

WIRE-CONNECTING TERMINAL CONNECTOR AND SWITCHING DEVICE FOR WIRING ACCESSORY

TECHNICAL FIELD

The present invention relates to a connector and a switching device that includes a terminal for connecting a wire and that is used for a wiring accessory, such as a switch or a receptacle.

BACKGROUND ART

Conventionally as shown in Fig. 15, a wire-connecting terminal connector (which is a so-called "pillar terminal", and which hereinbelow will be simply referred to as a "connector") is configured of a terminal section 16 and a terminal screw 6, wherein the terminal section 16 is constituted of a wire-holding terminal plate 14 and a terminal plate 15. As shown in Fig. 16, a plate is bent in such a manner as to substantially form a letter "U" in a plain cross sectional view, thereby forming a wire-holding terminal plate 14 on an inner face of a central portion thereof. The wire-holding section 14 holds a core 8a of a wire 8 in a space formed with an end portion of the terminal screw 6 engagingly inserted into a threaded hole 17 of a bent-down portion of the terminal plate 15. In addition, insertion holes 14b are formed to receive projections 18 provided on a sidewall of the terminal plate 15.

As shown in Fig. 17, the terminal plate 15 is formed in a manner wherein the threaded hole 17 is provided in a central portion thereof, and the aforementioned plurality of projections 18 are formed on two side ends in the

longitudinal direction to protrude in the width direction. In addition, a stopper portion 19 is formed integrally with the terminal plate 15, upon which the end of the core 8a of the wire 8 abuts when the wire 8 is inserted toward an upper end portion of the terminal plate 15. A terminal portion is integrally formed in an end portion of the stopper portion 19, and a fixed contact 20 to be used for a switch is formed on an outer surface of the stopper portion 19.

The terminal section 16 is formed by coupling the wire-holding terminal plate 14 and the terminal plate 15 together according to a procedure illustrated in Fig. 18. Specifically, as shown in 18(a), prior to the coupling, two end portions of the wire-holding terminal plate 14 are widely spaced from each other. In this state, the projection 18 of the terminal plate 15 shown in Fig. 18(b) is inserted into the one-side insertion hole 14b, and the opposite end portion is closed. Then, as shown in Fig. 18(c), the projection 18 is inserted into the insertion hole 14b of the end portion, and caulking is performed for the projections 18 of two sides. Thereby, the wire-holding terminal plate 14 and the terminal plate 15 are fixedly coupled. According to the aforementioned coupling, the terminal section 19 is completed, as shown in Fig. 16. In this state, the terminal screw 6 is engagingly inserted into the threaded hole 17; and thereby, coupling can be achieved.

However, the above conventional example of the connector arises a problem in that since the terminal plate 15 is inserted into the wire-holding terminal plate 14, and caulking is performed. Therefore, work steps and assembly costs are thereby increased. Another problem is that, while the normal condition is as shown in Fig. 15, when the wire 8 is inserted by exerting a force, as shown in Fig. 20, the stopper portion 19 is pressed to the extent of causing deformation by the end of a core 8a of the wire 8; and as a result, deviation is

caused in the position of the contact 20.

DISCLOSURE OF INVENTION

The present invention is made in view of the above-described problems. Accordingly, an object of the present invention is to provide a wire-connecting terminal connector that does not cause the deviation in a terminal portion during wire insertion, and in addition, that allows reduction in assembly steps and production costs to be implemented.

In order to achieve the above object, the present invention is characterized that, a connector to be used with a wiring accessory and having a wire-connecting terminal, by comprising a terminal screw; a first terminal plate formed to include a central portion formed to have a substantially U-shaped plan cross section, bilateral portions thereof, and a terminal portion integrally formed to continue outwardly from the central portion, wherein an opening is formed between ends of the bilateral portions; and a second terminal plate formed to include a stopper portion and a bent-down portion, wherein the stopper portion is formed to extend between upper end portions of the bilateral portions of the first terminal plate and upon which the end of a wire is brought to about, and the bent-down portion is integrally formed to be pendent along the opening of the first terminal plate from one end of the stopper portion and to have a threaded hole into which the terminal screw is engagingly inserted. In addition, a wire insertion entry for inserting the wire is formed by being surrounded by lower ends of the bilateral portions of the first terminal plate and the lower end of the bent-down portion of the second

terminal plate. The wire inserted from the wire insertion entry is held between an inner surface of the central portion and the end of the terminal screw engagingly inserted from the threaded hole.

