



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
09.01.2013 Bulletin 2013/02

(51) Int Cl.:
H01R 13/18 (2006.01) H01R 13/11 (2006.01)

(21) Application number: **12004306.2**

(22) Date of filing: **06.06.2012**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(72) Inventor: **Itou, Tomoya**
Yokkaichi-city
Mie 510-8503 (JP)

(74) Representative: **Müller-Boré & Partner**
Patentanwälte
Grafinger Straße 2
81671 München (DE)

(30) Priority: **04.07.2011 JP 2011148617**

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

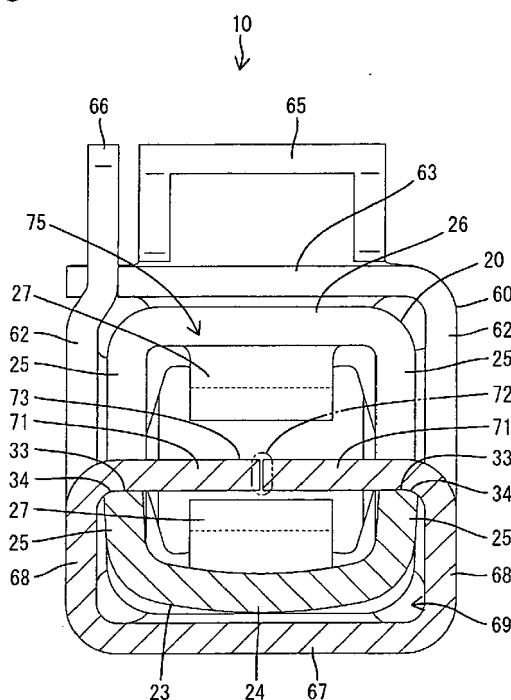
(54) **Terminal fitting and method of producing it**

(57) An object of the present invention is to provide a terminal fitting in which a shell is firmly held to a terminal main body.

A terminal fitting 10 is provided with a terminal main body 20 including a wire connecting portion 21 and a resilient contact portion 22, and a shell 60 to be assembled with the terminal main body 20 to cover the resilient

contact portion 22. The shell 60 is formed with a pair of engaging pieces 71. The both engaging pieces 71 are provided with a welded portion 72 as a connecting means for holding an assembled state of the shell 60 with the terminal main body 20 by connecting the both engaging pieces 71 to each other with the terminal main body 20 fitted in the shell 60.

FIG. 3



Description

[0001] The present invention relates to a terminal fitting and to a method of producing it.

[0002] A conventional terminal fitting is disclosed in Publication of Japanese Patent No. 3719107. This terminal fitting is composed of a terminal main body and a shell. The terminal main body includes a wire connecting portion to which a wire is to be connected, a resilient contact portion which comes into contact with a mating male tab, and a coupling portion which is located between the resilient contact portion and the wire connecting portion and couples them. The coupling portion is formed with a pair of standing side walls. The shell is mounted on the terminal main body to cover the resilient contact portion and box-shaped as a whole. In this case, two types of terminal main bodies, e.g. gold-plated one and tin-plated one are prepared, so that the both can be separately used according to usage.

[0003] In the case of the above terminal fitting, parts of the shell are crimped and connected to the projecting ends of the both side walls of the coupling portion or the like from an outer side, whereby the shell is fixed to the terminal main body. However, the shell may not be firmly held to the terminal main body if only such a fixing force of the shell is used. For example, if the shell includes a locking lance to be engaged with the inner wall of a cavity of a connector housing, when a force acts on the terminal fitting in a pulling-out direction, a locking state of the locking lance is held, whereby a large shear force is generated between the shell and the terminal main body and, at worst, the shell and the terminal main body may be separated.

[0004] The present invention was completed in view of the above situation and an object thereof is to provide a terminal fitting in which a shell is firmly held to a terminal main body.

[0005] This object is solved according to the invention by the features of the independent claims. Particular embodiments of the invention are subject of the dependent claims.

[0006] According to the invention, there is provided a terminal fitting, comprising a terminal main body including a wire connecting portion to which a wire is to be connected and at least one resilient contact portion which comes or is to come into contact with a mating terminal fitting; and a shell which is to be assembled with the terminal main body to at least partly cover the resilient contact portion; wherein the shell is formed with a pair of engaging pieces and the both engaging pieces are provided with a connecting means for holding an assembled state of the shell with the terminal main body by connecting the both engaging pieces to each other with the terminal main body at least partly fitted in the shell.

[0007] Since the shell is formed with the at least one pair of engaging pieces and the both engaging pieces are provided with the connecting means for holding the assembled state of the shell by connecting the both en-

gaging pieces to each other with the terminal main body fitted in the shell, a holding force of the shell to the terminal main body can be increased as compared with the case where the shell is crimped and connected to the terminal main body. As a result, the shell is firmly held to the terminal main body.

[0008] According to a particular embodiment, a coupling portion is formed between the resilient contact portion and the wire connecting portion in the terminal main body and includes at least one stopper portion with at least one recess formed between the resilient contact portion and the stopper portion, and the engaging pieces are positioned and/or at least partly accommodated in the recess.

[0009] Since the engaging pieces are positioned and accommodated in the recess formed between the resilient contact portion and the stopper portion, displacements of the engaging pieces are prevented and the assembled state of the shell and the terminal main body is reliably held even if a shear stress is applied between the shell and the terminal main body.

[0010] Particularly, the connecting means comprises (or particularly is) a welded portion formed by welding the both engaging pieces to each other.

[0011] Since the connecting means comprises or is the welded portion formed by welding the both engaging pieces to each other, a connected state of the both engaging pieces is reliably held.

[0012] Particularly, the both engaging pieces extend substantially parallel to each other and include a contact surface with which a retainer for locking comes or can come into flat or surface contact.

[0013] Since the both engaging pieces extend substantially parallel to each other, the terminal fitting is prevented from being rotated about an axis in a state locked by the retainer for locking by the contact of the retainer with the both engaging pieces.

[0014] Further particularly, the both engaging pieces are inclined in a direction away from a space into which the retainer for locking at least partly is insertable.

[0015] Since the both engaging pieces are inclined in the direction away from the space into which the retainer for locking is insertable, a situation is avoided where the retainer interferes with the both engaging pieces and an inserting movement thereof is prevented.

[0016] Further particularly, at least one engaging hole is formed in a leading end part of one of the both engaging pieces, at least one projecting piece is formed on a leading end part of the other engaging piece, and the leading end parts of the both engaging pieces are connected to each other by being at least partly placed one over the other and at least partly inserting the projecting piece into the engaging hole.

[0017] Since the leading end parts of the both engaging pieces at least partly are placed one over the other and the projecting piece at least partly is inserted into the engaging hole to connect the leading end parts of the both engaging pieces to each other, the connected state

of the both engaging pieces is reliably held without requiring a welding process.

[0018] Further particularly, the shell comprises one or more bulging pieces in order to narrow a front end opening of the shell to have a gradually decreasing opening diameter by the respective bulging pieces such that a male tab of the mating terminal fitting can be guided toward the axial center of the terminal fitting by sliding on the respective bulging pieces.

[0019] According to a further aspect of the invention, there is provided a method of producing or assembling a terminal fitting, in particular according to the above aspect of the invention or a particular embodiment thereof, comprising the following steps: forming a terminal main body including a wire connecting portion to which a wire is to be connected and at least one resilient contact portion which is to come into contact with a mating terminal fitting; and assembling a shell with the terminal main body to at least partly cover the resilient contact portion; and holding an assembled state of the shell with the terminal main body by connecting a pair of engaging pieces of the shell to each other with the terminal main body at least partly fitted in the shell by means of a connecting means provided on one or both of the engaging pieces.

[0020] According to a particular embodiment, a coupling portion is formed between the resilient contact portion and the wire connecting portion in the terminal main body and includes at least one stopper portion with at least one recess formed between the resilient contact portion and the stopper portion, and the engaging pieces are positioned and/or at least partly accommodated in the recess.

