the second housing; the second housing includes a fixing groove for receiving the latching member which is in a state where the preload is applied to the portion to which the opening is faced when the first housing is fitted; and the latching member is provided so as to slidably move to the first position where the latching member is held in the guiding groove of the first housing in the preload-applied state; and to the second position where the latching portion is shifted from the guiding groove to the fixing groove via the opening portion in the preload-applied state and is latched in the fixing groove.

[0010] In the electric connector according to the invention, the first connection terminal is electrically connected to the second connection terminal by the second housing being inserted into and fitted to the first housing. In addition, the first housing is provided with a guiding groove and an opening portion. The latching member having a latch portion and a spring portion is slidably held in the guiding groove. A fixing groove for receiving the latch portion is formed in the second housing. First, the latch member is held in the guiding groove of the first housing in a preload-applied state. Next, when the second housing is inserted into and fitted to the first housing, the latch portion is moved from the guiding groove to the fixing groove of the second housing via the opening portion in a preload-applied state by the latch member being slid and moved from the first position to the second position.

[0011] In this case, since the latch member is slid from the direction, perpendicular to the direction along which the latch member is pressed, to the guiding groove of the first housing, and is held in the first housing, the latch member can be easily held in the guiding groove of the first housing in a preload-applied state even if the pressing force of the spring portion is intense.

[0012] Further, since the latch portion of the latch member

member is moved from the opening portion of the first housing to the fixing groove of the second housing, a pressing force held by the latching member can be added in the direction along which the first housing and the second housing are fitted to each other.

[0013] Also, since the latching member slides in the direction perpendicular to the direction along which the latching member is fitted from the first position to the second position by inserting and fitting the first housing into the second housing, the entire pressing force of the spring portion is not necessarily required when fitting. As a result, even if the pressing force of the spring portion is intense, the first housing can be easily inserted into and fitted to the second housing and can be fitted to each other.

[0014] Thus, since the pressing force of the spring portion can be made intense, the first housing and the second housing can be made rigid. Resultantly, it is possible to improve the vibration-resisting property of the electric connector, therefore it is possible to prevent the contacts of the first connection terminal and the second connection terminal from wearing under an environment where high acceleration vibrations occur, and electric conductivity can be maintained. Further, no component other than the first housing, the second housing and the latching member are required, therefore the weight of the electric connector can be made light, and downsizing thereof can be achieved.

[0015] (2) A tapered engagement portion that is tightened in the fitting direction may be formed at the fitting portion between the first housing and the second housing.

[0016] In this case, fitting between the first housing and the second housing is made further intense. Further, since the tapered engagement portion is tightened in the fitting direction even if the fitting portion between the first housing and the second housing is subjected to wearing under an environment where high acceleration vibrations occur, rigidity between the first housing and the second housing can be maintained.

[0017] (3) The second housing includes a leading guide for leading the latching portion to the fixing groove, the leading guide is provided so as to be inclined in the fitting direction; and the latching member may slidably move from the first position to the second position when the second housing is inserted into and fitted to the first housing.

[0018] In this case, since the leading guide is provided so as to be inclined in the fitting direction, the latching portion of the latching member can be moved along the leading guide. That is, by inserting the first housing into and fitting the same to the second housing, the latching member is automatically slid and moved from the first position to the second position. As a result, only by a process of applying a force in the fitting direction, fitting of the first housing and the second housing can be achieved.

[0019] (4) The latching member may be provided so

as to slidably move to the third position deviated from the fixing groove of the second housing.

[0020] In this case, since the latching portion of the latching member can be removed from the fixing groove of the second housing by the latching member sliding and moving to the third position, pressing of the latching member is not applied to the second housing. As a result, it is possible to easily separate the first housing from the second housing.

[0021] (5) The latching member may be formed to be roughly like an overturned U shape by bending a single rod-like member whose section is roughly circular; the spring portion of the latching member may be formed by bending the rod-like member; and the latching portion of the latching member may be formed by bending a part of the spring portion.

[0022] In this case, since the latching member can be formed by an easy construction with only one rod-like member, it is possible to attempt to downsize the electric connector and to reduce the weight thereof.

[0023] In addition, since the section is roughly circular, it is possible to reduce the contact-frictional resistance in the guiding groove and the leading guide when making a sliding movement, therefore it is possible to easily fit the first housing and the second housing to each other.

[0024] (6) The guiding groove may include a first groove portion having a first groove width by which the spring portion of the latching member is pressed and preload is caused to operate; and a second groove portion having a second groove width by which the spring portion of the latching member is idly fitted and the preload is released.

[0025] In this case, the spring portion of the latching member is pressed by the first groove portion, and preload is caused to be applied. Also, the spring portion of the latching member is idly fitted by the second groove portion, and the preload-applied state is released.

[0026] As a result, by disposing the first position of the latching member so as to correspond to the first groove portion and disposing the second position of the latching member so as to correspond to the second groove portion, it is possible to easily control the preload state of the latching member and its release state.

[0027] (7) A housing according to a second aspect of the invention comprises at least one of housings of an electric connector for supporting one or a plurality of electric connection terminals and simultaneously for fitting the same in a state where the connection terminals are inserted and fitted therein; and a latching member having a spring portion being pressed in the fitting direction and extending in a direction orthogonal to the fitting direction of the housing; wherein the housing includes a guiding groove capable of slidably moving the latching member in the orthogonal direction; and the latching member is provided so as to slidably move to a first position where the latching member is held in a preload-applied state against pressing the spring portion in the fitting direction by the guiding groove of the housing, and a second po-

sition where the latching member is held by the guiding groove of the housing in a state where a preload-released state.

[0028] The housing including the latching member according to the invention is provided with a guiding groove. The latching member is slidably held in the guiding groove. In addition, the latching member is held in the first position in a state where preload is applied to the guiding groove of the housing, and is held in the second position in a state where preload is released by the guiding groove of the housing.

[0029] In this case, since the latching member is caused to slide from the direction perpendicular to the pressing direction of the latching member to the guiding groove of the housing and is held in the housing, it is possible to easily hold the latching member in a state where preload is applied to the guiding groove of the housing even if the pressing force of the spring portion is intense.

[0030] Further, since the latching member slides and moves in the direction perpendicular to the direction along which the latching member is fitted from the first position to the second position, the entire pressing force of the spring portion is not necessarily required when fitting the same. As a result, since the latching member can easily slide and move, it is possible to increase the pressing force of the spring portion.

[0031] (8) The guiding groove includes a first groove portion having a first groove width by which the spring portion of the latching member is pressed and the preload is applied; and a second groove portion having a second groove width by which the spring portion of the latching member is idly fitted and the preload is released.

[0032] In this case, the spring portion of the latching member is pressed by the first groove portion to cause preload to be applied. Also, the spring portion of the latching member is idly fitted by the second groove portion to release the preload.

[0033] As a result, by disposing the first position of the latching member so as to correspond to the first groove portion and disposing the second position of the latching member so as to correspond to the second groove portion, it is possible to easily control the preload state of the latching member and the release state thereof.

[0034] (9) An electric connector according to a third aspect of the invention comprises: an electric connector having a pair of male and female housings by which connection terminals are supported; and a latching member being pressed in the fitting direction of the male and female housings; wherein the latching member is provided so as to slidably move to a first position where the latching member is held in at least one of the male and female housings in a state where preload is applied in the fitting direction; and a second position by which, when the male and female housings are fitted to each other, the preload is released in the fitting direction of the male and female housings, and a part of the latching member is moved to the other of the male and female housings.

[0035] In the electric connector according to the invention, the latching member is held in the first position in a state where preload is applied in the fitting direction. And, when sliding from the first position to the second position, the latching member releases the preload when the male and female housings are fitted to each other, and a part of the latching member moves to the other of the male and female housings.

[0036] In this case, since the latching member is slid from the direction perpendicular to the pressing direction of the latching member to at least one of the male and female housings and is held in the male and female housings, even if the pressing force is intense, it is possible to easily hold the latching member in at least one of the male and female housings in a state where preload is applied.

[0037] Also, the latching member that is held by at least one of the male and female housings is moved from at least one of the male and female housings to the other thereof, therefore it is possible to apply the pressing force held by the latching member in the fitting direction.

[0038] Further, since the latching member slides in the direction perpendicular to the fitting direction from the first position to the second position by inserting and fitting the male and female housings to each other, the entire pressing force is not necessarily applied when fitting the same. As a result, even if the pressing force is intense, the male and female housings can be easily inserted into and fitted to each other.

[0039] Thus, since the pressing force can be intensified, the male and female housings can be made rigid. Resultantly, it is possible to improve the vibration-resisting property of the electric connector, therefore it is possible to prevent the contacts from wearing under an environment where high acceleration vibrations occur, and electric conductivity can be maintained.

[0040] (10) The latching member has a latching portion to be latched in the other of the male and female housings at the spring portion and a part of the spring portion, which being pressed in the fitting direction; at least one of the male and female housings includes: a guiding groove by which the latching member is held so as to slidably move in the direction orthogonal to the fitting direction in a preload-applied state against pressing of the spring portion in the fitting direction, and an opening portion where the preload-applied state is released and the latching portion is opened so as to operate in the other of the male and female housings; and the other of the male and female housings includes a fixing groove for receiving the latching portion, which is in a preload-applied state, at a portion opposed to the opening when the other of the male and female housings is fitted in one thereof.

[0041] In this case, in the latching member, a spring portion and a latching portion, which is a part of the spring portion, are provided. In addition, at least one of the male and female housings is provided with a guiding groove, and the other thereof is provided with an opening portion.

Therefore, the latching member can slide and move in a roughly orthogonal direction while being held by the guiding groove in a preload-applied state against pressing of the spring portion. And, the sliding movement releases the preload-applied state. In this case, the latching portion is received by the other fixing groove of the male and female housings.