According to the above-described present invention, the first terminal plate and the second terminal plate can be coupled without performing caulking. This simplifies the assembly, thereby allowing reduction in assembly time and costs to be implemented. Furthermore, since the stopper portion and the terminal portion are provided in the separate members, even when the stopper portion is deformed during the insertion of the wire, no deviations occur in positions of the terminal portion. Thus, the contact position and the power connection position do not deviate even if the contact terminal portion and the power terminal portion are constituted by this terminal portion.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an exploded perspective view of a wire-connecting terminal connector according to a first embodiment of the present invention;

Fig. 2 is an explanatory assembly view of the above;

Fig. 3 is an explanatory assembly view of the above;

Fig. 4 is a use-state view of the above;

Fig. 5 is a cross-sectional view of the above, wherein a wire insertion entry is partly omitted;

Fig. 6 is a partly-omitted exploded perspective view showing a state wherein the above is assembled into a wiring-accessory body;

Fig. 7 is a partly-omitted top view showing a state where the above is

stowed in the wiring-accessory body;

Fig. 8(a) is a top view of a terminal plate according to a second embodiment which is used in the above, and Fig. 8(b) is a side view thereof;

Fig. 9(a) is a top view of a terminal plate according to a third embodiment which is used in the above, and Fig. 9(b) is a side view thereof;

Fig. 10(a) is a top view of a terminal plate according to a fourth embodiment which is used in the above, and Fig. 10(b) is a side view thereof;

Fig. 11(a) is a plan view of a common terminal plate according to a fifth embodiment which is used in the above, Fig. 11(b) is a side view thereof, and Fig. 11(c) is a top view thereof;

Fig. 12 is a side view of a terminal section using the aforementioned common terminal plate;

Fig. 13 is an exploded perspective view of a wiring accessory to which the connector of the first embodiment is adapted;

Fig. 14 is a cross-sectional view of the aforementioned wiring accessory;

Fig. 15 is a side view showing a use state a conventional example connector;

Fig. 16(a) is a side view of a wire-holding terminal plate used in the above, and Fig. 16(b) is a cross-sectional view thereof;

Fig. 17(a) is a plan view of a terminal plate used in the above, and Fig. 17(b) is a side view thereof;

Fig. 18 is an explanatory view of assembly steps for the above;

Fig. 19(a) is a plan view of the above, and Fig. 19(b) is a side view thereof;
and

Fig. 20 is a side view used to explain problems with the above.

BEST MODE FOR CARRYING OUT THE INVENTION

Hereinbelow, embodiments will be described with reference to the drawings to set out the best mode of the present invention.

(FIRST EMBODIMENT)

As shown in Fig. 1, a connector (pillar terminal) of a first present embodiment is configured of a common terminal plate 1 in common among a power terminal and a contact terminal plate; a terminal plate 2 for a contact terminal, which is formed according to the present embodiment; and a terminal screw 6. The common terminal plate 1 is formed by bending a plate with a right angle. The one-side portion of the common terminal plate 1 is used to form a stopper portion 3 that abuts the end of a core 8a of a wire 8 (shown in Fig. 4), and the other portion is used to form a bent-down portion 4 having a threaded hole 10 formed in a central portion according to a counter sinking method. The stopper portion 3 is formed to have projection portions 3a at end portions, and the projection portions 3a projects in the width direction thereof. The bent-down portion 4 is formed to have engagement portions 4a projecting in the lateral directions.