[0021] Particularly, the method further comprises welding the both engaging pieces to each other to form a welded portion as the connecting means.

[0022] Further particularly, the both engaging pieces are arranged to extend substantially parallel to each other and are formed include a contact surface with which a retainer for locking can come into flat or surface contact.

[0023] Further particularly, the both engaging pieces are inclined in a direction away from a space into which the retainer for locking at least partly is insertable.

[0024] Particularly, the method further comprises forming at least one engaging hole in a leading end part of one of the both engaging pieces, forming at least one projecting piece on a leading end part of the other engaging piece, and connecting the leading end parts of the both engaging pieces to each other by being at least partly placed one over the other and at least partly inserting the projecting piece into the engaging hole.

[0025] Further particularly, the shell is formed to comprise one or more bulging pieces in order to narrow a front end opening of the shell to have a gradually decreasing opening diameter by the respective bulging pieces such that a male tab of a mating terminal fitting can be guided toward the axial center of the terminal fitting by sliding on the respective bulging pieces.

[0026] 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 plan view of a terminal fitting according to a first embodiment of the present invention, FIG. 2 is a side view of the terminal fitting, FIG. 3 is a section along A-A of FIG. 2, FIG. 4 is a side view of a shell, FIG. 5 is a rear view of the shell, FIG. 6 is a side view of a terminal main body, FIG. 7 is a side view, corresponding to FIG. 2, of a terminal fitting according to a second embodiment of the present invention, FIG. 8 is a rear view of a shell of a terminal fitting according to a third embodiment of the present invention, FIG. 9 is a front view of the shell, and FIG. 10 is a perspective view of the shell.

<First Embodiment>

[0027] A first particular embodiment of the present invention is described with reference to FIGS. 1 to 6. A terminal fitting 10 according to this embodiment is integrally or unitarily formed by bending a conductive (particularly metal) plate and composed of or comprising two members, i.e. a terminal main body 20 and a shell 60. The same type or different types of plating particularly are applied to the terminal main body 20 and the shell 60. The terminal fitting 10 is to be at least partly inserted into a cavity of a connector housing (not shown) and electrically connected to a mating terminal fitting (not shown) at least partly accommodated in a mating connector housing (not shown) by connecting the connector housing to the mating connector housing.

[0028] As shown in FIG. 6, the terminal main body 20 substantially is shaped to be long and narrow in forward and backward directions as a whole and includes a wire connecting portion 21 which is located toward or at a rear side and to which a wire (not shown) is to be connected, a resilient contact portion 22 which is located toward or near or at a front side and resiliently comes into contact with a male tab of the mating terminal fitting, and a coupling portion 23 which is located between the resilient contact portion 22 and the wire connecting portion 21 in forward and backward directions and coupled to both. Further, the terminal main body 20 includes a base wall 24 substantially extending in forward and backward directions and forming a bottom or base portion, and one or more, particularly a pair of side walls 25 standing up projecting from the lateral side(s) (particularly from both left and right edges) of the base wall 24.

[0029] As shown in FIG. 3, the resilient contact portion 22 specifically is in the form of a (particularly substantially

rectangular or polygonal) tube as a whole by bridging (particularly the upper ends or extending ends) of the (both) side walls 25 by at least one ceiling wall 26. Further, as shown in FIG. 6, one or more parts of the base wall 24 and/or the ceiling wall 26 are cut and bent to form one or more (particularly a pair of upper and lower) resilient contact pieces 27. The (particularly both) resilient contact pieces 27 substantially extend in forward and backward directions, are bent toward an inner side of the resilient contact portion 22 to have a mountain or pointed or curved shape and are formed with a tip portion 28 particularly substantially at a position near the front end. Specifically, the both resilient contact pieces 27 are closest to each other at the tip portions 28. When the male tab is connected to the terminal fitting (particularly substantially sandwiched between the both tip portions 28), the resilient contact piece(s) 27 is/are resiliently displaced outwardly and connected to the male tab at a specified (predetermined or predeterminable) contact pressure by resilient restoring forces thereof.

[0030] The (both) side wall(s) 25 is/are formed with one or more, particularly a pair of (left and/or right) slits 29 which substantially extend in forward and backward directions and are open on the front ends. The rear end(s) of the (both) slits 29 is/are located more backward than the rear end(s) of the (both) resilient contact piece(s) 27 that serve(s) as supporting point(s) of resilient deformation. Further, the wire connecting portion 21 particularly includes one or more, particularly a pair of front and rear crimping pieces 31 connected to and standing up or projecting from the side wall(s) 25, particularly from the upper ends of the both side walls 25. The respective crimping pieces 31 are wrapped around or deformed or bent on an end portion of the wire, whereby the wire connecting portion 21 is crimped and connected to the wire.

[0031] As shown in FIG. 1, one or more, particularly a pair of (left and/or right) stopper portions 32 are formed on the side wall(s) 25 of the coupling portion 23, particularly on the upper ends of the both side walls 25 of the coupling portion 23. As shown in FIG. 6, the (both) stopper portion(s) 32 is/are substantially in the form of plate(s) connected to and standing up or projecting from the side wall(s) 25 of the coupling portion 23, particularly substantially from the upper ends of the both side walls 25 and/or substantially having a trapezoidal side view. One or more, particularly a pair of lateral (left and/or right) receiving edges 33 which can come into contact with the (particularly both) engaging piece(s) 71 (to be described later) of the shell 60 are formed on part(s) of the upper end(s) of the (both) side wall(s) 25 of the coupling portion 23 located adjacent to the stopper portion 32 and/or to the side wall(s) 25 of the resilient contact portion 22 (particularly substantially between the both stopper portions 32 and the both side walls 25 of the resilient contact portion 22). Further, one or more recesses 34 capable of accommodating the (both) engaging piece(s) 71 are formed between the front end(s) of the (both) stopper portion(s) 32, the (both) receiving groove(s) 33 and the

(both) side wall(s) 25 of the resilient contact portion 22. The one or more recesses 34 are open upward.

[0032] Next, the shell 60 is described. As shown in FIG. 3, the shell 60 substantially is in the form of a (particularly substantially rectangular or polygonal) tube as a whole and dimensioned to be one size larger than the terminal main body 20 so as to be able to at least partly cover the resilient contact portion 22 of the terminal main body 20 from the outer side. As shown in FIGS. 4 and 5, the shell 60 includes a base plate 61, one or more, particularly a pair of side plates 62 standing up or projecting from (particularly both left and right edges of) the base plate 61, and at least one ceiling plate 63 extending from the side plate(s) 62, particularly extending between the upper ends of the both side plates 62.

[0033] Front end parts of the base plate 61, the both side plates 62 and the ceiling plate 63 are bent inwardly, thereby forming one or more, particularly a pair of lateral (upper and/or lower) bulging pieces 64 and/or one or more, particularly a pair of lateral (left and/or right) bulging pieces 64 on the front end edge of the shell 60. The front end opening of the shell 60 particularly substantially is narrowed to have a gradually decreasing opening diameter by the respective bulging piece(s) 64. The male tab of the mating terminal fitting can be guided toward the axial center of the terminal fitting 10 by sliding on the respective bulging piece(s) 64. As shown in FIG. 1, a resiliently deformable locking lance 65 is formed on the shell 60, particularly on the ceiling plate 63, by cutting and bending. As shown in FIG. 4, the locking lance 65 substantially extends obliquely upward toward the back from its front end connected to the ceiling plate 63 and is resiliently deformable inwardly with its front end as a supporting point. Further, as shown in FIG. 5, the shell 60 is formed with at least one stabilizer 66 connected to and standing up or projecting from one side plate 62 and/or substantially projecting upwardly from the ceiling plate 63. When the terminal fitting 10 is at least partly inserted into the cavity of the connector housing, the stabilizer 66 at least partly is fitted or inserted into a guiding groove formed in the inner wall of the cavity, thereby ensuring stability in the inserting posture of the terminal fitting 10.

