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(54) **Connector**

Steckverbinder

Connecteur

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(73) Proprietor: **Sumitomo Wiring Systems, Ltd.**
Yokkaichi-city,
Mie 510-8503 (JP)

(72) Inventor: **Hiraishi, Takumi**
Yokkaichi-City
Mie 510-8503 (JP)

(74) Representative: **Müller-Boré & Partner**
Patentanwälte PartG mbB
Friedenheimer Brücke 21
80639 München (DE)

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Description

[0001] Japanese Unexamined Patent Publication No. 2005-123029 discloses a connector including a housing, into which terminal fittings are to be inserted, and a retainer to be mounted into the housing, wherein the retainer mounted in the housing is movable between a partial locking position to permit insertion and withdrawal of the terminal fittings and a full locking position to retain the inserted terminal fittings. The retainer is formed with a partial locking arm portion and a full locking arm portion extending substantially in parallel to a moving direction and juxtaposed with each other, and a space between these arms serves as a deformation space into which the respective arm portions are resiliently deformed.

[0002] In a state where the retainer is at the partial locking position, the partial locking arm portion is engaged with the housing, thereby preventing a movement of the retainer in a direction opposite to the one toward the full locking position, and the full locking arm portion is held in contact with a projecting portion of the housing to prevent a movement of the retainer toward the full locking position. Further, in the process of moving the retainer from the partial locking position to the full locking position, the full locking arm portion interferes with the projecting portion to be resiliently deformed toward the partial locking arm portion. When the retainer reaches the full locking position, the full locking arm portion is resiliently restored to be engaged with the projecting portion, whereby the retainer is held at the full locking position.

[0003] Document US 5,769,664 discloses a mechanism for detecting whether a terminal of a connector is full-inserted or half-inserted into a terminal receiving chamber. A housing of the connector has a terminal receiving chamber into which a metal terminal is to be inserted, a flexible engagement arm projecting into the terminal receiving chamber and being designed to engage to a metal terminal inserted into the terminal receiving chamber to thereby prevent disengagement of the metal terminal from the terminal receiving chamber, and a wall defining a deformation space between itself and the engagement arm, the engagement arm deformable in the deformation space. A front holder is to be inserted into the deformation space so as to prevent the metal terminal from being disengaged from the terminal receiving chamber, and has a half-insertion detector for detecting half-insertion of the metal terminal into the terminal receiving chamber. The wall includes an abutment surface to which the half-insertion detector abuts when the metal terminal is half-inserted into the terminal receiving chamber, the abutment surface being located closer to the deformation space than to a free end of the engagement arm. The wall further includes, at an inlet through which the front holder is to be inserted into the housing, an abutment surface guide for deforming the half-insertion detector towards the abutment surface.

[0004] Document US 5,769,664 discloses the preamble of independent claim 1.

[0005] Document EP 1 524 730 A1 discloses an electrical connector comprising an insulating housing, contacts that are accommodated in the housing, and a retainer that is inserted from a front surface of the housing. Locking arms are provided on the retainer having first locking parts, substantially on central portions of the locking arms, that restrain the retainer from being moved from a temporary locking position to a main locking position, and have abutting parts, in the vicinity of the free ends thereof, that abut against the housing. When the retainer is in the temporary locking position, the locking arms are supported in the housing at two pairs of points, that is by the first locking parts and by the abutting parts. The first locking parts are disposed on one side of the locking arms, and the abutting parts are disposed on the other side of the locking arms. The connector prevents the retainer from being moved unintentionally from the temporary locking position to the main locking position, without requiring a large space.

[0006] Document US 2003/0199206 A1 discloses a connector having male and female housings that are connectable with one another. A moving plate is movable in the male housing from a first position to a second position during the connection process. A resistance arm on the moving plate must deflect to pass an abutting surface on the male housing during connection, and a lock arm on the female housing must deflect to pass a locking section of the male housing during connection. Resistance forces for deflecting the resistance arm and the lock arm reach peaks substantially simultaneously and before terminal fittings of the housings engage.

[0007] Document US 6 648 699 B1 discloses a connector having a retainer which is insertable through one side surface of a housing. The retainer is provided with forked locking arms. The width and/or thickness of partial locking arms is set smaller than the full locking arms to thereby set the elastic forces of the partial locking arms smaller than those of the full locking arms.

[0008] Since this connector is assembled by holding the retainer at the partial locking position in advance and moving the retainer to the full locking position after the terminal fittings are inserted, an extending end portion of the full locking arm portion and that of the partial locking arm portion are connected to prevent an inadvertent movement of the retainer to the full locking position. If the full locking arm portion is supported at both ends in this way, flexural stiffness of the full locking arm portion can be increased as compared to a full locking arm portion supported only at one end, wherefore a resilient deformation of the full locking arm portion becomes more difficult and an inadvertent movement of the retainer to the full locking position can be avoided.

[0009] However, stiffness of the full locking arm portion becomes extremely high when the full locking arm portion is supported at both ends. Thus, if the full locking arm portion is short, it may be plastically deformed beyond their resiliency limit in the process of moving the retainer from the partial locking position to the full locking position.

Therefore, to avoid a plastic deformation, the full locking arm portion needs to be made longer and an accommodation space for the retainer in the housing has to be increased by that much. This consequently leads to enlargement of the housing.

[0010] An object of the present invention is to provide a more reliable connector.

[0011] This object is solved according to the invention by the features of the independent claim. Particular embodiments of the invention are subject of the dependent claims.

[0012] According to the invention, there is provided a connector as disclosed in claim 1, comprising:

a housing into which at least one terminal fitting is to be at least partly inserted; and
a retainer to be mounted to or into the housing;
wherein:
the mounted retainer is movable between a partial locking position to permit insertion and withdrawal of the terminal fitting and a full locking position to retain the inserted terminal fitting;
the retainer is formed with a partial locking arm portion and a full locking arm portion extending in a cantilever manner substantially in the same direction as a moving direction from the partial locking position to the full locking position and spaced apart from each other;
a movement of the retainer in a direction opposite to the one toward the full locking position is prevented by the engagement of the partial locking arm portion and the housing and a movement of the retainer toward the full locking position is prevented by the contact of the full locking arm portion with a projecting portion of the housing when the retainer is at the partial locking position; and
the full locking arm portion interferes with the projecting portion to be resiliently deformed toward the partial locking arm portion in the process of moving the retainer from the partial locking position to the full locking position and the full locking arm portion is resiliently at least partly restored and engaged with the projecting portion to hold the retainer at the full locking position when the retainer reaches the full locking position.

[0013] The full locking arm portion and the partiall locking arm portion include extending end portions serving as deformation restraining portions for restraining any further resilient deformation of the full locking arm portion by coming into contact with each other when the full locking arm portion interferes with the projecting portion to be resiliently deformed.

[0014] A displacement of the partial locking arm portion is maximized at the ex-tending end portion on the side surface facing the full locking arm portion.

[0015] A displacement of the full locking arm portion is maximized at the extending end portion on the side surface facing the partial locking arm portion.

[0016] The full locking arm portion is formed with an interfering portion projecting from a side surface of the full locking arm portion opposite to the one facing the partial locking arm portion so that the interfering portion interferes with the projecting portion; and the deformation restraining portions are arranged at positions displaced from the interfering portion in an extending direction of the full locking arm portion. In the process of moving the retainer to the full locking position, the interfering portion of the full locking arm portion interferes with the projecting portion of the housing so that the full locking arm portion is resiliently deformed to approach the partial locking arm portion. While the interfering portion and the projecting portion are interfering with each other, the deformation restraining portion of the full locking arm portion comes into contact with the deformation restraining portion of the partial locking arm portion.

[0017] In the process of moving the retainer from the partial locking position to the full locking position, the full locking arm portion approaches the partial locking arm portion to bring the deformation restraining portions into contact with each other, whereby the full locking arm portion comes to be apparently supported at both ends and flexural stiffness thereof is increased. Since this restrains any further resilient deformation of the full locking arm portion, an inadvertent movement of the retainer to the full locking position can be prevented.

[0018] If the extending end portion of the full locking arm portion is connected to the partial locking arm portion, a maximum displacement part of the full locking arm portion at the time of interference with the projecting portion is a substantially central part in the extending direction. Thus, to avoid a plastic deformation of the full locking arm portion, the full locking arm portion needs to be made longer. On the contrary, in the present invention, the flexural stiffness of the full locking arm portion can be increased even if the full locking arm portion is supported only at one end. Thus, as compared to the full locking arm portion supported at both ends, the length of the full locking arm portion can be shortened.

[0019] Particularly, a front surface of the projecting portion serves as a first locking surface inclined with respect to the assembling direction of the retainer into the housing, and/or wherein a rear surface of the projecting portion serves as a second locking surface inclined with respect to the assembling direction.

[0020] Particularly, a front surface of the interfering portion serves as a second contact surface inclined with respect to the assembling direction of the retainer, and/or wherein a rear surface of the interfering portion serves as a first contact surface inclined with respect to the assembling direction of the retainer.

[0021] Further particularly, the second contact surface and the second surface being both inclined with respect to the assembling direction of the retainer form a semi-locking structure preventing a return of the retainer.

[0022] Particularly, a front surface of the retaining por-

tion serves as an assembling guide surface inclined with respect to the assembling direction of the retainer and/or wherein a rear surface of the retaining portion serves as a retaining contact surface substantially perpendicular to the assembling direction of the retainer.

