

## SWITCH HAVING TERMINALS FOR HOLDING ELECTRIC WIRES

### BACKGROUND OF THE INVENTION

The present invention relates to a switch having terminals for holding electric wires.

Conventionally, in switches, sockets and other wiring devices or lighting devices, terminal devices known as quick coupling terminals have been widely used for connecting electric wires connected to the casing through wire holes provided in the casing. For example, a switch shown in Fig. 42 comprises a terminal plate 3 accommodated in a casing 1 and contacting with an electric wire 2 provided in the casing 1 through a wire hole 12, and a locking spring 4 for holding the electric wire 2 together with the terminal plate 3. The locking spring 4 is a flat spring, and it is designed to hold the electric wire 2 by gripping the electric wire 2 between a contact piece 4a and locking piece 4b provided in the locking spring 4 and the terminal plate 3. That is, when the electric wire 2 is guided into the casing 1 through the wire hole 12 provided in the casing 1, the electric wire 2 deflects the contact piece 4a and the locking piece 4b in a direction away from the terminal plate 3, and the electric wire 2 is gripped between the terminal plate 3 and the locking piece 4b by the spring force created between the contact piece 4a and locking piece 4b. With the electric wire 2 being gripped between the terminal plate 3 and the contact piece 4a and locking piece 4b, edges of the contact piece 4a and locking piece 4b elastically contact with

the electric wire 2, and the locking piece 4b bites into part of the electric wire 2, so that the electric wire 2 is prevented from being slipped out.

In this switch, at the front side of a turning handle 50 installed in the casing 1 in a state being rollingly supported by the casing 1, an operation handle 60 of a wider operation surface area than the turning handle 50 is provided to cover the front surface of the turning handle 50. At the rear side of the operation handle 60, a coupling leg 61 to be engaged with a coupling claw 53 provided in the turning handle 50 is projecting, a leg claw 61a to be engaged with the rear side of the coupling claw 53 is formed at the leading end (rear end) of the coupling leg 61, the turning handle 50 is held between a pressing protuberance 62 protruding from the rear side of the operation handle 60 and the leg claw 61a, and the operation handle 60 is fixed to the turning handle 50. When mounting the operation handle 60 on the turning handle 50, as shown in Fig. 43, the leg claw 61a of the coupling leg 61 of the operation handle 60 is engaged with the coupling claw 53 at the right end in a state of the left end of the turning handle 50 positioned behind the right end, and the center of the operation handle 60 is pressed to the casing 1 side, and the leg claw 61a of the coupling leg 61 of the operation handle 60 is engaged with the coupling claw 53 at the left end of the turning handle 50.

At both ends of the casing 1 in the longitudinal direction, fitting ribs 25 are projecting from the front side of the casing 1, and a pair of mounting claws 26 are projecting from the outer side of each

fitting rib 25, and as shown in Fig. 44, as being engaged with holding grooves 87a, 87b provided in a plate frame 80 which is a mounting frame for wiring devices, the casing 1 can be held in the plate frame 80. Herein, the fitting ribs 25 abut against the back side of abutting portions 84d, 85d provided in the plate frame 80 when the casing 1 is mounted on the plate frame 80, the operation handle 60 is disposed between the both fitting ribs 25, and the gap formed between the casing 1 and the operation handle 60 in the installed state may be hardly visible from outside.

In the switch shown in Fig. 45, the terminal device comprises a terminal plate 3', contacting with the electric wire 2 inserted in the casing 1 through the wire hole 12, provided in the casing 1, a terminal screw 5 inserted in the terminal plate 3', and a rectangular nut 6 engaged with the leading end of the terminal screw 5. In this terminal device, the electric wire 2 is inserted into the casing 1 through the wire hole 12, and the terminal screw 6 is turned and tightened at the leading end of a screw driver through an operation hole 7 provided in the side wall of the casing 1, so that the distance between the nut 6 and a principal piece 3a' of the terminal plate 3' becomes shorter, so that the electric wire 2 may be gripped.

The terminal device used in the switch shown in Fig. 42 is assumed to connect an electric wire composed of a solid core wire, and when the core is a stranded wire, slipping preventive effect by the locking piece is not enough. That is, as shown in Fig. 42, by using the terminal plate 3 having a flat principal piece 3a as the contacting

portion with the electric wire, if the core is a stranded wire, when inserted between the terminal plate 3 and locking piece 4b, strands forming the stranded wire scatter about at random, and the distance between the locking spring 4 and the principal piece 3a of the terminal plate 3 is shorter, and a sufficient contact pressure by the locking spring 4 cannot be obtained, so that the electric wire 2 may drop out.

Further, the terminal device used in the switch shown in Fig. 45 is free from problem as far as connecting an electric wire of a solid core wire, connecting an electric wire of a stranded core wire, or connecting wires of a same type in a combination of strands of a same diameter, but since the opposite side for gripping the electric wire 2 together with the nut 6 (that is, the confronting side of the nut 6 in the principal piece 3a of the terminal plate 3') is a flat plane, the electric wire cannot be held with a sufficient strength when connected by combining, for example, wires of different diameters or different types out of plural types of applicable wires shown in Fig. 46, and the electric wire may drop out.

Incidentally, when mounting the switch shown in Fig. 42 on the plate frame 80 as shown in Fig. 44, after the casing 1 is mounted on the plate frame 80, the operation handle 60 is mounted on the turning handle 50, but since the clearance is small between the both ends of the operation handle 60 mounted on the turning handle 50 of the casing 1 attached to the plate frame 80 and the abutting portions 84d, 85d of the plate frame 80, the operation handle 60 cannot be

operation handle 60 cannot be dismounted, and the device cannot be replaced.

#### SUMMARY OF THE INVENTION

It is therefore a primary object of the present invention is to overcome the above disadvantages of the prior art, and to provide a switch having a terminal device capable of holding the electric wire with a sufficient strength even if wires of different diameters or wires of different types are used in combination.

An aspect of the present invention concerns a switch comprising, a contact device including a movable contact and a fixed contact, a terminal device having the fixed contact for holding electric wires, and a casing accommodating the contact device and terminal device, wherein the terminal device includes annular terminal frames and terminal screws engaged with screw holes provided in the peripheral wall of the terminal frames for holding the electric wires together with the terminal frames, and the terminal frames have holding planes curved to swell in a direction of departing from the leading end face of terminal screws at the section along the opening of the terminal frames, at positions for holding the electric wires together with the leading end face of terminal screws, the terminal frames being formed by crimping and coupling a screw side terminal plate forming the screw holes, and a receiving side terminal plate forming the holding planes, and include a wire stopper disposed integrally on the screw side terminal plate for defining the depth of insertion of the electric wires, and a contact holding piece disposed at the leading end of a coupling piece extending from the receiving side terminal plate for holding the fixed contact.