[0034] As shown in FIGS. 4 and 5, the shell 60 also includes an attached base plate 67 connected to and extending backward from the rear end of the base plate 61 and one or more, particularly a pair of lateral (left and/or right) attached side plates 68 connected to and extending backward from a lower part (particularly substantially lower halves) of the (particularly both) side wall(s) 62. A holding space 69 for the coupling portion 23 of the terminal main body 20 is formed between the attached base plate 67 and the both attached side plates 68. As shown in FIG. 3, when the terminal main body 20 is to be at least partly inserted into the shell 60, the coupling portion 23 at least partly is to be fitted into the holding space 69, the attached base plate 67 is arranged to substantially face the base wall 24 of the coupling portion 23

and the (both) attached side plate(s) 68 is/are arranged to substantially face the (both) side wall(s) 25 of the coupling portion 23.

[0035] Further, as shown in FIG. 3, the shell 60 includes one or more, particularly a pair of lateral (left and/or right) engaging pieces 71 connected to and projecting from (particularly the upper end(s) of) the (both) attached side plate(s) 68. As shown in FIG. 4, the (both) engaging piece(s) 71 has/have a width in forward and backward directions extending substantially over the entire length of the (both) attached side plate(s) 68 and/or is/are bendable inwardly by being separated from the (both) side plate(s) 62. When the terminal main body 20 at least partly is inserted into the shell 60, the (both) engaging piece(s) 71 is/are arranged at position(s) corresponding to the recess(es) 34. If the (both) engaging piece(s) 71 is/are bent inwardly with the upper end(s) of the (both) attached side plate(s) 68 as supporting point(s) in this state, base end part(s) of the (both) engaging piece(s) 71 is/are inserted into the recess(es) 34 and/or come(s) into contact with the (both) receiving edge(s) 33 to be supported. At this time, as shown in FIG. 3, the (both) engaging piece(s) 71 is/are bent at an angle different from 0° or 180°, preferably substantially at right angles from the upper end(s) of the (both) attached side plate(s) 68 and/or substantially arranged substantially horizontally, i.e. particularly substantially in parallel to each other. Specifically, the leading ends of the both engaging pieces 71 are arranged to substantially face each other with hardly any clearance therebetween. If welding (such as laser welding) is applied to leading end parts of the both engaging pieces 71 in this state, the leading ends of the both engaging pieces 71 are melted and fixed to form at least one welded portion 72. The welded portion 72 particularly is arranged substantially in central parts of the both engaging pieces 71 in a width direction.

[0036] Further, the both engaging pieces 71 are integrally connected via the welded portion 72. In this case, the upper or outer surface of the welded portion 72 particularly serves as a contact surface 73 which is arranged substantially horizontally and can come into contact with a retainer for locking (not shown). The contact surface 73 of the (both) engaging piece(s) 71 is located to be substantially perpendicular to the rear surface of the resilient contact portion 22 and, as shown in FIG. 2, an insertion space 75 for the retainer is formed between the contact surface 73 and the rear surface of the resilient contact portion 22. The insertion space 75 is open outward or upward.

[0037] Next, functions of the terminal fitting 10 according to this embodiment are described.

[0038] In assembling the terminal fitting 10, the terminal main body 20 is at least partly inserted into the shell 60 from behind. When the terminal main body 20 is properly fitted into the shell 60, the resilient contact portion 22 is (particularly substantially entirely) accommodated in the shell 60. In this state, the both engaging pieces 71 are bent and welding (particularly laser welding) is ap-

plied to the leading end parts of the both engaging pieces 71 (particularly substantially parallel to each other) to form the at least one welded portion 72. At this time, as shown in FIG. 3, the both engaging pieces 71 and the base wall 24 of the coupling portion 23 are arranged at a specified (predetermined or predeterminable) distance from each other. Further, the coupling portion 23 is at least partly surrounded by the attached base plate 67, the (both) attached side plate(s) 68 and/or the (both) engaging piece(s) 71 particularly substantially over the entire circumference, whereby loose movements of the coupling portion 23 in the holding space 69 are prevented and/or an upward movement of the coupling portion 23 to come out of the holding space 69 is prevented by the (both) engaging piece(s) 71.

[0039] Further, the (both) engaging piece(s) 71 is/are positioned and accommodated in the recess(es) 34 while being held in contact with the receiving edge(s) 33. In this case, the front end(s) of the (both) engaging piece(s) 71 come(s) into contact with the rear end of the resilient contact portion 22, whereby a forward displacement of the shell 60 relative to the terminal main body 20 is prevented and/or the rear end(s) of the (both) engaging piece(s) 71 is/are held in contact with the front end(s) of the stopper portion(s) 32 to prevent a backward displacement of the shell 60 relative to the terminal main body 20. Thus, the shell 60 and the terminal main body 20 are closely held to each other via the (both) engaging piece(s) 71. Further, the wire connecting portion 21 is connected to the end portion of the wire.

[0040] Subsequently, the terminal fitting 10 is at least partly inserted into the cavity of the connector housing particularly substantially from behind. When the terminal fitting 10 is properly inserted into the cavity, the locking lance 65 is resiliently engaged with the inner wall of the cavity and the terminal fitting 10 is primarily locked in the cavity. In this case, even if the wire drawn out from the rear surface of the connector housing is pulled backward, the locking lance 65 tries to maintain its locking state, whereby a large shear stress may be produced between the shell 60 and the terminal main body 20 and the terminal main body 20 may come out of the shell 60. However, according to this embodiment, the front end(s) of the (particularly both) engaging piece(s) 71 come(s) into contact with the rear surface of the resilient contact portion 22 when a force acts on the terminal fitting 10 in a pulling-out direction. This prevents the terminal main body 20 from coming out of the shell 60.

[0041] Subsequently, the retainer particularly is brought to a locking position in the connector housing and/or inserted into the insertion space 75. Then, the retainer is arranged to substantially face the rear surface of the resilient contact portion 22 and the terminal fitting 10 is secondarily locked in the cavity. This reliably prevents the terminal fitting 10 from coming out of the cavity of the connector housing. Further, when the retainer is in a locking state, the lower end of the retainer can be held in flat or surface contact with the contact surface 73

of the (both) engaging piece(s) 71, thereby preventing side portion(s) of the (both) engaging piece(s) 71 from being vertically inclined and, consequently, preventing the rotation of the terminal fitting 10 about an axis in the cavity.

[0042] As described above, according to this embodiment, the shell 60 is formed with the one or more, particularly the pair of engaging pieces 71 and/or the both engaging pieces 71 particularly are connected to each other with the terminal main body 20 at least partly fitted in the shell 60, thereby holding an assembled state of the shell 60. Thus, the shell 60 can be held to the terminal main body 20 with a larger holding force than in the case of crimping and connecting the shell 60 to the terminal main body 20. As a result, the shell 60 is firmly held to the terminal main body 20.

[0043] Further, since the engaging piece(s) 71 is/are positioned and at least partly accommodated in the recess(es) 34 formed between the resilient contact portion 22 and the stopper portion(s) 32, displacements of the engaging pieces 71 are prevented and the shell 60 and the terminal main body 20 are reliably held in the assembled state even if a shear stress is applied between the shell 60 and the terminal main body 20.

[0044] Furthermore, since the both engaging pieces 71 are welded or soldered to each other by the welded or soldered portion 72, the connected state of the both engaging pieces 71 is reliably held. In addition, since the both engaging pieces 71 particularly extend substantially parallel to each other, the terminal fitting 10 is prevented from being rotated about the axis in the cavity of the connector housing by the contact of the retainer with the contact surface 73 of the both engaging pieces 71 when being locked by the retainer.