[0023] Particularly, the assembling direction of the retainer into the housing substantially is opposite to an inserting direction of the terminal fitting into the housing.

[0024] Particularly, when the retainer is moved to the full locking position, a second contact surface of the second arm portion comes into contact with the second locking surface of the housing from behind, whereby a movement of the retainer toward the partial locking position is prevented.

[0025] These and other objects, features and advantages of the present invention will become more apparent upon reading of the following detailed description of preferred embodiments and accompanying drawings. It should be understood that even though embodiments are separately described, single features thereof may be combined to additional embodiments.

FIG. 1 is a section of a first connector according to an embodiment,
FIG. 2 is a section showing a state where a retainer is assembled at a partial locking position in the first connector,
FIG. 3 is a plan view of the retainer,
FIG. 4 is a side view of the retainer,
FIG. 5 is a rear view of the retainer,
FIG. 6 is a section showing a state where the retainer is held at the partial locking position,
FIG. 7 is a section showing a process of moving the retainer from the partial locking position to a full locking position,
FIG. 8 is a section showing a state where the retainer is held at the full locking position, and
FIG. 9 is a section showing a connected state of the first connector and a second connector.

<Embodiment>

[0026] One specific embodiment of the present invention is described with reference to FIGS. 1 to 9. FIG. 9 shows a connected state of a first connector F (as a particular connector) and a second connector M. The first connector F includes a (particularly substantially block-shaped) housing 10 made e.g. of synthetic resin, one or more, particularly a plurality of female terminal fittings 30 (as a particular terminal fitting) to be at least partly inserted into the housing 10, and a retainer 40 made e.g. of synthetic resin for retaining one or more, particularly a plurality of inserted female terminal fittings 30.

[0027] A lock arm 11 extending backward (direction substantially opposite to a connecting direction CD with the second connector M) in a cantilever manner is formed along the outer or upper surface of the housing 10. A lock projection 12 is formed on the outer or upper surface of the lock arm 11. The lock projection 12 is formed with a locking surface 13 substantially facing backward (or arranged substantially perpendicular to the connecting direction CD) and a slide surface 14 inclined with respect to the connecting direction CD with the second connector M. Mirror surface finishing particularly is applied to the slide surface 14 to reduce surface roughness as compared to areas of the outer surfaces of the lock arm 11 other than the slide surface 14.

[0028] The second connector M includes a terminal holding portion 60 made e.g. of synthetic resin, a receptacle 61 made e.g. of synthetic resin and substantially projecting forward from the terminal holding portion 60 and one or more male terminal fittings (not shown) to be mounted into the terminal holding portion 60. A lock projection 62 projecting inwardly (downwardly) of the receptacle 61 is formed at an upper or lateral wall portion of the receptacle 61. A guide inclined surface 63 inclined with respect to the connecting direction CD of the two connectors F, M is formed on the projecting end surface (lower end surface) of the lock projection 62. Surface roughness of the guide inclined surface 63 particularly is higher than the mirror surface finished slide surface 14.

[0029] In the process of connecting the two connectors F, M, the lock arm 11 is resiliently deformed downward (direction toward the outer or upper surface of the housing 10) as the housing 10 at least partly enters the receptacle 61 and the slide surface 14 of the lock projection 12 slides in contact with the guide inclined surface 63. During this time, sliding resistance resulting from a resilient restoring force of the lock arm 11 is produced between the slide surface 14 and the guide inclined surface 63. However, since mirror surface finishing particularly is applied to the slide surface 14 in this embodiment, the sliding resistance between the slide surface 14 and the guide inclined surface 63 (lock projection 62) is reduced to improve connection operability. When the two connectors F, M substantially reach a properly connected state, the lock projection 12 has already passed the lock projection 62, wherefore the lock arm 11 is resiliently at least partly restored, the locking surface 13 of the lock projection 12 is engaged with the lock projection 62 and the two connectors F, M properly connected are inseparably locked into each other by this locking action.

[0030] As shown in FIGS. 1 and 2, one or more, particularly a plurality of terminal accommodating chambers 15, into which the one or more respective female terminal fittings 30 are at least partly inserted from an insertion side, particularly substantially from behind, are formed in one or more levels or stages, particularly in two upper and lower levels, in the housing 10 of the first connector F. A locking lance 16 (particularly substantially extending forward in a cantilever manner) is formed along or at the lateral or upper wall in each terminal accommodating chamber 15 particularly in the upper level, and a locking lance 16 (particularly substantially extending forward in a cantilever manner) is formed along or at the lateral or lower wall in each terminal accommodating chamber 15

particularly in the lower level. In the process of inserting the female terminal fitting 30 into the terminal accommodating chamber 15 particularly in the upper level from behind, the locking lance 16 is resiliently deformed outward or upward (at least partly into a first accommodating portion 18 in the upper level to be described later) due to interference with the female terminal fitting 30. In the process of inserting the female terminal fitting 30 into the terminal accommodating chamber 15 particularly in the lower level from behind, the locking lance 16 is resiliently deformed outward or downward (at least partly into a first accommodating portion 18 in the lower level to be described later) due to interference with the female terminal fitting 30. When the female terminal fitting 30 substantially is inserted to a proper position as shown in FIG. 1, the locking lance 16 is resiliently at least partly restored to be engaged with the female terminal fitting 30, whereby the female terminal fitting 30 is held and retained with a backward movement thereof prevented (also referred to as partial locking).

[0031] The housing 10 is formed with an accommodation space 17 which particularly is open in the front end surface of the housing 10 to at least partly accommodate the retainer 40 mounted in a mounting direction MD, particularly inserted from front. As shown in FIGS. 1 and 2, the accommodation space 17 is composed of or comprises the first accommodating portion 18 in the upper level substantially facing the upper surfaces of the locking lances 16 in the upper level, the first accommodating portion 18 in the lower level substantially facing the lower surfaces of the locking lances 16 in the lower level, and a second accommodating portion 19 (see FIGS. 6 to 8) located in a substantially central or intermediate part of the housing 10 in a height direction. The both upper and lower first accommodating portions 18 also have a function as deformation spaces for permitting resiliently deformations of the locking lances 16 in directions to be disengaged from the female terminal fittings 30.

[0032] As shown in FIGS. 6 to 8, a projecting portion 20 is formed on one side surface of the inner wall surface of the second accommodating portion 19 and a retaining portion 23 is formed on the other side surface. The projecting portion 20 and the retaining portion 23 particularly are arranged substantially at the same height (or position along the connecting direction CD or the mounting direction MD of the retainer 40) and project toward each other. The front surface of the projecting portion 20 serves as a partial locking surface 21 (as a particular first locking surface) inclined with respect to forward and backward directions (directions parallel to the assembling or mounting direction MD of the retainer 40 into the housing 10), and the rear surface thereof serves as a full locking surface 22 (as a particular second locking surface) inclined with respect to forward and backward directions (directions parallel to the assembling or mounting direction MD of the retainer 40 into the housing 10). The front surface of the retaining portion 23 serves as an assembling guide surface 24 inclined with respect to forward and backward directions (directions parallel to the assembling or mounting direction MD of the retainer 40 into the housing 10), and the rear surface thereof serves as a retaining contact surface 25 substantially perpendicular to forward and backward directions (directions parallel to the assembling or mounting direction MD of the retainer 40 into the housing 10). Note that the assembling or mounting direction MD of the retainer 40 into the housing 10 particularly substantially is opposite to the inserting direction of the female terminal fittings 30 into the housing 10 in forward and backward directions.

[0033] As shown in FIGS. 3 to 5, the retainer 40 includes a main body 41 particularly substantially in the form of a laterally long plate, one or more, particularly a plurality of (particularly substantially plate-like) deformation restricting portions 42 projecting from (particularly the upper and/or lower ends of) the rear surface of the main body 41 and corresponding to the one or more locking lances 16 of the respective terminal accommodating chambers 15 (first accommodating portions 18), a partial locking arm portion 43 (as a particular first arm portion) projecting from (particularly the rear surface of) the main body 41 substantially in a cantilever manner so as to substantially correspond to the second accommodating portion 19, and a full locking arm portion 48 (as a particular second arm portion) likewise projecting from (particularly the rear surface of) the main body 41 substantially in a cantilever manner so as to substantially correspond to the second accommodating portion 19.

[0034] Projecting directions of the partial locking arm portion 43 and the full locking arm portion 48 particularly are both substantially the same as the assembling or mounting direction MD of the retainer 40 to or into the housing 10. Further, the partial locking arm portion 43 and the full locking arm portion 48 particularly are arranged substantially at the same height (i.e. height corresponding to the projecting portion 20 and a locking projection 44) and/or juxtaposed in a lateral direction (direction substantially perpendicular to the assembling direction MD of the retainer 40 into the housing 10) with a deformation space 53 formed therebetween. This deformation space 53 is a space for permitting resilient deformations of the partial locking arm portion 43 and the full locking arm portion 48.