According to the present invention, whether the core is a solid wire or a stranded wire, regardless of the diameter or type of electric wire, the electric wire can be held with a sufficient strength if wires of different diameters or wires of different types are used in combination, and it is applicable to various forms of connection, such

as simultaneous connection of solid wire and stranded wire to one terminal frame, or connection of two wires of solid core to one terminal frame.

According to another feature of the present invention, the depth of insertion of wire is defined by the wire stopper provided integrally on the screw side terminal plate, for example, if the length of insertion of wire is too long, the linking piece or contact holding piece is free from effects of wire, and deviation of position of fixed contact is prevented, and moreover since the screw side terminal plate and receiving side terminal plate are crimped and coupled, if terminal screws are tightened, the screw side terminal plate is hardly deformed, and it is resistant to tightening of terminal screws, so that the wires can be held firmly.

According to a further feature of the present invention, regardless of the shape of the contact holding piece of the receiving side terminal plate, the screw side terminal plate can be used commonly, and the cost can be reduced by sharing parts. Moreover since the countersink is provided in the screw hole to be engaged with the terminal screw, the engaging amount of the terminal frame and terminal screw is larger as compared with the case not provided with countersink, and the terminal screw can be tightened firmly, so that the wires can be held firmly.

According to a further feature of the present invention, when assembling the terminal frames, the screw side terminal plate can be provisionally fixed on the receiving side terminal plate by making

use of the protrusions and positioning holes, and it is easier to couple the screw side terminal plate and receiving side terminal plate, and moreover the strength of the countersink can be enhanced.

According to a further feature of the present invention, looseness of terminal frames due to reaction of the wires when tightening the terminal screws can be prevented, and deviation of position of fixed contact can be prevented, so that a stable contact pressure can be obtained.

According to a further feature of the present invention, the contact piece as the current feed path to the pilot lamp can be easily coupled with the screw side terminal plate when assembling.

According to a further feature of the present invention, the cover and body can be easily coupled when assembling, and reverse assembling of cover and body can be prevented at the same time.

According to a further feature of the present invention, reverse assembling of cover and body can be prevented more securely.

According to a further feature of the present invention, even in the state of the casing being installed in the mounting frame and the operation handle installed in the turning handle, the operation handle can be detached from the turning handle by applying a force in a direction of detaching the operation handle from the turning handle by inserting a leading end of a screwdriver or the like into the notch.

According to a further feature of the present invention, the mounting direction of the operation handle on the turning handle can

be defined, and reverse assembling of operation handle in turning handle can be prevented.

According to a further feature of the present invention, the mounting direction of the operation handle on the turning handle can be checked easily.

According to a further feature of the present invention, the operation handle can be shared commonly between a mounting frame having two sets of device mounting means in one direction and a mounting frame having three sets of device mounting means, and the cost is saved as compared with a case of using an exclusive operation handle for each mounting frame.

According to a further feature of the present invention, the coupling leg is guided along the guide groove when mounting the operation handle on the turning handle, it is easier to mount the operation handle on the turning handle.

According to a further feature of the present invention, the light of the pilot lamp can be guided to the display unit of the operation handle if the turning handle is provided at either right or left side in the lateral direction in the operation handle formed in a size enough to cover the opening surface of the front side of a window hole with about two pieces.

According to a further feature of the present invention, the relief recesses for preventing interference of box screws in the state of installing the casing in the mounting frame are provided in the operation handle, interference of box screws on the operation handle

at the time of manipulation of the operation handle can be avoided.

### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective exploded view of embodiment 1 of the invention.

Fig. 2 is a sectional view of the same.

Fig. 3 is a front view of a cover removed state of the same.

Fig. 4 is an essential explanatory diagram of the same.

Fig. 5 is an essential explanatory diagram of the same.

Fig. 6 shows the same, in which (a) is a cover back side view and (b) is a body front view.

Fig. 7 is a bottom view of the terminal device used in the same.

Fig. 8 shows an example of use of the terminal device used in the same, indicating a front view in wire connected state.

Fig. 9 shows an example of use of the terminal device used in the same, indicating a front view in wire connected state.

Fig. 10 shows a screw side terminal plate used in the same, in which (a) is a bottom view, (b) is a side view, and (c) is a front view.

Fig. 11 is an explanatory diagram of assembling process of terminal device used in the same.

Fig. 12 is an explanatory diagram of assembling process of terminal device used in the same.

Fig. 13 is a bottom view showing a comparative example of terminal device used in the same.

Fig. 14 is a bottom view showing a comparative example of

terminal device used in the same.

Fig. 15 is a sectional view of the same in a state installed in a mounting frame.

Fig. 16 is an explanatory diagram of mounting method of operation handle on turning handle in the same.

Fig. 17 is a perspective view of operation handle for one used in the same.

Fig. 18 is an explanatory diagram of mounting method of turning handle on operation handle for one in the same.

Fig. 19 is a perspective view of operation handle for two used in the same.

Fig. 20 is an explanatory diagram of mounting method of turning handle on operation handle for two in the same.

Fig. 21 is an essential explanatory diagram of the same.

Fig. 22 is an explanatory diagram of mounting method of turning handle on operation handle for two in the same.

Fig. 23 is an explanatory diagram of mounting method of turning handle on operation handle for two in the same.

Fig. 24 is a front view of mounted state of the same switch on the plate frame.

Fig. 25 is a perspective exploded view of mounting two pieces of the same on the plate frame.

Fig. 26 is a perspective exploded view of mounting one piece of the same on the plate frame.

Fig. 27 is a front view of the same switch mounted on another

plate.

Fig. 28 is a perspective exploded view showing embodiment 2.

Fig. 29 is a sectional view of the same.

Fig. 30 is a front view of cover removed state in the same.

Fig. 31 is an essential explanatory diagram of the same.

Fig. 32 is an essential explanatory diagram of comparative example of the same.

Fig. 33 is an essential sectional view of another structural example of the same.

Fig. 34 is an explanatory diagram of mounting position of turning handle on operation handle for two in another structural example of the same.

Fig. 35 is a bottom view of operation handle in another structural example of the same.

Fig. 36 shows a contact piece used in another structural example of the same, in which (a) is a front view and (b) is a bottom view.

Fig. 37 is a relation explanatory diagram of contact piece and terminal device in another structural example of the same.

Fig. 38 shows a receiving side terminal plate of the same, in which (a) is a front view and (b) is a bottom view.

Fig. 39 shows a receiving side terminal plate of the same, in which (a) is a front view and (b) is a bottom view.

Fig. 40 shows a receiving side terminal plate of the same, in which (a) is a front view and (b) is a bottom view.