[0045] Accordingly, to provide a terminal fitting in which a shell is firmly held to a terminal main body, a terminal fitting 10 is provided with a terminal main body 20 including a wire connecting portion 21 and a resilient contact portion 22, and a shell 60 to be assembled with the terminal main body 20 to at least partly cover the resilient contact portion 22. The shell 60 is formed with at least one pair of engaging pieces 71. The both engaging pieces 71 are provided with at least one welded or soldered portion 72 as a connecting means for holding an assembled state of the shell 60 with the terminal main body 20 by connecting the both engaging pieces 71 to each other with the terminal main body 20 fitted in the shell 60.

<Second Embodiment>

[0046] FIG. 7 shows a second particular embodiment of the present invention. In the second embodiment, the shapes of the both engaging pieces 71A differ from those of the first embodiment. Since the other configurations are similar or the same as in the first embodiment, the similar or same configurations as in the first embodiment are denoted by the same reference signs and the same components as in the first embodiment are not repeatedly

described.

[0047] Both engaging pieces 71A are bent at obtuse angles from the upper ends of both attached side plates 68 and extend obliquely downwardly or inwardly toward an attached base plate 67. In other words, the both engaging pieces 71A extend obliquely in a direction away from an insertion space 75. When a terminal main body 20 is inserted into a shell 60 and the both engaging pieces 71 A are bent, the leading ends of the both engaging pieces 71A are arranged to substantially face each other slightly above a central or intermediate part of a base wall 24 in a width direction. In that state, welding (such as laser welding) or soldering is applied to leading end parts of the both engaging pieces 71A to form a welded or soldered portion 72. In this way, the both engaging pieces 71 A are formed to have a V-shape, the opening of which is widened from the welded portion 72 toward the upper ends of the both attached side plates 68.

[0048] Since the both engaging pieces 71A are inclined in the direction away from the insertion space 75 for the retainer according to the second embodiment, the wide insertion space 75 is ensured and a situation is avoided where the retainer interferes with the both engaging pieces 71A and an inserting movement thereof is prevented.

<Third Embodiment>

[0049] FIGS. 8 to 10 show a third particular embodiment of the present invention. In the third embodiment, the shapes of both engaging pieces 71 E, 71 F differ from those of the first embodiment and, in addition, a means for connecting the both engaging pieces 71 E, 71 F differs from that in the first embodiment. Since the other configurations are similar or the same as in the first embodiment, the similar or same configurations as in the first embodiment are denoted by the same reference signs and the same components as in the first embodiment are not repeatedly described.

[0050] The both engaging pieces 71 E, 71 F are bent substantially at right angles from the upper ends of both attached side plates 68 and arranged substantially parallel to each other and leading end parts thereof are overlapped or placed vertically one over the other to form an overlapping portion 77. One (hereinafter, first engaging piece 71 E) of the both engaging pieces 71 E, 71 F particularly is arranged at a lower side in the overlapping portion 77, and an engaging hole 78 is formed in this first engaging piece 71 E. The engaging hole 78 is a (particularly substantially rectangular) cutout which is open on the front end of the first engaging piece 71 E. Further, the other (hereinafter, second engaging piece 71 F) of the both engaging pieces 71 E, 71 F is arranged at an upper side in the overlapping portion 77 and this second engaging piece 71 F is formed with a projecting piece 79 bent or projecting downwardly. The projecting piece 79 is substantially in the form of a (particularly substantially rectangular) column at least partly fittable into the engaging hole 78.

[0051] Here, a terminal main body 20 (terminal main body 20 is not shown in FIGS. 8 to 10) is inserted into a shell 60. When the both engaging pieces 71 E, 71 F are bent, the overlapping portion 77 is formed and the projecting piece 79 is at least partly inserted into the engaging hole 78 from above to be hooked. In this way, the both engaging pieces 71 E, 71 F are connected to each other and the shell 60 is firmly held to the terminal main body 20. According to the third embodiment, the both engaging pieces 71 E, 71 F can be held in a connected state particularly without requiring a welding process.

<Other Embodiments>

[0052] The present invention is not limited to the above described and illustrated embodiments. For example, the following embodiments are also included in the technical scope of the present invention.

(1) Since the terminal main body is prevented from coming out backward from the shell by the contact of the both engaging pieces with the resilient contact portion, the stopper portions can be omitted in some cases.

(2) In the first and second embodiments, the welded portion may be formed by a known welding means such as solder welding other than laser welding.

(3) In the first and second embodiments, the leading end parts of the both engaging pieces may include parts to be placed vertically one over the other and welding may be applied to such parts.

(4) In the second embodiment, the welded portion may be formed in contact with the base wall of the coupling portion.

(5) In the third embodiment, the engaging hole may not be open on the front end of the first engaging piece.

Reference Numerals

[0053]

10 ... terminal fitting
 20 ... terminal main body
 21 ... wire connecting portion
 22 ... resilient contact portion
 27 ... resilient contact piece
 23 ... coupling portion
 32 ... stopper portion
 34 ... recess
 60 ... shell
 64 ... bulging piece(s)
 71, 71 A, 71 E, 71 F ... engaging piece
 72 ... welded or soldered portion (connected portion)
 73 ... contact surface
 75 ... insertion space
 78 ... engaging hole
 79 ... projecting piece

Claims

1. A terminal fitting (10), comprising:

5 a terminal main body (20) including a wire connecting portion (21) to which a wire is to be connected and at least one resilient contact portion (22) which is to come into contact with a mating terminal fitting; and
 10 a shell (60) which is to be assembled with the terminal main body (20) to at least partly cover the resilient contact portion (22);
 wherein the shell (60) is formed with a pair of engaging pieces (71; 71 A; 71 E, 71 F) and the both engaging pieces (71; 71 A; 71 E, 71 F) are provided with a connecting means (72; 78, 79) for holding an assembled state of the shell (60) with the terminal main body (22) by connecting the both engaging pieces (71; 71A; 71 E, 71 F) to each other with the terminal main body (22) at least partly fitted in the shell (60).

2. A terminal fitting according to claim 1, wherein a coupling portion (23) is formed between the resilient contact portion (22) and the wire connecting portion (21) in the terminal main body (20) and includes at least one stopper portion (32) with at least one recess (34) formed between the resilient contact portion (22) and the stopper portion (32), and the engaging pieces (71; 71A; 71E, 71F) are positioned and/or at least partly accommodated in the recess (34).

3. A terminal fitting according to any one of the preceding claims, wherein the connecting means (72; 78, 79) comprises a welded portion (72) formed by welding the both engaging pieces (71; 71 A) to each other.

4. A terminal fitting according to any one of the preceding claims, wherein the both engaging pieces (71; 71 E, 71 F) extend substantially parallel to each other and include a contact surface (73) with which a retainer for locking can come into flat or surface contact.

45 5. A terminal fitting according to any one of the preceding claims 1 to 3, wherein the both engaging pieces (71A) are inclined in a direction away from a space into which the retainer for locking at least partly is insertable.

50 6. A terminal fitting according to any one of the preceding claims, wherein at least one engaging hole (78) is formed in a leading end part of one (71 E) of the both engaging pieces (71 E, 71 F), at least one projecting piece (79) is formed on a leading end part of the other engaging piece (71 F), and the leading end parts of the both engaging pieces (71 E, 71 F) are connected to each other by being at least partly

placed one over the other and at least partly inserting the projecting piece (79) into the engaging hole (78).