The terminal plate 2 is formed by bending a plate so that a plan section thereof has substantially the shape of a letter "U". Projected portions 5 are formed to forwardly project on the lower portions of the bilateral portion 2b. In upper end portions of the projected portions 5, there are formed insertion cutouts 5a that allow the insertion of lower ends of the engagement portions 4a provided on the bent-down portion of the common terminal plate 1. In addition, indented portions 2c upwardly opening are individually formed on upper end portions of

bilateral portions 2b and 2b; a terminal portion 7 having the shape of a reversed letter "L" is integrally formed from an upper end portion of a central portion 2a; and a fixed contact 7a for a switch is provided on an outer surface of an end vertical portion.

The terminal plate 1 and the terminal plate 2, which constitute the connector of the present embodiment, are connected as follows. As shown in Figs. 2(a) and 2(b) or Figs. 3(a) and 3(b), lower ends of the engagement portions 4a formed in the bent-down portion 4 of the terminal plate 1 are inserted into the insertion cutouts 5a formed on upper end portions of the projected portions 5 formed to project in the lower portions of the bilateral portions 2b of the terminal plate 2. The stopper portion 3 of the terminal plate 1 is mounted so as to extend between the bilateral portions 2b and 2b of the terminal plate 2 in the following manner. The projection portions 3a formed on the two side ends of the stopper portion 3 of the terminal plate 1 are engaged with in the indented portions 2c, the bent-down portion 4 is lowered along front end faces of the bilateral portions 2b and 2b of the terminal plate 2, and the lower ends of the projected portions 5 are fitted into the insertion cutouts 5a. Concaved portions 2d individually formed between upper portions and lower portions of the bilateral portions 2b and 2b work as escape portions for counter sinking.

In this way, a terminal section 12 is completed according to the common terminal plate 1 and the terminal plate 2, and a wire insertion entry 12a is opened in a lower end portion thereof. Then, the terminal screw 6 is engagingly inserted into the threaded hole 10 of the common terminal plate 1. Thereby, and the connector is completed.

As described above, the terminal section 12 can be assembled only by

conducting the following two steps at the same time: one of the steps is the insertion of the engagement portions 4a, which are formed in bent-down portion 4 of the common terminal plate 1, into the insertion cutouts 5a of the projected portions 5 formed on the terminal plate 2, and the other steps is the insertion of the projection portions 3a, which are formed in the stopper portion 3 of the common terminal plate 1, into the indented portions 2c provided in the upper end portions of the bilateral portions 2b of the terminal plate 2. Thus, the assembly does not require caulking to be performed, therefore providing an advantage in the reduction of the assembly costs.

As shown in Fig. 4, the core 8a of the wire 8 is inserted from the wire insertion entry 12a provided in the terminal section 12, the core 8a is then inserted between the end of the terminal screw 6 and an inner surface of the central portion 2a of the terminal plate 2, and subsequently, the terminal screw 6 is tightened. In this way, the core 8a is held between the inner surface of the central portion 2a and the end of the terminal screw 6; that is, the core 8a of the wire 8 is mechanically held, and concurrently, is electrically connected. In this case, even when the stopper portion 3 of the common terminal plate 1 is pushed up by the end of the core 8a of the wire 8 and is thereby deformed as shown by dotted lines in the figure, the terminal portion 7 of the terminal plate 2 is not deformed. Therefore, the position of the fixed contact 7a is not changed.

As shown in Fig. 5, chamfering 12b is performed for an inner surface of an opening of the wire insertion entry 12a provided to open at one end of the terminal section 12. Therefore, even when the wire 8 is rotated and moved, the core 8a is not easily damaged.

In addition, the threaded hole 10 is formed with a countersink to extend in

the internal direction of the terminal section 12, that is, toward the reverse surface of the bent-down portion 4 of the common terminal plate 1. Therefore, the screw stroke can be lengthened without changing the protrusion of the terminal screw 6.