[0035] The partial locking arm portion 43 is resiliently deformable in the lateral direction so as to at least partly enter the deformation space 53 with a base end portion (front end portion connected to the main body 41) as a supporting point. When the partial locking arm portion 43 is resiliently deformed, a displacement of the partial locking arm portion 43 is maximized at an extending end portion 43E (rear end portion). The full locking arm portion 48 is resiliently deformable in the lateral direction so as to at least partly enter the deformation space 53 with a base end portion (front end portion connected to the main body 41) as a supporting point. When the full locking arm portion 48 is resiliently deformed, a displacement of the full locking arm portion 48 is maximized at an extending

end portion 48E (rear end portion).

[0036] As shown in FIGS. 3, 6 to 8, the extending end portion 43E of the partial locking arm portion 43 is formed with the locking projection 44 projecting from a side surface thereof particularly substantially opposite to the one facing the full locking arm portion 48. The front surface of the locking projection 44 serves as a retaining surface 45 substantially perpendicular to the assembling or mounting direction MD of the retainer 40, and the rear surface thereof serves as an assembling inclined surface 46 inclined with respect to the assembling direction MD of the retainer 40. The extending end portion 43E on the side surface facing the full locking arm portion 48 out of the left and right surfaces of the partial locking arm portion 43 particularly serves as a receiving portion 47 (as a particular deformation restraining portion of the partial locking arm portion).

[0037] An interfering portion 49 projecting from a side surface of the full locking arm portion 48 particularly substantially opposite to the one facing the partial locking arm portion 43 is formed at a position of the full locking arm portion 48 closer to the base end side than the extending end portion 48E. The front surface of the interfering portion 49 particularly serves as a full locking contact surface 50 inclined with respect to the assembling direction MD of the retainer 40, and/or the rear surface thereof particularly serves as a partial locking contact surface 51 inclined with respect to the assembling direction MD of the retainer 40. The extending end portion 48E on the side surface facing the partial locking arm portion 43 out of the left and right surfaces of the full locking arm portion 48 particularly serves as a contact portion 52 (as a particular deformation restraining portion of the full locking arm portion).

[0038] Next, functions of this embodiment are described. In assembling the first connector F, the retainer 40 is first assembled to or into the housing 10 in the assembling or mounting direction MD, particularly substantially from front, and positioned or held at a partial locking position 1 P (as a particular first position, see e.g. FIGS. 2 and 6). In assembling, the one or more deformation restricting portions 42 are at least partly inserted into the one or more respective first accommodating portions 18 and the partial locking arm portion 43 and the full locking arm portion 48 are at least partly inserted into the second accommodating portion 19. In the assembling process, the assembling inclined surface 46 of the locking projection 44 of the partial locking arm portion 43 slides in contact with the assembling guide surface 24 of the retaining portion 23 of the housing 10 and, accordingly, the partial locking arm portion 43 is resiliently deformed to at least partly enter the deformation space 53. When the retainer 40 reaches the partial locking position 1 P, the locking projection 44 has already passed the retaining portion 23. Thus, the partial locking arm portion 43 is resiliently at least partly restored, the retaining surface 45 of the partial locking arm portion 43 is engaged with the retaining contact surface 25 of the retaining portion 23, and a forward detaching movement of the retainer 40 particularly is prevented by this locking action.

[0039] When the retainer 40 reaches the partial locking position 1 P, the partial locking contact surface 51 of the interfering portion 49 of the full locking arm portion 48 comes into contact with or comes to proximately face (or be adjacent to) the partial locking surface 21, whereby the retainer 40 is restricted from being pushed backward (rearward) from the partial locking position 1P. Since these partial locking contact surface 51 and partial locking surface 21 particularly are both inclined with respect to the assembling direction MD of the retainer 40, this movement of the retainer 40 is prevented by a semi-locking structure. By the above, the retainer 40 particularly is held at the partial locking position 1 P. Further, when the retainer 40 is at the partial locking position 1 P, the deformation restricting portions 42 particularly substantially are retracted forward from the front ends (extending ends) of the locking lances 16 as shown in FIG. 2, wherefore resilient deformations of the locking lances 16 are possible. After the retainer 40 is assembled at the partial locking position 1 P, the one or more female terminal fittings 30 at least partly are inserted into the respective terminal accommodating chambers 15. The inserted female terminal fittings 30 particularly are held and retained by primary locking action of the locking lances 16.

[0040] After the insertion of the female terminal fittings 30 is completed, the retainer 40 at the partial locking position 1 P is moved backward to a full locking position 2P (as a particular second position). When the retainer 40 is moved to the full locking position 2P, the deformation restricting portions 42 are deeply inserted to positions facing the locking lances 16 in the first accommodating portions 18 as shown in FIG. 1 and resilient deformations of the locking lances 16 in directions away from the female terminal fittings 30 are prevented by the deformation restricting portions 42. The female terminal fittings 30 are reliably retained and locked by this secondary locking action of the retainer 40 and the primary locking action of the locking lances 16.

[0041] In the process of moving the retainer 40 to the full locking position 2P, the interfering portion 49 of the full locking arm portion 48 interferes with the projecting portion 20 of the housing 10 and the partial locking contact surface 51 of the full locking arm portion 48 and the partial locking surface 21 of the housing 10 interfere, whereby the full locking arm portion 48 is resiliently deformed to at least partly enter the deformation space 53 (to approach the partial locking arm portion 43) (see FIG. 7). While the interfering portion 49 and the projecting portion 20 are interfering with each other, the contact portion 52 of the full locking arm portion 48 comes into contact with the receiving portion 47 of the partial locking arm portion 43 and, by this contact action, any further resilient deformation of the full locking arm portion 48 is prevented and the full locking arm portion 48 particularly is supported at two front and rear positions, i.e. at the base end portion (front end portion) and the rear end portion (ex-

tending end portion 48E) to increase apparent flexural stiffness of the full locking arm portion 48.

[0042] Thus, to advance the retainer 40 toward the full locking position 2P in this state, a stronger operation force (pushing force) is necessary. Thereafter, as the retainer 40 is displaced or pushed, the interfering portion 49 and the projecting portion 20 substantially slide in contact with each other with an increasing degree of resilient deformation of the full locking arm portion 48. When the retainer 40 is moved to the full locking position 2P, the full locking contact surface 50 of the full locking arm portion 48 particularly comes into contact with the full locking surface 22 of the housing 10 from behind as shown in FIG. 8, whereby a movement (return) of the retainer 40 toward the partial locking position 1 P is prevented. Since the full locking contact surface 50 and the full locking surface 22 are both inclined with respect to the assembling direction MD of the retainer 40, the return of the retainer 40 is prevented by a semi-locking structure. When the retainer 40 is moved to the full locking position 2P, the assembling of the first connector F is completed.

[0043] The first connector F of this embodiment is such that the retainer 40 includes the (particularly substantially cantilever-shaped) partial locking arm portion 43 and full locking arm portion 48 and the retainer 40 at the partial locking position 1 P has a movement toward the full locking position 2P particularly prevented by the contact of the full locking arm portion 48 with the projecting portion 20 of the housing 10. Further, in the process of moving the retainer 40 from the partial locking position 1 P to the full locking position 2P, the full locking arm portion 48 interferes with the projecting portion 20 to be resiliently deformed toward the partial locking arm portion 43. The full locking arm portion 48 and the partial locking arm portion 43 particularly are respectively formed with the contact portion 52 and the receiving portion 47 as the deformation restraining portions for restraining any further resilient deformation of the full locking arm portion 48 by coming into contact with each other when the full locking arm portion 48 interferes with the projecting portion 20 to be resiliently deformed.

[0044] Accordingly, when an unexpected pushing force acts on the retainer 40 held at the partial locking position 1 P such as due to interference of an external matter from front, the contact portion 52 of the full locking arm portion 48 comes into contact with the receiving portion 47 of the partial locking arm portion 43 before the retainer 40 reaches the full locking position 2P, whereby apparent flexural stiffness of the full locking arm portion 48 is increased and, at that point of time, the retainer 40 is prevented from being pushed toward the full locking position 2P any further.

[0045] Effects of this embodiment are as follows. If an extending end portion of a full locking arm portion is connected to a partial locking arm portion, a maximum displacement part of the full locking arm portion at the time of interference with a projecting portion is a substantially central part in an extending direction. Thus, to avoid a plastic deformation of the full locking arm portion, the full locking arm portion needs to be made longer in the extending direction. On the contrary, in this embodiment, the flexural stiffness of the full locking arm portion 48 is increased although the full locking arm portion 48 is supported only at one end. Therefore, as compared to the above full locking arm portion supported at both ends, the length of the full locking arm portion 48 can be shortened and, consequently, the first connector F can be miniaturized.

[0046] Accordingly, to allow miniaturization of a connector, a retainer 40 includes (particularly substantially cantilever-shaped) partial locking arm portion 43 and full locking arm portion 48. A movement of the retainer 40 at a partial locking position 1 P (first position) toward a full locking position 2P (esecond position) is prevented by the contact of the full locking arm portion 48 with a projecting portion 20 of a housing 10. In the process of moving the retainer 40 from the partial locking position 1 P to the full locking position 2P, the full locking arm portion 48 interferes with the projecting portion 20 to be resiliently deformed toward the partial locking arm portion 43. The full locking arm portion 48 and the partial locking arm portion 43 respectively include a contact portion 52 and a receiving portion 47 as deformation restraining portions for restraining any further resilient deformation of the full locking arm portion 48 by coming into contact with each other when the full locking arm portion 48 interferes with the projecting portion 20 to be resiliently deformed.

