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INT CL[5] **H01R**
Online databases: WPI
updated as appropriate

FIG. 1A

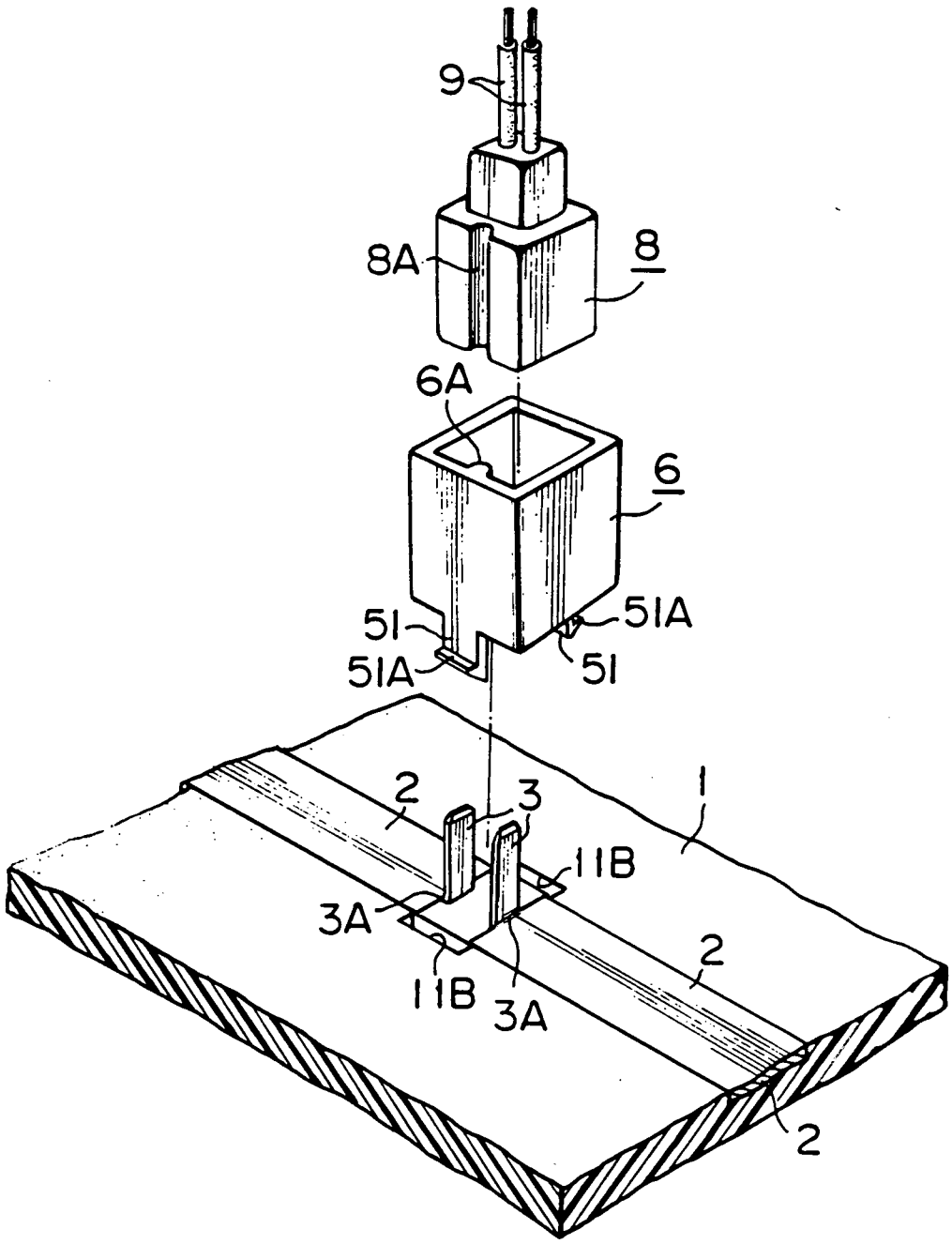
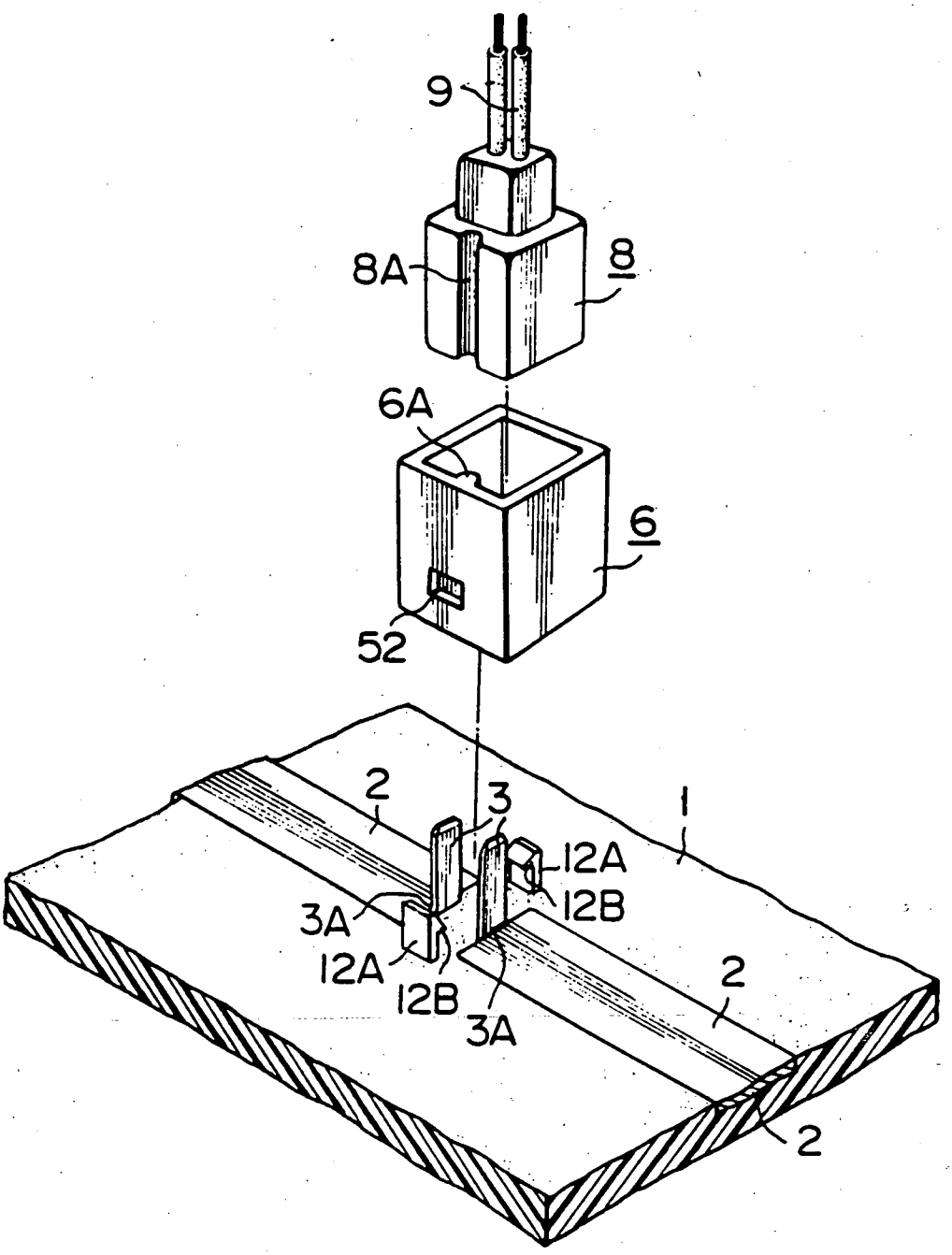
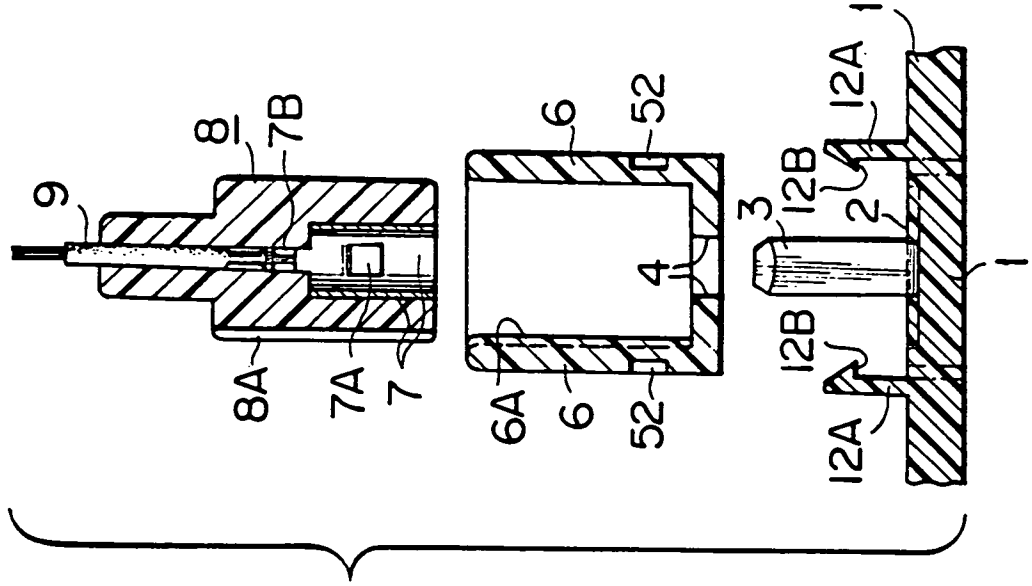


