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H01H 9/00 , H01R 11/09

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H2E EEKH E163
H1N NQK N637 N649 N664 N712 N714 N854

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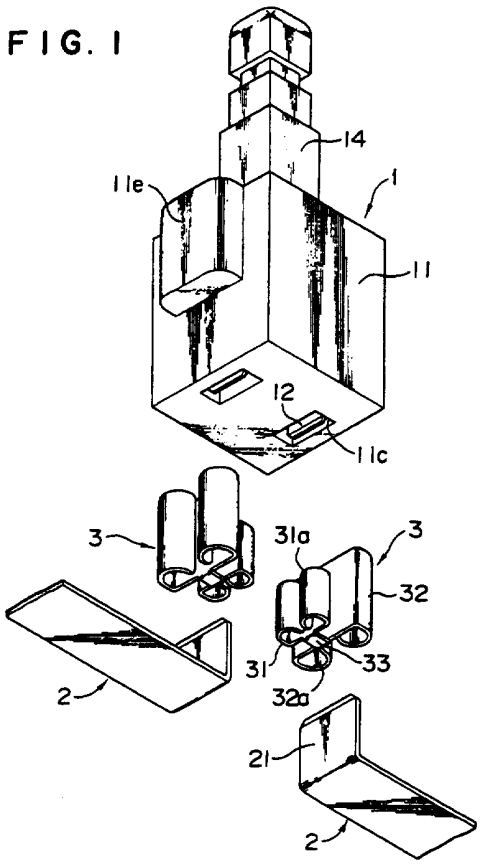
(58) Field of Search
UK CL (Edition O) H1N NQK , H2E EEKE EEKH
INT CL[6] H01H 9/00 , H01R 11/09

(54) A switch for connection to a bus bar

(57) A switch structure comprising a switch (1) in which at least two facing terminal plates (12) are formed within recesses (11c) formed in a portion of a housing; bus bars (2) having blade terminals (21) rising from an insulated base; and a pair of connection terminals (3) in each of which are formed a first resilient clamp (31) that is inserted into an associated housing recess (11c) and resiliently fits onto an associated terminal plate (12), and a second resilient clamp (32) that resiliently fits onto the blade terminal (21) of an associated bus bar (2).

FIG. 1



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This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

