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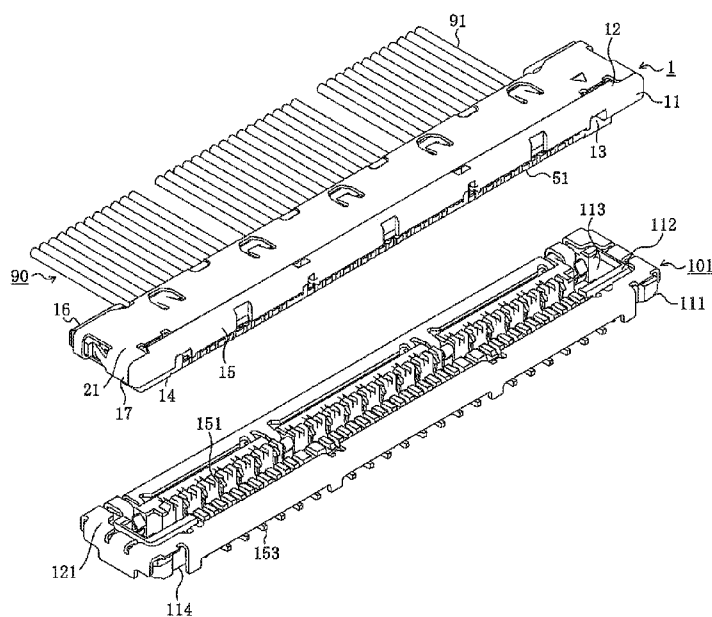


Fig. 3

(57) Abstract: Electrical connector cap and method of use is disclosed. The cap is attached to and detached from the connector, while not coming off the connector unnecessarily in the state of being attached to the connector, wherein the cap is able to be easily gripped with fingers or the like in the state of being attached to the connector, and wherein the cap is easy to handle, high in workability, not bulky, easy to manufacture and low in cost, since the cap is made of a flexible sheet material, having a bag-like shape with a distal end closed and an opening provided at a rear end and being capable of changing in position between a first position which enables a separation prevention function for preventing separation from the connector and a second position which disables the separation prevention function.

ELECTRICAL CONNECTOR CAP AND METHOD OF USE THEREOF

REFERENCE TO RELATED APPLICATIONS

[0001] The Present Application claims priority to prior-filed U.S. Provisional Application No. 2009-220309, entitled “Cap, Connector And Method Of Using The Cap,” and filed 25 September 2009, the contents of which is fully incorporated in its entirety herein.

BACKGROUND OF THE PRESENT APPLICATION

[0002] The Present Application relates to a cap, a connector, and a method of using the cap.

[0003] Conventionally, a cap is used to protect a connector or a connector terminal and the like. An example is disclosed at Japanese Patent Application No. 2001-155818.

[0004] Fig. 7 is a sectional side view of a conventional cap illustrating a state in which the cap is attached to a terminal. In Fig. 7, reference numeral 851 indicates a terminal, which is connected to an end of an electric wire 891, such as, for example, a terminal for testing an electric circuit of an automobile, and which is disposed in an engine room of the automobile. Moreover, a cap 831 attached to the terminal 851 is made of, for example, rubber or the like having some elasticity and stretchability. The cap 831 encloses the terminal 851 to function as a waterproof cover.

[0005] Further, the cap 831 has an opening 833 at its rear end and includes a cylindrical sheath 832 with the front end thereof closed and a terminal accommodating portion 834 which is formed inside the sheath 832 and capable of accommodating the terminal 851. On the rear end side of the terminal accommodating portion 834, there is an expanded diameter portion 835 having a larger diameter than the diameter of the front end side portion of the terminal accommodating portion 834. A positioning projection 836 and a retaining projection 837 each having a toric shape are formed on an inner surface of the expanded diameter portion 835.

[0006] Further, the terminal 851 includes a barrel 853 disposed rearward and a plate-like tab 852 disposed forward. In the barrel 853, a wire barrel 853a on the front side of the barrel 853 is crimped onto the core wire of the electric wire 891 and an insulation barrel 853b on the rear side of the barrel 853 is crimped onto a waterproof plug 841 attached to the coating of the electric wire 891. Thereby, the terminal 851 is connected to the electric wire 891 with being integrated with the waterproof plug 841.

[0007] The waterproof plug 841 is generally a cylindrical member made of rubber. A projection portion 842 projecting over the entire circumference is formed on the outer peripheral surface and is fit into the expanded diameter portion 835 of the cap 831. Thereby, the terminal 851 is covered with the cap 831 in a watertight state. Therefore, even if the cap 831 is splashed with water, the terminal 851 does not come into contact with water.

[0008] A slit 838 is formed at the distal end of the cap 831. This enables the distal end of a probe, which is not shown, to be pushed into the cap 831 from the slit 838 so as to be put in contact with the terminal 851 when an electric circuit is tested.

[0009] Nevertheless, the conventional cap is made of rubber or the like having some elasticity and includes the cylindrical sheath 832 and therefore has difficulty in covering a connector connected to the distal end of a wire including a plurality of electric wires. For example, in the case of a wire connector for use in connecting a wire including a plurality of electric wires to a board by being mated with a board connector mounted on a board such as a circuit board, it is sometimes required to attach a cap to the wire connector in order to prevent foreign substances such as dust in the air from adhering to the wire connector when the wire connector is stored in a warehouse or the like for a long term with being connected to the distal end of the wire. If, however, a cap made of rubber or the like having some elasticity, but lacking in flexibility and having a cylindrical part is attached to the wire connector in such a way as to enclose the wire connector, the cap is bulky due to the cylindrical shape of the cap maintained as it is and therefore a larger space is required to store the wire connector with the cap.

[0010] Moreover, in the case of a wire connector for use in a compact electronic device such as a portable telephone or video camera, the wire connector needs to be passed through a tiny hole formed in a casing or the like of the electronic device with being connected to the distal end of the wire in wiring work. In this situation, if the work is performed with the wire connector enclosed in a cap which is made of rubber or the like having some elasticity, but lacking in flexibility and having a cylindrical part, the cap does not deform flexibly and thus the workability is reduced. Naturally, if the cap is detached, the plurality of electric wires of the wire get separated. Therefore, the workability is also reduced.

[0011] Further, generally the connector such as a wire connector has a substantially rectangular parallelepiped shape. Therefore, the toric positioning projection 836 and retaining projection 837, if formed, make it difficult to insert the connector into the terminal accommodating portion

834 and also to pull out the connector once accommodated in the terminal accommodating portion 834.

SUMMARY OF THE PRESENT APPLICATION

[0012] Therefore, an object of the Present Application is to solve the problems of the foregoing conventional cap and to provide a cap, a connector with the cap attached thereto, and a method of using the cap, wherein the cap is easily attached to and detached from the connector, while not coming off the connector unnecessarily in the state of being attached to the connector, wherein the cap is able to be easily gripped with fingers or the like in the state of being attached to the connector, and wherein the cap is easy to handle, high in workability, not bulky, easy to manufacture, and low in cost, since the cap is made of a flexible sheet material, having a bag-like shape with a distal end closed and an opening provided at a rear end and being capable of changing in position between a first position which enables a separation prevention function for preventing separation from the connector and a second position which disables the separation prevention function.

[0013] In order to achieve the above-mentioned object, the Present Application provides a cap for covering a connector, which is made of a flexible sheet material, which has a bag-like shape with a distal end closed and an opening provided at a rear end, and which is capable of changing in position between a first position which enables a separation prevention function for preventing separation from the connector and a second position which disables the separation prevention function.

[0014] According to another cap of the Present Application, the cap has a separation preventing portion formed in a part of the opening, and the separation preventing portion prevents the connector from coming off an accommodating portion in the cap in the first position.

[0015] According to a further cap of the Present Application, the cap has a first end edge and a second end edge extending from the distal end to the rear end at both ends in a width direction, the separation preventing portion connects to the first end edge at the rear end, the first end edge is opposed to a first end surface of the connector in the first position, and the second end edge is opposed to the first end surface of the connector in the second position.

[0016] According to a still further cap of the Present Application, the accommodating portion is a flat space within the cap, having a longitudinal dimension greater than a linear dimension of

the connector and having a widthwise dimension at the rear end greater than a widthwise dimension at the distal end and greater than a widthwise dimension of the connector.

[0017] According to another cap of the Present Application, the cap further has a pair of sidewalls, a first end edge and a second end edge connecting both end edges in a width direction of the sidewalls, and a front end edge connecting front end edges of the sidewalls, the separation preventing portion partially connects the rear end edges of the sidewalls at one end of the opening and is connected to the rear end of the first end edge.

[0018] According to still another cap of the Present Application, further the connector is a wire connector connected to an end of a wire, including a first end surface which extends in a longitudinal direction and a second end surface which is located on the opposite side to the first end surface and into which an electric wire of the wire is inserted.

[0019] According to the Present Application, there is provided a connector comprising: a housing mating with a mating housing of a mating connector; and a terminal which is fitted in the housing and comes in contact with a mating terminal fitted in the mating housing, wherein: a cap for covering the connector, which is made of a flexible sheet material and has a bag-like shape with a distal end closed and an opening provided at a rear end, is attached to the connector so as to be able to change in position between a first position which enables a separation prevention function for preventing separation from the connector and a second position which disables the separation prevention function.

[0020] According to the Present Application, there is provided a method of using a cap for covering a connector, wherein: the cap is made of a flexible sheet material, having a bag-like shape with a distal end closed and an opening provided at a rear end; the cap is placed in a first position which enables a separation prevention function for preventing separation from the connector in a state where the cap is attached to the connector; and the cap is placed in a second position which disables the separation prevention function to detach the cap from the connector.