Fig. 41 shows a receiving side terminal plate of the same, in which (a) is a front view and (b) is a bottom view.

Fig. 42 is a sectional view of a prior art.

Fig. 43 is a sectional view of mounted state of the same on a mounting frame with an operation handle assembled.

Fig. 44 is an explanatory diagram of mounting method of operation handle in the same.

Fig. 45 is a sectional view showing another prior art.

Fig. 46 is an explanatory diagram of applicable electric wires.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE PRESENT INVENTION

##### (Embodiment 1)

The switch of the embodiment is shown in Fig. 1 to Fig. 12, and Fig. 15 to Fig. 27. As shown in Fig. 1 to Fig. 3, the switch comprises a casing 1 composed of a synthetic resin body 10 of rectangular parallelepiped with an open front side, and a synthetic resin cover 20 of a rectangular frame coupled to the front side of the body 10. At both outer sides of the body 10 in the width direction, a pair of assembly bumps 11 are projecting, being spaced in the longitudinal direction of the body 10, and assembly tongues 21 are extended backward from the rear edge of the cover 20, and the assembly bumps 11 are engaged with assembly holes 21a formed in the assembly tongues 21, so that the body 10 and cover 20 are coupled together.

In the embodiment, supposing the width of the assembly bump

11 at one outer side of the body 10 shown in Fig. 4 to be  $W1$ , and the width of the assembly bump 11 at the other outer side of the body 10 shown in Fig. 5 to be  $W2$ ,  $W1$  and  $W2$  are different from each other (that is, the width of assembly bumps 11 in the longitudinal direction of the body 10 is different at both outer sides of the body 10). By contrast, the width  $W1'$  of the assembly hole 21a at the assembly tongue 21 formed at one outer side of the cover 20 shown in Fig. 4 is formed slightly larger than  $W1$ , and the width  $W2'$  of the assembly hole 21a at the assembly tongue 21 formed at the other outer side of the cover 20 shown in Fig. 5 is formed slightly larger than  $W2$ , and  $W2'$  and  $W1'$  are different from each other same as the relation between  $W2$  and  $W1$ . Thus, reverse assembling of the cover 20 and body 10 is prevented at the time of assembling.

Further, as shown in Fig. 6 (a), at the rear side at both ends of the cover 20 in the longitudinal direction, ribs 27 projecting backward are formed along the width direction of the cover 20, and at the front side at both ends of the body 10 in the longitudinal direction (lateral direction), recesses 16 are formed, in which the ribs 27 are positioned at the time of assembling, and supposing the width of the rib 27 at one end (left end in the drawing) of the cover 20 in the longitudinal direction to be  $W3$ , and the width of the rib 27 at the other end (right end in the drawing) to be  $W4$ ,  $W3$  and  $W4$  are different from each other, so that reverse assembling of the cover 20 and body 10 can be also prevented at the time of assembling.

The body 10 includes two terminal devices 30a, 30b for

connecting an electric wire 2 to be inserted into the casing 1 through a wire hole 12 provided in the rear wall of the body 10, and a contact device 40 for opening and closing the circuit between the terminal devices 30a and 30b. On the other hand, in a central opening window 22 of the cover 20, a synthetic resin turning handle 50 is supported and disposed rollingly in the cover 20, and by oscillation of this turning handle 50, the contact device 40 is opened or closed. At the front side of the turning handle 50, a synthetic resin operation handle 60 (see Fig. 15) overlapping with the front side of the cover 20 is detachably coupled, and by manipulating the operation handle 60, the turning handle 50 oscillates to open or close the contact device 40.

Inside of the body 10, a plurality of holding grooves 14 (see Fig. 3) and holding ribs 13 each are formed for positioning the terminal devices 30a, 30b and contact device 40. The terminal devices 30a, 30b are disposed in both end portions of the body 10 in the longitudinal direction, and the contact device 40 is disposed in the central portion of the body 10 in the longitudinal direction.

The terminal devices 30a, 30b comprise annular terminal frames 100a, 100b provided in the casing 1, and terminal screws 34 to be engaged with screw holes 35 formed in the peripheral wall of the terminal frames 100a, 100b for connecting and holding the electric wire set in the terminal frames 100a, 100b through the wire hole 12 provided in the rear wall of the casing 1 between the terminal frames 100a and 100b. That is, the terminal devices 30a, 30b are

configured to hold the electric wire mechanically and connect electrically, by putting the terminal screw 34 into the screw hole 35 provided in the annular terminal frames 100a, 100b, and holding the electric wire between the leading end 34a of the terminal screw 34 and the terminal frames 100a, 100b.

In the terminal frames 100a, 100b, at the outer periphery of the screw hole 35, a countersink 36 is formed by burring. Therefore, in the terminal frames 100a, 100b, since the countersink 36 is formed around the screw hole 35 to be engaged with the terminal screw 34, as compared with the case not forming the countersink 36, the engaging amount of the terminal frames 100a, 100b and the terminal screw 34 is larger, so that the terminal screw 34 can be tightened more firmly.

In the terminal frames 100a, 100b, at the position of gripping the electric wire together with the leading end 34a (see Fig. 1 and Fig. 8) of the terminal screw 34, curved holding planes 31b, 32b are formed so that the section along the opening side of the terminal frames 100a, 100b may swell in the direction of departing from the leading end of the terminal screw 34.

The terminal frames 100a, 100b are formed by coupling screw side terminal plates 33, 33 forming the screw hole 35, and receiving side terminal plates 31, 32 forming the holding planes 31b, 32b. In the both terminal frames 100a, 100b, since the screw side terminal plates 33 are common, the cost can be reduced.

The screw side terminal plates 33, 33 and receiving side terminal plates 31, 32 are formed by bending metal plates.

The screw side terminal plates 33, 33 are formed in an L-shape as shown in Fig. 10, and include principal pieces 33a forming the screw hole 35 and countersink 36, and wire stopper pieces 33b nearly orthogonal to the principal pieces 33a for defining the depth of insertion of electric wire. That is, as shown in Fig. 7, the leading end of the electric wire 2 abuts against the wire stopper piece 33b, so that the depth of insertion of the electric wire 2 can be defined.

On the other hand, the receiving side terminal plate 31 includes a principal piece 31a for inserting and holding protrusions 33c (see Fig. 11) extended at both sides in the holding groove 14 provided in the inner circumference of the operation groove 15 near one end (left end in Fig. 3) of the body 10 in the longitudinal direction, a contact holding piece 31d disposed in the center of the body 10 in the longitudinal direction for fixing a fixed contact 41, and coupling pieces 31c, 32c extended along the opening side of the body 10 for coupling continuous and integrally the front edge of the principal piece 31a and the front edge of the contact holding piece 31d. That is, in the receiving side terminal plate 31, the contact holding piece 31d extended from the coupling piece 31c and having the fixed contact 41 at the leading end is extended obliquely backward (downward in Fig. 2) toward the center of the body 10 in the longitudinal direction.