[0042] Therefore, since the latching member slides in the direction perpendicular to the fitting direction from the first position to the second position, the entire pressing force of the spring portion is not necessarily applied when fitting. As a result, even if the pressing force of the spring portion is intense, the male and female housings can be easily inserted into and fitted to each other.

[0043] Thus, since the pressing force of the spring portion can be increased, the male and female housings can be made rigid. As a result, it is possible to improve the vibration-resisting property of the electric connector, therefore it is possible to prevent the contacts from wearing under an environment where high acceleration vibrations occur, and electric conductivity can be maintained.

BRIEF DESCRIPTION OF THE DRAWINGS

[0044]

FIG. 1 is a schematic perspective view depicting one example of an electric connector according to Embodiment 1 of the invention;

FIG. 2 is a schematic view describing the shape of a female housing;

FIG. 3 is a schematic view describing the shape of a latching member;

FIG. 4 is a schematic view describing the shape of a male housing;

FIG. 5 is a schematic view describing the shape of a cable fixing member;

FIG. 6 is a view describing a state where the latching member is pressure-inserted into the female housing;

FIG. 7 is a view describing a state where the male housing is pressure-inserted into the female housing to which the latching member is attached;

FIG. 8 is a schematic view enlarging a partial section of the view of FIG. 7; and

FIG. 9 is a view describing a state where a pair of latching portions are fitted to the fixing groove of the male housing.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0045] Hereinafter, a description is given of an embodiment of the invention.

(Embodiment 1)

[0046] FIG. 1 is a schematic perspective view depicting one example of an electric connector 100 according to

Embodiment 1 of the invention.

[0047] As shown in FIG. 1, an electric connector 100 according to the embodiment includes a female housing 200, a latching member 300, a male housing 400 and a cable fixing member 500.

[0048] As shown in FIG. 1, a guiding groove 210 is provided in the direction (the direction of the arrow Y in the drawing) perpendicular to the fitting direction (the direction of the arrow X in the drawing) along which the female housing 200 and the male housing 400 are fitted to each other in the female housing 200. The latching member 300 is pressure-inserted in the guiding groove 210 of the female housing 200.

[0049] Further, the cable-fixing member 500 is inserted into the female housing 200. The cable-fixing member 500 assumes a role of holding and fixing an electric connection (conductor or harness) connected to the female housing 200.

[0050] A pair of first connection terminals 201a and 201b (not illustrated) are secured inside the female housing 200 shown in FIG. 1. Similarly, a pair of second connection terminals 401a and 401b (not illustrated) are secured inside the male housing 400.

[0051] In addition, electric wires (not illustrated) are connected to the first connection terminals 201a and 201b secured inside the female housing 200 via the cable fixing member 500.

[0052] On the other hand; electric wires (not illustrated) are connected to the second connection terminals 401a and 401b secured inside the male housing 400.

[0053] By the male housing 400 being inserted into the female housing 200 and being fitted thereto, the first connection terminal 201a is connected to the second connection terminal 401a, and the first connection terminal 201b is connected to the second terminal 401b, respectively, thereby securing electric conductivity.

[0054] Next, a detailed description is given of the shapes of the female housing 200, the male housing 400, the latching member 300 and the cable fixing member 500.

[0055] After that, a description is given of a state where the latching member 300 is pressure-inserted into the female housing 200, and a state where the male housing 400 is inserted into and fitted to the female housing 200 having the latching member 300 attached thereto.

[0056] FIG. 2 is a schematic view describing the shape of the female housing 200, wherein (a) is a front elevational view of the female housing 200, (b) is an upper surface view of the female housing 200, (c) is a side elevational view of the same, and (d) is a view of the tapered shape. In addition, the lower surface of the female housing 200 is identical to the upper surface thereof.

[0057] The female housing 200 shown in FIG. 2 presents a roughly square tubular shape enclosing a roughly square tubular shape of the male housing 400 described later (Refer to FIG. 4).

[0058] As shown in FIG. 2(a), the first connection terminals 201a and 201b are provided in the female housing

200. There are two poles as the number of poles of the electric connector 100 according to the embodiment. Therefore, the first connection terminals 201a and 201b are juxtaposed to each other.

[0059] As shown in FIG. 2(a), a rectangular rib 202 and a T-shaped rib 203 are formed in the female housing 200. A tapered shape is formed in the rectangular rib 202 and the T-shaped rib 203, respectively. The tapered shape is provided so as to smoothen insertion and fitting of the first connection terminals 201a and 201b and the second connection terminals 401a and 401b of the male housing 400 described later, and so as to improve the cohesion degree between the rectangular rib 202 and the T-shaped rib 203 and the rectangular groove 402 and the T-shaped groove 403 of the male housing 400 described later.

[0060] Further, the shapes of the rectangular rib 202 and the T-shaped rib 203 are provided to prevent inverted fitting of the male housing 400 and the female housing 200.

[0061] As shown in FIG. 2(a), a rib 205a, 205b, 205c and 205d are provided at the four corners of the female housing 200. These ribs 205a, 205b, 205c and 205d are provided so as to be brought into contact with slits 405a, 405b, 405c and 405d of the male housing 400 when the female housing 200 is fitted to the male housing 400 described later.

[0062] Further, slits 250a, 250b, 250c and 250d are provided at the central parts of respective planes of the female housing 200. These slits 250a, 250b, 250c and 250d are provided so as to be brought into contact with ribs 450a, 450b, 450c and 450d of the male housing 400 described later when the female housing 200 is fitted to the male housing 400 described later. Also, these ribs 205a, 205b, 205c, and 205d and the slits 250a, 250b, 250c and 250d are provided with a tapered shape the width of which is gradually narrowed from the center to the outside. The tapered shape will be described in detail later.

[0063] Subsequently, as shown in FIG. 2(b), a guiding groove 210 is formed on the upper and lower surfaces of the female housing 200 in the direction parallel to the direction of the arrow Y (Refer to FIG. 1). The guiding groove 210 includes an inclined wall 220, a bent of having vertical surface 221, a slit portion 222 and an opening 223.

[0064] An opening 223 is provided almost at the central part of the guiding groove 210. The distance between the inclined wall 220 and the bent inclined wall 221 is L1. Also, at the portion where the opening 223 is provided, the distance between the inclined wall 220 and the bent the inclined wall 221 is L2, wherein the relationship between the distance L1 and the distance L2 is $L1 < L2$.

[0065] A detailed description will be given of the inclined wall 220, the bent inclined wall 221, the notched portion 222 and the opening 223, which compose the guiding groove 210, when fitting the latching member 300 described later is fitted to the female housing 200.

[0066] Continuously, as shown in FIG. 2 (c), projections 230 are formed at the end portion of the female housing 200 in the direction of the arrow X (Refer to FIG. 1) in order to be fitted to the cable fixing member 500 described later and to hold the same. The projections 230 are shaped so as to be fit to the opening 531 of the cable fixing member 500 described later. The projections 230 are composed to be triangular so as to facilitate insertion into and fitting to the cable fixing member 500 as shown in FIG. 2(b).

[0067] . Next, a description is given of one example of the tapered shape using a rib 290 and a slit 291. As shown in FIG. 2(b), the tapered shape is formed at both side portions of the rib 290 and the slit 291 and on the upper parts thereof. The rib 290 has a grade surfaces α and the slit 291 has grade surfaces β . Also, in FIG. 2(d), since a force is applied in the downward direction of the rib 290 and a force is applied in the upward direction of the slit 291, the cohesion property at both the grade surfaces α and β can be improved. For example, even in a case that the tip end γ of the rib 290 is grinding, since the rib 290 moves in the rubbing direction against the grade surfaces β of the slit 291, a lowering in the cohesion property does not occur, therefore it is possible to maintain the rigidity.

[0068] Next, FIG. 3 is a schematic view describing the shape of the latching member 300, wherein (a) is a front elevational view of the latching member 300, (b) is an upper surface view of the latching member, and (c) is a side elevational view of the latching member 300.

[0069] The latching member 300 shown in FIG. 3 is composed of a metal having a spring capability. For example, the latching member 300 is formed of a metal material such as spring steel and stainless steel. Also, coating treatment may be applied onto the latching member 300 in compliance with the use situation thereof. For example, where it is intended that the weather resistance of the latching member 300 or corrosion resistance thereof is improved, zinc plating, painting or chromate treatment, etc., may be applied thereto.

[0070] As shown in FIG. 3 (a), the latching member 300 is formed to be roughly an overturned U shape by bending a single member whose section is roughly circular. Hereinafter, the latching member 300 that is roughly an overturned U shape is divided into an upper portion 310, a vertical portion 320 and a lower portion 330 for description of the latching member 300.

[0071] As shown in FIG. 3(b), when the latching member 300 is observed from upside, the spring portions 311 and 331 are provided in the direction of the arrow X at the upper portion 310 and the lower portion 330 of the latching member 300. The spring portions 311 and 331 are formed to be bent roughly like a trapezoid. Also, the width of the spring portions 311 and 331 is made into a distance LB (Refer to FIG. 3).

[0072] In addition, as shown in FIG. 3(a), a pair of latching portions 315 and 335 are formed at the upper portion 310 and lower portion 330 of the latching member 300. The pair of latching portions 315 and 335 are provided

at parts of the spring portions 311 and 331. In addition, the pair of latching portions 315 and 335 are provided in the inward direction of the roughly overturned U shape portion. Further, bending portions 318 and 338 are formed at the ends of the upper portion 310 and the lower portion 330 of the latching member 300 in order to increase the strength of the latching member 300.