[0021] According to the Present Application, the cap is made of a flexible sheet material, having a bag-like shape with a distal end closed and an opening provided at a rear end and being capable of changing in position between a first position which enables the separation prevention function for preventing separation from the connector and a second position which disables the separation prevention function. This enables the cap to be easily attached to and detached from the connector, while the cap does not come off the connector unnecessarily in the state of being

attached to the connector, and enables the cap to be easily gripped with fingers or the like in the state of being attached to the connector, and therefore it is possible to achieve the cap which is easy to handle, high in workability, not bulky, easy to manufacture, and low in cost.

BRIEF DESCRIPTION OF THE FIGURES

[0022] The organization and manner of the structure and operation of the Present Application, together with further objects and advantages thereof, may best be understood by reference to the following Detailed Description, taken in connection with the accompanying Figures, wherein like reference numerals identify like elements, and in which:

[0023] Fig. 1 is a diagram illustrating a cap accommodating a connector according to the Present Application: Fig. 1A is a side view; and Fig. 1B is an A-A sectional view;

[0024] Fig. 2 is a diagram illustrating the cap according to the embodiment of the Present Application: Fig. 2A is a rear view; Fig. 2B is a side view; and Fig. 2C is a B-B sectional view;

[0025] Fig. 3 is a diagram illustrating a state of the connector and its mating connector before mating according to the Present Application;

[0026] Fig. 4 is a diagram for describing a change in a separation prevention function of the cap according to the Present Application: Figs. 4A to 4D illustrate a series of cap positions;

[0027] Fig. 5 is a diagram for describing a process of attaching the cap to the connector according to the Present Application: Figs. 5A to 5D illustrate a series of processes;

[0028] Fig. 6 is a diagram for describing a process of detaching the cap from the connector according to the Present Application: Figs. 6A to 6D illustrate a series of processes; and

[0029] Fig. 7 is a sectional side view of a conventional cap.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0030] While the Present Application may be susceptible to embodiment in different forms, there is shown in the Figures, and will be described herein in detail, specific embodiments, with the understanding that the disclosure is to be considered an exemplification of the principles of the Present Application, and is not intended to limit the Present Application to that as illustrated.

[0031] In the illustrated embodiments, directional representations – *i.e.*, up, down, left, right, front, rear and the like, used for explaining the structure and movement of the various elements of the Present Application, are relative. These representations are appropriate when the elements

are in the position shown in the Figures. If the description of the position of the elements changes, however, it is assumed that these representations are to be changed accordingly.

[0032] In the drawings, reference numeral 1 indicates the connector according to this embodiment. Although it may be any type of connector, it is typically a wire connector which is one of the connectors constituting a wire-to-board connector and is connected to an end of a wire 90 including a plurality of electric wires 91. Further, as shown in Fig. 3, the connector 1 is mated with a mating connector 101. Although the mating connector 101 may be any type of connector, it is typically a board connector which is the other of the connectors constituting the wire-to-board connector and is a surface-mounted connector to be mounted on the surface of a board such as a circuit board which is not shown.

[0033] The board is typically a printed circuit board for use in an electrical apparatus, an electronic device, or the like. The wire 90 is typically a conductive wire for use in connecting a signal line, a power line, or the like of the electrical apparatus or the electronic device. Further, although the electrical apparatus and the electronic device are typically a personal computer, a portable telephone, a digital camera, a video camera, a digital television, a vehicle navigation device, a gaming machine, or the like, they may be any type of electrical apparatus and electronic device.

[0034] Moreover, as shown in Fig. 1, a cap 31 is able to be attached to the connector 1. The cap 31 is a member, which is made of a flexible sheet material, which has a bag-like shape with the distal end closed and an opening provided at the rear end, and which is easily attached to or detached from the connector 1 connected to the distal ends of the wires 91 of the wire 90. Although the sheet material may be any material as long as it has flexibility, the sheet material is typically a transparent or semitransparent thin sheet material made of high-density polyethylene. The sheet material need not be always transparent or semitransparent, but may be nontransparent. In this embodiment, however, the sheet material is transparent or semitransparent for convenience of explanation, so that the connector 1 and the wires 91 accommodated in the cap 31 is visible.

[0035] Moreover, as shown in Fig. 3, the first connector 1 is integrally formed of an insulating material such as a synthetic resin and includes a housing 11 as a first housing having an overall shape like a substantially flat rectangular parallelepiped, a terminal 51 as a first terminal made of metal fitted in the housing 11, and an auxiliary metallic bracket 21 made of metal attached to the

housing 11 as a first housing auxiliary metallic bracket. Although 40 terminals 51 are arranged in parallel in the shown example, the number of the terminals 51 may be arbitrarily changed so as to correspond to the number of the electric wires 91. Moreover, the pitch of the terminals 51 may be arbitrarily determined. The terminals 51 are connected to the ends of the corresponding electric wires 91, respectively.

[0036] The housing 11 includes a mating convex portion 13 which projects downward holding the terminals 51, a substantially plate-like rectangular top plate 12 which is located in the upper surface of the housing 11, a first end surface 15 as a substantially plate-like rectangular front plate which is located in the front surface of the housing 11, a second end surface 16 as a substantially plate-like rectangular rear plate, which is located in the rear surface of the housing 11 and into which the distal ends of the electric wires 91 are inserted, and a pair of sidewalls 17 located on both sides of the housing 11. The lower surface of the housing 11 is a mating surface 14 which mates with the mating connector 101. Moreover, the auxiliary metallic bracket 21, which is a member made by bending a metal plate, is attached to the housing 11 so as to cover at least a part of the top plate 12 and the sidewalls 17. In the shown example, the length (the dimension in a direction from the lower left to the upper right in Fig. 3), the width (the dimension in a direction from the upper left to the lower right in Fig. 3), and the thickness (the dimension in the vertical direction in Fig. 3) of the connector 1 are approx. 17 mm, approx. 3 mm, and approx. 1.5 mm, respectively, though the dimensions of each part may be arbitrarily set.

[0037] On the other hand, the mating connector 101 is integrally formed of an insulating material such as a synthetic resin and includes a mating housing 111 as a second housing having an overall shape like a substantially flat rectangular parallelepiped, a mating terminal 151 as a second terminal made of metal and fitted in the mating housing 111, and a mating auxiliary metallic bracket 121 as a second housing auxiliary metallic bracket made of metal and attached to the mating housing 111. Although 40 mating terminals 151 are arranged in parallel in the shown example, the number of the mating terminals 151 may be arbitrarily changed so as to correspond to the number of the terminals 51. Moreover, the pitch of the mating terminals 151 may be changed so as to correspond to the pitch of the terminals 51. Each of the mating terminals 151 is connected at its tail 153 to the electrode of a conductive trace on the board by soldering or the like.

[0038] The mating housing 111 includes a substantially plate-like rectangular bottom plate 114 which is located on the lower surface of the mating housing 111 and is opposed to the surface of the board and a substantially plate-like rectangular mating top plate 112 which is located on the upper surface of the mating housing 111 and functions as a mating surface to be mated with the connector 1. In the mating top plate 112, there is formed a mating concave portion 113 which is a concave part with the mating terminals 151 exposed to its sidewall and accommodates the mating convex portion 13.

[0039] The mating connector 101 is surface-mounted on the board by connecting the tails 153 of the mating terminals 151 to the electrodes of the conductive traces formed on the surface of the board by soldering or the like and connecting a part of the mating auxiliary metallic bracket 121 to a fixing portion formed on the surface of the board by soldering or the like. An operator then makes the mating surface 14 of the connector 1 and the mating top plate 112 of the mating connector 101 opposed to each other and inserts the mating convex portion 13 of the connector 1 into the mating concave portion 113 of the mating connector 101 to mate the connector 1 with the mating connector 101.

[0040] Moreover, when the connector 1 is not mated with the mating connector 101, the cap 31 is preferably attached to the connector 1 as shown in Fig. 1. This prevents foreign substances such as, for example, dust in the air from adhering to the connector 1. In addition, it prevents the connector 1 from being damaged when the connector 1 interferes with other members.

[0041] Further, when the connector 1 connected to the end of the wire 90 is attached to an electrical apparatus or an electronic device along with the wire 90, the wire 90 is able to be treated more easily and therefore the workability is improved. For example, in a work of passing the wire 90 to which the connector 1 is connected through a through-hole formed in a casing of the electrical apparatus or the electronic device, it is possible to pass the wire 90 through the through-hole smoothly without a catch on the wall surface of the through-hole since the cap 31 covers the vicinity of the end of the wire 90 and the periphery of the connector 1. Moreover, there is no damage on the vicinity of the end of the wire 90 and on the connector 1. The same effect is achieved, not only in the case of passing the wire 90 through a through-hole, but also in a case of passing the wire 90 through a narrow space.

[0042] Although the cap 31 may have any shape as long as it has a bag-like shape with the distal end closed and the rear end open, typically the cap 31 has the shape as shown in Fig. 2.

Specifically, the cap 31 has a tubular shape with the slightly tapered distal end closed when viewed from the side and has an extremely thin lip-like shape when viewed from the rear.

[0043] The cap 31 is made of a flexible sheet material. Therefore, if the cap 31 is placed on a flat surface such as the upper surface of a platform such as a table with the right or left sidewall in Fig. 2A down, in other words, with being laid down, the cap 31 becomes further flat by its own weight and has a sheet-like shape when viewed from the rear. Therefore, the cap 31 is able to be placed on top of another cap 31 with being laid down when stored, thereby enabling the storage space saving.