Further, in the receiving side terminal plate 32, from the rear edge of a principal piece 32a of U-section forming the holding plate 32b, a support piece 32d is extended along the rear side of the body 10

toward the center of the body 10 in the longitudinal direction, and a support bump 32e bent like a caret is formed at the leading end of the support piece 32d. The rear side of a central piece 43a of a switching element 43 made of a pi-shaped conductive plate abuts against the support bump 32e.

The contact device 40, formed in a pi-shape, has the switching element 43 wherein the rear side of the central piece 43a abuts against the support bump 32e. The switching element 43 has side pieces 43b, 43c extended from both side edges of the central piece 43a, and is disposed in the center of the body 10 in the longitudinal direction rollingly about the support bump 32e. In the central part of the body 10, holding ribs 13, 13 are projecting from the inside of the both side walls of the body 10 in the width direction, and the move of the switching element 43 in the width direction of the body 10 is defined by the ribs 13, 13. A protrusion 43d is projecting at the side edge of the side piece 43b of the switching element 43, and as this protrusion 43d abuts against the holding ribs 13, the oscillating range of the switching element 43 is defined.

The switching element 43 is disposed oppositely to the contact holding piece 31d, and a movable contact 42 contacting with and departing from the fixed contact 41 provided in the contact holding piece 18d is disposed at one side piece 43b. That is, as the switching element 43 turns about the support bump 32e, the movable contact 42 contacts with or departs from the fixed contact 41, and the terminal device 30a and terminal device 30b are electrically connected or

disconnected. In short, the contact device 40 of the embodiment forms a single pole switch (or single-off switch) used in single pole and single throw having one fixed contact 41 and one movable contact 42. Between the switching element 43 and turning handle 50, an inverting spring 44 composed of a coil spring is held, and one end of the inverting spring 44 is put in a space enclosed by the central piece 43a and both side pieces 43b, 43c of the switching element 43, and the other end is put in the turning handle 50.

At both sides of the turning handle 50 in the width direction of the casing 1, support bumps 51 are projecting, and these support bumps 51 are tapered at the front end. At both sides of the cover 20 in the center of the longitudinal direction and in the width direction, a pair of bearing tips 23 are projecting forward from the peripheral edge of the opening window 22, and at the confronting sides of the both bearing tips 23, bearing recesses 24 are formed for inserting the support bumps 51 of the turning handle 50. The bearing recesses 24 rollingly support the support bumps 51 at least at the front end. At both ends of the turning handle 50 in the longitudinal direction, coupling claws 53 for coupling the operation handle 60 to the turning handle 50 are projecting.

Further, at both ends of the cover 20 in the longitudinal direction, fitting ribs 25 projecting from the front side of the cover 20 are formed along both end edges of the cover 20, and a pair of mounting claws 26 are projecting from the outer sides of the fitting ribs 25. Although not specifically described herein, the mounting

claws 26 are engaged with mounting holes provided in the mounting frame for the wiring device for holding the casing 1 on the mounting frame, and it is designed to be easier in the coupling job of the casing 1 with the mounting frame fixed on a plane of installation when installing by burying part of the casing 1 in the plane of installation such as wall surface. The fitting ribs 25 abut against the rear side of the mounting frame when the casing 1 is mounted on the mounting frame. The operation handle 60 is disposed between the both fitting ribs 25, and the operation handle 60 is formed so as not to interfere with the fitting ribs 25 in oscillation process. Thus, the fitting ribs 25 are provided in the cover 20 and mounting claws 26 are provided in the fitting ribs 25, and as compared with the case not forming the fitting ribs 25, the operation handle 60 can be positioned behind, and the gap formed between the cover 20 and operation handle 60 in the state of installation is hardly visible from outside.

As shown in Fig. 15, the operation handle 60 covers the front side of the turning handle 50, and a coupling leg 61 to be engaged with the coupling claw 53 provided in the turning handle 50 is projecting from the rear side of the operation handle 60. At the leading end (rear end) of the coupling leg 61, a leg claw 61a is formed to be engaged with the rear side of the coupling claw 53, and the turning handle 50 is held between a pressing protrusion 62 projecting from the rear side of the operation handle 60 and the leg claw 61a, so that the operation handle 60 is fixed on the turning handle 50.

Briefly describing the operation of the switch having such

configuration, as shown in Fig. 2, when the right end of the turning handle 50 is positioned behind (beneath in the drawing) the left end, the middle position of the inverting spring 44 is swollen to the left side more than the both ends, and the movable contact 42 is pressed to the fixed contact 41 by the inverting spring 44, so that a contact pressure is applied. In this state, on the other hand, when the left end of the operation handle 60 not shown in the drawing is pushed behind, the front end of the inverting spring 44 moves to the right side, and therefore the inverting spring 44, once compressed, is suddenly extended, and the middle position is swollen to the right side more than the both ends, and at this time the switching element 43 is tilted to the right side, and the movable contact 42 is separated from the fixed contact 41.

Incidentally, the wire hole 12 is formed at a position corresponding to the middle position between the screw side terminal plates 33, 33 and receiving side terminal plates 31, 32 of the terminal frames 100a, 100b, and when the terminal screw 34 is tightened with the electric wire 2 inserted in the casing 1 through the wire hole 12, the leading end of the electric wire 2 is gripped between the leading end 34a of the terminal screw 34 and the holding planes 31b, 32b of the principal pieces 31a, 32a of the receiving side terminal plates 31, 32, and the electric wire 2 contacts with the principal pieces 31a, 32a, and the terminal devices 30a, 30b and the electric wire 2 are connected electrically, so that the electric wire 2 is mechanically held so as not to slip out of the casing 1.

At both side walls of the body 10 in the longitudinal direction, operation grooves 15 (Fig. 1) are formed at positions corresponding to the terminal frames 100a, 100b. The operation grooves 15 have such a shape as to allow the leading end of a screwdriver or other tool to be inserted into the casing 1, and when the terminal screw 34 is tightened by inserting the tool into the operation groove 15, the leading end 34a of the terminal screw 34 comes closer to the holding planes 31b, 32b of the principal pieces 31a, 32a of the receiving side terminal plates 31, 32. To the contrary, with the electric wire 2 connected to the terminal devices 30a, 30b, when the terminal screw 34 is loosened by inserting the tool into the operation groove 15, the distance from the holding planes 31b, 32b becomes longer so that the leading end 34a of the terminal screw 34 may be remoter from the electric wire 2, and mechanical holding of the electric wire 2 is released, so that the electric wire 2 can be pulled out of the casing 1.