[0073] Next, FIG. 4 is a schematic view describing the shape of the male housing 400, wherein (a) is a front elevational view of the male housing 400, (b) is an upper surface view of the male housing 400, (c) is a side elevational view of the male housing 400, and (d) depicts a section on the X-Z plane (Refer to FIG. 1) of the fixing groove 410 of the male housing 400. Also, the lower surface of the male housing 400 is identical to the upper surface thereof.

[0074] The male housing 400 shown in FIG. 4 presents a roughly square tubular shape enclosed by a roughly square tubular shape of the female housing 200 described above.

[0075] As shown in FIG. 4(a), the second connection terminals 401a and 401b are provided inside the male housing 400. As in the first connection terminal shown in FIG. 2(a), there are two poles as the number of poles of the electric connector 100 according to the embodiment. Therefore, the second connection terminals 401a and 401b are juxtaposed to each other. When fitting the male housing 400 and the female housing 200 to each other, the second connection terminal 401a is connected to the first connection terminal 201a shown in FIG. 2, and the second connection terminal 401b is connected to the first connection terminal 201b shown in FIG. 2.

[0076] As shown in FIG. 4(a), a rectangular groove 402 and a T-shaped groove 403 are formed in the male housing 400. A tapered shape is formed at the rectangular groove 402 and T-shaped groove 403. The tapered shape smoothens insertion and fitting of the second connection terminals 401a and 401b in the first connection terminals 201a and 201b of the female housing 200, and simultaneously are provided to improve the cohesion property between the rectangular rib 202 and the T-shaped rib 203.

[0077] Further, in order to prevent inverted fitting of the male housing 400 and the female housing 200, the rectangular groove 402 and the T-shaped groove 403 are provided with different shapes.

[0078] As shown in FIG. 4(a), slits 405a, 405b, 405c and 405d are provided at the four corners of the male housing 400. The slits 405a, 405b, 405c and 405d are provided so as to be brought into contact with the internal slits 205a, 205b, 205c and 205d of the female housing 200 when the insertion and fitting of the male housing 400 and the female housing 200 are completed.

[0079] Further, ribs 450a, 450b, 450c, 450d are provided at the central parts of the respective sides of the male housing 400. These ribs 450a, 450b, 450c, 450d are provided so as to be brought into contact with the slits 250a, 250b, 250c and 250d of the female housing

200 when the fitting of the male housing 400 and the female housing 200 are completed.

[0080] Further, these slits 405a, 405b, 405c and 405d and ribs 450a, 450b, 450c and 450d are provided with a tapered shape whose width is narrowed from the center to the outside (Refer to FIG. 2(d)).

[0081] Also, in the embodiment, slits 405a, 405b, 405c and 405d are provided at the four corners of the male housing 400, and ribs 450a, 450b, 450c and 450d are provided at the central parts of the respective sides, ribs 205a, 205b, 205c, and 205d are provided at the four corners of the female housing 200, and slits 250a, 250b, 250c, and 250d are provided at the central parts. However, the slits and ribs are not limited thereto. Ribs and slits may be optionally provided at the fitting parts between the male housing 400 and the female housing 200.

[0082] Also, the shapes of these ribs and slits are not limited to the above-described tapered shape. The shape thereof may be optional if the ribs and slits are brought into contact with each other and they can increase the cohesion property when the male housing 400 and the female housing 200 are fitted to each other.

[0083] Continuously, as shown in FIG. 4(b), a fixing groove 410 is formed in the direction parallel to the direction of the arrow Y (Refer to FIG. 1) on the upper surface and the lower surface of the male housing 400. The shape of the fixing groove 410 will be described later.

[0084] In addition, a leading guide 420 is provided in the direction of the arrow X (Refer to FIG. 1) from the end of the male housing 400 toward the fixing groove 410.

[0085] As shown in FIG. 4(b), the leading guide 420 is provided so as to be inclined in the direction of the arrow X (Refer to FIG. 1).

[0086] Next, as shown in FIG. 4 (d), the depth of the fixing groove 410 is deeper than that of the leading guide 420. Also, an inclined surface 410a is formed on the bottom of the fixing groove 410. The inclined surface 410a is provided so that a pair of latching portions 315 and 335 are not idly fitted to the bottom of the fixing groove 410. Therefore, the width 410H of the bottom portion of the fixing groove 410 is prepared so as to be almost equal to the width (the diameter of the section) of a pair of the latching portions 315 and 335. In addition, the width of the inlet of the fixing groove 410 is prepared so as to be larger than the width (the diameter of the section) of a pair of latching portions 315 and 335. That is, the greater the extent the pair of latching portions 315 and 335 are let into, the more complete the fixing is made.

[0087] Continuously, FIG. 5 is a schematic view describing the shape of the cable fixing member 500, wherein (a) is a front elevational view of the cable fixing member 500, (b) is an upper surface view of the cable fixing member 500, and (c) is a side elevational view of the cable fixing member 500.

[0088] As shown in FIG. 5(a), the cable fixing member 500 includes a pair of nipping portions 530 and a body portion 510. The body portion 510 includes two holding parts 501a and 501b.

[0089] There are two poles as the number of poles of the electric connector according to the embodiment. Therefore, the number of holding parts 501a and 501b is two. As shown in FIG. 5(b), the holding parts 501a and 501b are made cylindrical and hold electric wires inserted there into.

[0090] Also, as shown in FIG. 5(c), an opening 531 that can be fitted to the protrusion 230 of the female housing 200 shown in FIG. 2 is provided for a pair of nipping portions 530.

[0091] With the above-described construction, the cable fixing member 500 can fix electric wires to the female housing 200 of FIG. 2 while holding them.

[0092] Next, a description is given of a state where the latching member 300 is pressure-inserted into the female housing 200.

[0093] FIG. 6 is a view describing a state where the latching member 300 is pressure-inserted into the female housing 200, wherein (a) depicts a state before the latching member 200 is pressure-inserted into the female housing 200, (b) depicts a state where pressure-insertion of the latching member into the female housing 200 is started, (c) depicts a state where pressure-insertion of the latching member 300 into the female housing 200 is completed. Also, the latching member 300 to which initial load (preload) is applied is called a "latching member 300P."

[0094] First, as shown in FIG. 6(a), the latching member 300 is disposed roughly in parallel to the direction of the arrow Y (Refer to FIG. 1) with respect to the guiding groove 210 of the female housing 200.

[0095] Herein, the width of the spring portion of the latching member 300 is LB, and the distance between the inclined wall 220 of the guiding groove 210 and the bent inclined wall 221 thereof is L1 or L2. The relationship between the width LB of the spring portion and the distances L1 and L2 satisfies $L1 < LB < L2$.

[0096] Next, as shown in FIG. 6(b) and FIG. 6(c), the latching member 300 is pressure-inserted into the guiding groove 210 of the female housing 200. At this time, the width LB of the spring portions 311 and 331 of the latching member 300 is narrowed to the distance L1 by means of the inclined wall 220 and the bent inclined wall 221 of the female housing 200 to cause the latching member 300 to be made into preload.

[0097] In addition, as shown in FIG. 6(c), where the latching member 300P is pressure-inserted into the guiding groove 210 of the female housing 200, a pair of latching portions 315 and 335 of the latching member 300P are fitted to the opening 223 secured in the guiding groove 210 of the female housing 200. Further, by pressure-inserting the latching member 300P, the preloaded state of the latching member 300P is provisionally released at the portion where the distance to the inclined wall 220 and the bent inclined wall 221 is made into L2, wherein the latching member 300 is brought into an idly fitted state.

[0098] Finally, as shown in FIG. 6(d), the preloaded

state of the latching member 300P is again maintained by means of the corner portion 221a of the bent inclined wall 221 of the guiding wall 210 after the opening 223 is fitted to the latching portions 315 and 335 of the latching member 300. Hereinafter, the female housing 200 which is provided with a preloaded latching member 300P is called a "female housing 200P."

[0099] Next, a description is given of a state where the male housing 400 is inserted into and fitted to the female housing 200 to which the latching member 300 is attached.

[0100] FIG. 7 is a view describing a state where the male housing 400 is inserted into and fitted to the female housing 200 to which the latching member 300 is attached, and FIG. 8 is a schematic view enlarging a partial section of the descriptive view of FIG. 7.

[0101] In the drawing, (a) depicts a state before the male housing 400 is inserted into and fitted to the female housing 200, (b) depicts a state where insertion and fitting of the male housing 400 into the female housing 200 are started, (c) depicts a state immediately before the male housing 400 is inserted into and fitted to the female housing 200, and (d) depicts a state where the male housing 400 is completely inserted into and fitted to the female housing 200.

[0102] As shown in FIG. 7(a), before the male housing 400 is inserted into and fitted to the female housing 200, the male housing 400 is disposed so as to be opposed to the female housing 200P. In this case, as shown in FIG. 8(a), a pair of latching portions 315 and 335 of the latching member 300P inserted into and fitted to the opening 223 of the female housing 200P are opposed to the leading guides 420 of the male housing 200.

[0103] Next, as shown in FIG. 7(b), in a state where insertion and fitting of the male housing 400 into the female housing 200 are started, the second connection terminals 401a and 401b of the male housing 400 are inserted into and fitted to the first connection terminals 201a and 201b of the female housing 200, the rectangular rib 202 of the male housing 400 is started to be inserted into and fitted to the rectangular groove 402 of the female housing 200, and the T-shaped rib of the male housing 400 is started to be inserted into and fitted to the T-shaped groove 403 of the female housing 200.

[0104] Also, the ribs 450a, 450b, 450c and 450d of the male housing 400 are started to be inserted into and fitted to the slits 250a, 250b, 250c and 250d of the female housing 200, and the ribs 205a, 205b, 205c and 205d at the four corners of the female housing 200 are started to be inserted into and fitted to the slits 405a, 405b, 405c and 405d at the four corners of the male housing 400.