7. A terminal fitting according to any one of the preceding claims, wherein the shell (60) comprises one or more bulging pieces (64) in order to narrow a front end opening of the shell (60) to have a gradually decreasing opening diameter by the respective bulging pieces (64) such that a male tab of the mating terminal fitting can be guided toward the axial center of the terminal fitting (10) by sliding on the respective bulging pieces (64). 5
8. A method of producing a terminal fitting (10), comprising the following steps: 10
 - forming a terminal main body (20) including a wire connecting portion (21) to which a wire is to be connected and at least one resilient contact portion (22) which is to come into contact with a mating terminal fitting; and
 - assembling a shell (60) with the terminal main body (20) to at least partly cover the resilient contact portion (22); and
 - holding an assembled state of the shell (60) with the terminal main body (22) by connecting a pair of engaging pieces (71; 71A; 71E, 71F) of the shell (60) to each other with the terminal main body (22) at least partly fitted in the shell (60) by means of a connecting means (72; 78, 79) provided on one or both of the engaging pieces (71; 71 A; 71 E, 71 F). 20 25 30
9. A method according to claim 8, wherein a coupling portion (23) is formed between the resilient contact portion (22) and the wire connecting portion (21) in the terminal main body (20) and includes at least one stopper portion (32) with at least one recess (34) formed between the resilient contact portion (22) and the stopper portion (32), and the engaging pieces (71; 71 A; 71 E, 71 F) are positioned and/or at least partly accommodated in the recess (34). 35 40
10. A method according to claim 8 or 9, further comprising welding the both engaging pieces (71; 71A) to each other to form a welded portion (72) as the connecting means (72; 78, 79). 45
11. A method according to any one of the preceding claims 8 to 10, wherein the both engaging pieces (71; 71 E, 71 F) are arranged to extend substantially parallel to each other and are formed include a contact surface (73) with which a retainer for locking can come into flat or surface contact. 50 55
12. A method according to any one of the preceding claims 8 to 10, wherein the both engaging pieces (71A) are inclined in a direction away from a space

into which the retainer for locking at least partly is insertable.

13. A method according to any one of the preceding claims 8 to 12, further including:
 - forming at least one engaging hole (78) in a leading end part of one (71 E) of the both engaging pieces (71 E, 71 F),
 - forming at least one projecting piece (79) on a leading end part of the other engaging piece (71 F), and
 - connecting the leading end parts of the both engaging pieces (71 E, 71 F) to each other by being at least partly placed one over the other and at least partly inserting the projecting piece (79) into the engaging hole (78).
14. A method according to any one of the preceding claims 8 to 13, wherein the shell (60) is formed to comprise one or more bulging pieces (64) in order to narrow a front end opening of the shell (60) to have a gradually decreasing opening diameter by the respective bulging pieces (64) such that a male tab of a mating terminal fitting can be guided toward the axial center of the terminal fitting (10) by sliding on the respective bulging pieces (64).