As the electric wire to be connected to the terminal devices 30a, 30b in the embodiment, stranded wires and solid wires can be used, and various forms of connection are applicable. For example, as shown in Fig. 8, a core 2a of a solid wire and strands 2b of a stranded wire can be connected simultaneously, or as shown in Fig. 9, two cores 2a of solid wires can be connected simultaneously. Herein, since the holding planes 31b, 32b of the receiving side terminal plates 31, 32 confronting the leading end 34a of the terminal screw 34 are curved in an arc, strands 2b of a stranded wire can be held neatly so as not to scatter wide between the leading end 34a of the terminal

screw 34 and the terminal plate 31.

The gap between the inner circumference of the terminal frames 100a, 100b and the side face of the terminal screw 34 is set smaller than the diameter of the strand 2b of stranded wire, and when the strand 2b is gripped between the leading end 34a of the terminal screw 34 and holding planes 31b, 32b, the strand 2b is prevented from entangling on the terminal screw 34 as being gripped between the inner circumference of the terminal frames 100a, 100b and the terminal screw 34, so that breakage of strand 2b can be prevented when tightening the terminal screw 34.

At both side edges of the principal piece 33a of the screw side terminal plate 33, as shown in Fig. 10, a pair of coupling bumps 33d, 33d are formed as being spaced in the wire inserting direction, and in the principal pieces 31a, 32a of the receiving side terminal plates 31, 32, coupling holes (see Fig. 11) are formed at positions corresponding to the coupling bumps 33d, 33d. In the principal piece 33a of the screw side terminal plate 33, protrusions 33c projecting sideways from both side edges around the countersink 36 are provided, and positioning holes 37 (see Fig. 11) for inserting the protrusions 33c are provided in the principal pieces 31a, 32a of the receiving side terminal plates 31, 32. In the principal piece 33a of the screw side terminal plate 33, a pair of coupling bumps 33d, 33d are positioned at both sides of the protrusions 33c in the wire inserting direction, and the projecting dimension of the protrusions 33c is set slightly longer than the projecting dimension of the coupling bumps 33d.

Explaining the assembly process of the terminal frame 100a, the principal piece 31a of the receiving side terminal plate 31 before coupling is widened at the leading end side as shown in Fig. 11 (a), and from the widened state, as shown in Fig. 11 (b), by inserting part of the protrusion 33c of the screw side terminal plate 33 into the positioning hole 37 of the principal piece 31a of the receiving side terminal plate 31, the screw side terminal plate 33 is provisionally fixed in the receiving side terminal plate 31 (see Fig. 12), and then, as shown in Fig. 11 (c), the leading end side is brought closer (closing the principal piece 31a) so that the principal piece 31a of the receiving side terminal plate 31 may be formed in a U-shape, and the protrusion 33c is inserted into the positioning hole 37 and the coupling bump 33d is inserted into the coupling hole 38, and the leading end of the coupling bump 33d is crimped, so that the screw side terminal plate 33 and receiving side terminal plate 31 are coupled together. As for the terminal frame 100b, the screw side terminal plate 33 is a common part shared with the terminal frame 100a, and the shape of the principal piece 32a of the receiving side terminal plate 32 is nearly the same as the shape of the principal piece 31a, and the terminal frame 100b can be assembled in the same procedure as the terminal frame 100a.

Thus, at the time of assembling of terminal frames 100a, 100b, the screw side terminal plate 33 can be provisionally fixed to the receiving side terminal plates 31, 32 by using the protrusion 33c and positioning hole 37, and the coupling procedure of the screw side

terminal plate 33 and receiving side terminal plates 31, 32 is easy. Moreover, since the protrusion 33c is provided in the screw side terminal plate 33, the strength of the countersink 36 can be enhanced.

In the terminal frame 100a of the embodiment, as shown in Fig. 7, the wire stopper 33b is provided integrally in the screw side terminal plate 33, and the contact holding piece 31d holding the fixed contact 41 is provided at the leading end of the coupling piece 31c extended from the receiving side terminal plate 31. By contrast, as shown in Fig. 13, the contact holding piece 31d holding the fixed contact 41 may be provided at the leading end of the coupling piece 31c extended from the screw side terminal plate 33, but in the configuration shown in Fig. 13, if the insertion length of the electric wire 2 is too long, the coupling piece 31c may be deformed, and the position of the fixed contact 41 may be deviated. Or, as shown in Fig. 14, the principal piece 33a of the screw side terminal plate 33 may be held by the principal piece 31a of the receiving side terminal plate 31, and the wire stopper 33b may be extended from the principal piece 33a, but in the configuration shown in Fig. 14, if the insertion length of the electric wire 2 is too long, by tightening the terminal screw 34, the principal piece 31a may be deformed as indicated by double dot chain line in the diagram, and torque is hardly applied to the electric wire 2.

On the other hand, in the terminal frame 100a of the embodiment, since the depth of insertion of electric wire 2 is defined

by the wire stopper 33b provided integrally in the screw side terminal plate 33, for example, if the insertion length of the electric wire is too long, the coupling piece 31c and contact holding piece 31d are free from effects of the electric wire 2, and deviation of position of the fixed contact 41 can be prevented, and moreover since the screw side terminal plate 33 and receiving side terminal plate 31 are crimped and coupled together, if the terminal screw 34 is tightened, the screw side terminal plate 33 is hardly deformed, and it is resistant to tightening of the terminal screw 34, so that the electric wire 2 can be held firmly.

To mount the switch device having such configuration on a plane of installation such as wall surface, the plate 9 as shown in Fig. 25 and Fig. 26 is used. The plate 9 is composed of a plate frame 80 as a mounting frame for holding the casing 1, and a decorative plate 90 for covering the plate frame 80.

The plate frame 80 is made of a synthetic resin, and is insulating, in which left ends and right ends of a pair of upper and lower frame pieces 83a, 83b are respectively coupled continuously and integrally by transverse pieces 82, thereby forming a rectangular frame shape having an opening window 81 as a rectangular window exposing the front side of the operation handle 60 in the center. At the rear side of the both side edges along the longitudinal direction of the opening window 81, a fixed beam 84 (see Fig. 15) and a movable beam 85 (see Fig. 15) both of strip form are provided oppositely to each other.