[0044] In the shown example, the cap 31 includes a first sidewall 32a and a second sidewall 32b which are left and right sidewalls, respectively, a first end edge 33a and a second end edge 33b which are lower and upper end edges, a front end edge 36 which is an end edge at the distal end, an opening 35 which is an opening at the rear end, and an engaging portion 37 as a separation preventing portion formed at an end of the opening at the rear end.

[0045] Moreover, the front end edge 36 connects the front end edge of the first sidewall 32a and the front end edge of the second sidewall 32b, having a substantially semicircular arc shape when viewed from the side. Further, the first end edge 33a and the second end edge 33b connect both end edges in the width direction of the first sidewall 32a and the second sidewall 32b and each have a linear shape when viewed from the side, with the front end connected to the front end edge 36. Further, the rear end is linearly extending in the vertical direction when viewed from the side. The engaging portion 37 connects the rear end edge of the first sidewall 32a and the rear end edge of the second sidewall 32b at one end (the lower end in the example shown in Figs. 1A and 2B) of the opening 35 and the end (the lower end in the example shown in Figs. 1A and 2B) is connected to the first end edge 33a. The first end edge 33a and the second end edge 33b are not in parallel with each other. One of the first end edge 33a and the second end edge 33b is inclined at some angle to the other, and a distance between them closer to the front end edge 36 is narrower than the distance closer to the rear end.

[0046] Moreover, the first end edge 33a, the second end edge 33b, the front end edge 36, and the engaging portion 37 are closed, thereby forming an accommodating portion 34 which is a flat bag-like space with the periphery closed and only the opening 35 open between the first sidewall 32a and the second sidewall 32b. The side shape of the accommodating portion 34 is the same as the side shape of the entire cap 31. A sidewall 32 is used to collectively describe the first

sidewall 32a and the second sidewall 32b, and an end edge 33 is used to collectively describe the first end edge 33a and the second end edge 33b.

[0047] In the shown example, the first sidewall 32a and the second sidewall 32b are a pair of sheet materials formed in the same shape and made of high density polyethylene having the shape as shown in Fig. 2B. Further, the first end edge 33a, the second end edge 33b, and the front end edge 36 are formed by superimposing the first sidewall 32a on the second sidewall 32b and joining the end edges thereof by heat sealing, ultrasonic bonding, or other methods. In addition, the engaging portion 37 is similarly formed by forming a joint at one end of the opening at the rear end, in other words, at a part of the end edge at the rear end closer to the first end edge 33a.

[0048] The cap 31 does not always need to be manufactured by superimposing the pair of sheet materials and joining the end edges thereof. For example, it is possible to manufacture the bag-like cap 31 having the shape as shown in Fig. 2 by injecting resin into a mold by the same method as for manufacturing a bottle-like container by injection molding. In this case, all of the first sidewall 32a, the second sidewall 32b, the first end edge 33a, the second end edge 33b, the front end edge 36, and the engaging portion 37 are integrated with each other.

[0049] Moreover, in the example shown in Fig. 2, a dimension L in the longitudinal direction of the accommodating portion 34 (almost equal to the length of the cap 31) is approx. 27 [mm], a dimension W1 in the width direction at the distal end of the accommodating portion 34 (almost equal to the width at the distal end of the cap 31, in other words, the width of the front end edge 36) is approx. 3.5 mm, a dimension W2 which is the width of the opening 35 is approx. 4.5 mm, a dimension H which is the width of the engaging portion 37 is approx. 1.0 mm, and the angle of inclination of the second end edge 33b to the first end edge 33a is approx. 5 to 6 deg. The sum of the dimension W2 and the dimension H is almost equal to the dimension of the accommodating portion 34 at the rear end in the width direction. All of these numerical values are merely illustrative and therefore able to be appropriately changed as required.

[0050] Further, when the cap 31 is attached to the connector 1 connected to the end of the wire 90, the connector 1 is inserted into the accommodating portion 34 through the opening 35 in communication between the outside and the accommodating portion 34. Fig. 1 shows the connector 1 connected to the end of the wire 90 in a state of being accommodated in the accommodating portion 34 with the cap 31 attached to the connector 1.

[0051] In Fig. 1, reference numeral 92 indicates an insulating wire coating for coating the whole bundled electric wires 91 and the wire coating is removed to expose the electric wires 91 in a range from the distal end of the wire 90 up to a predetermined length. A coated end protecting portion 93 protects the end of the wire coating 92. The exposed electric wires 91 are separated from one another and are bent as shown in Fig. 1A. Thereby, the longitudinal direction of the connector 1, in other words, the extending direction of the first end surface 15 and the second end surface 16 is almost in parallel with the extending direction of at least the distal end of the part having the wire coating 92 of the wire 90, whereby the connector 1 is able to be accommodated in the slender accommodating portion 34. Moreover, when viewed from the side, the first end surface 15 of the connector 1 is almost in parallel with the first end edge 33a and is opposed to the first end edge 33a. Although the first end surface 15 of the connector 1 abuts against or is close to the first end edge 33a in the shown example, the first end surface 15 does not always need to abut against or be close to the first end edge 33a, but may be spaced apart from the first end edge 33a. Further, when viewed from the rear, the first sidewall 32a and the second sidewall 32b are largely bent since the wide connector 1 and the plurality of electric wires 91 are accommodated in the accommodating portion 34.

[0052] Further, the engaging portion 37 is formed at the rear end of the cap 31. Therefore, even if the cap 31 is moved forward relative to the connector 1, the engaging portion 37 engages with the rear side sidewall 17 of the connector 1 and thus it is understood that the cap 31 does not come off the connector 1. Accordingly, even if an operator treats the connector 1 connected to the wire 90 by gripping the cap 31 with his/her fingers or the like, the cap 31 does not come off the connector 1 unnecessarily, in other words, the separation prevention function of the cap 31 is enabled. Therefore, it is understood that the cap 31 is easy to handle and has high workability.

[0053] In Fig. 4, the illustration of the wire 90 including the electric wires 91 is omitted in order to clearly show the relationship between the position of the cap 31 and the connector 1.

[0054] In the case where the cap 31 is in a first position in which the first end edge 33a of the cap 31 is opposed to the first end surface 15 of the connector 1 as shown in Fig. 4A, the engaging portion 37 engages with the rear side sidewall 17 of the connector 1 and therefore the cap 31 does not come off the connector 1 even if the cap 31 is moved forward relative to the connector 1, that is, even if the connector 1 is moved backward relative to the cap 31. In other words, if the

position of the cap 31 is in the first position, the separation prevention function of the cap 31 is enabled and therefore the cap 31 does not come off the connector 1.

[0055] Accordingly, if it is required to detach the cap 31 from the connector 1, first, the connector 1 is moved forward relative to the cap 31 as indicated by an arrow C in Fig. 4B.

Thereby, the engaging portion 37 is disengaged from the sidewall 17. Subsequently, as indicated by an arrow D in Fig. 4B, the cap 31 is rotated by 180 degrees relative to the connector 1. In other words, the cap 31 is vertically flipped relative to the connector 1. Thereby, as shown in Fig. 4C, the cap 31 is placed in a second position in which the second end edge 33b of the cap 31 is opposed to the first end surface 15 of the connector 1. In the second position, the engaging portion 37 is located in a position far spaced from the second end surface 16 of the connector 1 in the upper side of Fig. 4C, and therefore the engaging portion 37 does not engage with the sidewall 17. In other words, if the cap 31 is in the second position, the separation prevention function of the cap 31 is disabled and not implemented.

[0056] Therefore, as indicated by an arrow E in Fig. 4D, the connector 1 exits backward from the cap 31 through the opening 35 if the cap 31 is moved forward relative to the connector 1 since the engaging portion 37 does not engage with the rear side sidewall 17 of the connector 1. In other words, the separation prevention function of the cap 31 is disabled and not implemented and therefore the cap 31 is detached from the connector 1.

[0057] In the example shown in Fig. 4B, a large space exists above the connector 1, in other words, between the second end surface 16 of the connector 1 and the second end edge 33b of the cap 31. Thus, if the connector 1 is largely displaced upward relative to the cap 31 in this state, the first end surface 15 of the connector 1 is far spaced from the first end edge 33a of the cap 31, and therefore the cap 31 seems to be detached from the connector 1 because the engaging portion 37 does not engage with the rear side sidewall 17 of the connector 1 only by moving the cap 31 forward relative to the connector 1 without rotating the cap 31 by 180 degrees.

[0058] As described later, however, an operator generally grips the cap 31 with his/her fingers or the like in moving the connector 1 with the cap 31 attached thereto. Therefore, the connector 1 in the cap 31 naturally gets closer to the first end edge 33a located on the lower side by its own weight. As a result, it is impossible for the connector 1 to be largely displaced upward relative to the cap 31 and therefore the first end surface 15 of the connector 1 cannot be far spaced from the first end edge 33a of the cap 31.

[0059] Moreover, when adopting the dimensions illustrated in this embodiment, the width of the connector 1, namely the vertical dimension of the sidewall 17 in the state shown in Fig. 4B is approx. 3 [mm] and the widthwise (in the vertical direction in Fig. 4B) dimension at the rear end of the accommodating portion 34 of the cap 31 is $W2+H$ that is approx. 5.5 [mm]. In this case, if the connector 1 were located in the center with respect to the width direction of the accommodating portion 34, the distance from each of both vertical ends of the sidewall 17 of the connector 1 to each of both vertical ends at the rear end of the accommodating portion 34 is approx. 0.75 [mm], which is smaller than the dimension H that is approx. 1.0 [mm], which is the width of the engaging portion 37. Therefore, even if the connector 1 were located in the center with respect to the width direction of the accommodating portion 34, the engaging portion 37 engages with the rear side sidewall 17 of the connector 1 and thus the separation prevention function of the cap 31 is enabled, by which the cap 31 does not come off the connector 1.