<Examples>

[0047] The present invention is not limited to the above described and illustrated embodiment. For example, the following examples are also included in the technical scope of the appended claims.

(1) Although the semi-locking structure that does not require an unlocking operation in moving the retainer to the partial locking position is used as a means for holding the retainer at the full locking position in the above embodiment, the retainer may be held at the full locking position by a locking structure which requires an unlocking operation in moving the retainer to the partial locking position.

(2) Although the deformation restraining portion is arranged on the extending end portion of the full locking arm portion in the above embodiment, it may be arranged at a position closer to the base end portion than the extending end portion of the full locking arm portion.

(3) Although the interfering portion that interferes with the projecting portion is arranged on the side of the full locking arm portion closer to the base end portion than the extending end portion and the deformation restraining portion is arranged on the extending end portion of the full locking arm portion in the above embodiment, the deformation restraining

portion may be arranged closer to the base end side than the interfering portion. In this case, the interfering portion may be arranged on the extending end portion of the full locking arm portion.

(4) Although the moving direction of the retainer from the partial locking position to the full locking position is opposite to the inserting direction of the terminal fittings in the above embodiment, it may be a direction crossing the inserting direction of the terminal fittings.

(5) Although the terminal fittings are indirectly retained by the retainer preventing the resilient deformations of the locking lances in the above embodiment, they may be retained by direct contact of the retainer with the terminal fittings.

LIST OF REFERENCE NUMERALS

[0048]

F	first connector (connector)
10	housing
20	projecting portion
30	female terminal fitting (terminal fitting)
40	retainer
43	partial locking arm portion
47	receiving portion (deformation restraining portion of the partial locking arm portion)
48	full locking arm portion
48E	extending end portion of the full locking arm portion
49	interfering portion
52	contact portion (deformation restraining portion of the full locking arm portion)
53	deformation space (space between the partial locking arm portion and full locking arm portion)

Claims

1. A connector (F), comprising:

a housing (10) into which at least one terminal fitting (30) is to be at least partly inserted; and
a retainer (40) to be mounted to or into the housing (10);
wherein:

the mounted retainer (40) is movable between a partial locking position (1 P) to permit insertion and withdrawal of the terminal fitting (30) and a full locking position (2P) to retain the inserted terminal fitting (30);
the retainer (40) is formed with a partial locking arm portion (43) and a full locking arm portion (48) extending in a cantilever manner substantially in the same direction as a moving direction (MD) from the partial locking position (1 P) to the full locking position (2P) and spaced apart from each other;
a movement of the retainer (40) in a direction opposite to the one toward the full locking position (2P) is prevented by the engagement of the partial locking arm portion (43) and the housing (10) and a movement of the retainer (40) toward the full locking position (2P) is prevented by the contact of the full locking arm portion (48) with a projecting portion (20) of the housing (10) when the retainer (40) is at the partial locking position (1 P); and
the full locking arm portion (48) interferes with the projecting portion (20) to be resiliently deformed toward the partial locking arm portion (43) in the process of moving the retainer (40) from the partial locking position (1 P) to the full locking position (2P) and the full locking arm portion (48) is resiliently at least partly restored and engaged with the projecting portion (20) to hold the retainer (40) at the full locking position (2P) when the retainer (40) reaches the full locking position (2P);
characterized in that
the full locking arm portion (48) and the partial locking arm portion (43) include extending end portions (43E, 48E) serving as deformation restraining portions (47, 52) for restraining any further resilient deformation of the full locking arm portion (48) by coming into contact with each other when the full locking arm portion (48) interferes with the projecting portion (20) to be resiliently deformed;
a displacement of the partial locking arm portion (43) is maximized at the extending end portion (43E) on the side surface facing the full locking arm portion (48);
a displacement of the full locking arm portion (48) is maximized at the extending end portion (48E) on a side surface facing the partial locking arm portion (43);
the full locking arm portion (48) is formed with an interfering portion (49) projecting from a side surface of the full locking arm portion (48) opposite to the one facing the partial locking arm portion (43) so that the interfering portion (49) interferes with the projecting portion (20);
the deformation restraining portions (52) are arranged at positions displaced from the interfering portion (49) in an extending direction of the full locking arm portion (48);
in the process of moving the retainer (40) to the full locking position (2P), the interfering portion (49) of the full locking arm portion

(48) interferes with the projecting portion (20) of the housing (10) so that the full locking arm portion (48) is resiliently deformed to approach the partial locking arm portion (43); and
while the interfering portion (49) and the projecting portion (20) are interfering with each other, the deformation restraining portion (52) of the full locking arm portion (48) comes into contact with the deformation restraining portion (47) of the partial locking arm portion (43).

2. A connector according to claim 1, wherein a front surface of the projecting portion (20) serves as a first locking surface (21) inclined with respect to the assembling direction (MD) of the retainer (40) into the housing (10), and/or wherein a rear surface of the projecting portion (20) serves as a second locking surface (22) inclined with respect to the assembling direction (MD).

3. A connector according to any one of the preceding claims, wherein a front surface of the interfering portion (49) serves as a second contact surface (50) inclined with respect to the assembling direction (MD) of the retainer (40), and/or wherein a rear surface of the interfering portion (49) serves as a first contact surface (51) inclined with respect to the assembling direction (MD) of the retainer (40).

4. A connector according to claim 3, wherein the second contact surface (50) and the second surface (22) being both inclined with respect to the assembling direction (MD) of the retainer (40) form a semi-locking structure preventing a return of the retainer (40).

5. A connector according to any one of the preceding claims, wherein a front surface of the retaining portion (23) serves as an assembling guide surface (24) inclined with respect to the assembling direction (MD) of the retainer (40) and/or wherein a rear surface of the retaining portion (23) serves as a retaining contact surface (25) substantially perpendicular to the assembling direction (MD) of the retainer (40).

6. A connector according to any one of the preceding claims, wherein the assembling direction (MD) of the retainer (40) into the housing (10) substantially is opposite to an inserting direction of the terminal fitting (30) into the housing (10).

7. A connector according to any one of the preceding claims, wherein when the retainer (40) is moved to the full locking position (2P), a second contact surface (50) of the second arm portion (48) comes into contact with the second locking surface (22) of the housing (10) from behind, whereby a movement of the retainer (40) toward the partial locking position (1 P) is prevented.

Patentansprüche

1. Verbinder (F), umfassend:

ein Gehäuse (10), in welches wenigstens ein Anschlusspassstück (30) wenigstens teilweise einzusetzen ist; und
eine Rückhalteeinrichtung (40), welche auf oder in das Gehäuse (10) zu montieren ist;
wobei:

die montierte Rückhalteeinrichtung (40) zwischen einer teilweisen verriegelnden Position (1P), um ein Einsetzen und ein Entnehmen des Anschlusspassstücks (30) zu erlauben, und einer vollständigen verriegelnden Position (2P) bewegbar ist, um das eingesetzte Anschlusspassstück (30) zurückzuhalten;
die Rückhalteeinrichtung (40) mit einem teilweisen verriegelnden Armabschnitt (43) und einem vollständigen verriegelnden Armabschnitt (48) ausgebildet ist, welche sich in einer vorkragenden Weise im Wesentlichen in derselben Richtung wie eine Bewegungsrichtung (MD) von der teilweisen verriegelnden Position (1P) zu der vollständigen verriegelnden Position (2P) erstrecken und voneinander beabstandet sind;
eine Bewegung der Rückhalteeinrichtung (40) in einer Richtung entgegengesetzt zu derjenigen in Richtung zu der vollständigen verriegelnden Position (2P) durch den Eingriff des teilweisen verriegelnden Armabschnitts (43) und des Gehäuses (10) verhindert wird und eine Bewegung der Rückhalteeinrichtung (40) in Richtung zu der vollständigen verriegelnden Position (2P) durch den Kontakt des vollständigen verriegelnden Armabschnitts (48) mit einem vorragenden Abschnitt (20) des Gehäuses (10) verhindert wird, wenn sich die Rückhalteeinrichtung (40) an der teilweisen verriegelnden Position (1P) befindet; und
der vollständige verriegelnde Armabschnitt (48) mit dem vorragenden Abschnitt (20) zusammentrifft bzw. -wirkt, um rückstellfähig in Richtung zu dem teilweisen verriegelnden Armabschnitt (43) in dem Prozess eines Bewegens der Rückhalteeinrichtung (40) von der teilweisen verriegelnden Position (1P) zu der vollständigen verriegelnden Position (2P) verformt zu werden, und der

vollständige verriegelnde Armabschnitt (48) rückstellfähig wenigstens teilweise rückgestellt und in Eingriff mit dem vorragenden Abschnitt (20) gebracht wird, um die Rückhalteeinrichtung (40) an der vollständigen verriegelnden Position (2P) zu halten, wenn die Rückhalteeinrichtung (40) die vollständige verriegelnde Position (2P) erreicht;

dadurch gekennzeichnet, dass

der vollständige verriegelnde Armabschnitt (48) und der teilweise verriegelnde Armabschnitt (43) sich erstreckende Endabschnitte (43E, 48E) beinhalten, welche als eine Verformung beschränkende Abschnitte (47, 52) für ein Beschränken jeglicher weiterer rückstellfähiger Verformung des vollständigen verriegelnden Armabschnitts (48) dienen, indem sie in Kontakt miteinander gelangen, wenn der vollständige verriegelnde Armabschnitt (48) mit dem vorragenden Abschnitt (20) zusammentrifft, um rückstellfähig verformt zu werden;