In the fixed beam 84 and movable beam 85, at one side facing the opening window 81, four holding grooves 87a, 87b (see Fig. 15) are disposed at equal intervals as mounting holes for device mounting means to be engaged with each pair of mounting claws 26 provided at both sides of the casing 1. Therefore, when the mounting claws 26 are engaged with the holding grooves 87a, 87b, the casing 1 can be fixed in the plate frame 80 while exposing the front side of the operation handle 60 from the opening window 81. In order that the casing 1 may not slip out forward from the plate frame 80, abutting portions 84d, 85d (see Fig. 15) abutting against the fitting ribs 25, projecting toward the cover 20 of the casing 1, are formed at the base parts of the fixed beam 84 and movable beam 85. That is, as the front side of fitting ribs 25 of the casing 1 abuts against the abutting portions 84d, 85d, and the rear side of the mounting claw 26 is stopped in the holding grooves 87a, 87b, the casing 1 is fixed in the plate frame 80. Herein, at the leading end portions at the side facing the opening window 81 of the fixed beam 84 and movable beam 85, guide portions 87c, 87d of slopes inclined to extend the mutual distance more at the leading end side are provided for guiding the mounting claws 26 into the holding grooves 87a, 87b when inserting the mounting claws 26 of the casing 1 into the holding grooves 87a, 87b from the rear side of the plate frame 80.

Thus, when mounting the casing 1 of the switch on the plate frame 80, the casing 1 is inserted from behind the plate frame 80, and the mounting claw 26 projecting to one side in the longitudinal

direction of the casing 1 is engaged with the holding groove 87a of the fixed beam 84, and the casing 1 is pushed forward to the plate frame 80, and the mounting claw 26 projecting to the other side of the casing 1 deflects the movable beam 85, so that the mounting claw 26 may be easily engaged with the holding groove 87b.

On the other hand, in the base part of the fixed beam 84, a device removal hole 84c (see Fig. 25) is drilled to penetrate through the face and back of the plate frame 80 between each pair of adjacent holding grooves 87a, and with the casing 1 fixed in the plate frame 80, the leading end of a screwdriver or other tool is inserted into the device removal hole 84c, and the casing 1 is pushed to the movable beam 85 side by the leading end of the tool, so that the movable beam 85 is deflected by a slight effort according to the principle of leverage, and the engagement of the holding groove 87a of fixed beam 84 side and mounting claw 26 of the casing 1 is cleared, so that the casing 1 can be detached from the plate frame 80.

The plate frame 80 has two pairs of holding grooves 87a, 87b each in the fixed beam 84 and movable beam 85, and the casing 1 has a pair of mounting claws 26 at each side. The interval of the mounting claws 26 provided in the casing 1 is equal to the pitch of the adjacent holding grooves 87a, 87b in the fixed beam 84 and movable beam 85, and the casing 1 shown in Fig. 1 is set in the dimension so that up to two pieces may be mounted on the plate frame 80. That is, the plate frame 80 shown in Fig. 25 and Fig. 26 is for mounting two pieces, so that up to two casings 1 may be mounted on the plate frame

80 for two pieces. The casing 1 of such dimension is called the casing 1 of unit dimension.

By thus defining the relative mounting dimensions of the casing 1 and plate frame 80, one or two casings 1 of unit dimension can be arbitrarily mounted on the plate frame 80.

To mount the plate frame 80 incorporating the casing 1 on a wall or the like, transverse pieces 82 of the plate frame 80 have extension pieces 82a having box holes 88a for receiving box screws 110 for installing the plate frame 80 in a buried box (not shown) buried in the wall. Frame pieces 83a, 83b of the plate frame 80 have screw holes 88b for receiving the screws for mounting the plate frame 80 directly on the wall or other plane of installation.

At four corners of the plate frame 80, there are decorative plate stop holes 89 for stopping the detent bumps (not shown) projecting from the rear side of the decorative plate 90, by inserting the detent bumps in the decorative plate stop holes 89, the decorative plate 90 can be detachably fitted so as to cover the front side of the plate frame 80.

The decorative plate 90 is made of an insulating synthetic resin, and is formed in a box shape, forming continuously and integrally a rectangular front plate 91 covering the front side of the plate frame 80, and side walls 92 projecting backward along the entire circumference from the peripheral edge of the front plate 91. The detent bumps for coupling to the plate frame 80 are projecting at four corners at the rear side of the front plate 91. In the center of

the front plate 91, an opening window 91a is provided for exposing the front side (operation handle 60) of the casing 1 assembled in the plate frame 80.

Of the side walls 92 of the decorative plate 90, the distance between the confronting sides is set larger than the width of the position corresponding to the plate frame 80. That is, when the decorative plate 90 is placed at the front side of the plate frame 80 disposed on the plane of installation, the plate frame 80 settles inside of the decorative plate 90, and the rear edge of the side wall 92 of the decorative plate 90 nearly abuts against the plane of installation. As a result, the butt face of the plate frame 80 and decorative plate 90 does not project ahead of the plane of installation, and the butt line of the two is hardly visible from the side, so that the appearance may be enhanced.

The operation handle 60 is, as shown in Fig. 24 and Fig. 25, formed in a size for covering the front side of the opening window 81 by about two pieces (hereinafter called the operation handle 60 for two pieces), or as shown in Fig. 26, formed in a size for covering the front side of the opening window 81 by one piece only (hereinafter called the operation handle 60 for one piece), which may be mounted on the turning handle 50.

Herein, each operation handle 60 has a relief recess 66 (see Fig. 21) for preventing interference of box screw 110 in a state of mounting the casing 1 in the plate frame 80. Thus, when manipulating the operation handle 60, interference of the box screw

110 on the operation handle 60 can be avoided.

In each operation handle 60, a notch 65 for detaching the operation handle 60 from the turning handle 50 in a state being assembled in the plate frame 80 is provided at the rear edge of the operation handle 60. The notch 65 is formed at a position corresponding to the coupling leg 61, and when the casing 1 is installed in the plate frame 80 and the operation handle is set in the turning handle, as shown in Fig. 15, by inserting the leading end of a screwdriver or the like into the notch 65 and applying a force in a direction of detaching the operation handle 60 from the turning handle 50, so that the operation handle 60 can be separate from the turning handle 50.

Further, as shown in Fig. 18 and Fig. 20, since the operation handle 60 and turning handle 50 are provided with reverse assembly preventive ribs 55, 68 for defining the mounting direction of the operation handle 60 on the turning handle 50 in a specified direction only, at the mutually confronting faces, and therefore the mounting direction of the operation handle 60 on the turning handle 50 can be defined, and reverse assembling of operation handle 60 on the turning handle 50 can be prevented. Further, at the mutually confronting sides of the operation handle 60 and turning handle 50, arrows 57, 67 indicating the mounting direction of the operation handle 60 are provided, so that the mounting direction of the operation handle 60 on the turning handle 50 can be easily recognized (checked visually).

The coupling claw 53 as the flange of the turning handle 50 is provided with a guide groove 53a for guiding the leg claw 61a of the coupling leg 61. Therefore, when mounting the operation handle 60 on the turning handle 50, the leg claw 61a of the coupling leg 61 is guided along the guide groove 53a, so that it is easier to mount the operation handle 60 on the turning handle 50.