FIG. 1

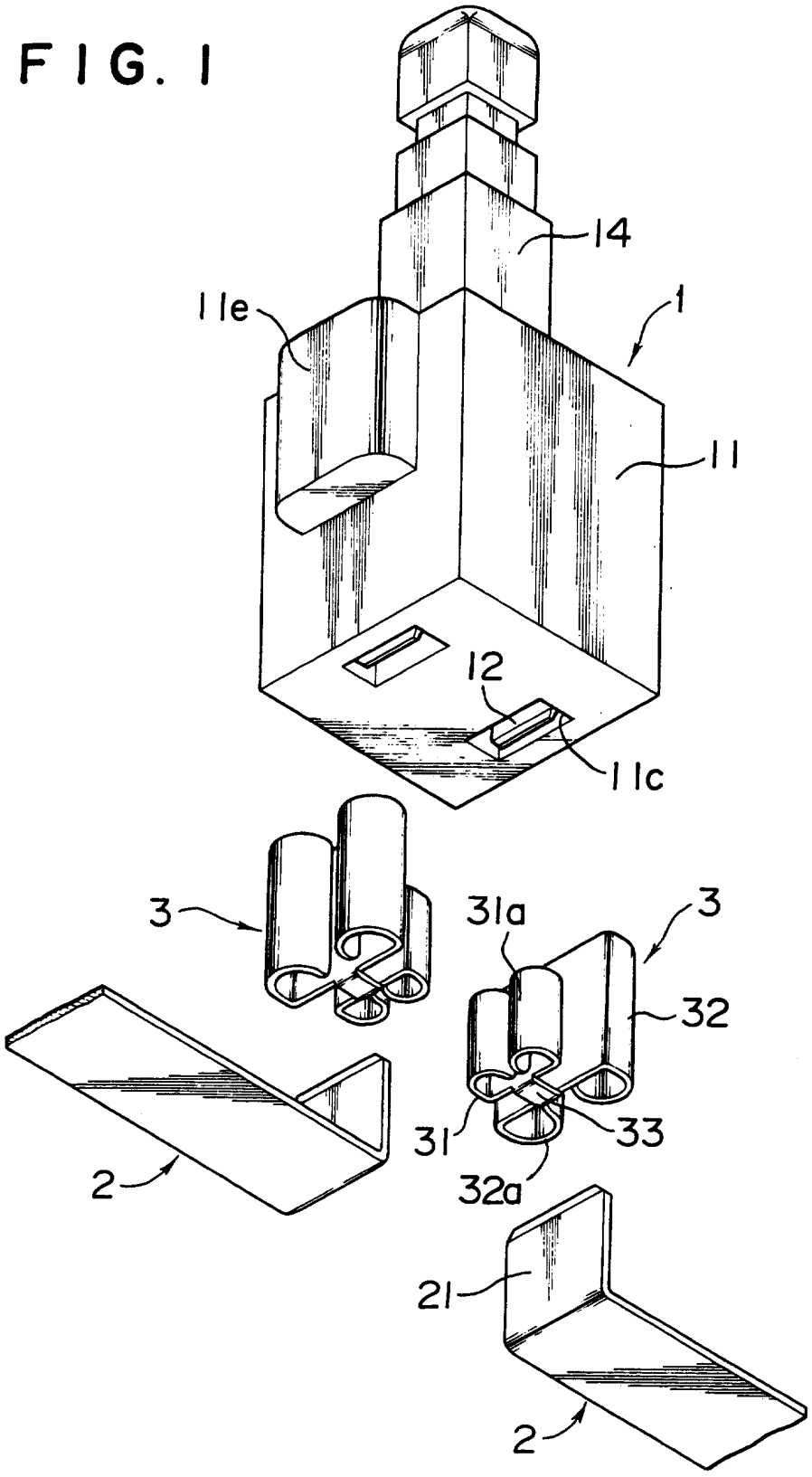


FIG. 2

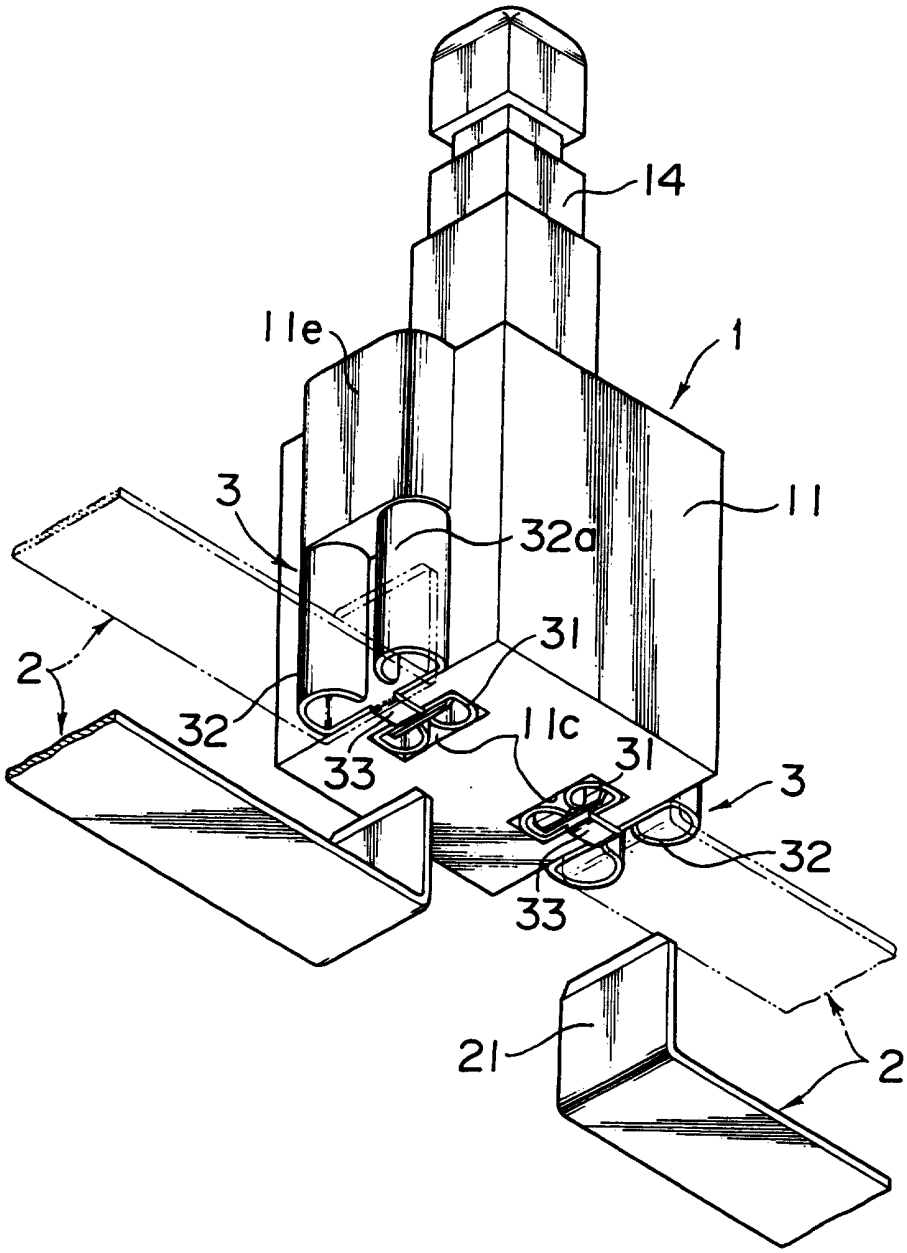


FIG. 3

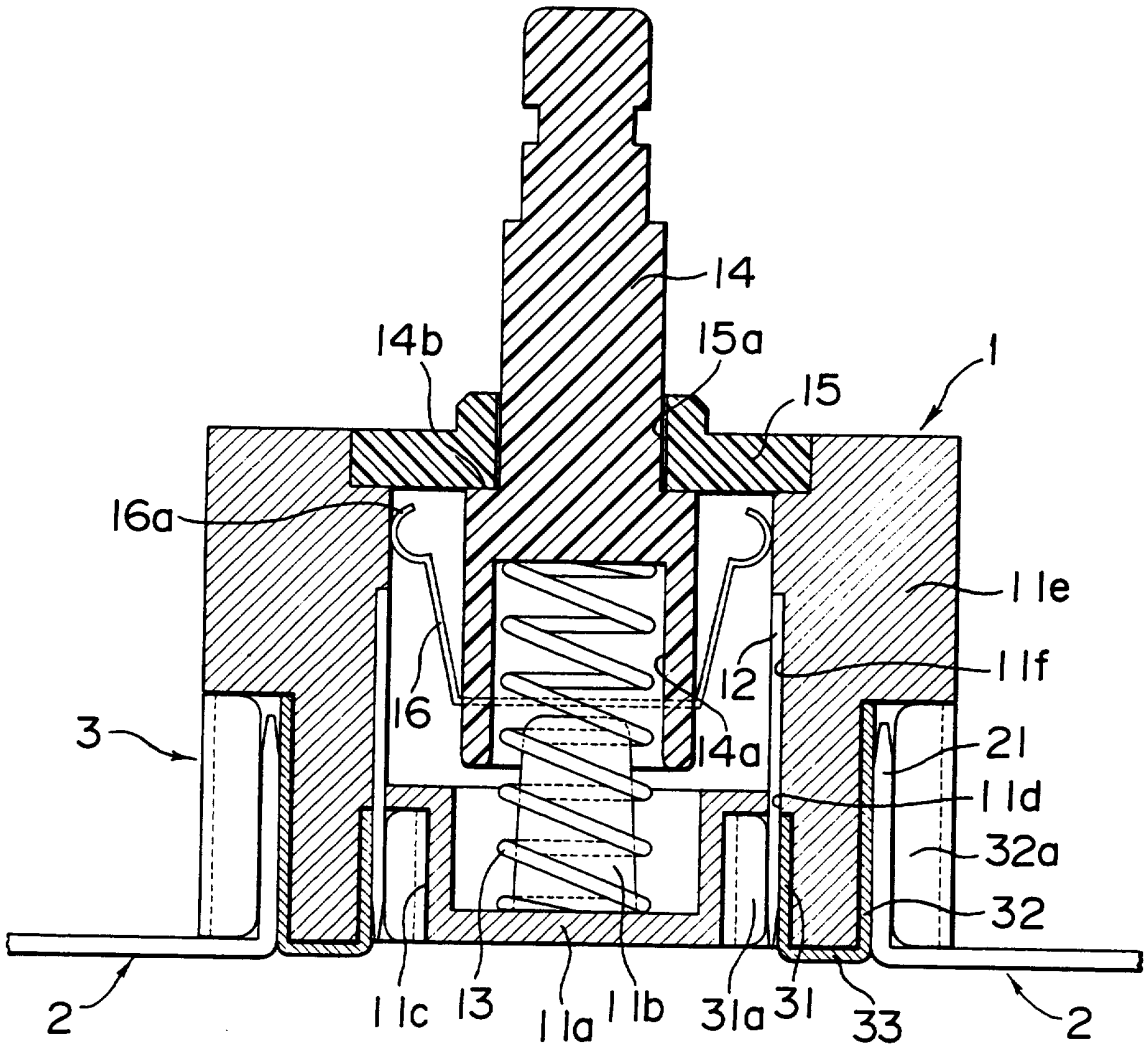

14
14b
15a
15
1
16a
11e
12
11f
16