[0105] Further, in this case, as shown in FIG. 8(b), a pair of latching portions 315 and 335 protruding from the opening 223 of the female housing 200 are inserted into and fitted to the leading guides 420 of the male housing 400.

[0106] Continuously, as shown in FIG. 7(c), in a state immediately before the male housing 400 is inserted into

and fitted to the female housing 200, insertion and fitting of the above-described second connection terminals 401a, 401b and first connection terminals 201a and 201b, rectangular rib 202 and rectangular groove 402, T-shaped rib 203 and T-shaped groove 403, and respective ribs and slits are progressed.

[0107] In this case, as shown in FIG. 8(c), a pair of latching portions 315 and 335 protruding from the opening 223 of the female housing 200 are pressed in the reverse direction of the arrow Y (Refer to FIG. 8(c) and FIG. 1) by means of the leading guide 420, and the entirety of the latching member 300P is moved into the guiding groove 210.

[0108] That is, since the leading guide 420 of the male housing 400 is provided to be inclined from the direction of the arrow X (refer to FIG. 1) of the male housing 400, a pair of latching portions 315 and 335 of the latching member 300 are automatically caused to move in the reverse direction of the arrow Y in line with insertion and fitting of the male housing 400 into the female housing 200.

[0109] Next, as shown in FIG. 7(d), in a state where the male housing 400 is inserted into and fitted to the female housing 200, insertion and fitting of the above-described second connection terminals 401a and 401b and first connection terminals 201a and 201b, rectangular rib 202 and rectangular groove 402, T-shaped rib and T-shaped groove 403, and respective ribs and slits are completed.

[0110] Also, the spring portions 311 and 331 of the latching member 300P move from the corner portion 221a (Refer to FIG. 7) of the bent erect portion 221 of the guiding groove 210 and move to the portion where the distance between the inclined wall 220 of the guiding groove 210 and the bent inclined wall 221 is L2. Simultaneously therewith, as shown in FIG. 8(d), a pair of latching portions 315 and 335 of the latching member 300 move from the leading guide 420 secured on the upper surface and the lower surface of the male housing 400 to the fixing groove 410.

[0111] In this case, as soon as a pair of latching portions 315 and 335 of the latching member 300 move to the fixing groove 410, the spring portions 311 and 331 of the latching member 300, which is maintained in a preload-applied state by means of the inclined wall 220 and the bent inclined wall 221 of the guiding groove 210 of the female housing 200, move to the portion where the distance between the inclined wall 220 of the latching member 200 and the bent inclined wall 221 thereof is L2. Therefore, the preloaded state of the latching member 300P is released, pressing of the spring portions 311 and 331 of the latching member 300 operates between the inclined wall 220 of the guiding groove 210 of the female housing 200 and the fixing groove 410 of the male housing 400.

[0112] In addition, where pressing brought about by the spring portions 311 and 331 of the latching member 300 is desired to be released, it is possible, by pressure-

inserting the latching member 300 into the notched portion 222 secured in the guiding groove 210, to move the latching portions 315 and 335 of the latching member 300 along the inclined surface 411 secured at the end portion of the fixing groove 410 as shown in FIG. 8(d). As a result, since the latching portions 315 and 335 can be moved to the outer circumferential surface other than the fixing groove 410 of the male housing 400, pressing brought about by the latching member 300 between the male housing 400 and the female housing 200 can be easily released.

[0113] Next, FIG. 9 is a view describing a state where a pair of latching portions 315 and 335 are inserted into and fitted to the fixing groove 410 of the male housing 400, wherein (a) depicts a case where a pair of latching portions 315 and 335 are in the leading guide 420, and (b) depicts a case where a pair of latching portions 315 and 335 are on the bottom of the fixing groove 410.

[0114] As shown in FIG. 9(a), where the male housing 400 is inserted into and fitted to the female housing 200, a pair of latching portions 315 and 335 move in the leading guide 420.

[0115] Next, as shown in FIG. 9(b), a pair of latching portions 315 and 335 move from inside of the leading guide 420 to inside of the fixing groove 410. In this case, since a pair of latching portions 315 and 335 will be returned to their original shape, the latching portions 315 and 335 move toward the bottom in the fixing groove 410. And, a pair of latching portions 315 and 335 are pressed by means of the inclined surface 410a secured on the bottom of the fixing groove 410, the bottom surface of the fixing groove 410 and the inclined wall of the fixing groove 410, and are fixed on the bottom portion of the fixing groove 410. Resultantly, a pair of latching portions 315 and 335 can be prevented from escaping from the fixing groove 410.

[0116] With the above construction, in the electric connector 100 according to the invention, since the latching member 300 slides from the direction perpendicular to the pressing direction of the latching member 300 into the guiding groove 210 of the female housing 200 and is held by the female housing 200, it is possible to easily hold the latching member 300 in a state where preload is applied to the guiding groove 210 of the female housing 200 even if the pressing forces of the spring portions 311 and 331 are intense.

[0117] Also, since the latching portions 315 and 335 of the latching member 300 held in the guiding groove 210 of the female housing 200 move from the opening 223 of the female housing 200 to the fixing groove 410 of the male housing 400, the pressing force held by the latching member 300 can be applied in the fitting direction.

[0118] In addition, since the latching member 300 slides in the direction (Y direction) perpendicular to the fitting direction by inserting the male housing 400 into and fitting the same to the female housing 200, the entire pressing forces of the spring portions 311 and 331 are

not necessarily applied when inserting and fitting the same. As a result, even in a case where the pressing forces of the spring portions 311 and 331 are intense, the male housing 400 can be easily inserted into and fitted to the female housing 200.

[0119] Thus, by increasing the pressing forces of the spring portions 311 and 331, the female housing 200 and the male housing 400 can be made integrally rigid. As a result, it is possible to improve the vibration-resisting property of the electric connector 100. The contacts can be prevented from wearing under an environment where high acceleration vibrations occur, and it is possible to maintain electric conductivity. Further, since no component other than the female housing 200, male housing 400 and latching member 300 are required, it is possible to reduce the weight of the electric connector 100 and to make the same small in size.

[0120] Still further, the inclined surfaces α and β which are tightened in the fitting direction are formed at the respective ribs and slits between the female housing 200 and the male housing 400, fitting between the female housing 200 and the male housing 200 is further strengthened. Furthermore, since the inclined surfaces α and β are tightened in the fitting direction even if the fitting portion between the female housing 200 and the male housing 400 is worn, the rigidity of the female housing 200 and the male housing 400 can be maintained.

[0121] Also, since the leading guide 420 is provided to be inclined in the fitting direction, it is possible to move the latching portions 315 and 335 of the latching member 300 along the leading guide 420. Therefore, by inserting the male housing 400 into the female housing 200 and fitting to each other, the latching member 300 automatically slides and moves. As a result, only by a process of applying a force in one direction (fitting direction), sliding movement of the latching member 300 is enabled, and fitting of the male housing 400 and the female housing 200 can be achieved.

[0122] In addition, since the latching member 300 can be formed by a simple construction with a single rod-like member, it is possible to further attempt to downsize the electric connector 100 and to reduce the weight thereof. Additionally, since the section thereof is roughly circular, it is possible to reduce the contact frictional resistance in the guiding groove 210 and the leading guide 420 when making a sliding movement, thereby it is possible to easily insert the male housing 400 into and fit to the female housing 200.

[0123] Also, by adjusting the distance L1 of the guiding groove 210 and the distance LB of the spring portions 311 and 331, it is possible to control a force by which preload in the latching member 300 operates in the female housing 200.

[0124] In the housing equipped with a latching member according to the embodiment and the electric connector 100 equipped with the housing, the first connection terminals 201a and 201b correspond to the first connection terminals, the second connection terminals 401a and

401b correspond to the second connection terminals, the first connection terminals 201a and 201b and the second connection terminals 401a and 401b correspond to one or a plurality of electric connection terminals and connection terminals, the female housing 200 corresponds to the first housing of female type, the male housing 400 corresponds to the second housing of male type, at least one of the female housing 200 and the male housing 400 corresponds to at least one housing of the electric connectors, the female housing 200 and the male housing 400 correspond to an electric connector including the male and female type housings, inclined surfaces α and β correspond to the tapered engagement portions, the direction of the arrow X corresponds to the fitting direction, the direction of the arrow Y corresponds to the direction orthogonal to the fitting direction, the latching member 300 corresponds to the latching member, the spring portions 311 and 331 correspond to the spring portions, the latching portions 315 and 335 correspond to the latching portions, the guiding groove 210 corresponds to the guiding groove, the opening 223 corresponds to the opening portion, the distance L1 of the guiding groove 210 corresponds to the first groove portion including the first position and the first groove width, the distance L2 of the guiding groove 210 corresponds to the second groove portion including the second position and the second groove width, the fixing groove 410 corresponds to the fixing groove, the leading guide 420 corresponds to the leading guide, and the outer circumferential surface other than the fixing groove 410 of the male housing 400 corresponds to the third position.

[0125] Also, although, in the above-described embodiment, a description was given of the case where the male housing 400 is fitted to the female housing 200 while retaining the latching member 300 in a preload-applied state with the guiding groove provided in the female housing 200, the invention is not limited thereto. The latching member 300 may be retained in a preload-applied state with the guiding groove provided in the male housing 400.

[0126] Further, the shapes of the guiding groove 210 and the latching member 300 are not limited to those of the embodiment. Any shape may be acceptable as long as the latching member 300 actuates preload.