[0060] In addition, even if the illustrated dimensions are not adopted, the same effect is achieved unless the size of the cap 31 is extremely larger than the size of the connector 1. Further, practically in the state where the connector 1 is accommodated in the accommodating portion 34, the bag-like cap 31 is extended in the width direction (the direction perpendicular to the drawing) and the widthwise dimension at the rear end of the accommodating portion 34 is much more decreased than in the state shown in Fig. 2. Therefore, the distance from each of both vertical ends of the sidewall 17 of the connector 1 to each of both vertical ends of the rear end of the accommodating portion 34 is much smaller than the above description. Accordingly, the engaging portion 37 engages with the rear side sidewall 17 of the connector 1 and thus the cap 31 does not come off the connector 1.

[0061] Further, if the wire 90 is connected to the connector 1, the plurality of electric wires 91 fill the space between the second end surface 16 of the connector 1 and the second end edge 33b of the cap 31 as shown in Fig. 1. Therefore, even in the state as shown in Fig. 4B, it is impossible for the connector 1 to be largely displaced upward relative to the cap 31 and the first end surface 15 of the connector 1 cannot be far spaced from the first end edge 33a of the cap 31. Accordingly, even if the connector 1 is displaced upward to some extent relative to the cap 31, the separation prevention function of the cap 31 is enabled and the engaging portion 37 engages with the rear side sidewall 17 of the connector 1, and therefore the cap 31 does not come off the

connector 1. In other words, in the first position, the separation prevention function of the cap 31 is reliably implemented, which prevents the cap 31 from coming off the connector 1 without fail.

[0062] Fig. 5 is a diagram for describing the process of attaching the cap to the connector according to the embodiment of the Present Application. First, when the cap 31 is attached to the connector 1, the exposed electric wires 91 ahead of the wire coating 92 are bent as shown in Fig. 5A, so that the extending direction of the first end surface 15 and the second end surface 16 of the connector 1 is aligned in parallel with the extending direction of at least the distal end of the part of the wire 90 having the wire coating 92.

[0063] Additionally, the cap 31 is oriented so that its rear end is opposed to the front side sidewall 17 of the connector 1 and so that the second end edge 33b is almost in parallel with the first end surface 15 of the connector 1 and opposed to the first end surface 15. In other words, the cap 31 is placed in the second position and the rear end of the cap 31 is opposed to the front side sidewall 17 of the connector 1.

[0064] Subsequently, as indicated by an arrow F in Fig. 5A, the connector 1 is moved forward relative to the cap 31. Thereby, the connector 1 goes into the accommodating portion 34 through the opening 35 along with the wire 90 without any interference of the sidewall 17 with the engaging portion 37.

[0065] Thereafter, as indicated by an arrow G in Fig. 5B, the connector 1 is further moved forward relative to the cap 31. Since the first end edge 33a is inclined at some angle relative to the second end edge 33b, the accommodating portion 34 has a tapered shape. Therefore, the connector 1 stops due to interference with the inner surface of the accommodating portion 34 in a place back from the front end edge 36 (the left side in Fig. 5B) as shown in Fig. 5B without abutting against the front end edge 36 of the cap 31. In the example shown in Fig. 5B, there is an enough space between the second end surface 16 of the connector 1 and the first end edge 33a of the cap 31 and therefore the connector 1 seems not to interfere with the inner surface of the accommodating portion 34. Actually, however, the bag-like cap 31 is extended in the width direction (the direction perpendicular to the drawing) in the state where the connector 1 is accommodated in the accommodating portion 34, and therefore the connector 1 interferes with the inner surface of the accommodating portion 34. As understood from the above description, the cap 31 does not come off the connector 1 when moving backward relative to the connector 1 even in the second position.

[0066] In the state shown in Fig. 5B, the dimension from the rear end of the cap 31 to the rear side sidewall 17 of the connector 1 is almost the same as a dimension P described later and is typically on the order of 5 to 10 [mm]. In other words, there is an excess length of a part of the cap 31 easily gripped by the operator with his/her fingers or the like behind the connector 1. Therefore, the operator is able to easily handle the cap 31 by gripping the excess part of the cap 31 with his/her fingers or the like. Although the wire 90 exists in the excess part behind the connector 1 in the cap 31, the connector 1 does not exist there and the tapered-shaped accommodating portion 34 has a large capacity in the vicinity of the rear end. Therefore, the cap 31 has a large space where any accommodated object does not exist. Accordingly, the operator is able to grip the flexible cap 31 with his/her fingers easily.

[0067] Subsequently, as indicated by an arrow J in Fig. 5C, the cap 31 is relatively rotated by 180 degrees with respect to the connector 1. In other words, the cap 31 is vertically flipped relative to the connector 1. In this instance, the operator is able to flip the cap 31 easily by gripping the excess part behind the connector 1 in the cap 31 with his/her fingers.

[0068] Thereby, as shown in Fig. 5C, the cap 31 is placed in the first position in which the first end edge 33a of the cap 31 is opposed to the first end surface 15 of the connector 1. In the first position, the engaging portion 37 is located in the lower side in Fig. 5C. Therefore, the engaging portion 37 is engageable with the sidewall 17 and the separation prevention function of the cap 31 is enabled.

[0069] Therefore, even if the connector 1 is moved backward relative to the cap 31 as indicated by an arrow K in Fig. 5D, the engaging portion 37 engages with the rear side sidewall 17 of the connector 1. Therefore, the connector 1 does not exit backward from the cap 31 through the opening 35. In other words, the separation prevention function of the cap 31 is enabled and therefore the cap 31 does not come off the connector 1. Although the first end surface 15 of the connector 1 abuts against or is close to the first end edge 33a in the shown example, the first end surface 15 does not always need to abut against or be close to the first end edge 33a, but may be spaced apart from the first end edge 33a.

[0070] Moreover, in the state shown in Fig. 5D, the dimension from the distal end of the cap 31 to the front side sidewall 17 of the connector 1 is equal to or greater than the dimension P and typically approx. 5 to 10 [mm] or greater. In other words, there is an excess length of a part of the cap 31 easily gripped by the operator with his/her fingers or the like ahead of the connector 1.

Therefore, the operator is able to easily handle the cap 31 by gripping the excess part of the cap 31 with his/her fingers or the like. Particularly, both of the wire 90 and the connector 1 do not exist in the excess part ahead of the connector 1 in the cap 31. Therefore, the excess part of the cap 31 is extremely flexible, and the operator is able to grip the excess part with his/her fingers or the like very easily.

[0071] Accordingly, when the connector 1 connected to the end of the wire 90 is attached to an electrical apparatus along with the wire 90, the operator can grip the excess part ahead of the connector 1 in the cap 31 to displace the connector 1 in a desired direction by a desired displacement amount, thereby facilitating the work and improving the workability. For example, in the work of passing the wire 90, which is connected to the connector 1, through a through-hole formed in the casing of the electrical apparatus or the electronic device, the connector 1 is able to be smoothly passed through the through-hole along with the wire 90 only by pushing the excess part ahead of the connector 1 in the cap 31 into the through-hole from one side, first, and then gripping and pulling out the distal end of the excess part from the other side. In this manner, when the connector 1 is passed through a narrow space such as a through-hole, it is only required to grip and displace the excess part ahead of the connector 1 in the cap 31 with fingers or the like, by which the workability is extremely improved.

[0072] Moreover, the cap 31 is made of a flexible sheet material. Accordingly, for example, during passing through the through-hole having a small diameter, the cap 31 flexibly deforms when being pushed to the inner surface of the through-hole, and therefore the cap 31 is able to be smoothly passed through the through-hole. In other words, it is possible to easily pass the connector 1 with the cap 31 through even an extremely narrow space.

[0073] The above description contemplates the case where the cap 31 is placed in the second position before the connector 1 is put into the accommodating portion 34 through the opening 35 so that the connector 1 is accommodated in the accommodating portion 34, and thereafter the cap 31 is vertically flipped to be placed in the first position. The connector 1, however, is also able to be put into the accommodating portion 34 through the opening 35 with the cap 31 maintained in the first position. In this case, it is possible to omit the process of vertically flipping the cap 31 after the connector 1 is accommodated in the accommodating portion 34, reducing work time.

[0074] Fig. 6 is a diagram for describing a process of detaching the cap from the connector according to the embodiment of the Present Application. While or after the operator treats the

connector 1 connected to the wire 90 by gripping the cap 31 with his/her fingers or the like, the cap 31 is in the first position and the connector 1 is located rearward relative to the cap 31, with the engaging portion 37 engaging with the rear side sidewall 17. In other words, it is the same state as shown in Fig. 5D, in which the separation prevention function of the cap 31 is enabled so that the cap 31 does not come off the connector 1. Although the first end surface 15 of the connector 1 abuts against or is close to the first end edge 33a in the shown example, the first end surface 15 does not always need to abut against or be close to the first end edge 33a, but may be spaced apart from the first end edge 33a.

[0075] Moreover, since the engaging portion 37 engages with the rear side sidewall 17 of the connector 1, the cap 31 cannot rotate relative to the connector 1. In other words, the cap 31 is unable to be placed in the second position while or after the operator treats the connector 1. Therefore, if the cap 31 is detached from the connector 1, the connector 1 is moved forward relative to the cap 31 as indicated by an arrow M in Fig. 6B, first. This releases the engagement between the engaging portion 37 and the sidewall 17. In addition, the second end edge 33b is inclined at some angle with respect to the first end edge 33a, so that the accommodating portion 34 has a tapered shape. Therefore, the connector 1 stops due to interference with the inner surface of the accommodating portion 34 in a place back from the front end edge 36 (the left side in Fig. 6B) as shown in Fig. 6B without abutting against the front end edge 36 of the cap 31.