Incidentally, in order that three casings of the same overall dimensions as the casing 1 may be disposed consecutively, the casing 1 may be also installed in a plate frame 80 having three sets of device mounting means as shown in Fig. 27. In other words, the outer dimension in the width direction (transverse direction) of the casing 1 is formed in a dimension enough to connect the number of sets of device mounting means of a mounting frame in the mounting frame for a buried wiring device having two or three sets of device mounting means in one direction formed in a rectangular frame having an opening window 81 in the center.

The operation handle 60 for two pieces is formed in a size for covering the front side of the opening window 81 with about two pieces. Herein, the operation handle 60 for two pieces has a pair of coupling legs 61 at both right and left sides so as to install the turning handle 50 detachably at the right and left sides as shown in Fig. 22 to Fig. 24 supposing one direction to be lateral direction. Thus, the operation handle 60 can be shared commonly between the mounting frame having two sets of device mounting means in the direction and the mounting frame having three sets of device

mounting means, and the cost is reduced as compared with the case of preparing an exclusive operation handle 60 for each mounting frame. (Embodiment 2)

This embodiment is shown in Fig. 28 to Fig. 31. This embodiment relates to a single pole double throw type switch (so-called three-way switch). In the three-way switch, as shown in Fig. 28 and Fig. 29, three terminal devices 30b, 30c, 30d are used. The terminal device 30b is of the same configuration as the single pole single throw switch in embodiment 1, and instead of the terminal device 30a used in the single pole single throw switch, two terminal devices 30c, 30d are used. The terminal devices 30c, 30d respectively have terminal frames 100c, 100d, and the terminal frames 100c, 100d are formed by coupling the screw side terminal plate 33 and receiving side terminal plates 45, 46 same as in embodiment 1. The same constituent elements as in embodiment 1 are identified with the same reference numerals, and explanation is omitted.

The receiving side terminal plates 45, 46 include principal pieces 45a, 46a forming holding planes 45b, 46b (see Fig. 30) holding an electric wire together with the leading end 34a of the terminal screw 34, coupling pieces 45c, 46c extended continuously and integrally from the front edges of the principal pieces 45a, 46a, and contact holding pieces 45d, 46d having fixed contacts 41a, 41b provided at the leading ends extended from the coupling pieces 45c, 46c.

The leading ends of the contact holding pieces 45d, 46d of the terminal devices 30c, 30d are disposed oppositely to each other, and the fixed contacts 41a, 41b confront each other. A switching element 43 has movable contacts 42a, 42b at both sides in the thickness direction, and as the switching element 43 rotates, the movable contacts 42a, 42b selectively contact with the fixed contacts 41a, 41b. That is, while the movable contact 42a is contacting with the fixed contact 41a, the movable contact 42b is apart from the fixed contact 41b, and while the movable contact 42b is contacting with the fixed contact 41b, the movable contact 42a is apart from the fixed contact 41a.

Herein, at the receiving side terminal plate 46 of the terminal device 30d, since the distance between the principal piece 46a and contact holding piece 46d is relatively long, as shown in Fig. 31, a pair of protrusions 46e for gripping the holding rib 13 are projecting from the side edge of the coupling piece 46c. Accordingly, when tightening the terminal screw 34, looseness of the terminal frame 100d due to reaction of electric wire can be prevented, and deviation of position of the fixed contact 41b is avoided, so that a stable contact pressure may be obtained. In the case of the receiving side terminal plate 46 without protrusion 46e as shown in Fig. 32, the contact holding piece 46d may be lifted forward (in the direction of arrow in the drawing) due to the reaction of electric wire.

The terminal devices 30c, 30d are disposed at the same side in the longitudinal direction of the body 10 (the left side in Fig. 30), and

operation grooves 15 are formed in the body 10, corresponding to the terminal screws 34 of the terminal devices 30c, 30d.

(Other embodiments)

As shown in Fig. 33 and Fig. 34, a position indicator 71 composed of a neon lamp is disposed, a through-hole 52 for transmitting the light from the position indicator 71 may be formed at one end of the turning handle 50 in the longitudinal direction. The position indicator 71 is inserted between the terminal device 30a and terminal device 30b through a contact piece 47 made of a metal plate in a shape as shown in Fig. 36 or Fig. 37.

In this case, the contact piece 47 made of conductive metal plate is coupled to the wire stopper 33b of each screw side terminal plate 33. Each contact piece 47 is elastic so as to elastically contact with the circuit board provided with the position indicator 71, and the contact piece 47 always contacts elastically with the circuit board regardless of oscillation of the turning handle 50. On the circuit board, a series circuit of position indicator 71 and resistance (not shown) is mounted, and the contact piece 47 contacts with each end of this series circuit. This kind of three-way switch is often used in lighting and putting out stairway lamps, and the three-way switches are installed upstairs and downstairs, so that the stairway lamp may be lit up or put out from either downstairs or upstairs. Therefore, by inserting a series circuit of position indicator 71 and resistance between the two fixed contacts 41a, 41b, when the stairway lamp is put out, the position indicator 71 can be lit up. The connection of

this type of circuit is known, and explanation is omitted. Other configurations of the three-way switch is the same as that of the single pole single throw switch.

Herein, the contact piece 47 has an extension piece 48 extended from both edges to the backward at one end in the longitudinal direction, and when the mounting protrusions 33e projecting from both edges of the wire stopper 33b are engaged with an engaging groove 49 of the extension piece 48, the contact piece 47 and screw side terminal plate 33 are coupled together. Herein, the mounting protrusion 33e has a slope 33f for decreasing the projecting amount from the wire stopper 33b more at the contact piece 47 side, so that the contact piece 47 as the current feed path to the position indicator 71 may be easily coupled with the screw side terminal plate 33 when assembling.

When using the turning handle 50 provided with the position indicator 71, the operation handle 60 has a lens 64 disposed at its rear side, as shown in Fig. 33 to Fig. 35, so as to guide the light of the position indicator 71 to a display unit 63 of the operation handle 60. Herein, the lens 64 is formed in a size for overlapping with the position indicator 71 in part whether the turning handle 50 is installed at either right or left side position (that is, in a size extending to the position corresponding to the position indicator 71), and therefore even in the case of the operation handle 60 for two pieces, whether the turning handle 50 is disposed at right or left side in the lateral direction, the light of the position indicator 71 can be

guided to the display unit 63 of the operation handle 60.

In the terminal devices 30a, 30b, 30c, 30d, as shown in Fig. 38 to Fig. 41, since the positioning holes 37 and coupling holes 38 are formed in the principal pieces 31a, 32a, 45a, 46a, and the screw side terminal plate 33 is used commonly, so that the cost can be reduced.