[0127] Further, in the embodiment, although the electric-connector 100 is composed of two poles, the number of poles is not limited thereto, wherein any optional number of poles may be acceptable. For example, the first connection terminal supported by the first housing and the second connection terminal supported by the second housing may not be necessarily provided as a pair, and the connection terminals may be adequately provided in a plurality.

[0128] Still further, the spring portions 311 and 331 of the latching member 300 and the latching portions 315 and 335 thereof are provided at two points. However, the spring portions and the latching portions are not limited thereto, and the electric connector may include any optional number of spring portions and latching portions.

Additionally, the latching member 300 may be composed of a plurality of parts, and the section of the latching member 300 is not limited to a roughly circular shape, wherein it may be any optional shape, for example, rectangular, elliptical, etc.

[0129] In addition, the electric connector according to the embodiment may be used not only in the vicinity of a power source where high acceleration vibrations occur, but also may be used as an electric connector in any optional use environment. For example, by optimally selecting the materials of the male housing and female housing described later, the housings are provided with durability, weather-resisting property and waterproof property, etc., and may be used under all kinds of environments.

[0130] The cable fixing member 500 is employed in the embodiment. However, the invention is not limited thereto. The structure of the cable fixing member 500 may be provided integrally with the female housing 200, or no structure of the cable fixing member 500 may be provided.

The latching member 300 is inserted into the guiding groove 210 of the female housing 200. The latching member 300 is made into a preload-applied state in the direction, along which the female housing 200 and the male housing 400 are inserted into and fitted to each other, in a state where the latching member 300 is held in the guiding groove 210 of the female housing 200. By inserting the male housing 400 into the female housing 200 and fitting to each other, the latching portion secured at the spring portion of the latching member 300 is fitted to the fixing groove via the leading guide of the male housing 400.

Claims

1. An electric connector being **characterized in** comprising:

a female first housing for supporting a first connection terminals (201a, 201b);

a male second housing for supporting a second connection terminal (401a, 401b) electrically connected to said first connection terminal (201a, 201b), and simultaneously being inserted into said first housing (200) and fitted thereto; and

a latching member (300) having a latch portion (315, 335) to be latched to said second housing (400) at a spring portion being pressed in the fitting direction and at a part of the spring portion (311, 331), and extending in a direction orthogonal to the fitting direction of said first housing (200) and said second housing (400); wherein said first housing (200) includes a guiding groove (210) for slidably holding said latching member (300) in the orthogonal direction

against pressing of the spring portion (311, 331) in the fitting direction in a preload-applied state and an opening (223) for releasing the preload-applied state and causing said latching member (300) to be operably opened toward said second housing (400);

said second housing (400) includes a fixing groove (410) for receiving said latching member (300) which is in a state where the preload is applied to the portion to which the opening (223) is faced when said first housing (200) is fitted; and

said latching member (300) is provided so as to slidably move to a first position where said latching member (300) is held in the guiding groove (210) of said first housing in the preload-applied state; and

to a second position where said latching portion (315, 335) is shifted from said guiding groove (210) to said fixing groove (410) in the preload-applied state and is latched in said fixing groove (410).

2. The electric connector according to Claim 1, wherein a tapered engagement portion which is tightened in the fitting direction is formed at the fitting portion between said first housing (200) and said second housing (400).

3. The electric connector according to Claim 1, wherein said second housing (400) includes a leading guide (420) for leading said latching portion (315, 335) to said fixing groove (410), said leading guide (420) is provided so as to be inclined in said fitting direction; and said latching member (300) slidably moves from said first position to said second position when said second housing (400) is inserted into and fitted to said first housing (200).

4. The electric connector according to Claims 1, wherein said latching member (300) is provided so as to slidably move to the third position deviated from said fixing groove (410) of said second housing (400).

5. The electric connector according to Claims 1, wherein said latching member (300) is formed to be roughly like an overturned U shape by bending a single rod-like member whose section is roughly circular; the spring portion (311, 331) of said latching member (300) is formed by bending the rod-like member; and said latching portion (315, 335) of the latching member (300) is formed by bending a part of the spring portion (311, 331).

6. The electric connector according to Claim 1, wherein said guiding groove (210) includes a first groove portion having a first groove width by which the spring portion (311, 331) of the latching member (300) is

pressed and preload is caused to operate; and a second groove portion having a second groove width by which said spring portion (311, 331) of the latching member (300) is idly fitted and the preload is released.

7. A housing being **characterized in** comprising: at least one of housings (200, 400) of an electric connector for supporting one or a plurality of electric connection terminals and simultaneously for fitting the same in a state where the connection terminals are inserted and fitted therein; and a latching member (300) having a spring portion (311, 331) being pressed in the fitting direction and extending in a direction orthogonal to the fitting direction of the housing; wherein said housing (200, 400) includes a guiding groove (210) capable of slidably moving said latching member (300) in the orthogonal direction; and said latching member (300) is provided so as to slidably move to a first position where said latching member (300) is held in a preload-applied state against pressing the spring portion (311, 331) in the fitting direction by said guiding groove (210) of the housing (200, 400), and a second position where said latching member (300) is held by said guiding groove (210) of said housing (200, 400) in a preload-released state.

8. The housing according to Claim 7, wherein said guiding groove (210) includes:

a first groove portion having a first groove width by which said spring portion (311, 331) of the latching member (300) is pressed and the preload is applied; and a second groove portion having a second groove width by which said spring portion (311, 331) of the latching member (300) is idly fitted and the preload is released.

9. An electric connector being **characterized in** comprising: an electric connector having a pair of male and female housings (200, 400) by which connection terminals are supported; and a latching member (300) being pressed in the fitting direction of the male and female housings (200, 400); wherein said latching member (300) is provided so as to slidably move to a first position where said latching member (300) is held in at least one of said male and female housings (200, 400) in a state where preload is applied in the fitting direction; and a second position by which, when the male and female housings (200, 400) are fitted to each other, the preload is released in the fitting direction of said male and female housings (200, 400), and a part of the latching member (300) is moved to the other of said male and female housings (200, 400).

10. The electric connector according to Claim 9, wherein said latching member (300) has a latching portion (315, 335) to be latched to the other of said male and female housings (200, 400) at said spring portion (311, 331) and a part of said spring portion (311, 331), which being pressed in the fitting direction; at least one of said male and female housings (200, 400) includes:

a guiding groove (210) by which said latching member (300) is held so as to slidably move in the direction orthogonal to the fitting direction in a preload-applied state against pressing of said spring portion (311, 331) in the fitting direction, and an opening (223) where the preload-applied state is released and said latching portion (300) is opened so as to operate in the other of said male and female housings (200, 400); and the other of said male and female housings (200, 400) includes a fixing groove (410) for receiving the latching portion (315, 335), which is in a preload-applied state, at a portion opposed to the opening (223) when the other of said male and female housings (200, 400) is fitted in one thereof.