Furthermore, abutting between the indented portions 2c and the stopper portion 3 that abuts the indented portions 2c, and insertion between the engagement portions 4a and the insertion cutouts 5a in which the engagement portions 4a are inserted individually function to preserve stresses developed according to screw tightening torques in the case of tightening the terminal screw 6. This arrangement is advantageous in that the wire 8 can be held only by the terminal section 12.

To equip the connector of the present embodiment with a wiring accessory, for example, as shown in Figs. 6 and 7, the grooved portions 13a and 13a opposing each other for slide-inserting projection ends 4e of the engagement portions 4a, which are formed in the bent-down portion 4 of the common terminal plate 1, are formed on two-side inner surfaces of a stowing concave portion 13 of a wiring-accessory body 11. In this configuration, the projection ends 4e function as stress stoppers for stresses generated according to tightening torques in the case of tightening the terminal screw 6. Therefore, deformation of the terminal plates 1 and 2 at the terminal section 12 can be further reduced by the wiring-accessory body 11.

(SECOND EMBODIMENT)

Fig. 8 shows a second embodiment. In the second embodiment, a connector in which the position of the fixed contact 7a is different from the above by can be configured by combining the common terminal plate 1 and a terminal

plate 2 as follows. The terminal plate 2 is formed such that a terminal portion 7 is formed of a planar portion outwardly extending from an upper end portion thereof and a vertical portion integrally extending from the end of the planar portion in the lateral directions, and a fixed contact 7a is provided on an outer surface of an end portion of the vertical portion.

(THIRD EMBODIMENT)

Fig. 9 shows a third embodiment. Similarly to the above, in the third embodiment, a connector in which the position of the fixed contact 7c is different from those of the above-described connectors can be configured by combining the common terminal plate 1 and a terminal plate 2 as follows. The terminal plate 2 is formed such that a terminal portion 7 is formed of a long and planar portion outwardly extending from an upper end portion thereof and a vertical portion integrally extending from the end of the planar portion in the lateral directions, and a fixed contact 7c is provided on an inner surface of an end portion of the vertical portion.

(FOURTH EMBODIMENT)

Fig. 10 shows a fourth embodiment. Each of the above-described connectors is formed by combining the terminal plate 2 having the fixed contact with the common terminal plate 1. According to the fourth embodiment, a terminal plate 2 described below is combined with the common terminal plate 1 to thereby enable a connector having a power terminal to be configured. As shown in Fig. 10, the terminal plate 2 is formed such that a contact portion 7a' having a mountain-like shape upwardly protruding is formed at the edge of a terminal portion 7 that integrally extends outwardly from a lower end portion of a central portion 2a. The terminal plate 2 serves as a power terminal plate.

(FIFTH EMBODIMENT)

For the common terminal plate 1, as shown in Fig. 11, a common terminal plate having a diagonally formed one-end side of projection portions 3a may be used. Basically, however, various types of connectors can be realized according to the combination of the common terminal plate 1 with the terminal plate 2.

In addition, as shown in Fig. 12, the threaded hole 10 to be provided around the center of the bent-down portion 4 of the common terminal plate 1 may be formed of a hole section that is formed with a countersink 9 so as to project in the obverse direction of a bent-down portion 4. The provision of the countersink produces an advantage in that the amount of screw engagement between the terminal screw 6 and the threaded hole 10 is increased. That is, the stroke of the terminal screw can be lengthened without changing the protrusion of the terminal screw.

As described above, according to the present invention, a first terminal plate and a second terminal plate can be coupled together through the insertion, and different from the conventional case, the assembly does not require caulking to be performed. Thereby, the assembly is facilitated, and the assembly time and costs can be reduced.