3
14a
21
11d
32a
32
2
11c
13
11a
11b
31a
31
33
2

FIG. 4

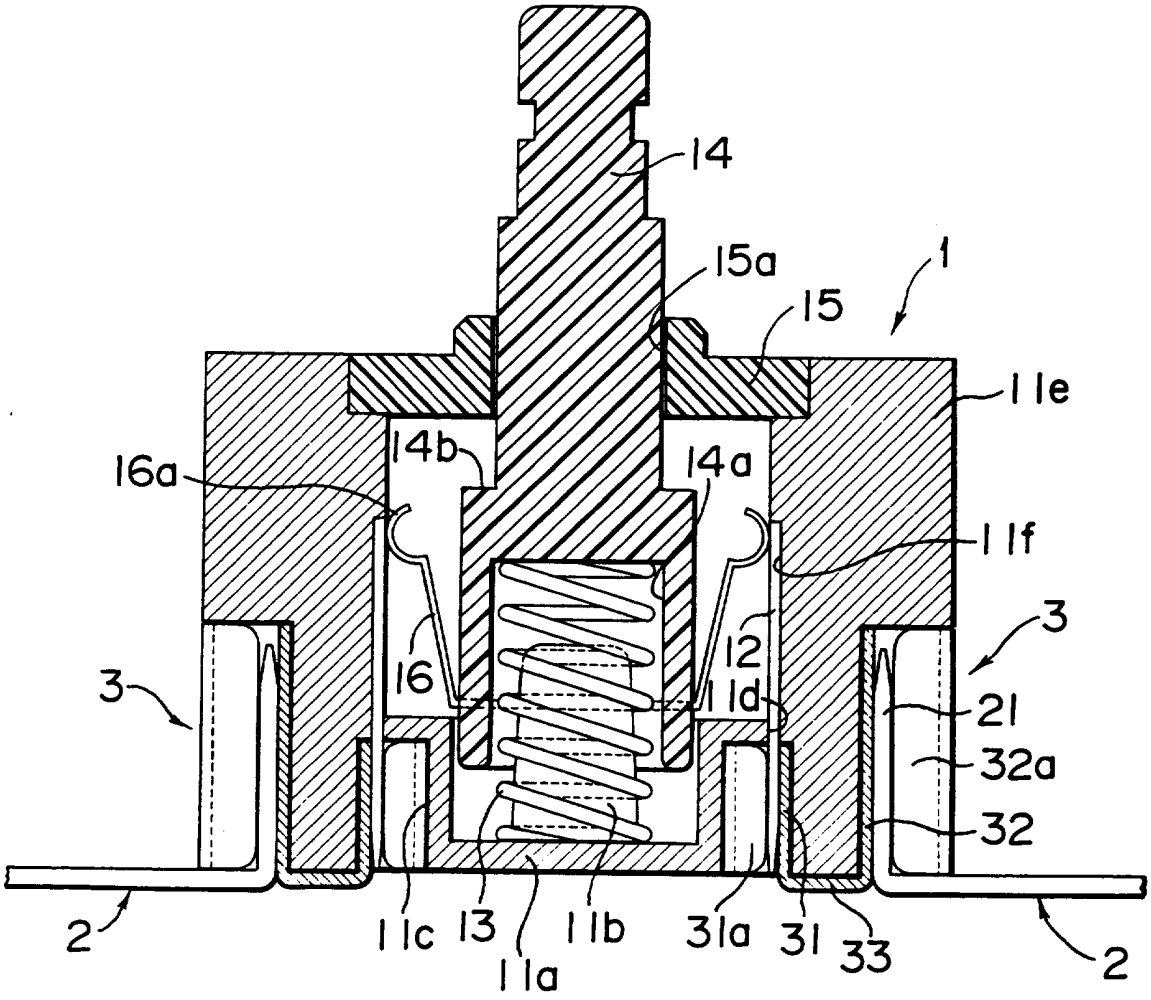

14
15a
1
15
11e
14b
14a
16a
11f
3
12
16
11d
3
21
32a
32
2
11c
13
11b
31a
31
33
2
11a