FIG. 1

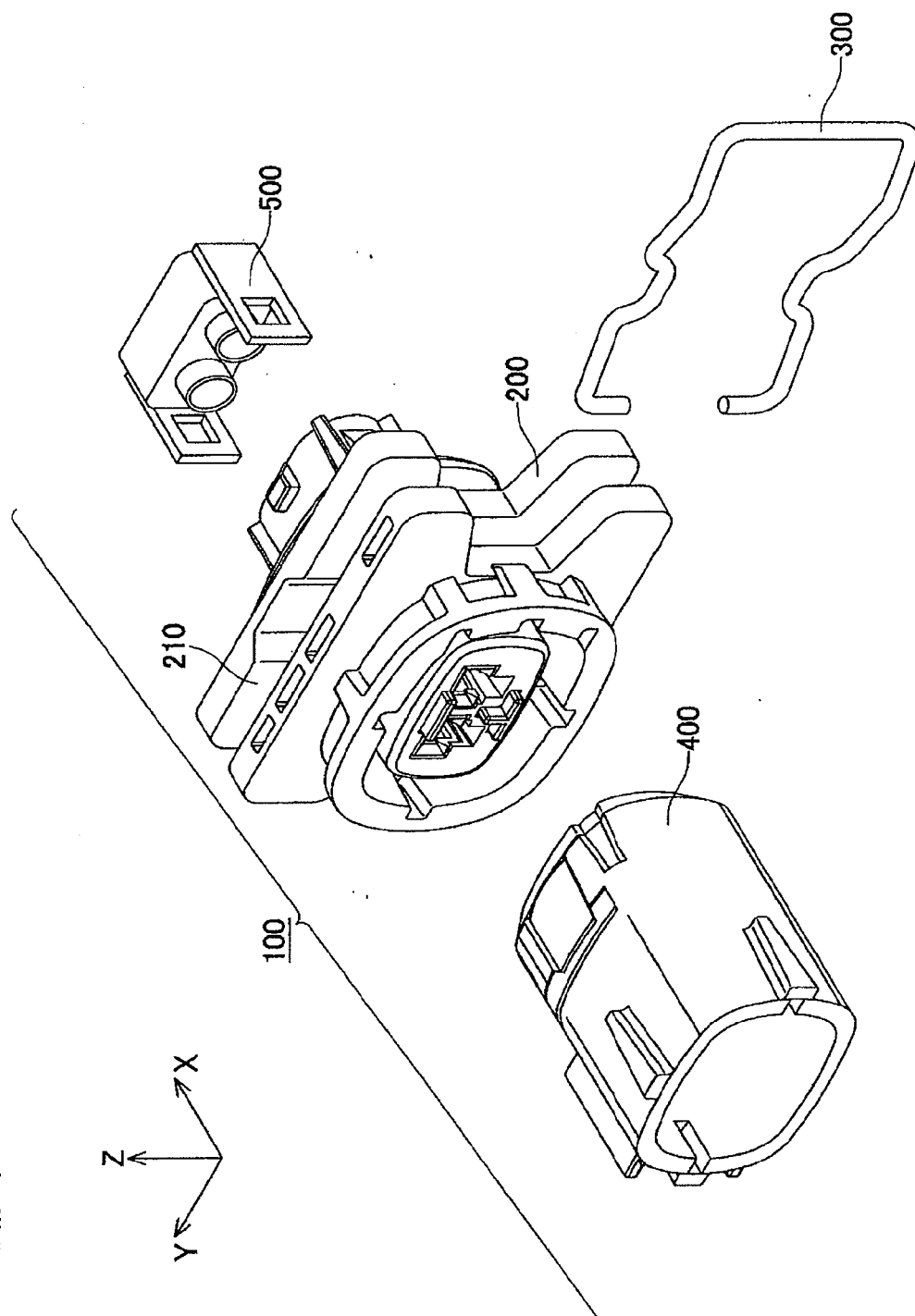


FIG. 2

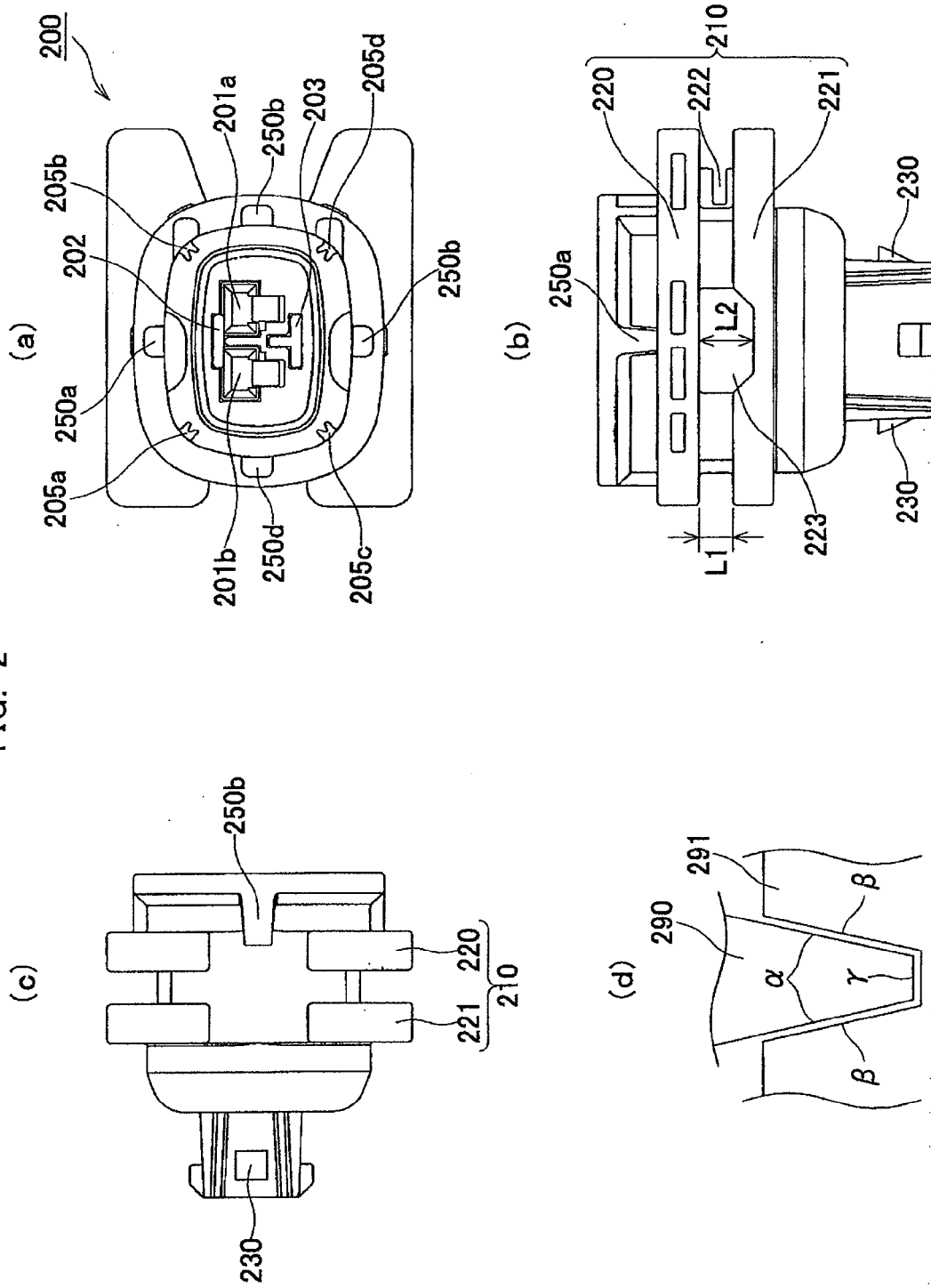


FIG. 3

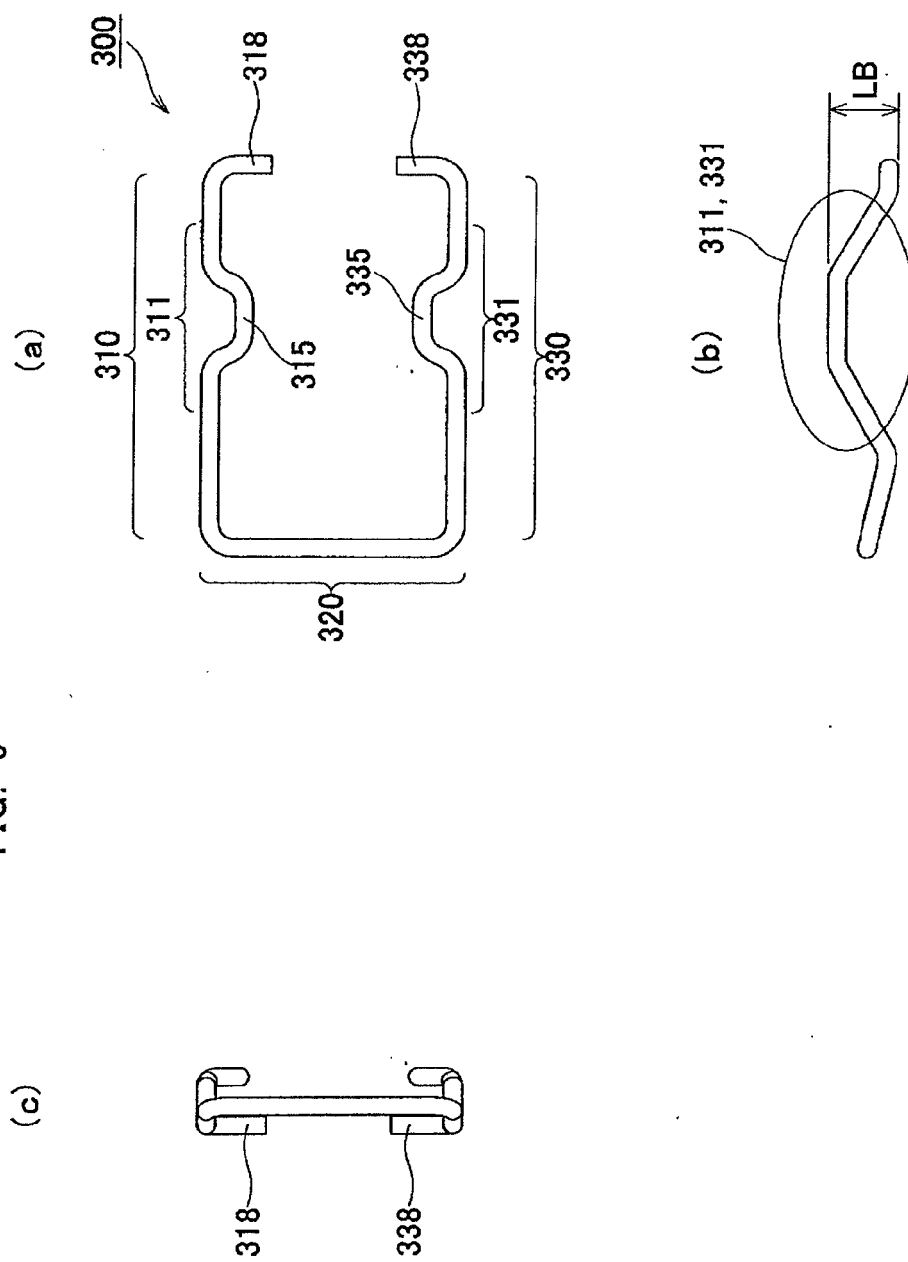


FIG. 4

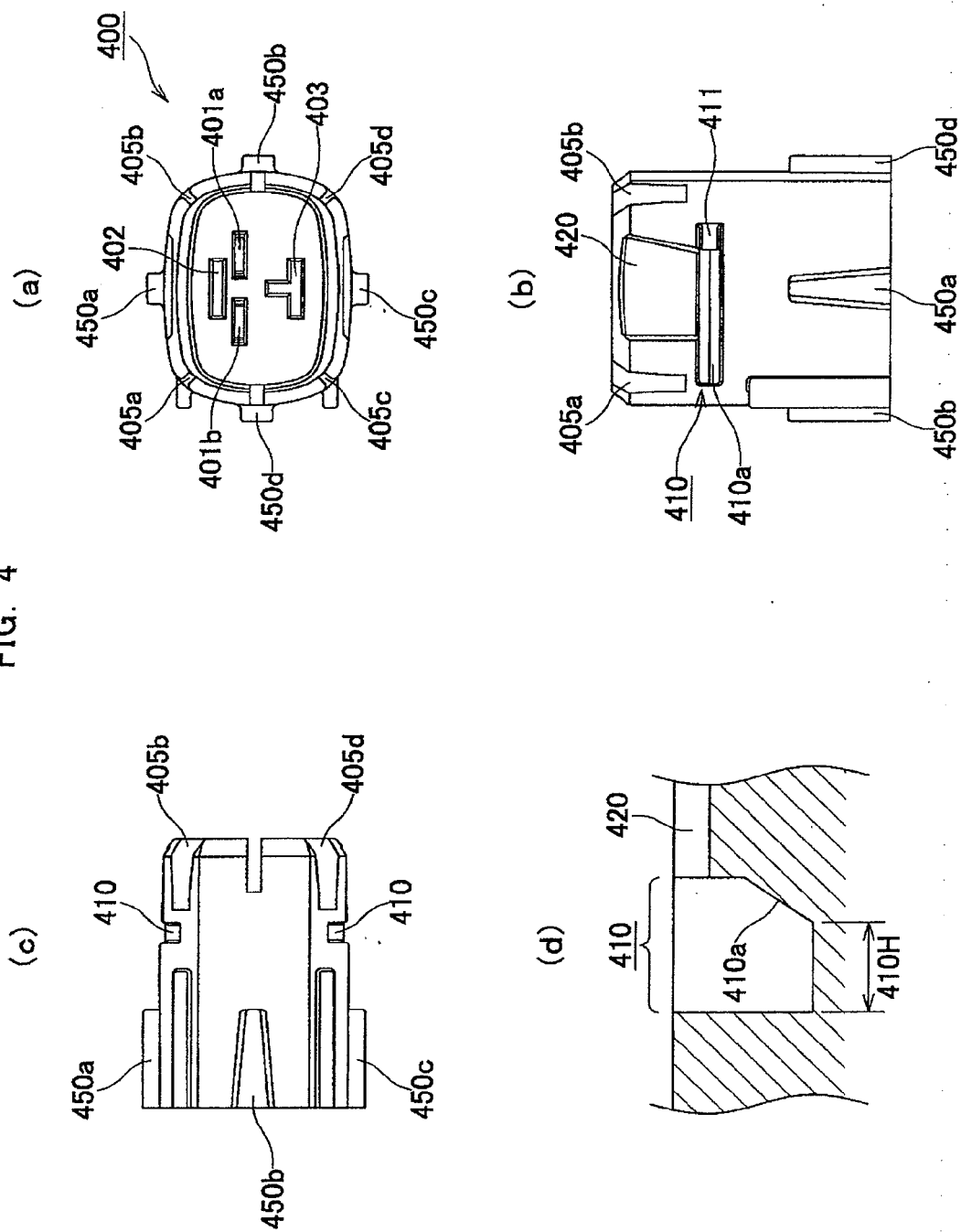