FIG. 1

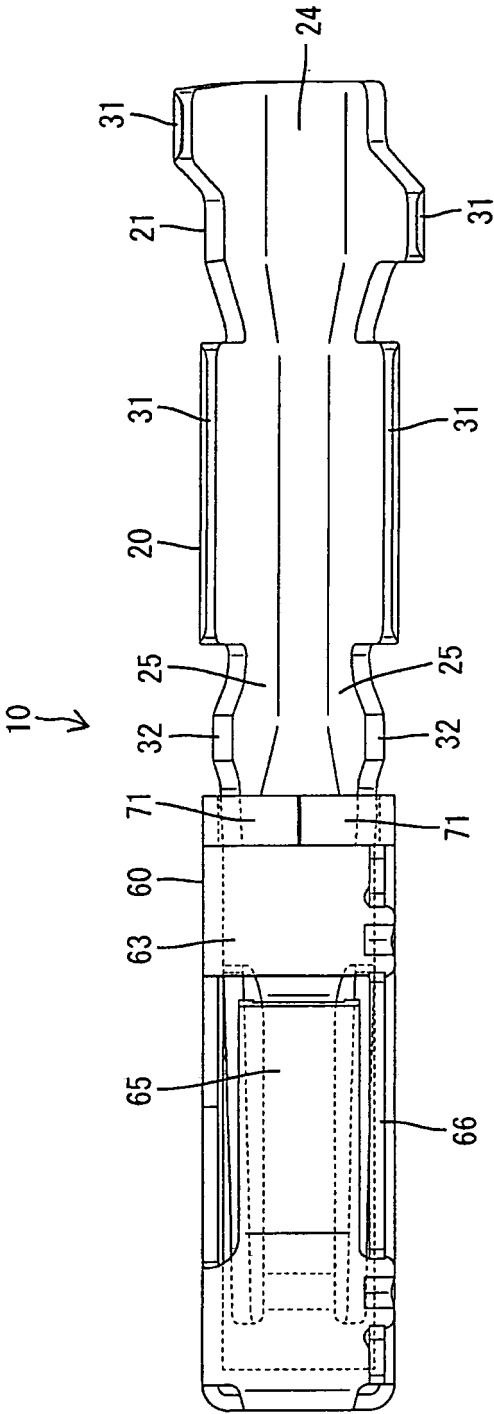


FIG. 2

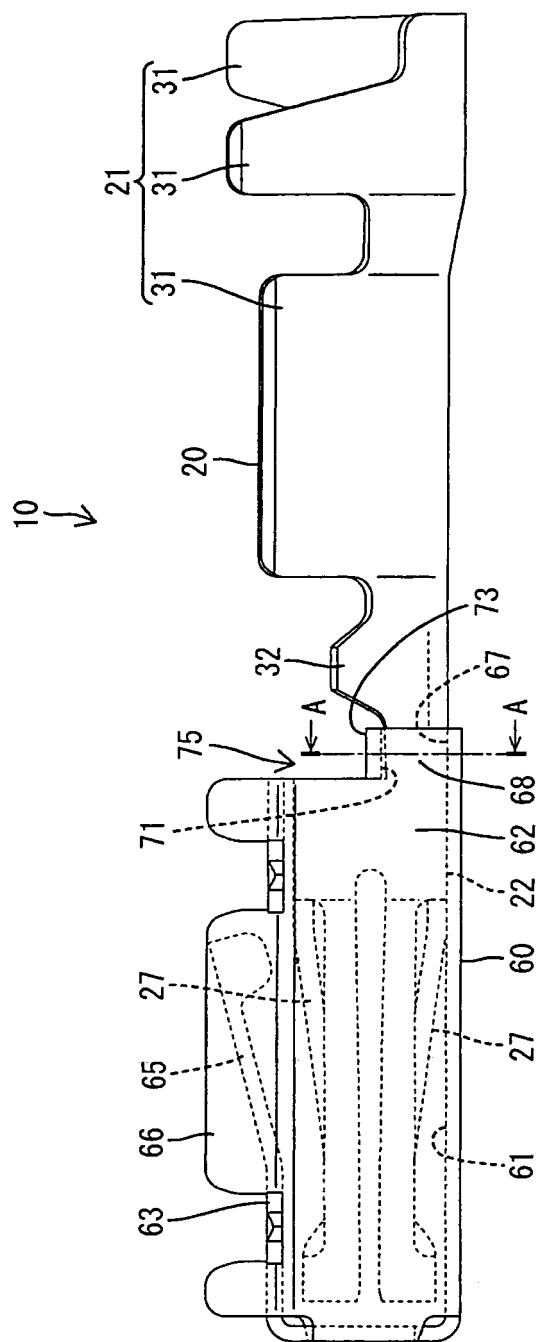


FIG. 3

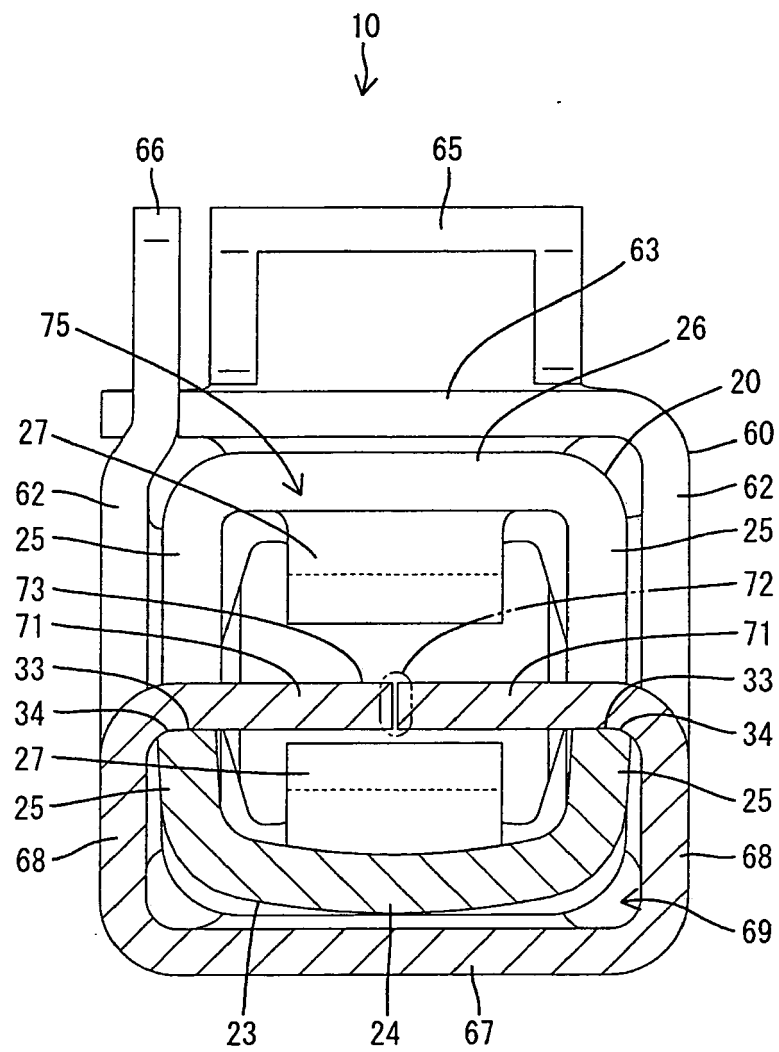


FIG. 4

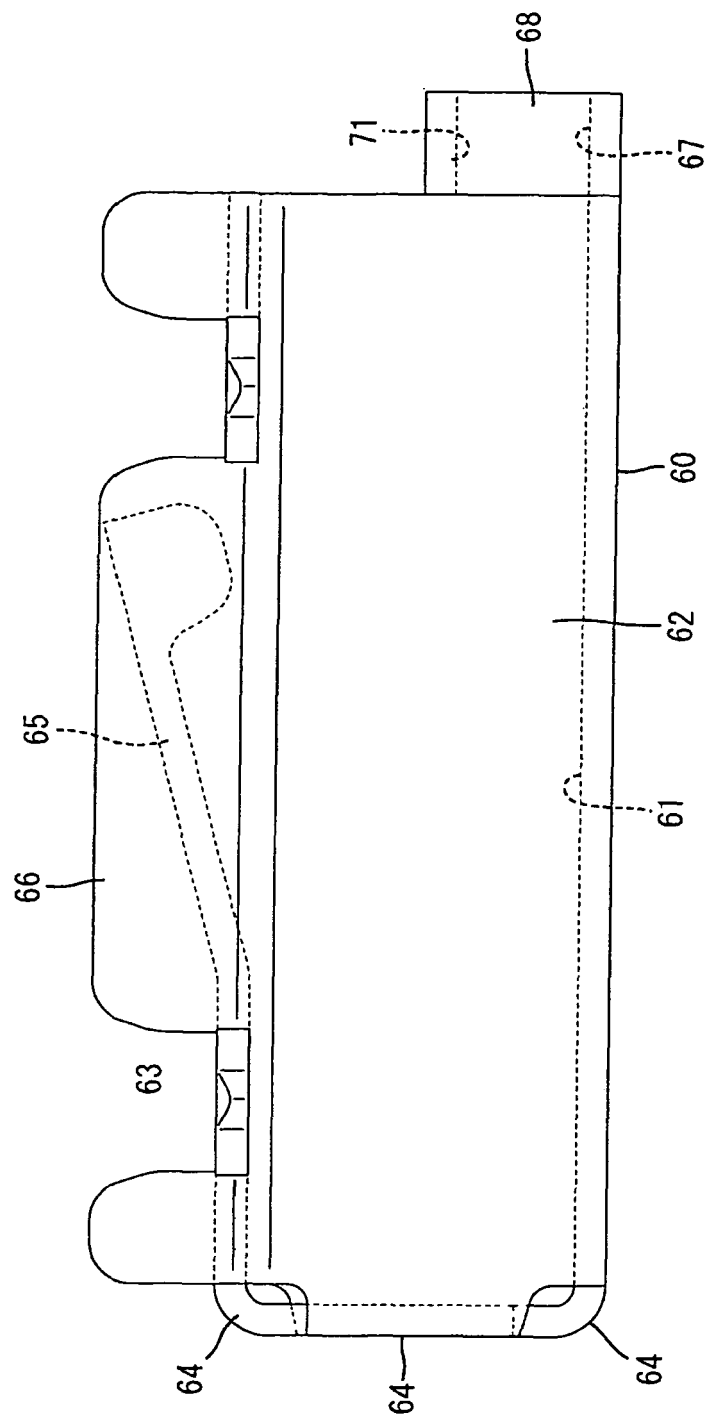


FIG. 5

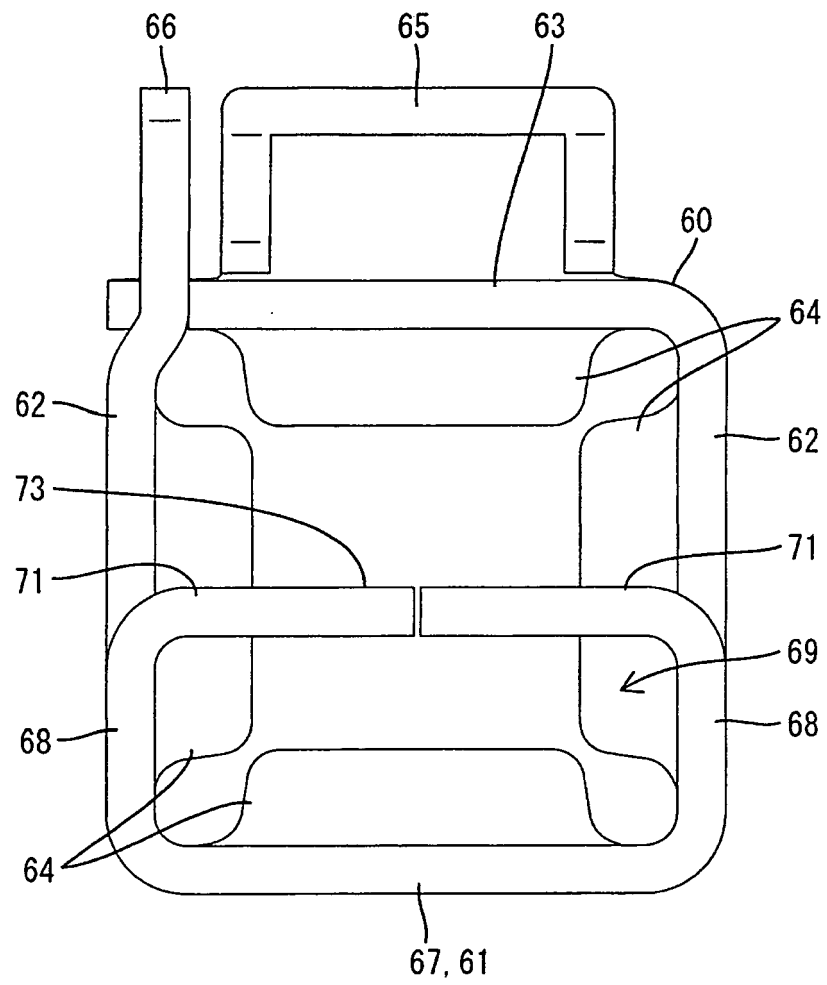


FIG. 6

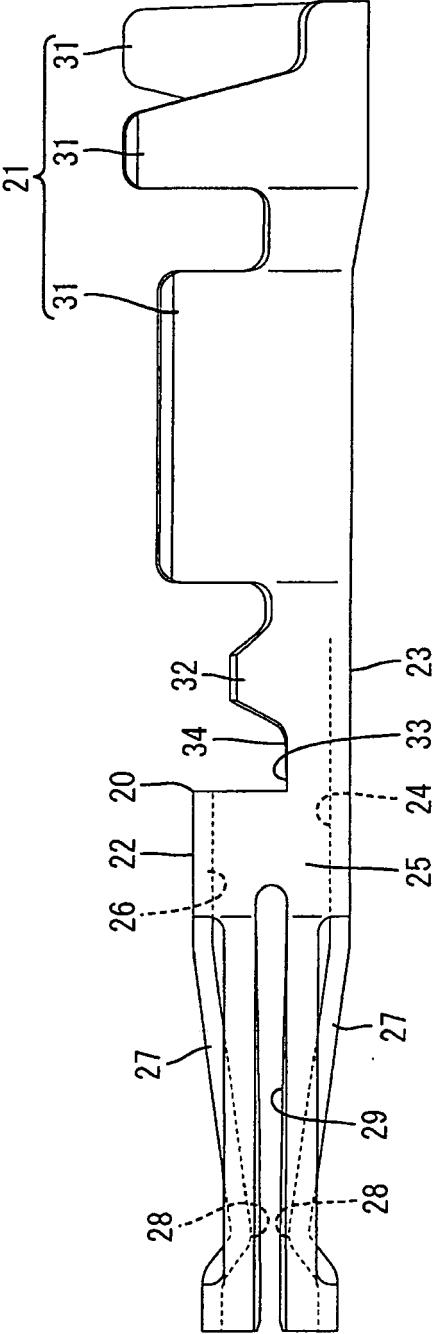


FIG. 7

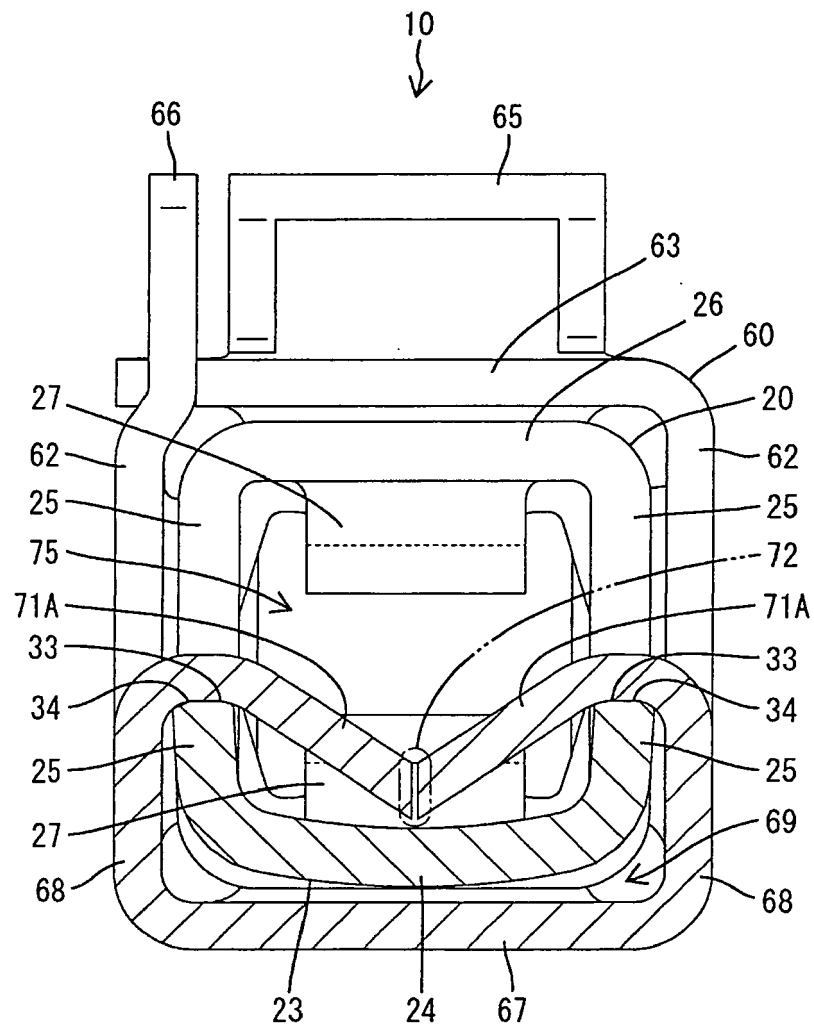


FIG. 8

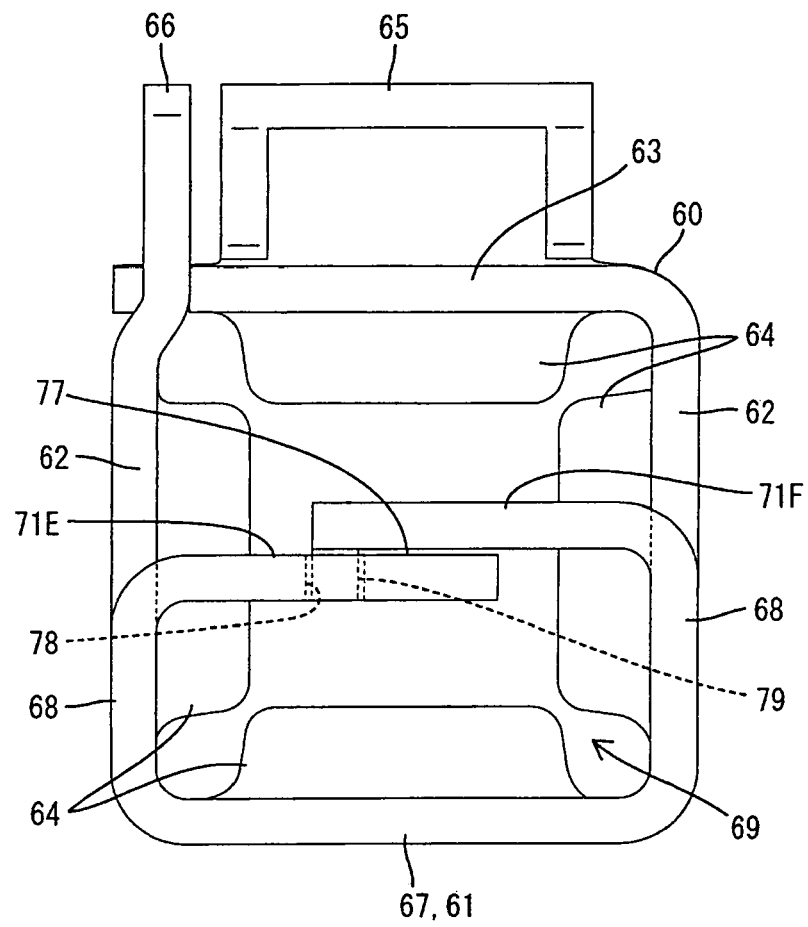
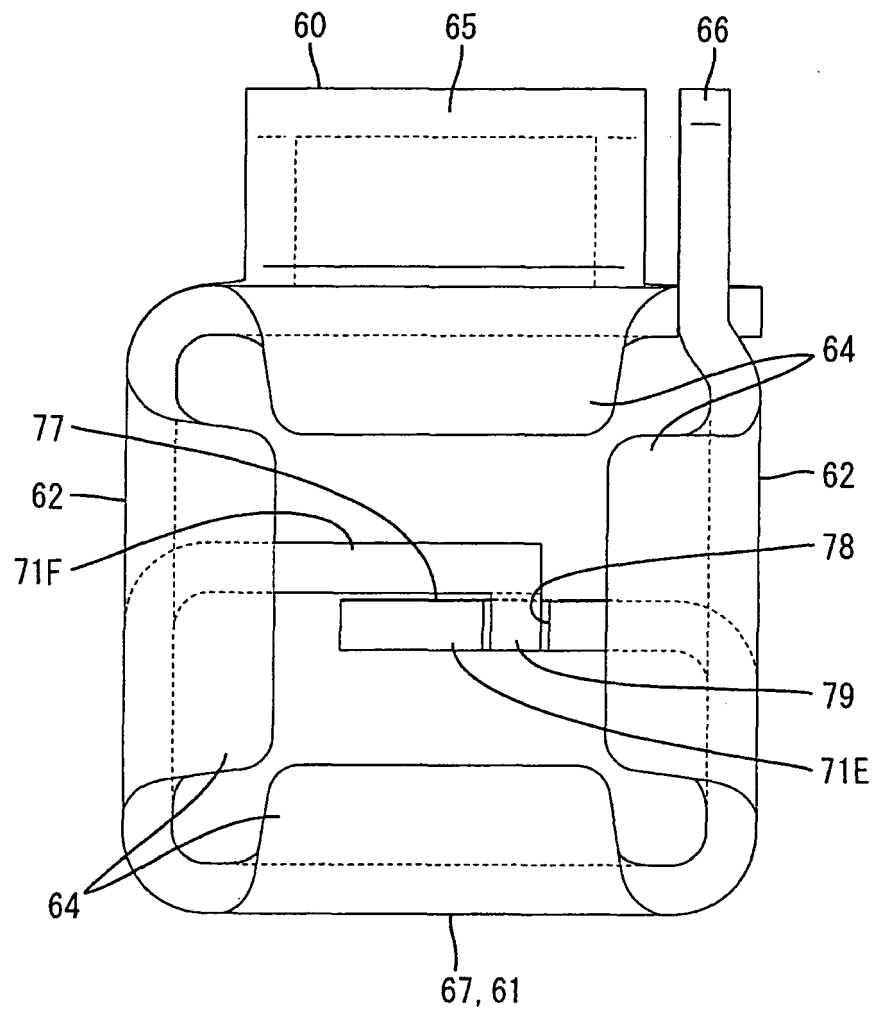
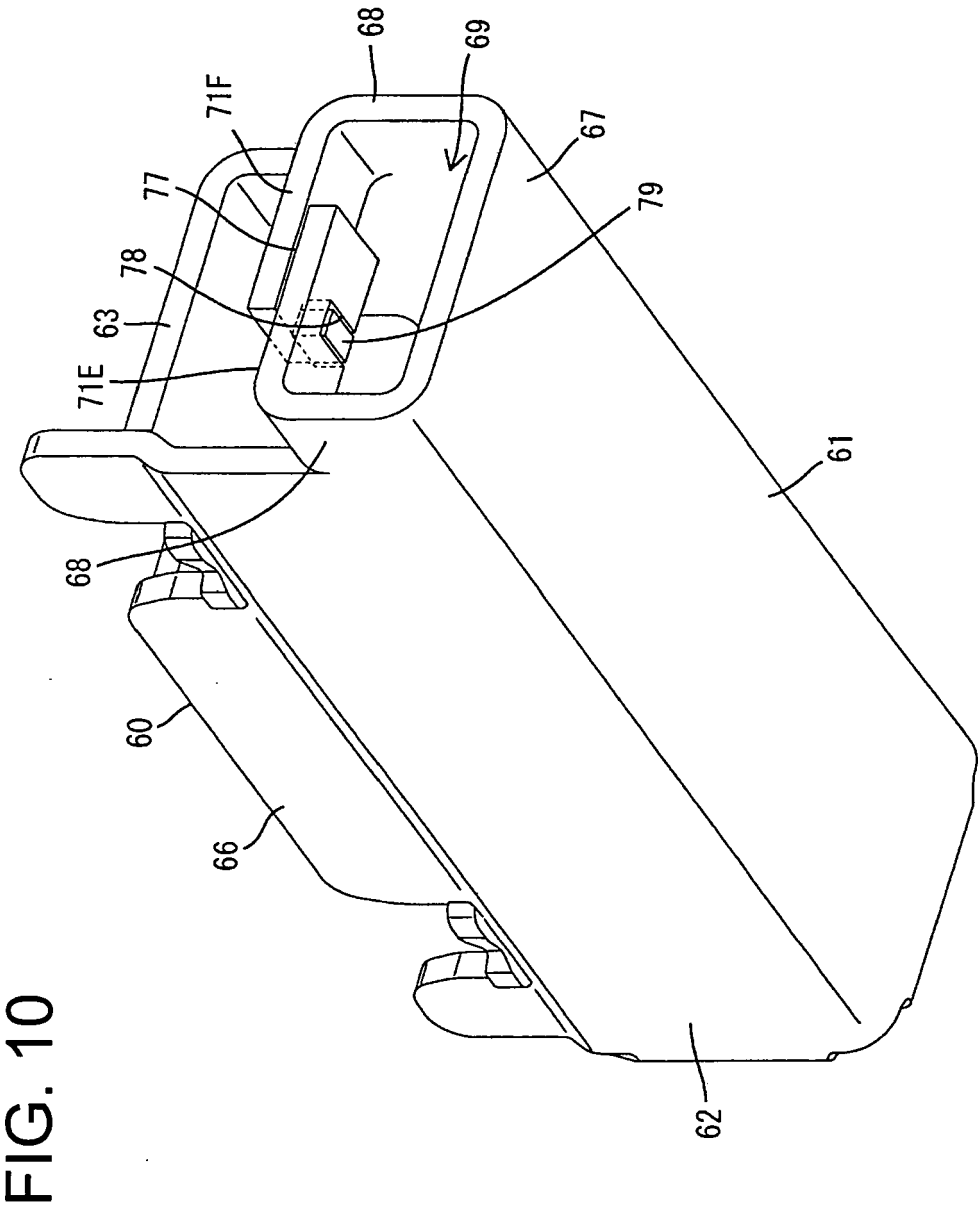


FIG. 9







EUROPEAN SEARCH REPORT

Application Number
EP 12 00 4306

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 0 700 122 A2 (WHITAKER CORP [US]) 6 March 1996 (1996-03-06) * the whole document * -----	1,3-5,7, 8,10-12, 14	INV. H01R13/18 H01R13/11