The individual constructions of the first terminal plate 2 and the second terminal plate 1 and the coupling configuration may be modified as follows. For example, in Fig. 1, the first terminal plate 2 may be formed of a base portion and a terminal portion 7, wherein the base portion has a plan cross section substantially U-shaped with the front opening, and the terminal portion 7 is continually and integrally formed rearwardly from the base portion. In this case, the second terminal plate 1 is made of a member disposed to cover the front opening of the

first terminal plate 2, wherein an upper end portion thereof is held between upper end portions of the base portion of the first terminal plate 2, and a lower end portion is held between lower end portions of the base portion of the first terminal plate 2.

(EXAMPLE APPLICATION TO A SWITCHING DEVICE)

Fig. 13 shows a wiring accessory employing the connectors according to the first and fourth embodiments. Fig. 14 shows a cross sectional configuration of the aforementioned accessory. The wiring accessory illustrated in these figures is a switching device. The switching device has a contact terminal connector A as shown in the first embodiment, a terminal connector B as shown in the fourth embodiment, and an on/off element C that can be actuated through user operations. The connectors and element are stowed in a stowing concave portion 13 of a wiring-accessory body 11. The switching device is used to perform on/off operations of a circuit. The connectors A and B each have a terminal that is connected to the wire inserted from a lower portion, when viewed in the drawing, of the wiring-accessory body 11. The on/off element C has a movable contact that is connected to and/or disconnected from the terminal of the contact terminal connector A; and it is always connected to the terminal connector B. The on/off element C is operated through a reversing handle 31 that can perform seesaw-like operations and a coil spring 32. The wiring-accessory body 11 is coupled to a cover 33 from an upper portion.

As shown in Fig. 14, when the reversing handle 31 is operated to be in a slanted state, the movable contact contacts the contact of the connector A, and the switch is thereby closed. When the reversing handle 31 is returned to the original state, the on/off element C is also returned to the original state, wherein

the movable contact is disconnected from the contact of the contact terminal connector A, and the switch is thereby opened.

The above-described switching device performs on/off operations for one circuit, but a switching device can also be configured to perform on/off operations for three circuits. In this case, it is configured to use two contact terminal connectors A, one terminal connector B and one on/off element C. For two contact terminal connectors A, connectors as shown in the first and third embodiments are used. The on/off element C is operated to move between these contacts of the connectors, thereby performing switching operations for the circuits.

The present invention is not restricted to the configurations of above-described embodiments, but various other modifications may be implemented as long as they do not depart from the scope of the invention, and the invention includes the modifications.

CLAIMS



1. A connector to be used with a wiring accessory and having a wire-connecting terminal, comprising:

a terminal screw;

a first terminal plate formed to include a central portion formed to have a substantially U-shaped plan cross section, bilateral portions thereof, and a terminal portion integrally formed to continue outwardly from said central portion, wherein an opening is formed between ends of said bilateral portions; and

a second terminal plate formed to include a stopper portion and a bent-down portion, wherein said stopper portion is formed to extend between upper end portions of said bilateral portions of said first terminal plate and upon which the end of a wire is brought to abut, and said bent-down portion is integrally formed to be pendent along said opening of said first terminal plate from one end of said stopper portion and to have a threaded hole into which said terminal screw is engagingly inserted,

wherein the connector;

a wire insertion entry for inserting said wire is formed by being surrounded by lower ends of said bilateral portions of said first terminal plate and the lower end of said bent-down portion of the second terminal plate, and

said wire inserted from said wire insertion entry is held between an inner surface of said central portion and the end of said terminal screw engagingly inserted from said threaded hole.

2. The connector as set forth in claim 1, characterized in that,



said bent-down portion of said second terminal plate comprises engagement portions at two side ends thereof so as to project in the width direction;

said bilateral portions of said first terminal plate comprises projected portions in front-end lower portions thereof so as to project in the front direction, and insertion cutouts formed at upper ends of said projected portions; and

said bent-down portion of said second terminal plate and said bilateral portions of said first terminal plate are held by inserting lower ends of said engagement portions into said insertion cutouts.