FIG. 5

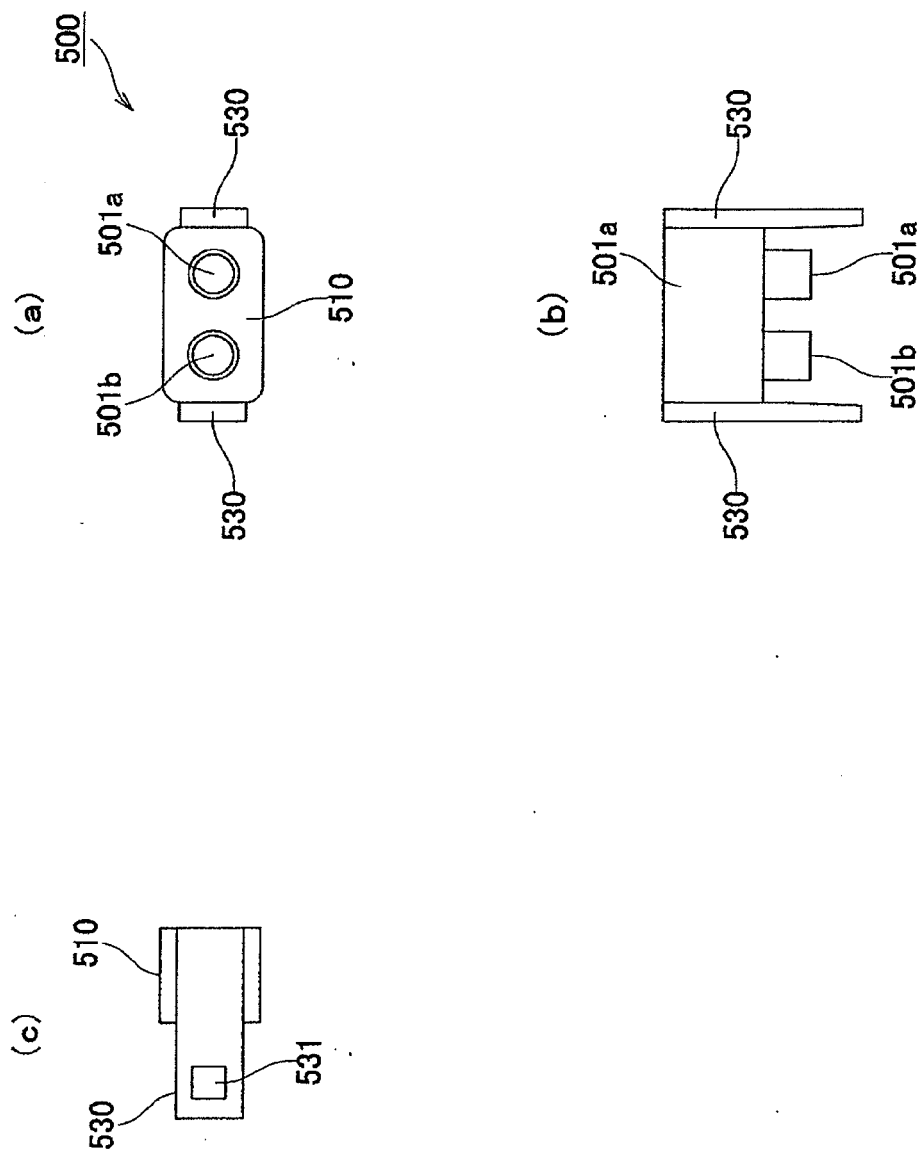


FIG. 6

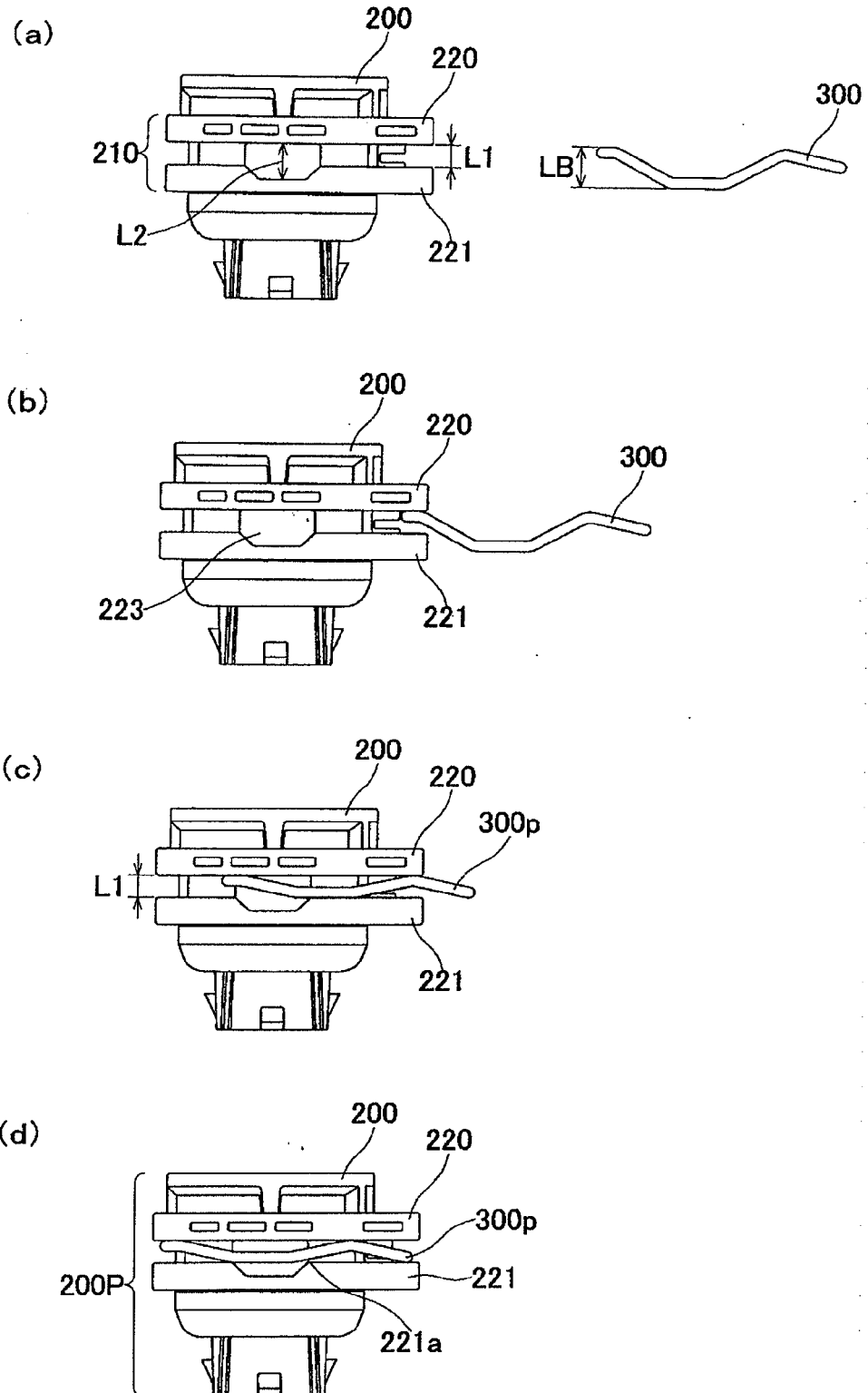
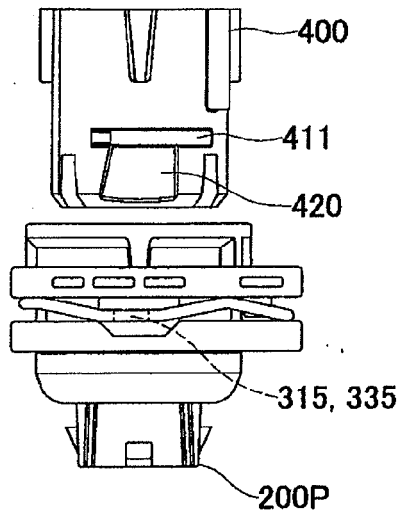
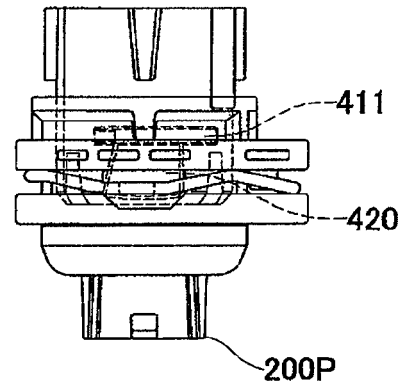