X	US 6 872 103 B1 (FLIEGER RICHARD [DE] ET AL) 29 March 2005 (2005-03-29) * the whole document * -----	1,6-8, 13,14	
A	US 5 308 267 A (HOTEA GHEORGHE [DE]) 3 May 1994 (1994-05-03) * the whole document * -----	2,9	
A	EP 0 837 529 A1 (SUMITOMO WIRING SYSTEMS [JP]) 22 April 1998 (1998-04-22) * the whole document * -----	2,9	
			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 30 October 2012	Examiner Tille, Daniel
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p>			

1

EPO FORM 1503 03.82 (P04C01)

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

EP 12 00 4306

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

30-10-2012

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
EP 0700122	A2	06-03-1996	DE	69523839 D1	20-12-2001
			DE	69523839 T2	29-05-2002
			EP	0700122 A2	06-03-1996

US 6872103	B1	29-03-2005	DE	19835020 A1	06-04-2000
			EP	1103088 A1	30-05-2001
			JP	2002522883 A	23-07-2002
			US	6872103 B1	29-03-2005
			WO	0008721 A1	17-02-2000

US 5308267	A	03-05-1994	DE	69320680 D1	08-10-1998
			DE	69320680 T2	25-03-1999
			EP	0566038 A2	20-10-1993
			JP	3287908 B2	04-06-2002
			JP	6013119 A	21-01-1994
			US	5308267 A	03-05-1994

EP 0837529	A1	22-04-1998	CN	1180949 A	06-05-1998
			DE	69726239 D1	24-12-2003
			DE	69726239 T2	02-09-2004
			EP	0837529 A1	22-04-1998
			JP	3724610 B2	07-12-2005
			JP	10189119 A	21-07-1998
			US	5951338 A	14-09-1999

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 3719107 B [0002]