FIG. 1B

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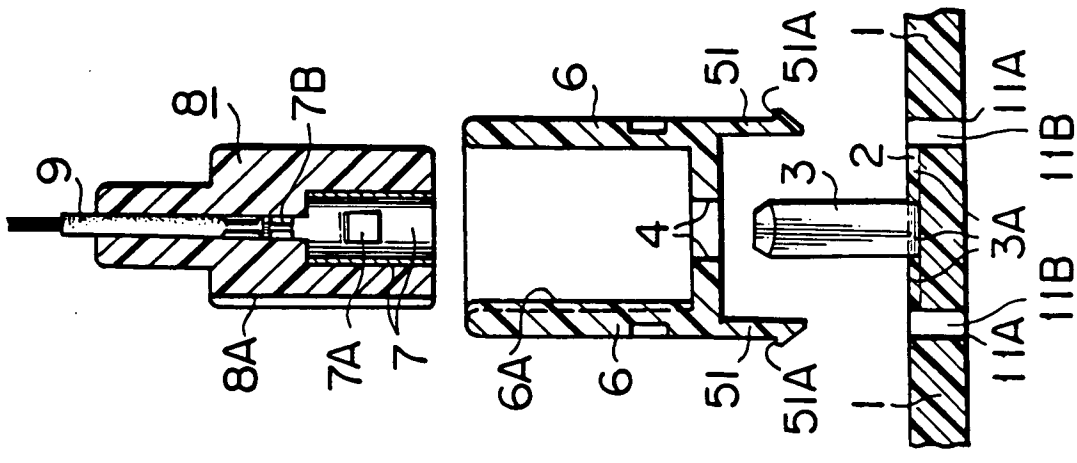
8
7B
8A
7A
7
6
52
6A
6
52
4
3
12B
2
1
12A
12B
12A
1

FIG. 2B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8
7B
8A
7A
7
6
51
51A
6A
6
51
51A
4
3
2
1
11A
11B
3A
11B
11A
1