3. The connector as set forth in claim 2, characterized in that,

said engagement portions of said second terminal plate comprise projected ends projecting outward from said insertion cutouts of said first terminal plate;

a body of a wiring accessory comprise a concave portion for stowing said connector, and guide grooves formed on opposite to two-side inner surfaces of the concave portion; and

said connector is held in said wiring accessory by inserting said projected ends into said guide grooves from an upper portion.

4. The connector as set forth in any of claims 1 to 3 characterized in that, said threaded hole is formed with a countersink.

5. The connector as set forth in any of claims 1 to 3 characterized in that,

said stopper portion of said second terminal plate comprises projected portions projecting at two side ends thereof in the width direction,



said bilateral portions of said first terminal plate provided with indented portions on its upper ends, and

said stopper portion is set to extend between said bilateral portions by setting said projected portions to engage with said indented portions.

6. The connector as set forth in claim 5, characterized in that, a stopper for a stress generated according to tightening torque of said terminal screw, is formed by inserting lower ends of said engagement portions into said insertion cutouts, and by engaging said projected portions with said indented portions.

7. The connector as set forth in any of claims 1 to 3 characterized in that, the projected ends of said second terminal plate, which are inserted into said guide grooves, serve as a stopper for a stress generated according to tightening torque of said terminal screw.

8. The connector as set forth in any of claims 1 to 3 characterized in that, opening inner periphery of said wire insertion entry is chamfered.

9. The connector as set forth in any of claims 1 to 3 characterized in that, a fixed contact is provided on the terminal portion of said first terminal plate, and

a movable contact movable by a user operation is provided in said body of the wiring accessory opposite to said fixed contact.



10. The connector as set forth in claim 9, characterized in that, said fixed contact is provided at the end extending outwardly of said terminal portion, and the extension length of said terminal portion depends on specifications.

11. A connector to be used with a wiring accessory and having a wire-connecting terminal, comprising:

a terminal screw;

a first terminal plate formed to include a base portion formed to have a substantially U-shaped plan cross section and to have a front opening, and a terminal portion integrally formed to continue rearwardly from said base portion; and

a second terminal plate which is disposed so as to close said front opening of said first terminal plate, of which an upper end portion is held between upper end portions of said base portion of said first terminal plate, of which a lower end portion is held between lower end portions of said base portion of said first terminal plate, and which has a threaded hole in the front for engagingly inserting said terminal screw,

wherein the connector;

a wire insertion entry for inserting the wire is formed of an opening portion surrounded by lower ends of said base portion of said first terminal plate and the lower end of said second terminal plate, and

said wire inserted from said wire insertion entry is held between an inner surface of said base portion and the end of said terminal screw engagingly inserted from said threaded hole.



12. The connector as set forth in claim 11, characterized in that,
a fixed contact is provided on the terminal portion of said first terminal
plate, and

a movable contact movable by a user operation is provided in a body of a
wiring accessory opposite to said fixed contact.

13. A switching device, comprising,
a body;
at least two connectors having wire-connecting terminals in the body; and
a terminal having a movable contact that can be moved through a user
operation, that is connected to or disconnects from one of wire-connecting
terminals, and that is always connected the other one of wire-connecting
terminals,

in which each of said connectors, further comprising:

a terminal screw;

a first terminal plate formed to include a base portion formed to have a
substantially U-shaped plan cross section and to have a front opening, and a
terminal portion integrally formed to continue rearwardly from said base portion;
and

a second terminal plate which is disposed so as to close said front opening
of said first terminal plate, of which an upper end portion is held between upper
end portions of the base portion of said first terminal plate, of which a lower end
portion is held between lower end portions of the base portion of said first terminal
plate, and which has a threaded hole in the front for engagingly inserting said



terminal screw,

wherein the connectors;

a wire insertion entry for inserting the wire is formed of an opening portion surrounded by lower ends of the base portion of said first terminal plate and the lower end of said second terminal plate, and

said wire inserted from said wire insertion entry is held between an inner surface of said base portion and the end of said terminal screw engagingly inserted from said threaded hole.