FIG. 7

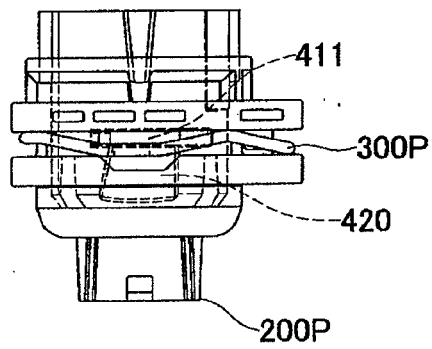
(a)



(b)



(c)



(d)

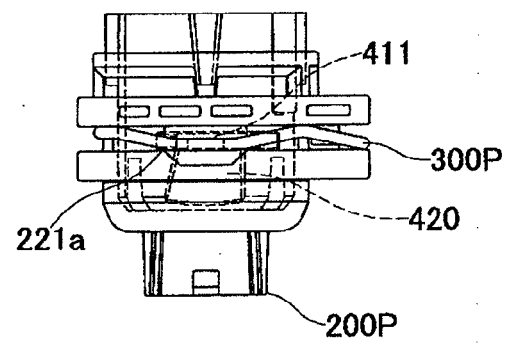


FIG. 8

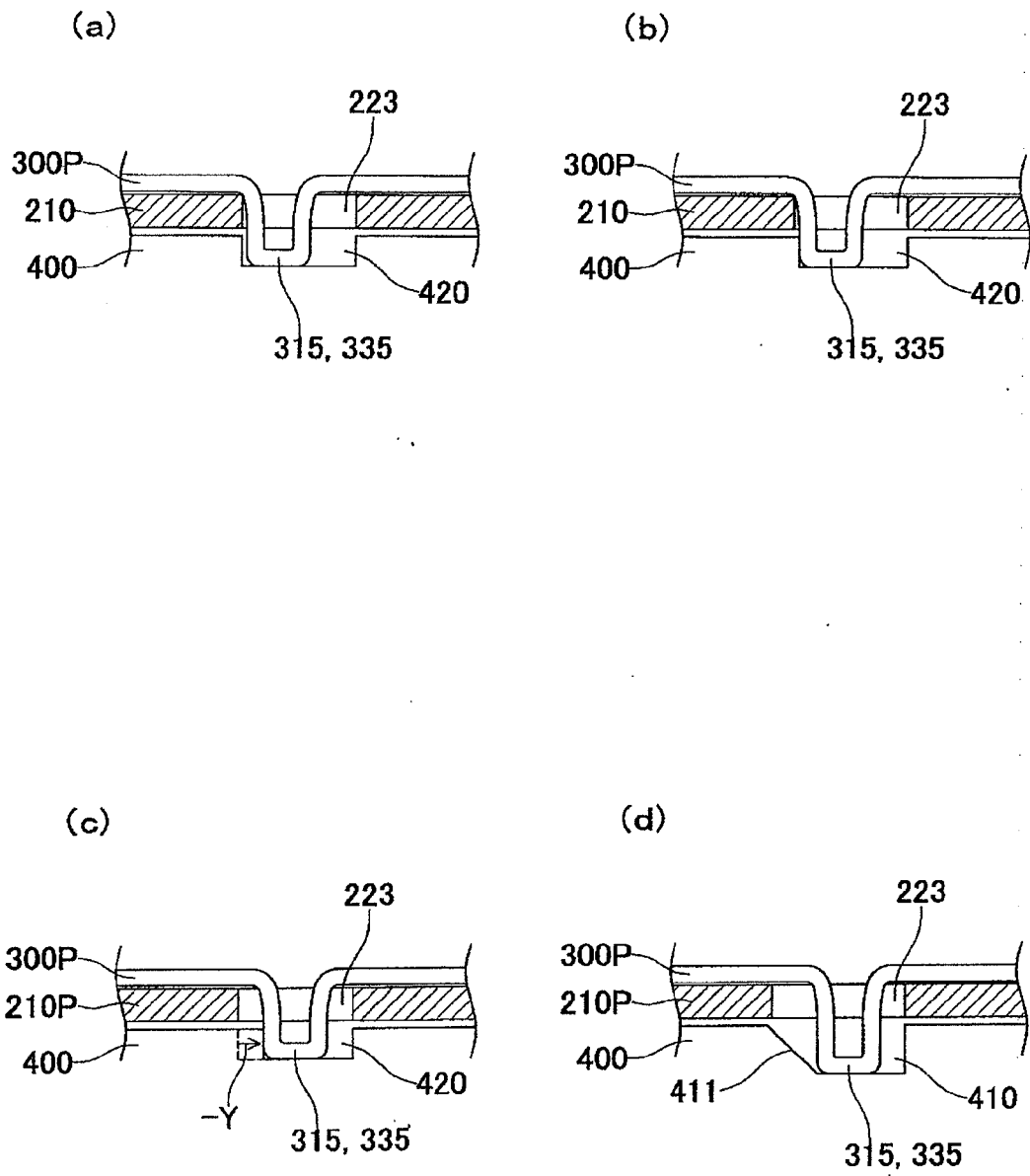
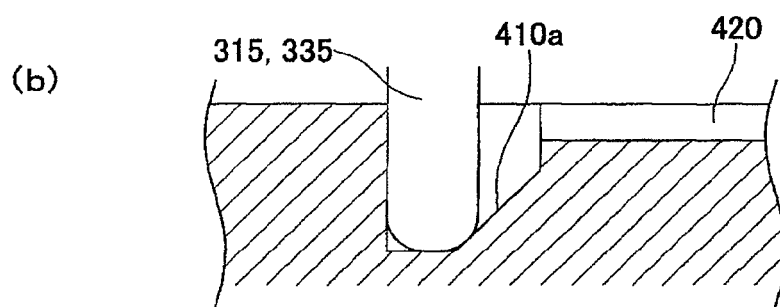
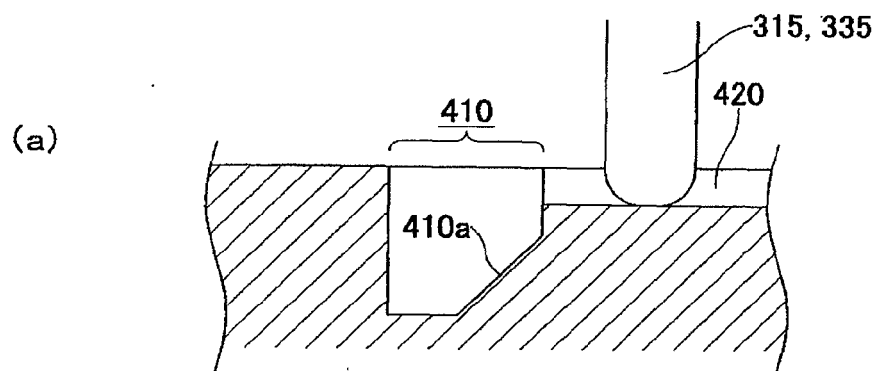


FIG. 9





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 10 0543

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 823 813 A (DYE ET AL) 20 October 1998 (1998-10-20) * figures 1,2,11,12 *	1-10	INV. H01R13/627
X	DE 37 25 261 A1 (TRW DAUT + RIETZ GMBH & CO KG; TRW DAUT + RIETZ GMBH & CO KG, 8500 NUE) 9 February 1989 (1989-02-09) * figure 3 *	1-10	
X	US 5 639 255 A (MUZSLAY ET AL) 17 June 1997 (1997-06-17) * figure 5 *	1-10	
X	EP 0 214 617 A (KABELWERKE REINSHAGEN GMBH) 18 March 1987 (1987-03-18) * figures 1,2 *	1-10	
A	US 5 219 185 A (ODDENINO ET AL) 15 June 1993 (1993-06-15) * figures 1,5,6 *	1-10	
D,A	PATENT ABSTRACTS OF JAPAN vol. 2003, no. 12, 5 December 2003 (2003-12-05) & JP 2004 171911 A (YAZAKI CORP), 17 June 2004 (2004-06-17) * abstract *	1	TECHNICAL FIELDS SEARCHED (IPC) H01R
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 26 April 2006	Examiner Demol, S
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 06 10 0543

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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