eine Verschiebung bzw. Verlagerung des teilweisen verriegelnden Armabschnitts (43) an dem sich erstreckenden Endabschnitt (43E) auf der Seitenoberfläche maximiert ist, welche zu dem vollständigen verriegelnden Armabschnitt (48) gerichtet ist;

eine Verschiebung des vollständigen verlagernden Armabschnitts (48) an dem sich erstreckenden Endabschnitt (48E) auf einer Seitenoberfläche maximiert ist, welche zu dem teilweisen verriegelnden Armabschnitt (43) gerichtet ist;

der vollständige verriegelnde Armabschnitt (48) mit einem zusammentreffenden bzw. -wirkenden Abschnitt (49) ausgebildet ist, welcher von einer Seitenoberfläche des vollständigen verriegelnden Armabschnitts (48) gegenüberliegend zu derjenigen vorragt, welche zu dem teilweisen verriegelnden Armabschnitt (43) gerichtet ist, so dass der zusammentreffende Abschnitt (49) mit dem vorragenden Abschnitt (20) zusammenwirkt;

die eine Verformung beschränkenden Abschnitte (52) an Positionen angeordnet sind, welche von dem zusammentreffenden Abschnitt (49) in einer sich erstreckenden Richtung des vollständigen verriegelnden Armabschnitts (48) verlagert sind;

in dem Prozess eines Bewegens der Rückhalteeinrichtung (40) zu der vollständigen verriegelnden Position (2P) der zusammenwirkende Abschnitt (49) des vollständigen verriegelnden Armabschnitts (48) mit dem vorragenden Abschnitt (20) des Gehäuses (10) derart zusammenwirkt, dass der vollständige verriegelnde Armabschnitt (48) rückstellfähig verformt ist, um sich dem teilweisen verriegelnden Armabschnitt (43) anzunähern; und

während der zusammenwirkende Abschnitt (49) und der vorragende Abschnitt (20) miteinander zusammenwirken, der eine Verformung beschränkende Abschnitt (52) des vollständigen verriegelnden Armabschnitts (48) in Kontakt mit dem eine Verformung beschränkenden Abschnitt (47) des teilweisen verriegelnden Armabschnitts (43) gelangt.

2. Verbinder nach Anspruch 1, wobei eine vordere Oberfläche des vorragenden Abschnitts (20) als eine erste verriegelnde Oberfläche (21) dient, welche relativ zu der Zusammenbaurichtung (MD) der Rückhalteeinrichtung (40) in das Gehäuse (10) geneigt ist, und/oder wobei eine rückwärtige Oberfläche des vorragenden Abschnitts (20) als eine zweite verriegelnde Oberfläche (22) dient, welche relativ zu der Zusammenbaurichtung (MD) geneigt ist.

3. Verbinder nach einem der vorangehenden Ansprüche, wobei eine vordere Oberfläche des zusammenwirkenden Abschnitts (49) als eine zweite Kontaktoberfläche (50) dient, welche relativ zu der Zusammenbaurichtung (MD) der Rückhalteeinrichtung (40) geneigt ist, und/oder wobei eine rückwärtige Oberfläche des zusammenwirkenden Abschnitts (49) als eine erste Kontaktoberfläche (51) dient, welche relativ zu der Zusammenbaurichtung (MD) der Rückhalteeinrichtung (40) geneigt ist.

4. Verbinder nach Anspruch 3, wobei die zweite Kontaktoberfläche (50) und die zweite Oberfläche (22), welche beide relativ zu der Zusammenbaurichtung (MD) der Rückhalteeinrichtung (40) geneigt sind, eine semi-verriegelnde Struktur bilden, welche eine Rückkehr der Rückhalteeinrichtung (40) verhindert.

5. Verbinder nach einem der vorangehenden Ansprüche, wobei eine vordere Oberfläche des rückhaltenden Abschnitts (23) als eine Zusammenbau-Führungsoberfläche (24) dient, welche relativ zu der Zusammenbaurichtung (MD) der Rückhalteeinrichtung (40) geneigt ist, und/oder wobei eine rückwärtige Oberfläche des rückhaltenden Abschnitts (23) als eine rückhaltende Kontaktoberfläche (25) im Wesentlichen normal auf die Zusammenbaurichtung (MD) der Rückhalteeinrichtung (40) dient.

6. Verbinder nach einem der vorangehenden Ansprüche, wobei die Zusammenbaurichtung (MD) der

Rückhalteeinrichtung (40) in das Gehäuse (10) im Wesentlichen entgegengesetzt zu einer Einsetzrichtung des Anschlusspassstücks (30) in das Gehäuse (10) ist.

7. Verbinder nach einem der vorangehenden Ansprüche, wobei, wenn die Rückhalteeinrichtung (40) zu der vollständigen verriegelnden Position (2P) bewegt wird, eine zweite Kontaktoberfläche (50) des zweiten Armabschnitts (48) in Kontakt mit der zweiten verriegelnden Oberfläche (22) des Gehäuses (10) von hinten gelangt, wodurch eine Bewegung der Rückhalteeinrichtung (40) in Richtung zu der teilweisen verriegelnden Position (1P) verhindert wird.

Revendications

1. Connecteur (F), comprenant :

un boîtier (10) dans lequel au moins un raccord de borne (30) doit être au moins partiellement inséré ; et
un élément de retenue (40) à monter sur ou dans le boîtier (10) ;
dans lequel :

l'élément de retenue monté (40) peut être déplacé entre une position de verrouillage partiel (1P) destinée à permettre l'insertion et le retrait du raccord de borne (30) et une position de verrouillage total (2P) destinée à retenir le raccord de borne (30) inséré ;
l'élément de retenue (40) comporte une partie de bras de verrouillage partiel (43) et une partie de bras de verrouillage total (48) s'étendant en porte-à-faux sensiblement dans la même direction que la direction de déplacement (MD) depuis la position de verrouillage partiel (1P) vers la position de verrouillage total (2P) et espacées l'une de l'autre ;
un mouvement de l'élément de retenue (40) dans une direction opposée à celle orientée vers la position de verrouillage total (2P) est empêché par le couplage de la partie de bras de verrouillage partiel (43) et du boîtier (10) et un mouvement de l'élément de retenue (40) vers la position de verrouillage total (2P) est empêché par le contact de la partie de bras de verrouillage total (48) avec une partie en saillie (20) du boîtier (10) lorsque l'élément de retenue (40) est à la position de verrouillage partiel (1P) ; et
la partie de bras de verrouillage total (48) interfère avec la partie en saillie (20) de manière à être déformée élastiquement vers la partie de bras de verrouillage partiel (43) au cours du déplacement de l'élément de retenue (40) depuis la position de verrouillage partiel (1P) vers la position de verrouillage total (2P) et la partie de bras de verrouillage total (48) est rappelée au moins partiellement de manière élastique et couplée à la partie en saillie (20) afin de maintenir l'élément de retenue (40) à la position de verrouillage total (2P) lorsque l'élément de retenue (40) atteint la position de verrouillage total (2P) ;

caractérisé en ce que

la partie de bras de verrouillage total (48) et la partie de bras de verrouillage partiel (43) comportent des parties d'extrémité en extension (43E, 48E) servant de parties de limitation de déformation (47, 52) destinées à limiter toute déformation élastique supplémentaire de la partie de bras de verrouillage total (48) en venant en contact l'une avec l'autre lorsque la partie de bras de verrouillage total (48) interfère avec la partie en saillie (20) de manière à se déformer élastiquement ;
un déplacement de la partie de bras de verrouillage partiel (43) est maximisé au niveau de la partie d'extrémité en extension (43E) sur la surface latérale faisant face à la partie de bras de verrouillage total (48) ;
un déplacement de la partie de bras de verrouillage total (48) est maximisé au niveau de la partie d'extrémité en extension (48E) sur une surface latérale faisant face à la partie de bras de verrouillage partiel (43) ;
la partie de bras de verrouillage total (48) comporte une partie en interférence (49) s'étendant à partir d'une surface latérale de la partie de bras de verrouillage total (48) opposée à celle faisant face à la partie de bras de verrouillage partiel (43) de telle sorte que la partie en interférence (49) interfère avec la partie en saillie (20) ;
les parties de limitation de déformation (52) sont agencées à des positions décalées par rapport à la partie en interférence (49) dans une direction d'extension de la partie de bras de verrouillage total (48) ;
au cours du déplacement de l'élément de retenue (40) vers de la position de verrouillage total (2P), la partie en interférence (49) de la partie de bras de verrouillage total (48) interfère avec la partie en saillie (20) du boîtier (10) de telle sorte que la partie de bras de verrouillage total (48) est déformée élastiquement afin de se rapprocher de la partie de bras de verrouillage partiel (43) ; et
alors que la partie en interférence (49) et la partie en saillie (20) interfèrent l'une avec

l'autre, la partie de limitation de déformation (52) de la partie de bras de verrouillage total (48) entre en contact avec la partie de limitation de déformation (47) de la partie de bras de verrouillage partiel (43).