The present invention is not limited to the configuration of the above-mentioned embodiments, and it is possible to modify variously.

What is claimed is:

1. A switch comprising:

a contact device including a movable contact and a fixed contact;

a terminal device having the fixed contact for holding electric wires; and

a casing accommodating the contact device and terminal device;

wherein the terminal device includes annular terminal frames and terminal screws engaged with screw holes provided in the peripheral wall of the terminal frames for holding the electric wires together with the terminal frames; and

the terminal frames have holding planes curved to swell in a direction of departing from the leading end face of terminal screws at the section along the opening of the terminal frames, at positions for holding the electric wires together with the leading end face of terminal screws, the terminal frames being formed by crimping and coupling a screw side terminal plate forming the screw holes, and a receiving side terminal plate forming the holding planes, and include a wire stopper disposed integrally on the screw side terminal plate for defining the depth of insertion of the electric wires, and a contact holding piece disposed at the leading end of a coupling piece extending from the receiving side terminal plate for holding the fixed contact.

2. The switch according to claim 1, wherein the terminal frames are formed by coupling a screw side

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terminal plate forming the screw holes, and a receiving side terminal plate forming the holding planes; and

the screw side terminal plate includes a countersink integrally formed at the outer circumference of peripheral edge of the screw hole, and a wire stopper integrally formed for defining the depth of insertion of the electric wires, and is formed to be coupled with the receiving side terminal plate.

3. The switch according to claim 2, wherein the screw side terminal plate has protrusions projecting sideways from both side edges, and the receiving side terminal plate has positioning holes for receiving the protrusions.

4. The switch according to claim 1, wherein the terminal frames are formed by coupling a screw side terminal plate forming the screw holes, and a receiving side terminal plate forming the holding planes, and include a contact holder disposed at the leading end of a coupling piece extended from the receiving side terminal plate for holding the fixed contact, and a pair of protuberances provided in the coupling piece for gripping the holding rib projecting to the inner side of the casing.

5. The switch according to claim 1, further comprising a turning handle for opening and closing the contact device installed in the casing, being rollingly supported by the casing, and a pilot lamp built in the turning handle;

wherein the terminal frames are formed by coupling a screw side terminal plate forming the screw holes, and a receiving side terminal plate forming the holding planes,

a wire stopper for defining the depth of insertion of

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the electric wires is provided integrally on the screw side terminal plate,

mounting bumps are formed at both side edges of the wire stopper,

the contact piece and screw side terminal plate are coupled together as the mounting bumps are engaged with an engaging portion provided at an extension piece extending from the contact piece made of a metal plate serving as a current feed path to the pilot lamp, and

the mounting bumps form slopes for decreasing the protruding amount from the wire stopper more at the contact piece side.

6. The switch according to claim 1, wherein the casing is a box, composed of a synthetic resin body opened in the front, and a cover disposed at the front side of the body,

a pair of assembling bumps are provided each at both sides of the body in the width direction, being spaced in the longitudinal direction of the body,

assembling tongues are provided backward from the rear edge of the cover, the body and cover are coupled together as the assembling bumps are engaged with assembling holes provided in the assembling tongues, and

the width of the assembling bumps in the longitudinal direction of the body is different at both sides of the body.

7. The switch according to claim 1, wherein the casing is a box, composed of a synthetic resin body opened in the front, and a cover disposed at the front side of the body,

a pair of assembling bumps are provided each at both

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sides of the body in the width direction, being spaced in the longitudinal direction of the body,

assembling tongues are provided backward from the rear edge of the cover,

the body and cover are coupled together as the assembling bumps are engaged with assembling holes provided in the assembling tongues,

a rib is formed in one of the confronting faces of the body and cover at both ends in the longitudinal direction,

a recess to be engaged with the rib is formed in the other, and the width of the rib is different at both ends.

8. The switch according to claim 6, wherein a rib is formed in one of the confronting faces of the body and cover at both ends in the longitudinal direction, a recess to be engaged with the rib is formed in the other, and the width of the rib is different at both ends.

9. The switch according to claim 1, further comprising a turning handle for opening and closing the contact device installed in the casing, being rollingly supported by the casing,

an operation handle detachably provided at the front side of the turning handle, and

a mounting portion for mounting on a mounting frame for a buried wiring device,

wherein a notch for detaching the operation handle from the turning handle in an installed state in the mounting frame is provided at the rear edge of the operation handle.

10. The switch according to claim 9, wherein reverse

assembly preventive ribs for defining the mounting direction of the operation handle on the turning handle only in a specified direction are provided on the mutually confronting faces of the operation handle and turning handle.

11. The switch according to claim 9, wherein marks indicating the mounting direction of the operation handle are provided on the mutually confronting faces of the operation handle and turning handle.

12. The switch according to claim 9, wherein the outer dimension in the transverse direction of the casing is formed in a dimension enough to connect the number of sets of device mounting means of a mounting frame, in the mounting frame for a buried wiring device having two or three sets of device mounting means in one direction formed in a rectangular frame having a window hole in the center, and

the operation handle is formed in a size for covering an opening face of the front side of the window hole with about two pieces, and has the turning handle detachably provided at right or left side supposing one direction to be the lateral direction.

13. The switch according to claim 9, wherein a coupling leg to be engaged with part of a flange formed in the turning handle projects from the rear side of the operation handle, and the flange of the turning handle has a guide groove for guiding the coupling leg.

14. The switch according to claim 12, wherein a pilot lamp is built in the turning handle, a lens for guiding the

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light of the pilot lamp to the display unit of the operation handle is disposed at the rear side of the operation handle, and the lens is formed in a size for reaching the positions corresponding to the pilot lamp at both right and left sides.

17. The switch according to claim 9, wherein the mounting frame forms mounting holes for box screws for installing in a buried box buried and disposed on the plane of installation, and the operation handle has relief recesses for preventing interference of box screws in the assembled state of the casing and the mounting frame provided at rear edges of both side walls in the transverse direction of the casing.

## ABSTRACT

## SWITCH HAVING TERMINALS FOR HOLDING ELECTRIC WIRES

A switch having a terminal device capable of holding an electric wire is provided with a sufficient strength even if electric wires of different diameters or electric wires of different types are used in combination. Terminal devices 30a, 30b comprise annular terminal frames 100a, 100b installed in a casing 1, and terminal screws 34 engaged with screw holes 35 provided in peripheral walls of the terminal frames 100a, 100b. The terminal screws 34 connect and hold electric wires inserted into the terminal frames 100a, 100b through wire holes 12 provided in the rear wall of the casing 1 together with the terminal frames 100a, 100b. In the terminal frames 100a, 100b, countersinks 36 are formed in the outer peripheral edges of screw holes 35.

Figure 1