[0076] In the example shown in Fig. 6B, there is an enough space between the second end surface 16 of the connector 1 and the second end edge 33b of the cap 31 and therefore the connector 1 seems not to interfere with the inner surface of the accommodating portion 34. Actually, however, the bag-like cap 31 is extended in the width direction (the direction perpendicular to the drawing) in the state where the connector 1 is accommodated in the accommodating portion 34, and therefore the connector 1 interferes with the inner surface of the accommodating portion 34. As understood from the above description, the cap 31 does not come off the connector 1 when moving backward relative to the connector 1 also in the first position similarly to the second position.

[0077] In the state shown in Fig. 6B, the dimension P from the rear end of the cap 31 to the rear side sidewall 17 of the connector 1 is typically on the order of 5 to 10 [mm]. In other words, there is an excess length of a part of the cap 31 easily gripped by the operator with his/her fingers or the like behind the connector 1. Therefore, the operator is able to easily handle the cap 31 by

gripping the excess part of the cap 31 with his/her fingers or the like. Although the wire 90 exists in the excess part behind the connector 1 in the cap 31, the connector 1 does not exist there and the tapered-shaped accommodating portion 34 has a large capacity in the vicinity of the rear end. Therefore, the cap 31 has a large space where any accommodated object does not exist. Accordingly, the operator is able to grip the flexible cap 31 with his/her fingers easily.

[0078] Subsequently, as indicated by an arrow N in Fig. 6B, the cap 31 is relatively rotated by 180 degrees with respect to the connector 1. In other words, the cap 31 is vertically flipped relative to the connector 1. In this instance, the operator is able to flip the cap 31 easily by gripping the excess part behind the connector 1 in the cap 31 with his/her fingers.

[0079] Thereby, as shown in Fig. 6C, the cap 31 is placed in the second position in which the second end edge 33b of the cap 31 is opposed to the first end surface 15 of the connector 1. In the second position, the engaging portion 37 is located in a position far spaced from the second end surface 16 of the connector 1 in the upper side of Fig. 6C, and therefore the engaging portion 37 does not engage with the sidewall 17. In other words, if the cap 31 is in the second position, the separation prevention function of the cap 31 is disabled and not implemented.

[0080] Therefore, as indicated by an arrow Q in Fig. 6D, the connector 1 exits backward from the cap 31 through the opening 35 along with the wire 90 if the cap 31 is moved forward relative to the connector 1 since the engaging portion 37 does not engage with the rear side sidewall 17 of the connector 1. In other words, the separation prevention function of the cap 31 is disabled and not implemented and therefore the cap 31 is detached from the connector 1.

[0081] Thereafter, the connector 1 detached from the cap 31 is mated with the mating connector 101 as shown in Fig. 3. Thereby, each terminal 51 of the connector 1 comes in contact with the corresponding mating terminal 151 of the mating connector 101 and then each electric wire 91 is electrically connected to the corresponding conductive trace of a board which is not shown via the corresponding terminal 51 and mating terminal 151.

[0082] In this manner, according to this embodiment, the cap 31 for covering the connector 1 is made of a flexible sheet material and has a bag-like shape with the distal end closed and the opening 35 provided at the rear end. The cap 31 is capable of changing in position between the first position which enables the separation prevention function for preventing the separation from the connector 1 and the second position which disables the separation prevention function.

[0083] Thereby, the cap 31 is easily attached to and detached from the connector 1, while not coming off the connector 1 unnecessarily in the state of being attached to the connector 1. With the cap 31 attached to the connector 1, the cap 31 is able to be easily gripped with fingers or the like. Therefore, it is possible to achieve the cap 31 which is easy to handle, high in workability, not bulky, easy to manufacture, and low in cost.

[0084] In addition, the cap 31 has the engaging portion 37 as a separation preventing portion, formed in a part of the opening 35. The engaging portion 37 prevents the connector 1 from coming off the accommodating portion 34 inside the cap 31 in the first position, and engages with the rear side sidewall 17 of the connector 1 even if the connector 1 is moved backward relative to the cap 31, and therefore the cap 31 does not come off the connector 1.

[0085] Further, the cap 31 has the first end edge 33a and the second end edge 33b extending from the distal end to the rear end at both ends in the width direction, and the engaging portion 37 is connected to the first end edge 33a at the rear end. The first end edge 33a is opposed to the first end surface 15 of the connector 1 in the first position, and the second end edge 33b is opposed to the first end surface 15 of the connector 1 in the second position. Thus, the cap 31 is placed in the second position by changing the position of the cap 31 with respect to the connector 1, which easily enables the cap 31 to be detached from the connector 1. Therefore, the cap 31 is easy to handle and has high workability.

[0086] Moreover, the accommodating portion 34 is a flat space within the cap 31, having a longitudinal dimension greater than the linear dimension of the connector 1 and having a widthwise dimension at the rear end greater than the widthwise dimension at the distal end and greater than the widthwise dimension of the connector 1. This enables the cap 31 to be easily attached to and detached from the connector 1 and enables saving in the storage space of the cap 31 since the cap 31 is not bulky. Further, the cap 31 is not bulky even in the state where the connector 1 is accommodated in the accommodating portion 34, and therefore it is possible to save the storage space of the connector 1 covered with the cap 31.

[0087] Further, the cap 31 has the pair of sidewalls 32, the first end edge 33a and the second end edge 33b connecting both end edges in the width direction of the sidewalls 32, and the front end edge 36 connecting the front end edges of the sidewalls 32. The engaging portion 37 partially connects the rear end edges of the sidewalls 32 at one end of the opening 35 and is connected to the rear end of the first end edge 33a. Thereby, in spite of having a simple shape and being easy

to manufacture, the cap 31 is easily attachable to and detachable from the connector 1 and is able to be reliably prevented from coming off the connector 1 in the first position.

[0088] Moreover, the connector 1, which is a wire connector connected to an end of the wire 90, includes the first end surface 15 which extends in the longitudinal direction and the second end surface 16 which is located on the opposite side to the first end surface 15 and into which the electric wires 91 of the wire 90 are inserted. Therefore, the cap 31 is easily attached to and detached from the connector 1 connected to the end of the wire 90, and improves the workability when the connector 1 is attached to an electrical apparatus along with the wire 90.

[0089] Further, the connector 1 includes the housing 11 mating with the mating housing 111 of the mating connector 101 and the terminals 51 fitted in the housing 11 and in contact with the mating terminals 151 fitted in the mating housing 111. The connector 1 is made of a flexible sheet material, having a bag-like shape with the distal end closed and the opening 35 provided at the rear end. Further, the cap 31 for covering the connector 1 is attached to the connector 1 so as to change in position between the first position which enables the separation prevention function for preventing the separation from the connector 1 and the second position which disables the separation prevention function. This prevents foreign substances such as dust in the air from adhering to the connector 1, and enables the cap 31 to be easily gripped when attached to the connector 1. Therefore, the cap 31 is easily handled, thus improving the workability.

[0090] Further, in a method of using the cap 31 for covering the connector 1, the cap 31 is made of a flexible sheet material, having a bag-like shape with the distal end closed and the opening 35 provided at the rear end. Further, in the state that the cap 31 is attached to the connector 1, the cap 31 is placed in the first position which enables the separation prevention function for preventing separation from the connector 1. To detach the cap 31 from the connector 1, the cap 31 is placed in the second position which disables the separation prevention function.

[0091] Thereby, while the cap 31 can be easily attached to and detached from the connector 1, the cap 31 does not come off the connector 1 unnecessarily. In addition, the cap 31 is able to be easily gripped with fingers or the like in the state where the cap 31 is attached to the connector 1 and easily handled, thereby improving the workability.

[0092] While a preferred embodiment of the Present Application is shown and described, it is envisioned that those skilled in the art may devise various modifications without departing from the spirit and scope of the foregoing Description and the appended Claims.

CLAIMS**WHAT IS CLAIMED IS:**

1. A cap (31) for covering a connector (1), wherein:
the cap (31) is made of a flexible sheet material;
the cap (31) has a bag-like shape with a distal end closed and an opening (35) provided at a rear end; and
the cap (31) is capable of changing in position between a first position which enables a separation prevention function for preventing separation from the connector (1) and a second position which disables the separation prevention function.
2. The cap (31) OF claim 1, having a separation preventing portion (37) formed in a part of the opening (35), wherein the separation preventing portion (37) prevents the connector (1) from coming off an accommodating portion (34) in the cap (31) in the first position.
3. The cap (31) of Claim 2, having a first end edge (33a) and a second end edge (33b) extending from the distal end to the rear end at both ends in a width direction, wherein:
the separation preventing portion (37) connects to the first end edge (33a) at the rear end;
the first end edge (33a) is opposed to a first end surface (15) of the connector (1) in the first position; and
the second end edge (33b) is opposed to the first end surface (15) of the connector (1) in the second position.
4. The cap (31) of Claim 3, wherein the accommodating portion (34) is a flat space within the cap (31), having a longitudinal dimension greater than a linear dimension of the connector (1) and having a widthwise dimension at the rear end greater than a widthwise dimension at the distal end and greater than a widthwise dimension of the connector (1).