FIG. 2A

FIG. 3A

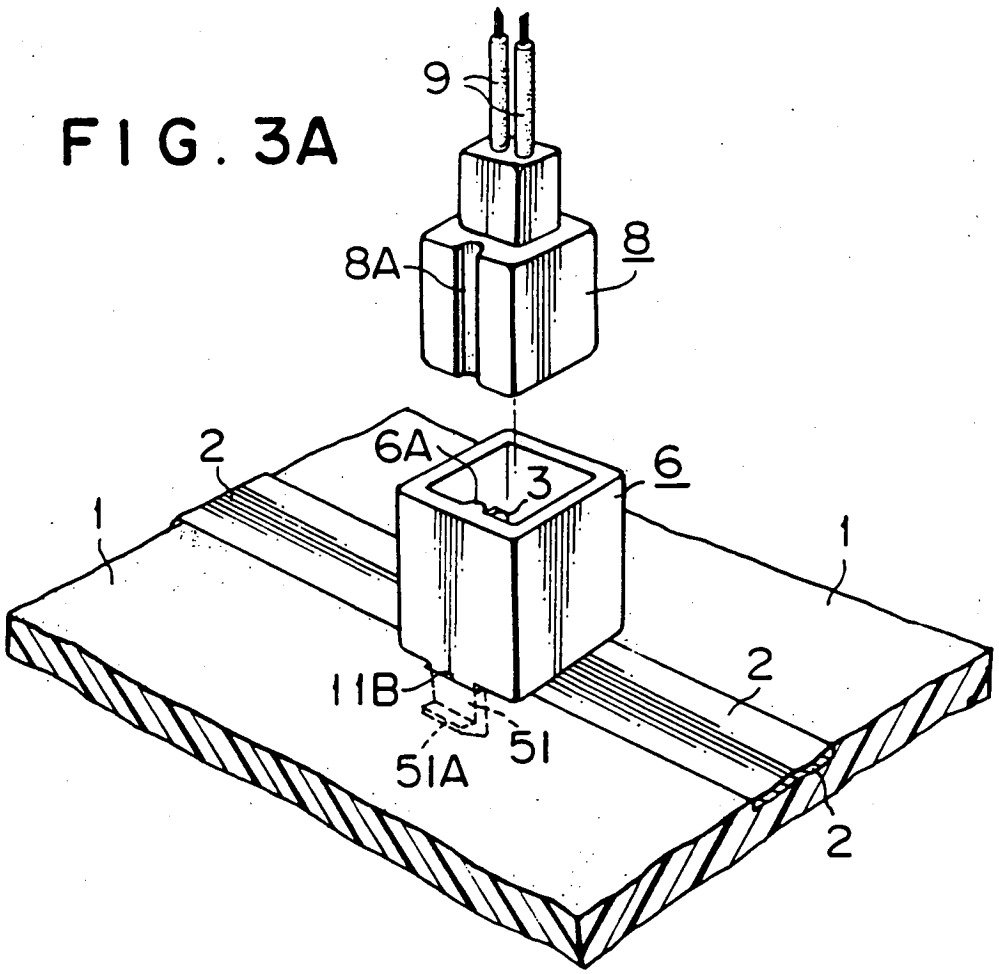
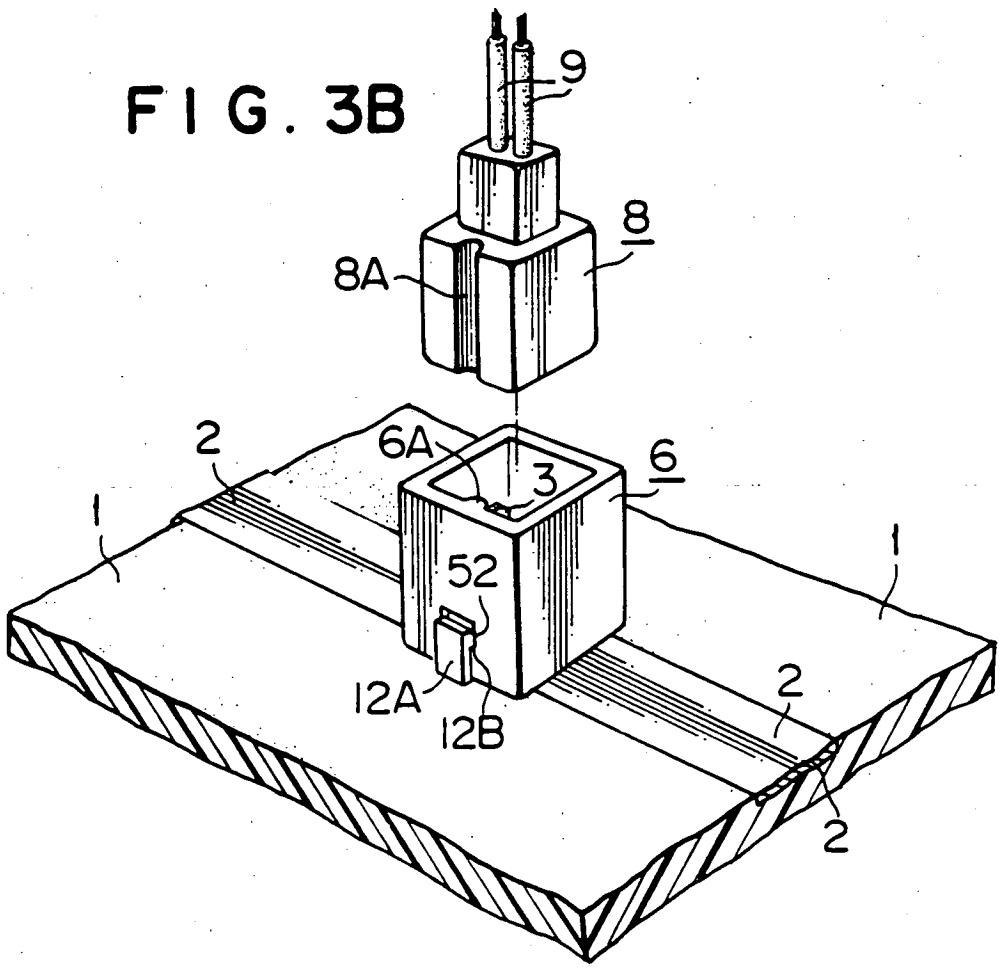