2. Connecteur selon la revendication 1, dans lequel une surface avant de la partie en saillie (20) sert de première surface de verrouillage (21) inclinée par rapport à la direction d'assemblage (MD) de l'élément de retenue (40) dans le boîtier (10), et/ou dans lequel une surface arrière de la partie en saillie (20) sert de seconde surface de verrouillage (22) inclinée par rapport à la direction d'assemblage (MD).

3. Connecteur selon l'une quelconque des revendications précédentes, dans lequel une surface avant de la partie en interférence (49) sert de seconde surface de contact (50) inclinée par rapport à la direction d'assemblage (MD) de l'élément de retenue (40), et/ou dans lequel une surface arrière de la partie en interférence (49) sert de première surface de contact (51) inclinée par rapport à la direction d'assemblage (MD) de l'élément de retenue (40).

4. Connecteur selon la revendication 3, dans lequel la seconde surface de contact (50) et la seconde surface (22), étant toutes deux inclinées par rapport à la direction d'assemblage (MD) de l'élément de retenue (40), forment une structure de verrouillage partiel empêchant un retour de l'élément de retenue (40).

5. Connecteur selon l'une quelconque des revendications précédentes, dans lequel une surface avant de la partie de retenue (23) sert de surface de guidage d'assemblage (24) inclinée par rapport à la direction d'assemblage (MD) de l'élément de retenue (40) et/ou dans lequel une surface arrière de la partie de retenue (23) sert de surface de contact de retenue (25) sensiblement perpendiculaire à la direction d'assemblage (MD) de l'élément de retenue (40).

6. Connecteur selon l'une quelconque des revendications précédentes, dans lequel la direction d'assemblage (MD) de l'élément de retenue (40) dans le boîtier (10) est sensiblement opposée à une direction d'insertion du raccord de borne (30) dans le boîtier (10).

7. Connecteur selon l'une quelconque des revendications précédentes, dans lequel, lorsque l'élément de retenue (40) est déplacé vers la position de verrouillage total (2P), une seconde surface de contact (50) de la seconde partie de bras (48) entre en contact avec la seconde surface de verrouillage (22) du boîtier (10) par l'arrière, de telle sorte qu'un mouvement de l'élément de retenue (40) vers la position de verrouillage partiel (1P) est empêché.