5. The cap (31) of Claim 4, having a pair of sidewalls (32), a first end edge (33a) and a second end edge (33b) connecting both end edges in a width direction of the sidewalls (32), and a front end edge (36) connecting front end edges of the sidewalls (32);

wherein the separation preventing portion (37) partially connects the rear end edges of the sidewalls (32) at one end of the opening (35) and is connected to the rear end of the first end edge (33a).

6. The cap (31) of Claim 5, wherein the connector (1) is a wire connector connected to an end of a wire (90), including a first end surface (15) which extends in a longitudinal direction and a second end surface (16) which is located on the opposite side to the first end surface (15) and into which an electric wire (91) of the wire (90) is inserted.

7. The cap (31) of Claim 1, wherein the connector (1) is a wire connector connected to an end of a wire (90), including a first end surface (15) which extends in a longitudinal direction and a second end surface (16) which is located on the opposite side to the first end surface (15) and into which an electric wire (91) of the wire (90) is inserted.

8. The cap (31) of Claim 2, wherein the accommodating portion (34) is a flat space within the cap (31), having a longitudinal dimension greater than a linear dimension of the connector (1) and having a widthwise dimension at the rear end greater than a widthwise dimension at the distal end and greater than a widthwise dimension of the connector (1).

9. The cap (31) of Claim 8, wherein the connector (1) is a wire connector connected to an end of a wire (90), including a first end surface (15) which extends in a longitudinal direction and a second end surface (16) which is located on the opposite side to the first end surface (15) and into which an electric wire (91) of the wire (90) is inserted.

10. The cap (31) of Claim 8, having a pair of sidewalls (32), a first end edge (33a) and a second end edge (33b) connecting both end edges in a width direction of the sidewalls (32), and a front end edge (36) connecting front end edges of the sidewalls (32);

wherein the separation preventing portion (37) partially connects the rear end edges of the sidewalls (32) at one end of the opening (35) and is connected to the rear end of the first end edge (33a).

11. The cap (31) of Claim 10, wherein the connector (1) is a wire connector connected to an end of a wire (90), including a first end surface (15) which extends in a longitudinal direction and a second end surface (16) which is located on the opposite side to the first end surface (15) and into which an electric wire (91) of the wire (90) is inserted.

12. The cap (31) of Claim 3, having a pair of sidewalls (32), a first end edge (33a) and a second end edge (33b) connecting both end edges in a width direction of the sidewalls (32), and a front end edge (36) connecting front end edges of the sidewalls (32);

wherein the separation preventing portion (37) partially connects the rear end edges of the sidewalls (32) at one end of the opening (35) and is connected to the rear end of the first end edge (33a).

13. The cap (31) of Claim 12, wherein the connector (1) is a wire connector connected to an end of a wire (90), including a first end surface (15) which extends in a longitudinal direction and a second end surface (16) which is located on the opposite side to the first end surface (15) and into which an electric wire (91) of the wire (90) is inserted.

14. The cap (31) of Claim 2, wherein the connector (1) is a wire connector connected to an end of a wire (90), including a first end surface (15) which extends in a longitudinal direction and a second end surface (16) which is located on the opposite side to the first end surface (15) and into which an electric wire (91) of the wire (90) is inserted.

15. The cap (31) of Claim 3, having a pair of sidewalls (32), a first end edge (33a) and a second end edge (33b) connecting both end edges in a width direction of the sidewalls (32), and a front end edge (36) connecting front end edges of the sidewalls (32);

wherein the separation preventing portion (37) partially connects the rear end edges of the sidewalls (32) at one end of the opening (35) and is connected to the rear end of the first end edge (33a).

16. The cap (31) of Claim 15, wherein the connector (1) is a wire connector connected to an end of a wire (90), including a first end surface (15) which extends in a longitudinal direction and a second end surface (16) which is located on the opposite side to the first end surface (15) and into which an electric wire (91) of the wire (90) is inserted.

17. The cap (31) of Claim 3, wherein the connector (1) is a wire connector connected to an end of a wire (90), including a first end surface (15) which extends in a longitudinal direction and a second end surface (16) which is located on the opposite side to the first end surface (15) and into which an electric wire (91) of the wire (90) is inserted.

18. The cap (31) of Claim 4, wherein the connector (1) is a wire connector connected to an end of a wire (90), including a first end surface (15) which extends in a longitudinal direction and a second end surface (16) which is located on the opposite side to the first end surface (15) and into which an electric wire (91) of the wire (90) is inserted.

19. A connector (1) comprising:
a housing (11) mating with a mating housing (111) of a mating connector (101);
and

a terminal (51) which is fitted in the housing (11) and comes in contact with a mating terminal (151) fitted in the mating housing (111);

wherein a cap (31) for covering the connector (1), which is made of a flexible sheet material and has a bag-like shape with a distal end closed and an opening (35) provided at a rear end, is attached to the connector (1) so as to be able to change in position between a first position which enables a separation prevention function for preventing separation from the connector (1) and a second position which disables the separation prevention function.

20. A method of using a cap (31) for covering a connector (1), wherein:

the cap (31) is made of a flexible sheet material, having a bag-like shape with a distal end closed and an opening (35) provided at a rear end;

the cap (31) is placed in a first position which enables a separation prevention function for preventing separation from the connector (1) in a state where the cap (31) is attached to the connector(1); and

the cap (31) is placed in a second position which disables the separation prevention function to detach the cap (31) from the connector (1).

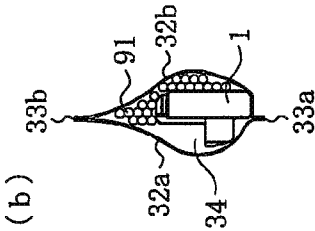
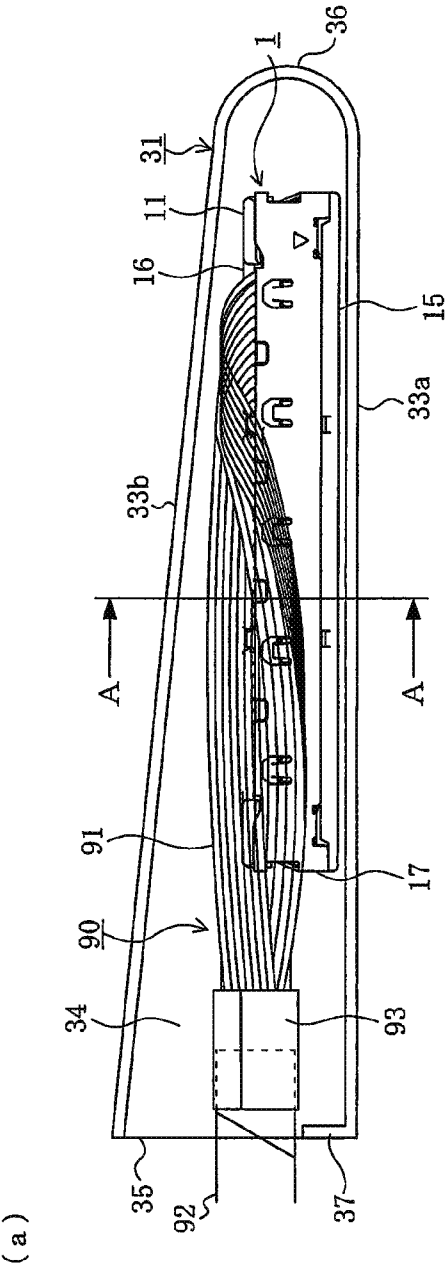
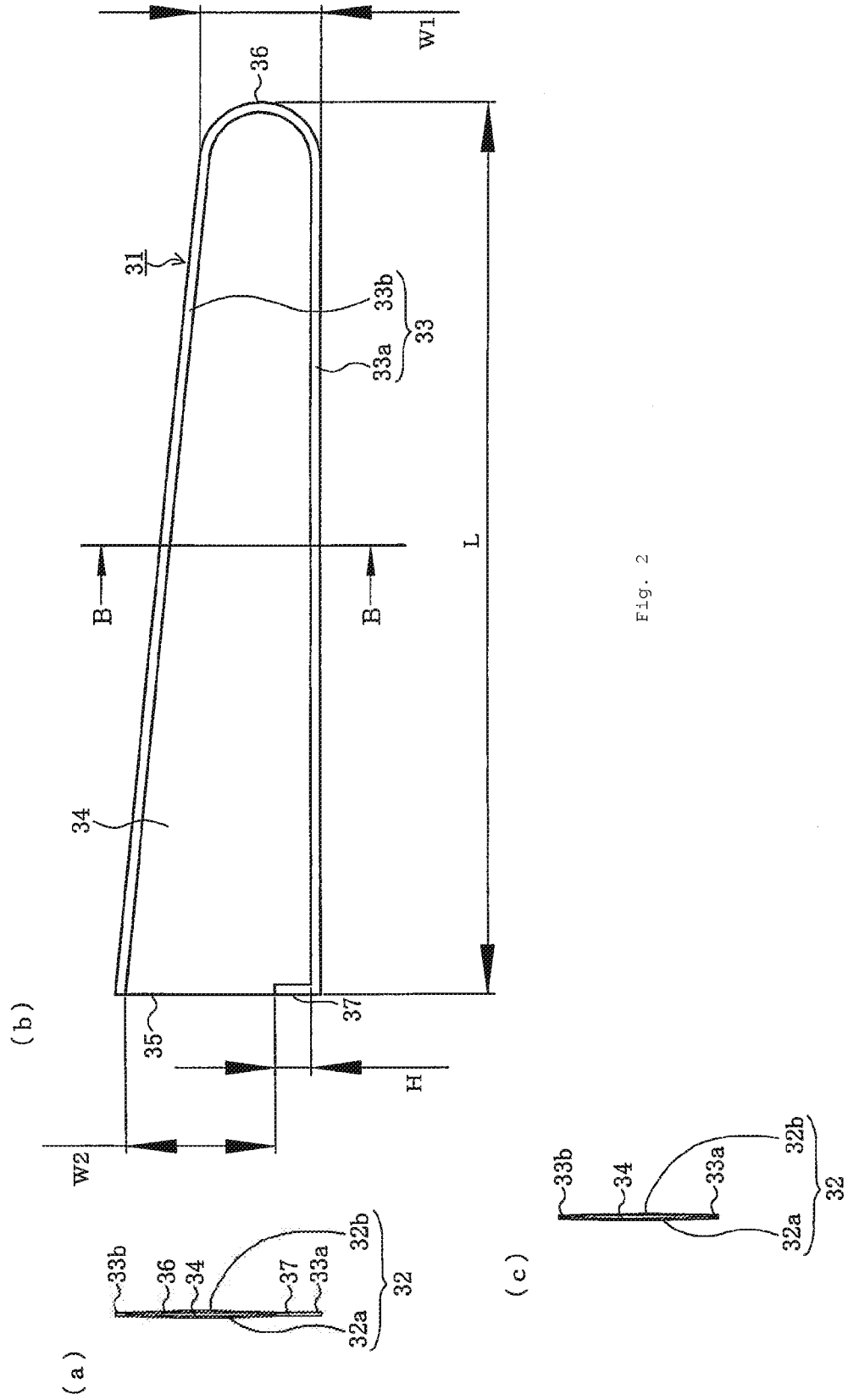