FIG. 5

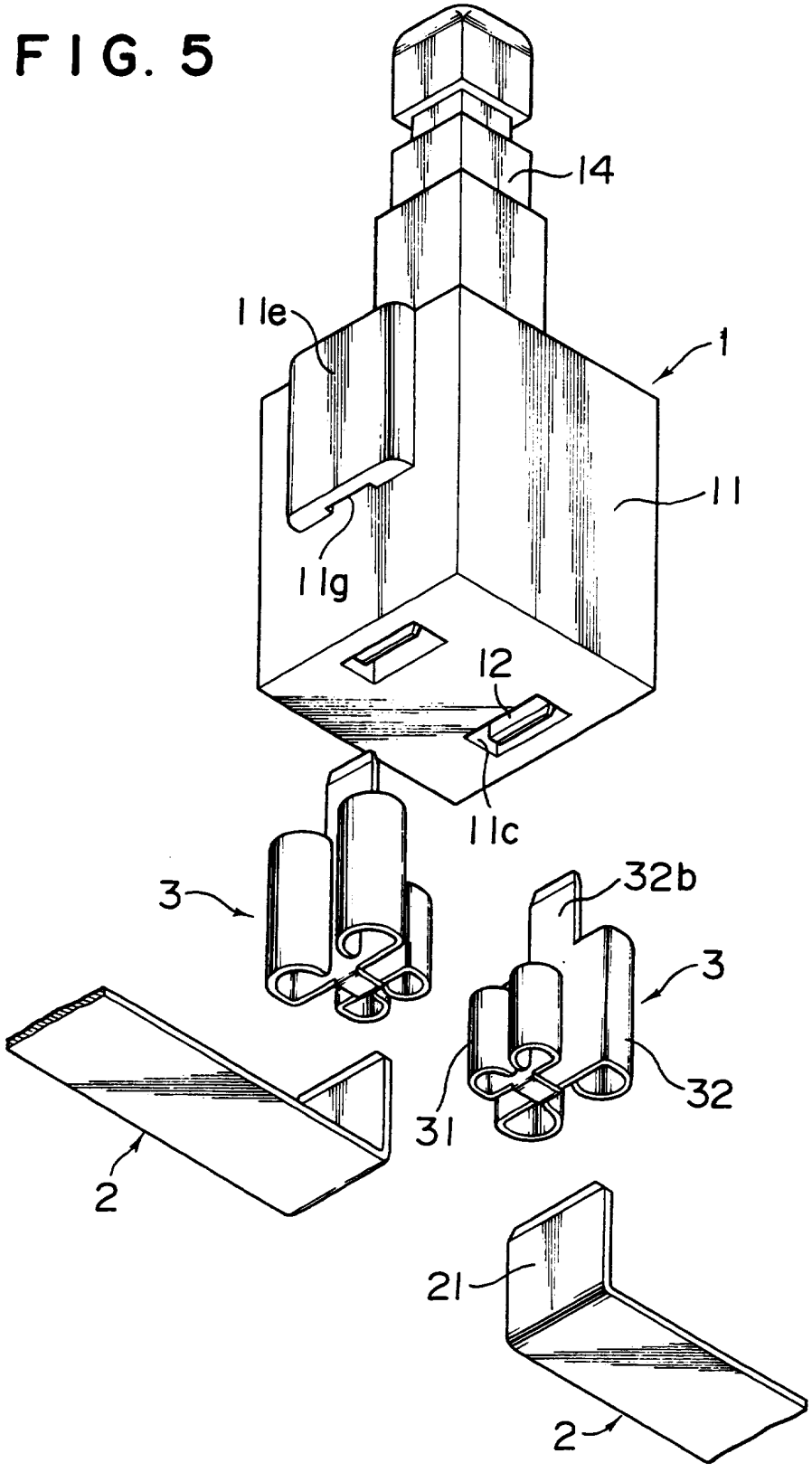


FIG. 6

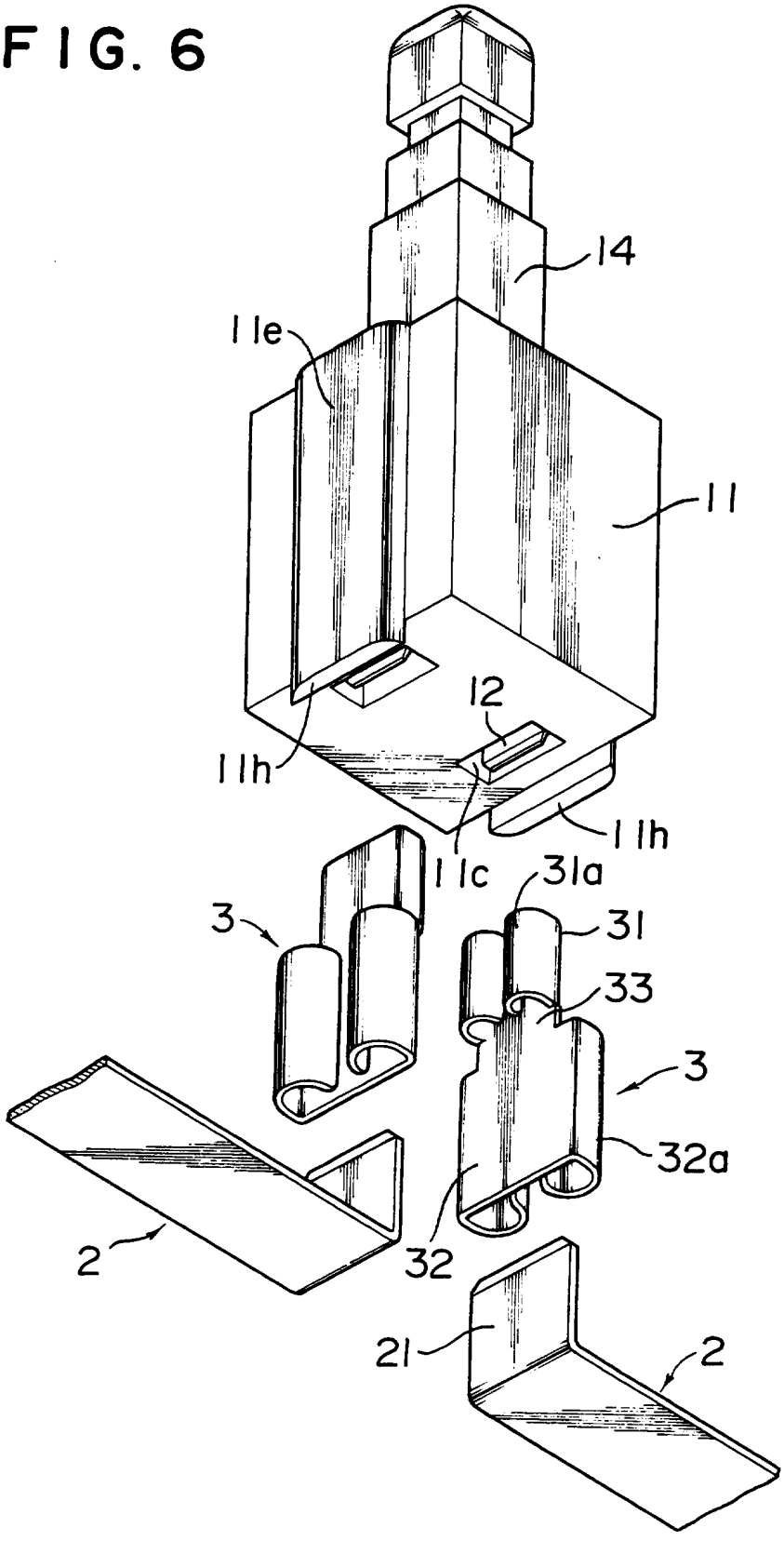


FIG. 7

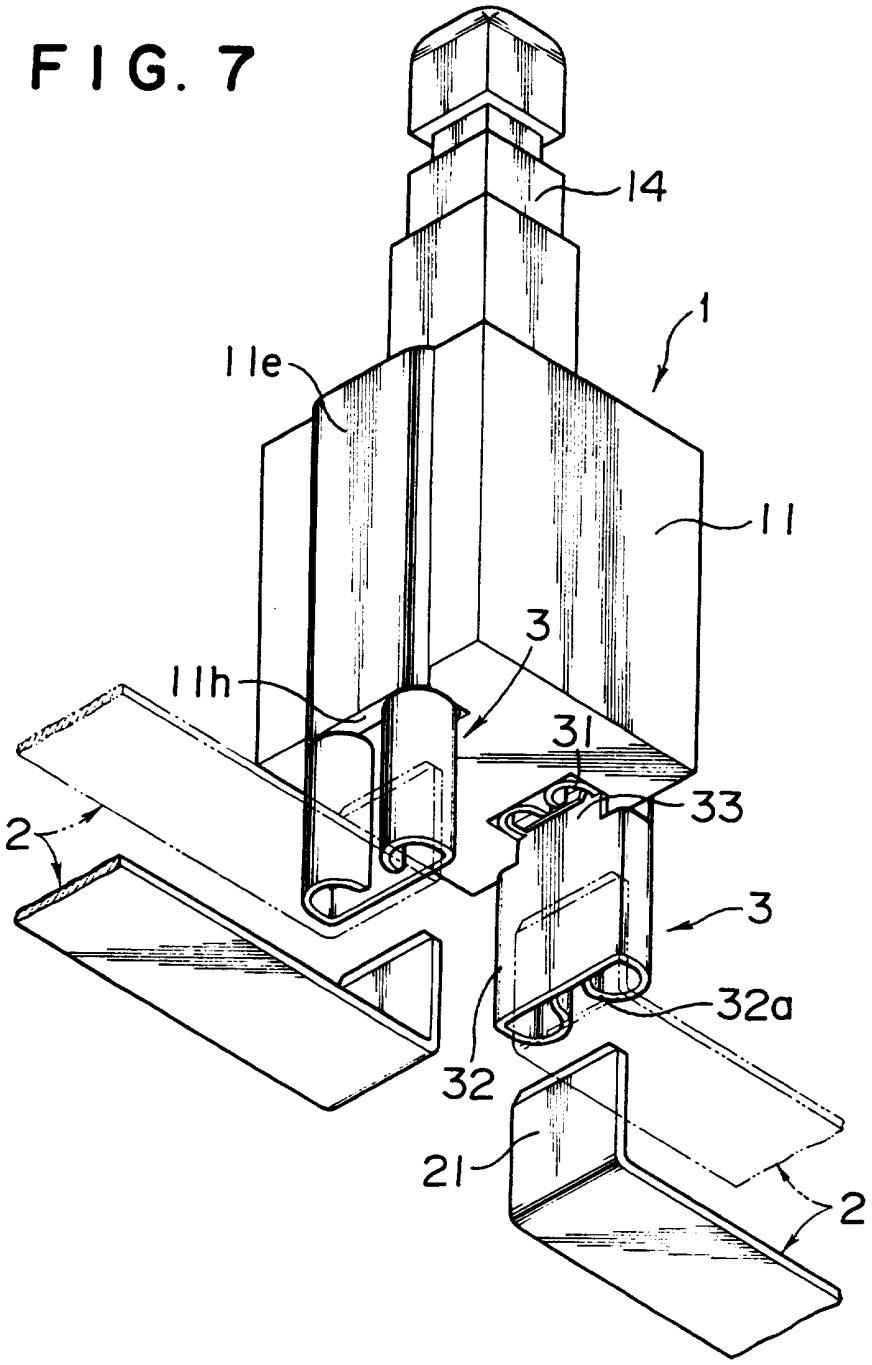


FIG. 8

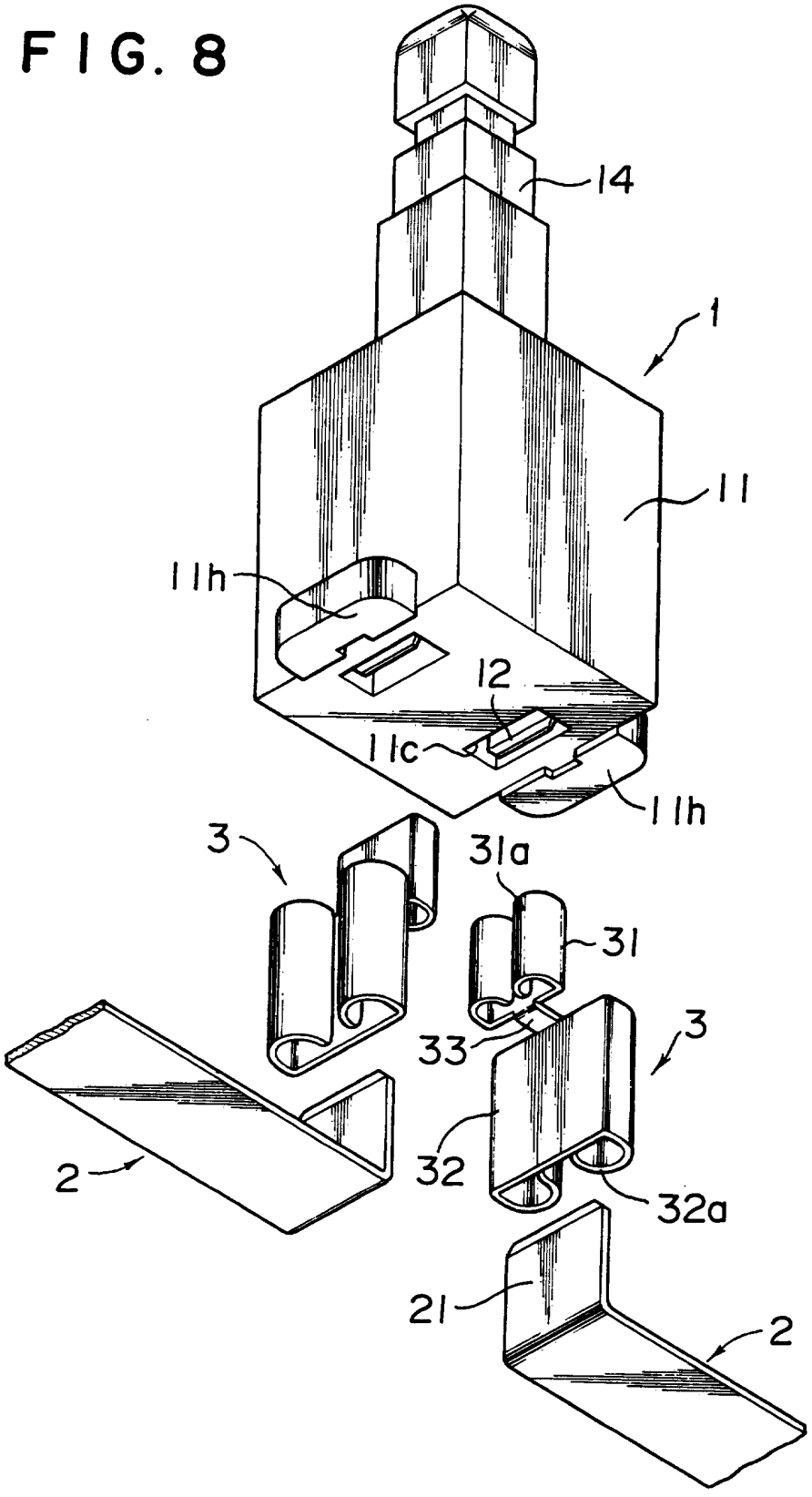
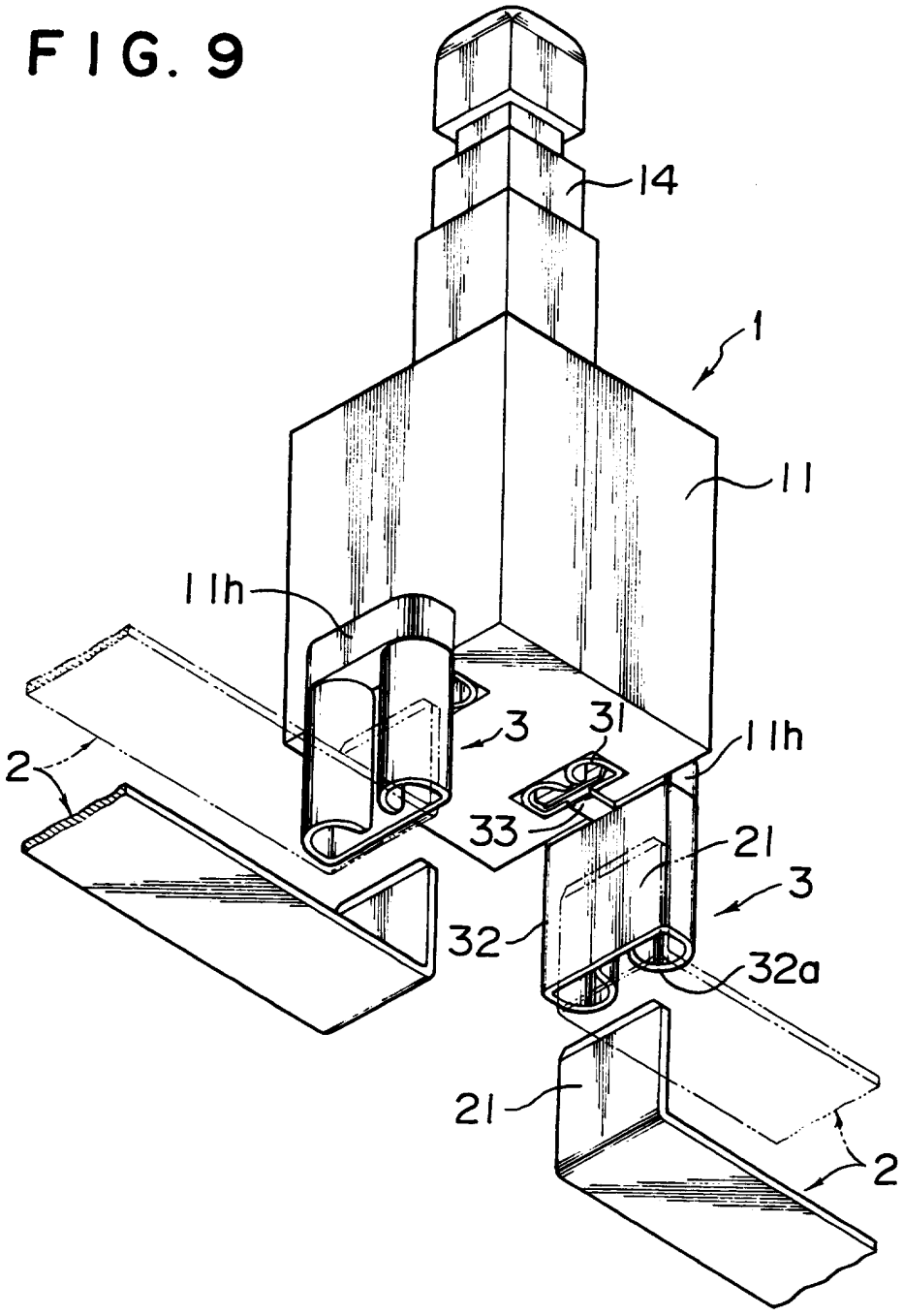


FIG. 9



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A SWITCH STRUCTURE

The present invention relates to a switch structure and more particularly to such a structure enabling a switch, such as a push-button switch, to be directly connected to contact blades, for example on bus bars formed on an insulated base.

In the past, in order to connect a switch with a circuit on an insulated base, the switch and circuit were connected by inserting the female connector of a lead wire, of which one end was soldered to the circuit on the insulated base, onto a lead plate of a switch attached to an attached body such as a panel. In the switch connecting structure of the prior art as described above, the number of work processes was large due to having a process in which the switch is mounted to the attached body, and a process in which the female connector connected with the lead of said switch is soldered to an insulated base by means of a lead wire. This resulted in the problems of requiring additional time for assembly as well as contributing to increased labour costs.