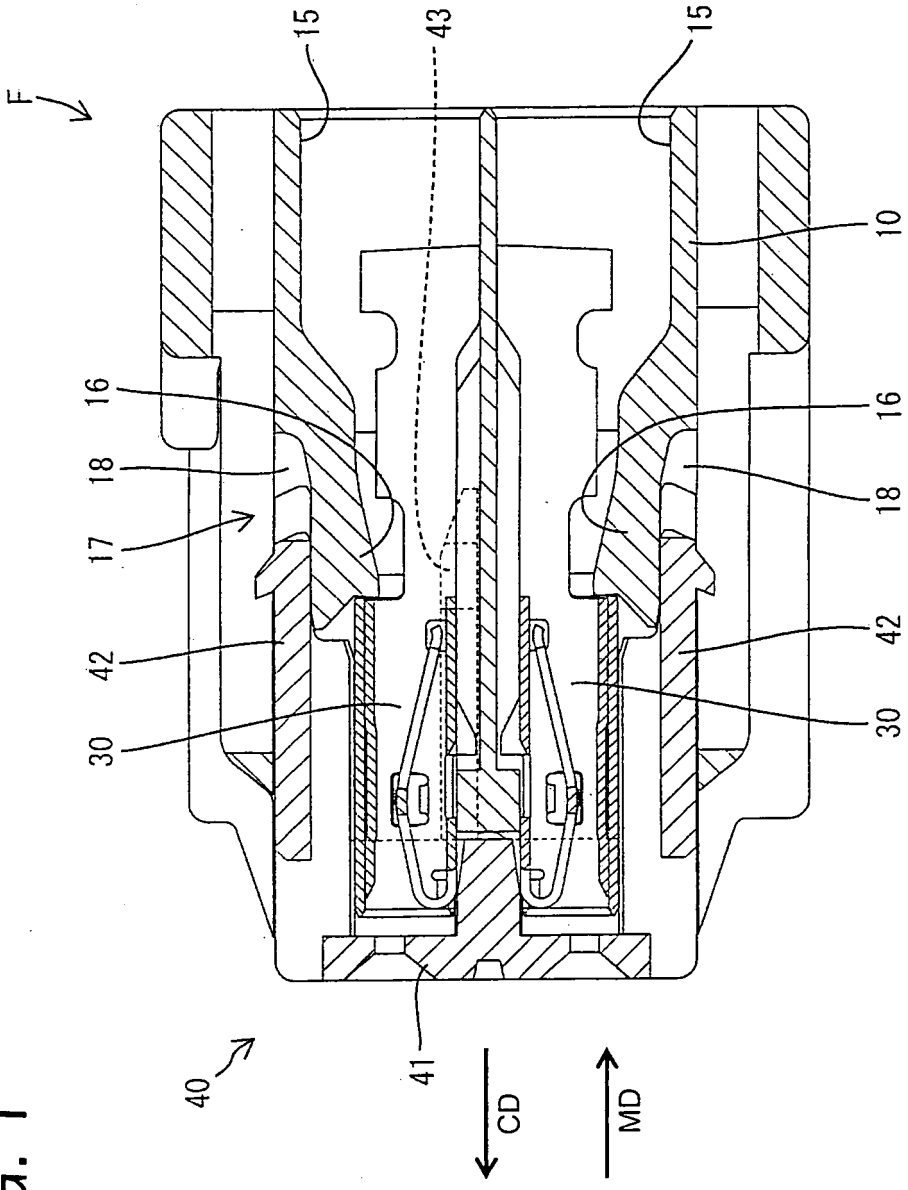


FIG. 1

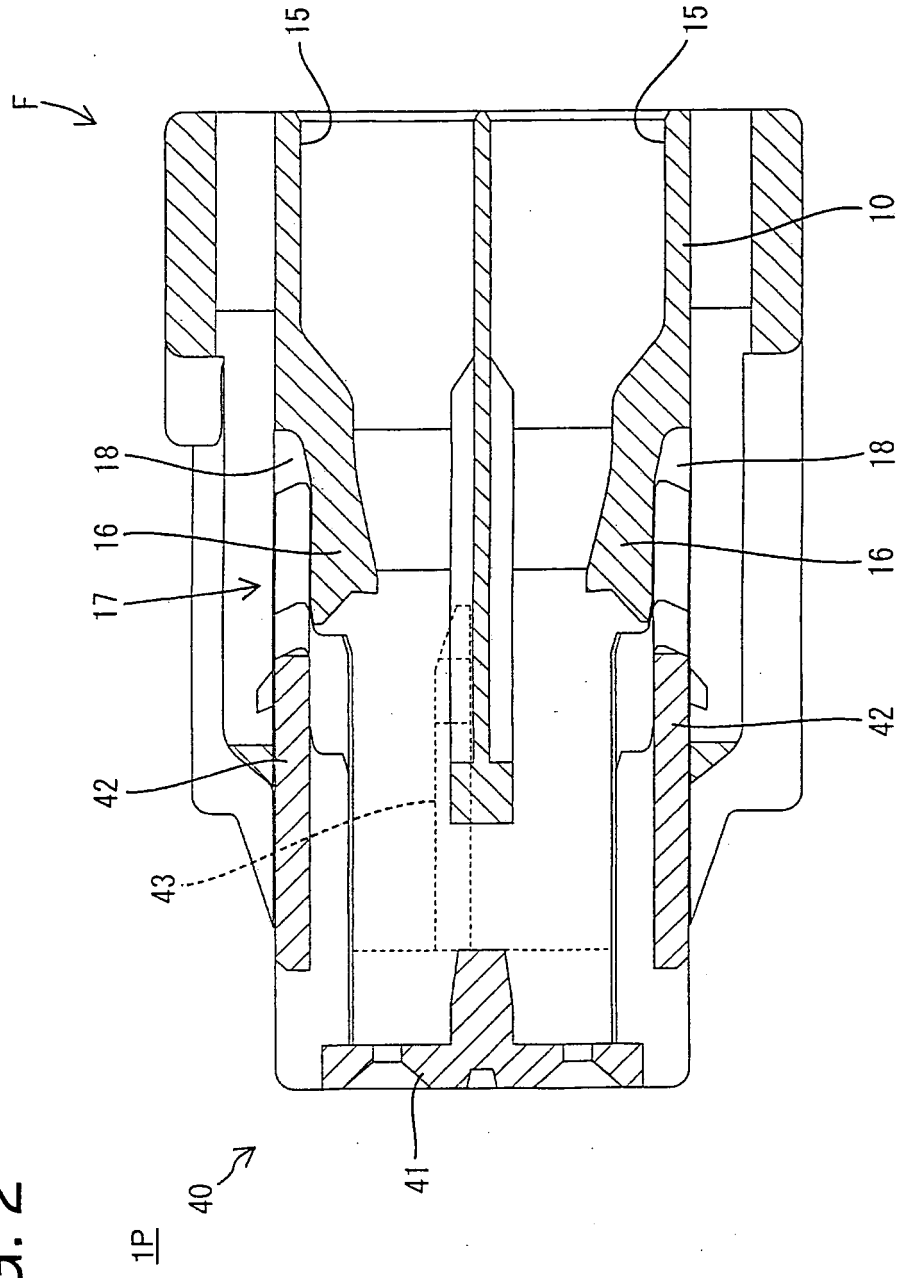


FIG. 2

FIG. 3

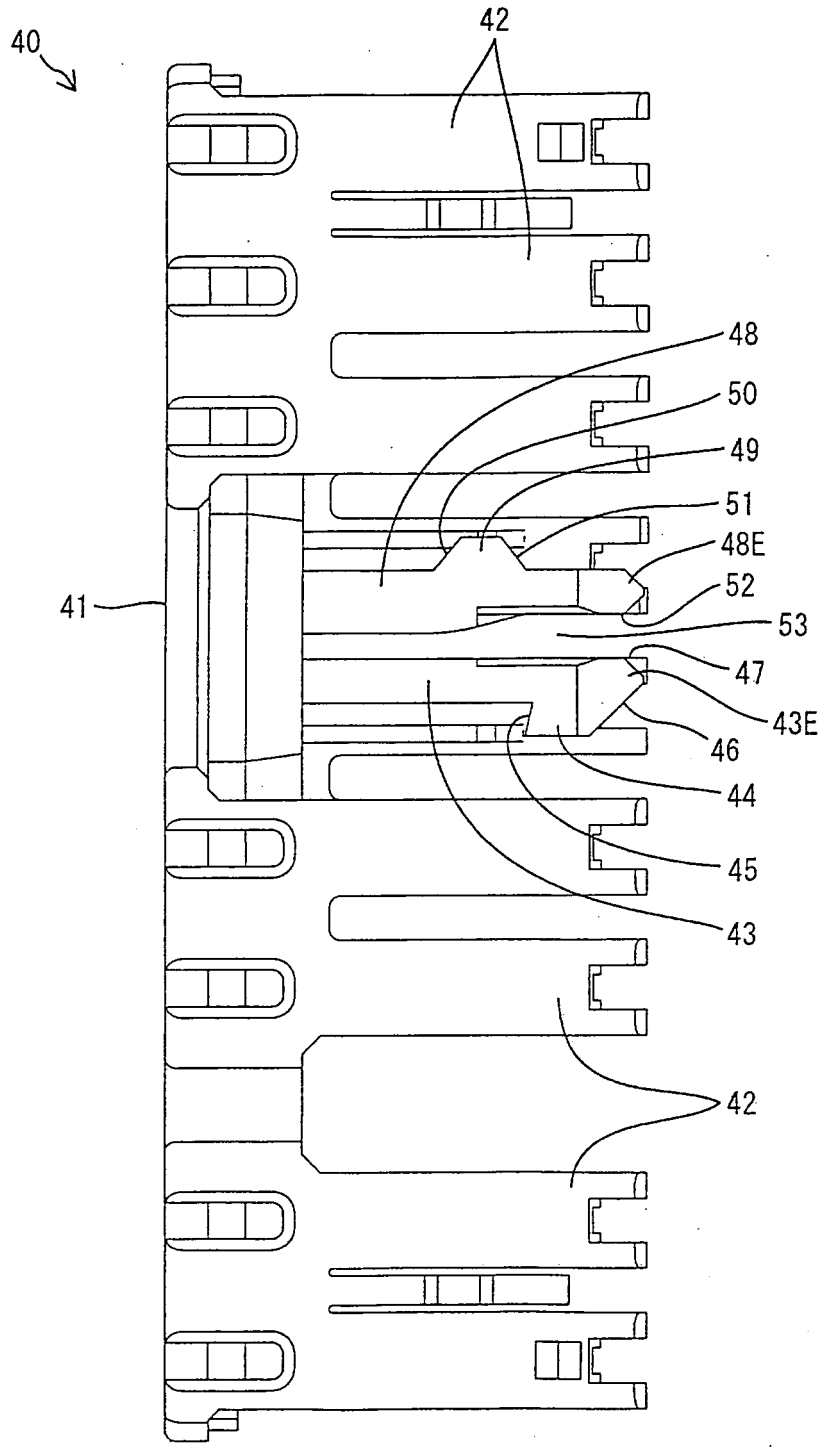
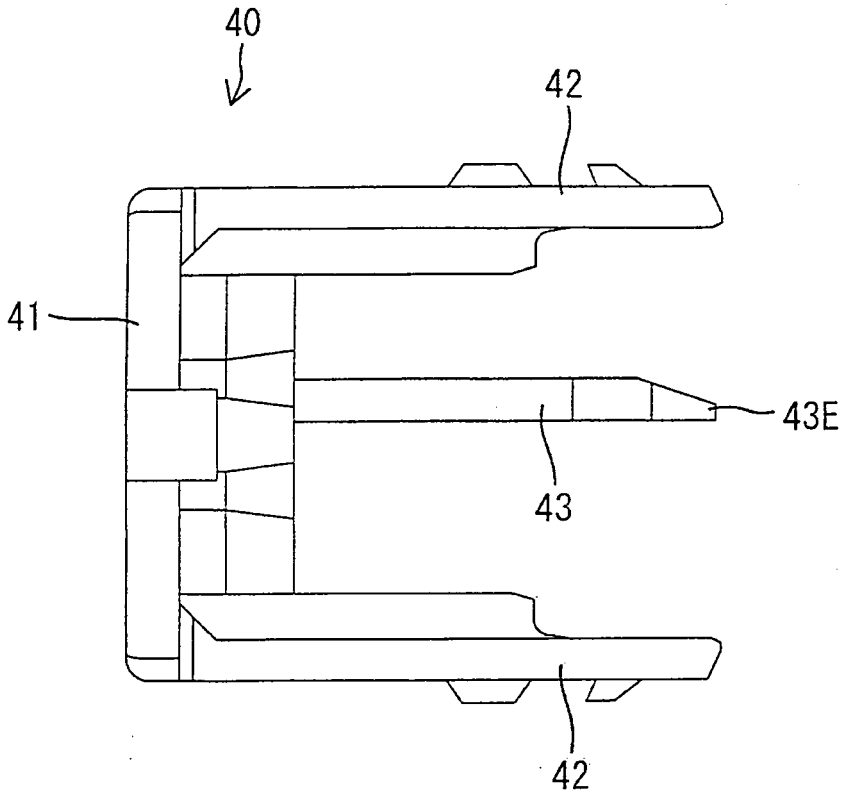