Fig. 1



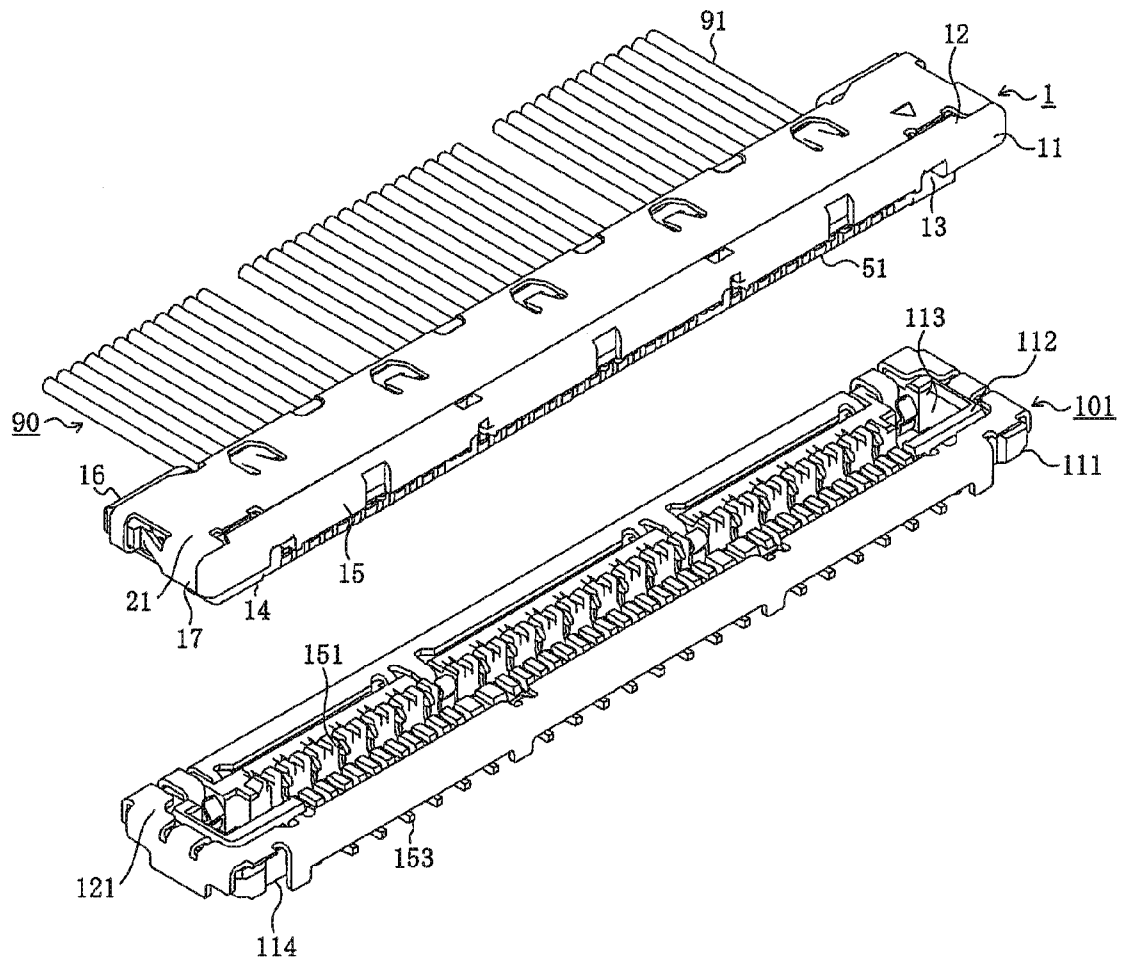
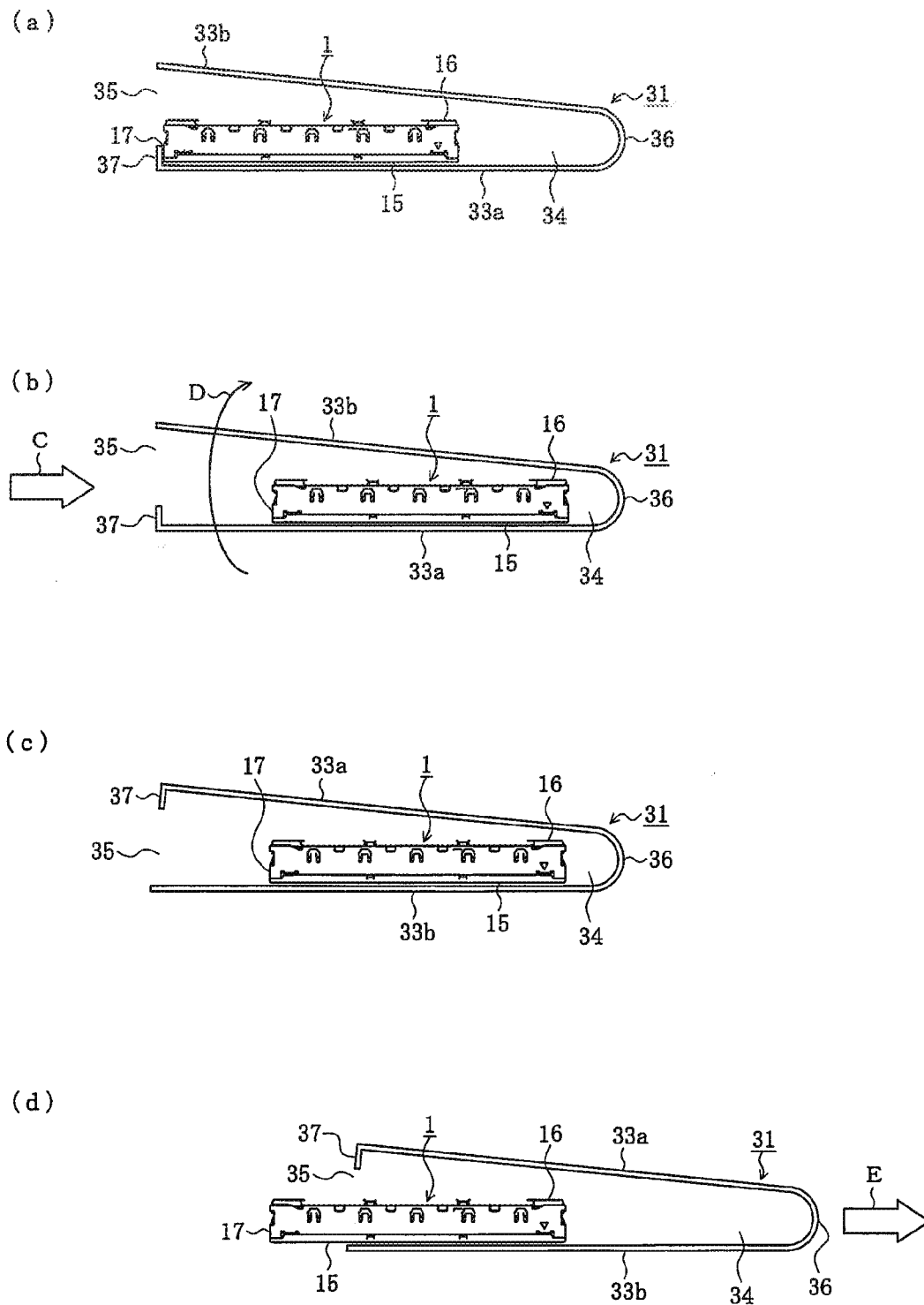