In order to solve the above-mentioned problems, it would be desirable to be able to provide a switch connecting structure that is able to shorten work time and lower labour costs by enabling a switch to be directly attached to a bus bar formed on an insulated base.

According to the present invention there is provided a switch structure for connection to a pair of spaced contact blades, the structure comprising an electrical switch including a housing having a pair of recesses formed therein in each of

which is located an electrically conductive terminal plate, and a pair of connection terminals each of which includes a first resilient clamp for location in an associated one of said recesses to fit resiliently onto the terminal plate therein, and a second resilient clamp to fit resiliently onto an associated one of the contact blades, whereby electrical continuity between the contact blades can be achieved on actuation of the switch.

In one embodiment of the invention, said first resilient clamp and said second resilient clamp are bent so as to be positioned with their backs to each other by means of a coupling in said connection terminal.

Receptacles for containing said second resilient clamps may be formed in said housing.

Insertion tabs may extend from said second resilient clamps, and be inserted into insertion holes formed in said housing.

The first resilient clamp and said second resilient clamp may be formed linearly in said connection terminal.

Alternatively, the first resilient clamp and said second resilient clamp may be bent into an offset shape by means of a coupling in said connection terminal.

The ends of said second resilient clamps may abut against ribs formed on the outside surface of said housing.

By way of examples only, embodiments of the invention will now be described in greater detail with reference to the accompanying drawings of which:

Fig. 1 is an exploded perspective view showing a first embodiment as claimed in the switch connection structure of the present invention.

Fig. 2 is a perspective view of the assembled state of the above.

Fig. 3 is a cross-sectional view of the switch in the off state.

Fig. 4 is a perspective view of the switch in the on state.

Fig. 5 is an exploded perspective view showing a second embodiment of the present invention.

Fig. 6 is an exploded perspective view showing a third embodiment of the present invention.

Fig. 7 is an exploded perspective view showing the assembled state of the above.

Fig. 8 is an exploded perspective view showing a fourth embodiment of the present invention.

Fig. 9 is an exploded perspective view showing the assembled state of the above.

The following provides an explanation of the form of one embodiment of the switch connecting structure as claimed in the present invention with reference to Fig. 1 through Fig. 4.

In the drawings, reference numeral 1 indicates a switch such as a push-button switch, seesaw switch or slide switch, and as shown in Figs. 3 and 4, indicates a push-button switch in this embodiment. Furthermore, this push-button switch 1 is used, for example, as a switch for turning on and off the interior lamp unit installed on the roof of an automobile interior.

The following provides a detailed explanation of switch 1. Reference numeral 11 indicates a bottomed housing, projection 11b projects toward the inside from the centre of bottom 11a, and together with mutually facing recesses 11c being formed, narrow slot 11d is formed in each recess 11c. Moreover, ribs 11e are formed on the outside of said housing 11 at which said recesses 11c are formed.

Reference numeral 12 indicates a pair of terminal plates press fit into each groove 11f formed in the inside wall of housing 11 from each of said slots 11d, the ends of which are exposed to the inside of said recesses 11c. Reference numeral 13 indicates a spring of which one end is inserted onto the above-mentioned projection 11b. Reference numeral 14 is a pushing lever that pushes on the other end of said spring 13 in hole 14a, and protrudes from through hole 15a of cover plate 15 fixed on the open end of the above-mentioned housing 11. Reference numeral 16 is an resilient contact plate bent roughly

into the shape of the letter "U" that is attached to the above-mentioned pushing lever 14, both ends of which have contacts 16a formed into a curved shape.

Next, the following provides an explanation of the operation of the above-mentioned switch 1. In Fig. 3, pushing lever 14 is pushed up by the spring force of spring 13, and is stopped as a result of ledge 14b of said pushing lever 14 making contact with cover plate 15. Thus, since contacts 16a of resilient contact plate 16 is positioned away from terminal plates 12 in this state, the space between the pair of terminal plates 12 is electrically off.

In the above-mentioned state, when pushing lever 14 is pushed down in opposition to the spring force of spring 13, contact plate 16 lowers as shown in Fig. 4 causing contacts 16a to make contact with terminal plates 12. Consequently, the space between the pair of terminal plates is electrically on. If this type of push-button switch 1 was to be installed, for example, on the chassis of an automobile with the door closed, switch 1 would enter the on state when the door was opened.

Furthermore, although the switch shown in the drawings only enters the on state when pushing lever 14 is pushed, it can be made into a locking push-button switch by incorporating a known locking mechanism. If this type of locking push-button switch 1 was to be used as, for example, a switch for turning on and off the interior lamp unit installed on the roof of an automobile interior, it could be used to turn the interior lamp on and off. Next, the following provides an explanation of a means for installing the above-mentioned switch 1 on, for

example, an automobile chassis as for use as a door switch.

Reference numeral 2 indicates blade terminals 21 formed by bending the ends of a pair of bus bars fixed in an insulated state on a chassis (not shown) at a right angle.

Reference numeral 3 indicates a connection terminal that connects the above-mentioned terminal pllate 12 in switch 1 and the above-mentioned blade terminal 21, forming a first resilient clamp 31 that engages with terminal plate 12 and a second resilient clamp 32 that engages with the above-mentioned blade terminal 21, and composing coupling 33 that connects this first resilient clamp 31 and second resilient clamp 32.

The above-mentioned first and second resilient clamps 31 and 32 are in the form of eyeglass-shaped terminals 31a and 32a bent towards the inside into a curved shape on the right and left sides. First resilient clamp 31 is of a size that enables it to enter into recess 11c of housing 11 causing terminal plate 12 to be clamped by terminal 31a. In addition, blade terminal 21 enters inside terminal 32a of second resilient clamp 32 and is clamped by said terminal 32a.

Thus, when terminals 31a of the first pair of resilient clamps 31 of a pair of connection terminals 3 are first inserted into recesses 11c of housing 11 so that terminals 32a are positioned on the outside of housing 11, terminals 31a engage with terminal plates 12 and are resiliently clamped in position. In this clamped state, terminals 32a are fixed in position by making contact with ribs 11e of housing 11 as shown in Fig. 2.

Next, since blade terminals 21 of a pair of bus bars 2 are

attached at roughly the same interval as the pair of second resilient clamps 32 in the pair of connection terminals 3, when switch 1 to which connection terminals 3 are fixed is lowered towards blade terminals 21, blade terminals 21 are inserted into terminals 32a of each second resilient clamp 32, thus causing switch 1 to be fixed to bus bars 2.