FIG. 4



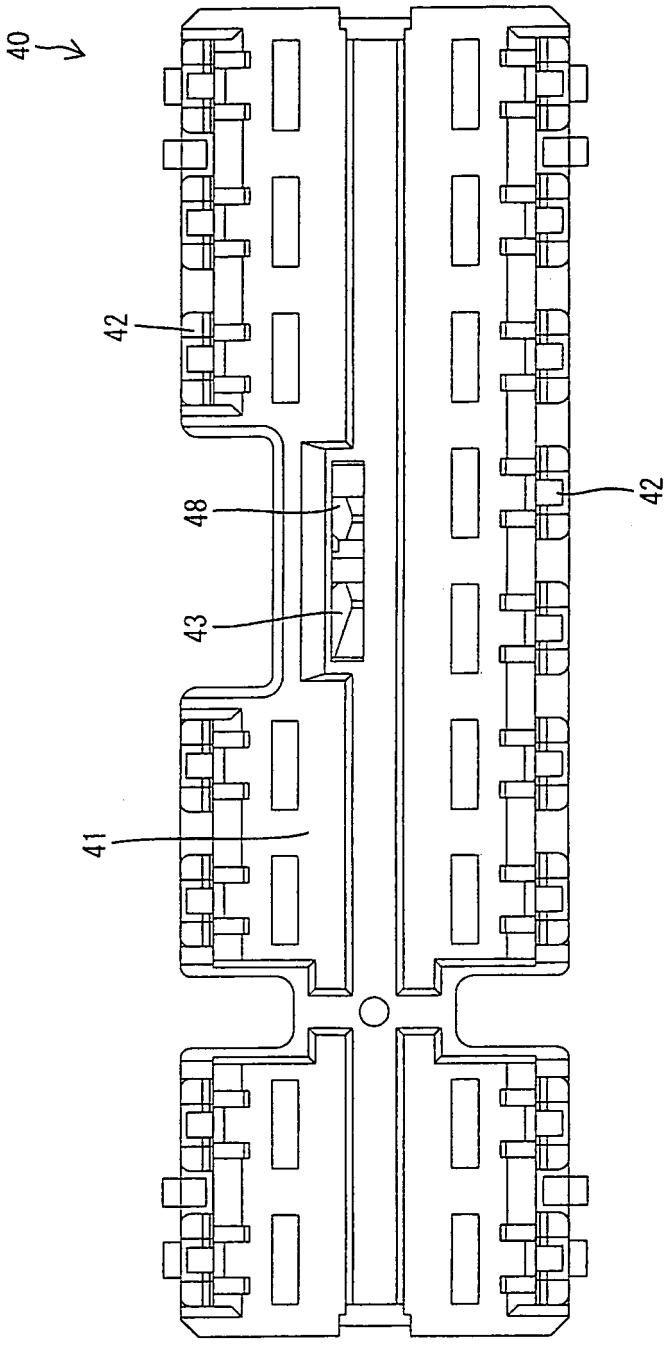


FIG. 5

FIG. 6

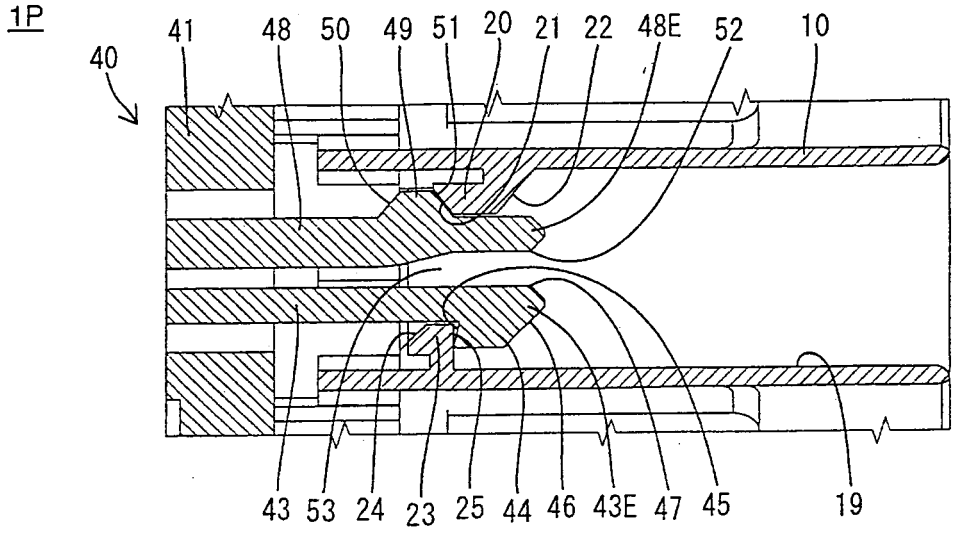

1P
40
41
48
50
49
51
20
21
22
48E
52
10
43
53
24
23
25
44
46
43E
47
45
19

FIG. 7

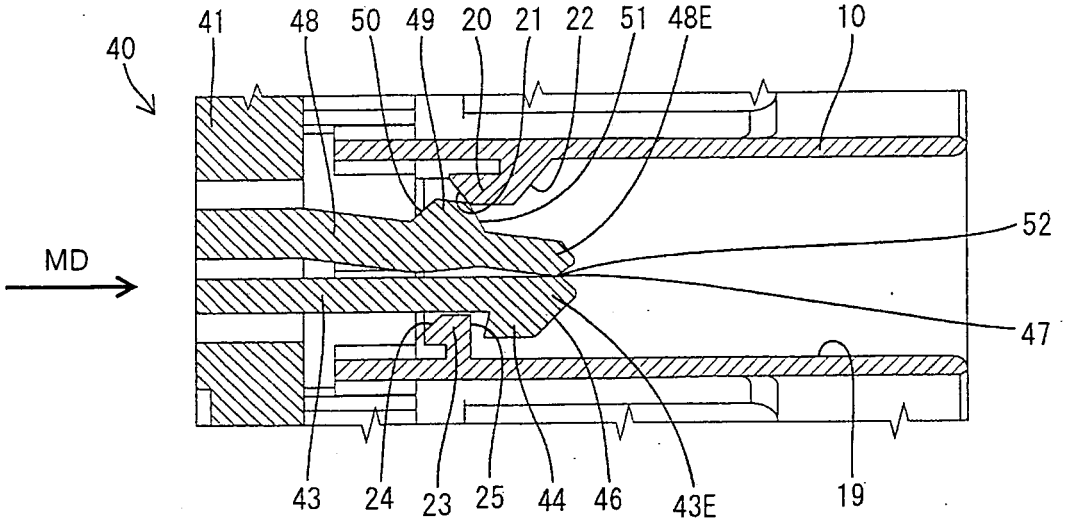

40
41
48
50
49
20
21
22
51
48E
10
MD
52
47
43
24
23
25
44
46
43E
19

FIG. 8

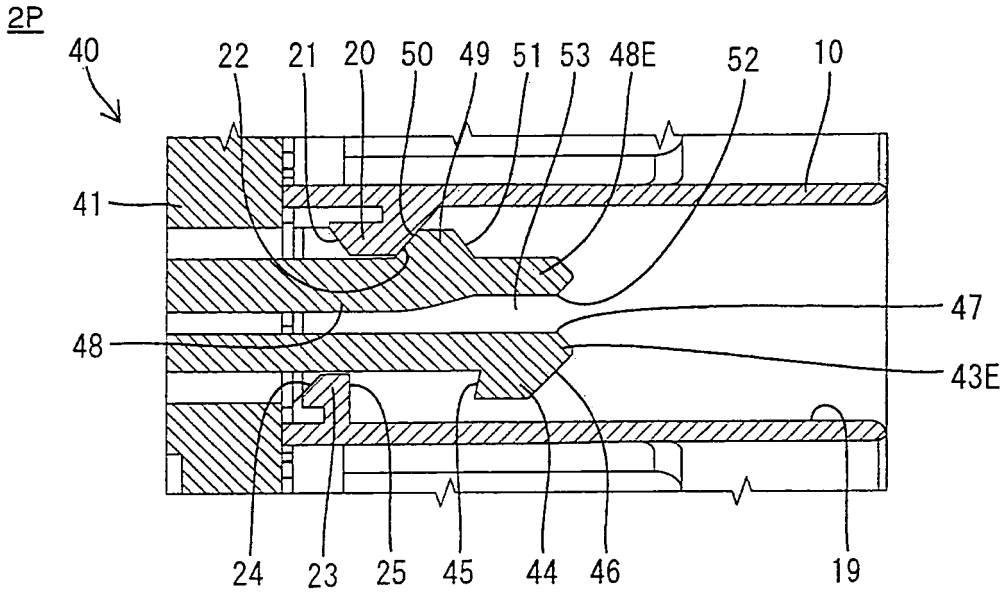
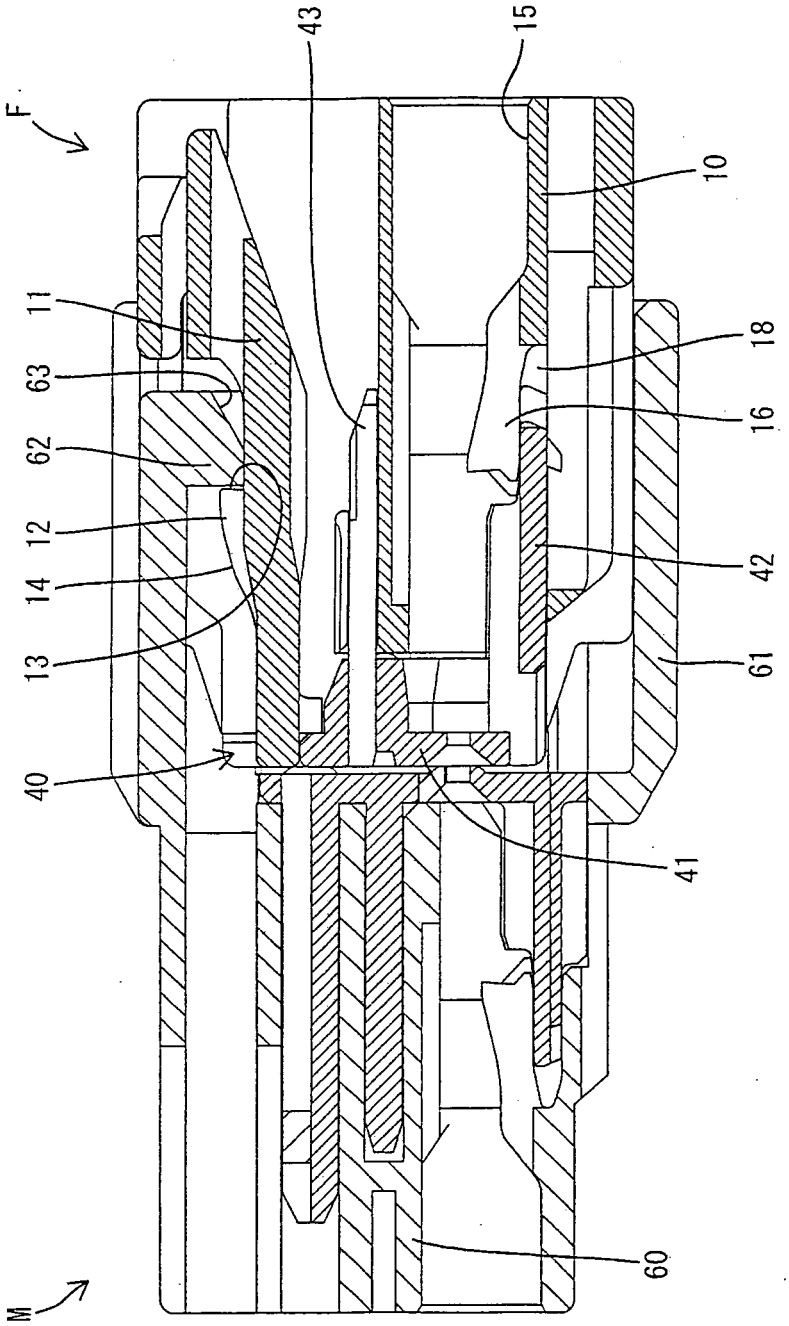


FIG. 9



REFERENCES CITED IN THE DESCRIPTION

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