Fig. 3



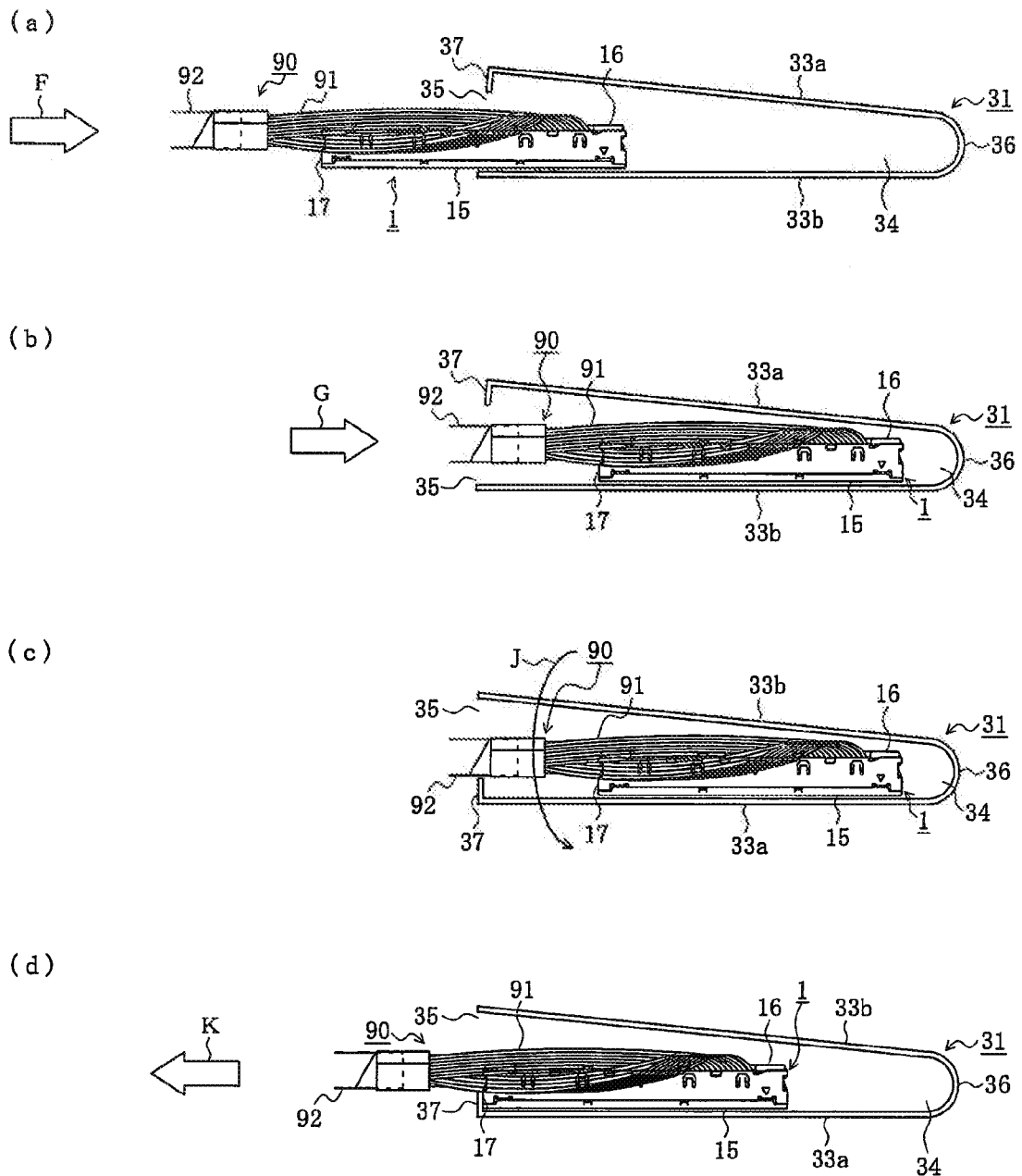


Fig. 5

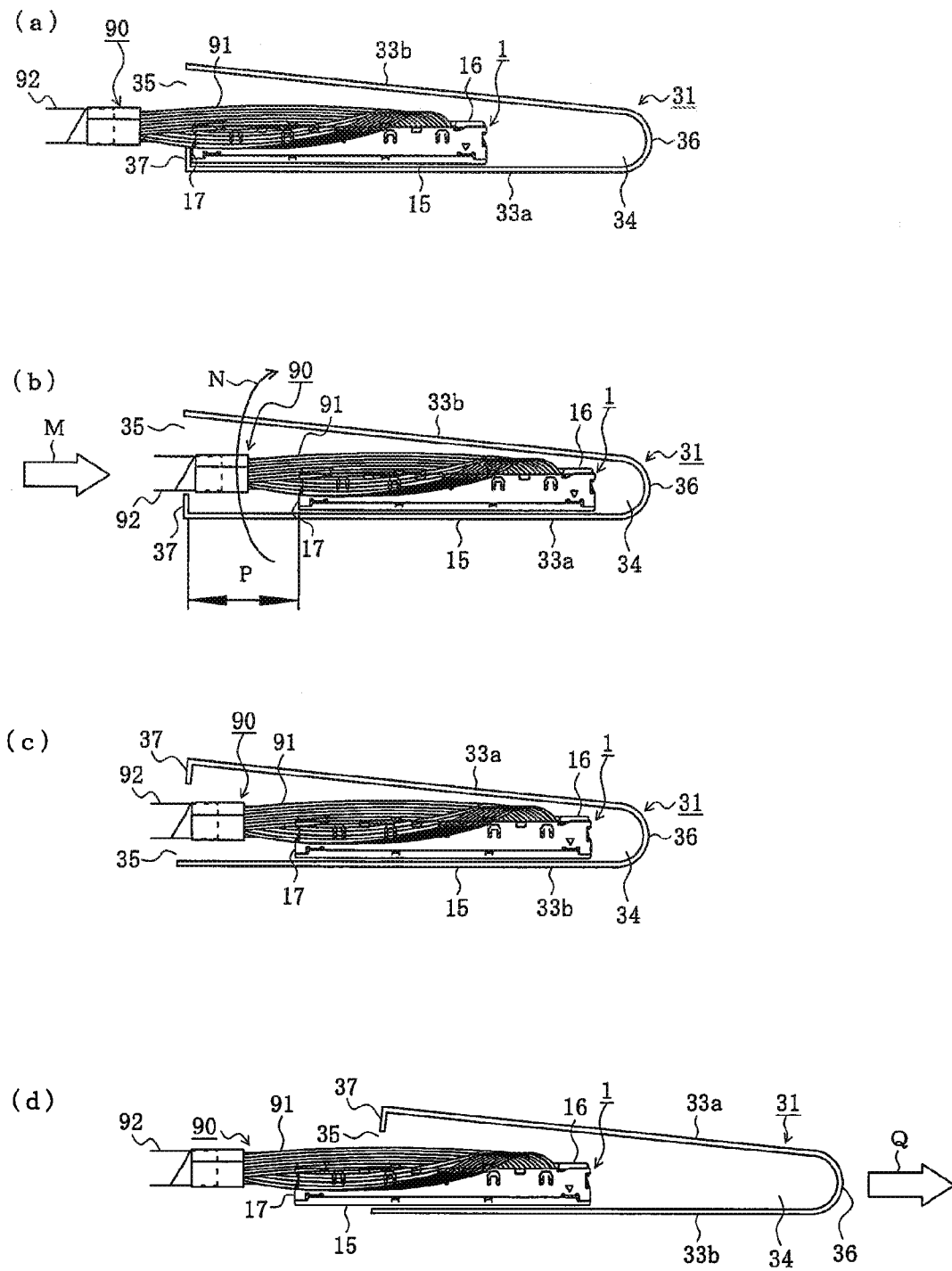
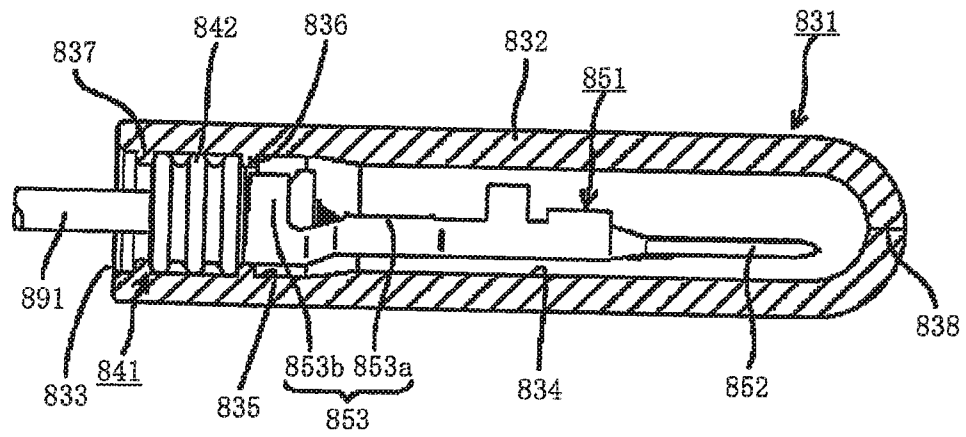


Fig. 6



Prior art

Fig. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2010/050423

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

H01R 4/22 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Epodoc and wpi, Google Patents, Esp@ceNet: Keywords- (electric, connector, cap, flexible, separate, prevent, plurality, wire) and similar terms

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 08-130043 A (SUMITOMO WIRING SYST LTD.) 21 May 1996. English abstract retrieved from EPODOC database (Abstract)	1, 19-20
A	US 5588853 A (ANTHONY) 31 December 1996 (Abstract)	
A	US 7267571 B1 (TWIGG et al.) 11 September 2007 (Abstract)	



Further documents are listed in the continuation of Box C



See patent family annex

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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Date of the actual completion of the international search

10 December 2010

Date of mailing of the international search report

- 4 JAN 2011

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2010/050423

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report			Patent Family Member					
JP	8130043	NONE						
US	5588853	CA	2175425					
US	7267571	CA	2668271	CN	101536256	EP	2089935	
		KR	20090077060	MX	2009004569	WO	2008054966	
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.								
END OF ANNEX								