Consequently, when pushing lever 14 in switch 1 is pushed down, the space between the pair of bus bars 2 becomes electrically connected. In addition, when the pushing force on pushing lever 14 is released, the space between the pair of bus bars 2 becomes electrically open.

In the above-mentioned embodiment, although the ends of second resilient clamps 32 are fixed in position by making contact with ribs 11e of housing 11, the ends of the switch can be prevented from being exposed by increasing the width in the horizontal direction of housing 11 (to the left and right in Figs. 3 and 4), forming holes to contain second resilient clamps 32 in the widened portion, and containing second resilient clamps 32 in these holes.

Furthermore, in the above-mentioned embodiment, although connection terminals 3 are fixed in housing 11 by engaging and clamping terminals 31a of first resilient clamps 31 in connection terminals 3 in terminal plates 12, connection terminals 3 can be fixed more reliably in housing 11 than by first resilient clamps 31 by extending insertion tabs 32b from the end of terminals 32a of second resilient clamps 32 as shown in Fig. 5, and inserting these insertion tabs 32b into insertion holes 11g formed in ribs 11e on housing 11.

Figs. 6 and 7 indicate another embodiment of the present invention. In contrast to the above-mentioned two embodiments having first and second resilient clamps 31 and 32 bent in the same direction with coupling 33 in between, in the present embodiment, first and second resilient clamps 31 and 32 are arranged linearly and mutually rotated 180 degrees with coupling 33 in between. In addition, ribs 11e of the housing 11 are made to protrude by the length of the above-mentioned coupling 33 forming extensions 11h.

As a result of being composed in this manner, when first resilient clamps 31 are engaged and clamped in terminal plates 12, since second resilient clamps 32 are in the state of being placed on the above-mentioned extensions 11h, they are fixed in a stable state. Consequently, this enables the switch to be used even in locations in which the interval between blade terminals 21 of bus bars 2 and housing 11 is long, or housing 11 and bus bars 2 are in such close proximity that they cannot be attached. Figs. 8 and 9 further indicate another embodiment of the present invention. In contrast to the above-mentioned embodiment shown in Figs. 6 and 7 having first and second resilient clamps 31 and 32 formed linearly, in the present embodiment, coupling 33 is bent at a right angle causing first resilient clamp 31 and second resilient clamp 32 to be offset from each other. In this case, since couplings 33 are placed on the upper surface of housing 11 and second resilient clamps 32 are placed on extensions 11h, they are fixed in position in a more stable state.

Furthermore, regardless of the shape of connection

terminals 3 in each of the above-mentioned embodiments, what is important is that two first and second resilient clamps 31 and 32 be formed on one connection terminal 3, so that the ends of terminals 31a of first resilient clamps 31 engage and are clamped in terminal plates 12 in housing 11, and terminals 32a of second resilient clamps 32 engage and are clamped in the blade terminals of bus bars 2.

As has been described above, since the present invention connects a switch, in which at least a pair of terminal plates are formed facing each other within recesses formed in a portion of a housing, to bus bars having blade terminals rising upwards from an insulated base, by means of connection terminals that are inserted into recesses of the above-mentioned housing, and form first resilient clamps that resiliently engage and are clamped in said terminals plates, and second resilient clamps that resiliently engage and are clamped in the blade terminals of the above-mentioned bus bars, connection of the switch and bus bars can be performed easily without using a connecting means such as soldering, thus simplifying the work process since the work time required for connecting the two components is shortened and the two components can be disconnected easily.

In addition, by engaging insertion tabs extending from the second resilient clamps with insertion holes of the housing, fixation of the connection terminals to the switch is made more reliable. Moreover, by forming first and second resilient clamps into a linear shape, the interval between the bus bars and switch can be made longer thus enabling variation to be

obtained in the manner in which the state is attached.

Moreover, by placing the ends of the second resilient clamps on ribs formed on the housing, the connection terminals are fixed to the switch in stable manner, thus offering the advantage of preventing the switch from being deformed with respect to the bus bars.

CLAIMS

1. A switch structure for connection to a pair of spaced contact blades, the structure comprising an electrical switch including a housing having a pair of recesses formed therein in each of which is located an electrically conductive terminal plate, and a pair of connection terminals each of which includes a first resilient clamp for location in an associated one of said recesses to fit resiliently onto the terminal plate therein, and a second resilient clamp to fit resiliently onto an associated one of the contact blades, whereby electrical continuity between the contact blades can be achieved on actuation of the switch.

2. A switch structure as claimed in claim 1 in which, for each connection terminal, the first resilient clamp and the second resilient clamp are bent to be positioned with their backs facing each other, a coupling in said connection terminal interconnecting said first and second clamps.

3. A switch structure as claimed in claim 1 or claim 2 wherein further recesses for containing the second resilient clamps are formed in the housing.

4. A switch structure as claimed in claim 1 or claim 2 in which insertion tabs extend from each second resilient clamp, and are inserted into corresponding insertion holes formed in the housing.

5. A switch structure as claimed in claim 1 in which, for each connection terminal, the first resilient clamp and the second resilient clamp extend linearly relative to one another.

6. A switch structure as claimed in claim 1 in which the first resilient clamp and the second resilient clamp of each connection terminal are interconnected by a coupling to be linearly offset relative to one another.

7. A switch structure as claimed in any of claims 1 to 5 in which the end of each second resilient clamp abuts an associated rib formed on the outside surface of the housing.

8. A switch structure substantially as described with reference to and as illustrated by the accompanying drawings.

The Patent Office

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Application No: GB 9718114.3 **Examiner:** Paul Nicholls
Claims searched: 1 - 8 **Date of search:** 10 November 1997

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): H1N (NQK); H2E (EEKE, EEKH)

Int Cl (Ed.6): H01H 9/00; H01R 11/09

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2,265,769 A	(SUMITOMO) - See figure 2	1, 3, 5
X	GB 2,247,351 A	(CRABTREE) - See figure 1	1
X	GB 758,301 A	(TELEMECANIQUE) - See figure 1	1
X	EP 0,463,608 A2	(YAZAKI) - See figure 1	1, 2
X	US 5,474,475 A	(YAMAGUCHI) - See figure 2	1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.