FIG. 3B



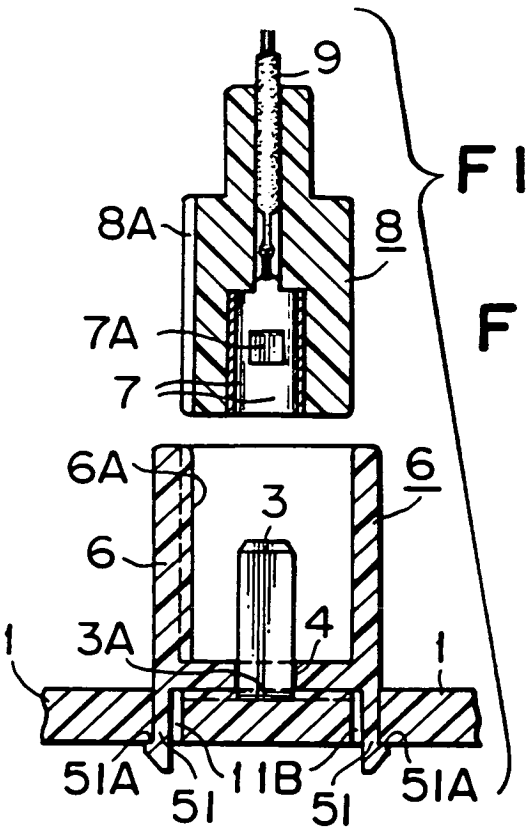


FIG. 4A

FIG. 4B

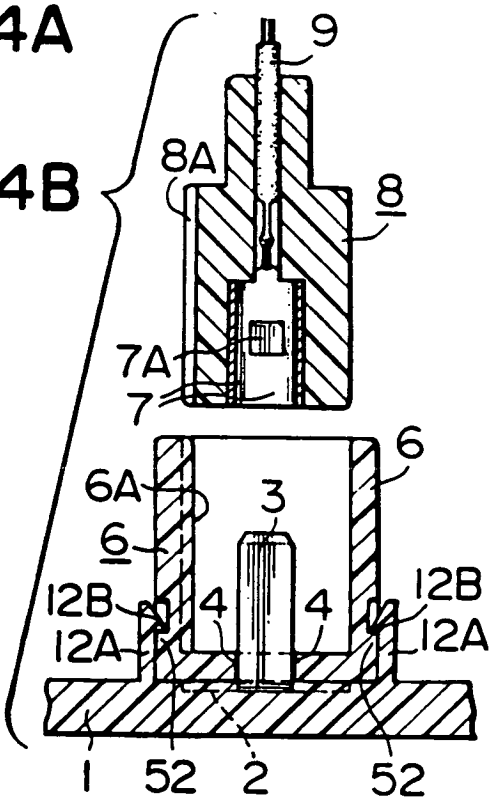


FIG. 5A

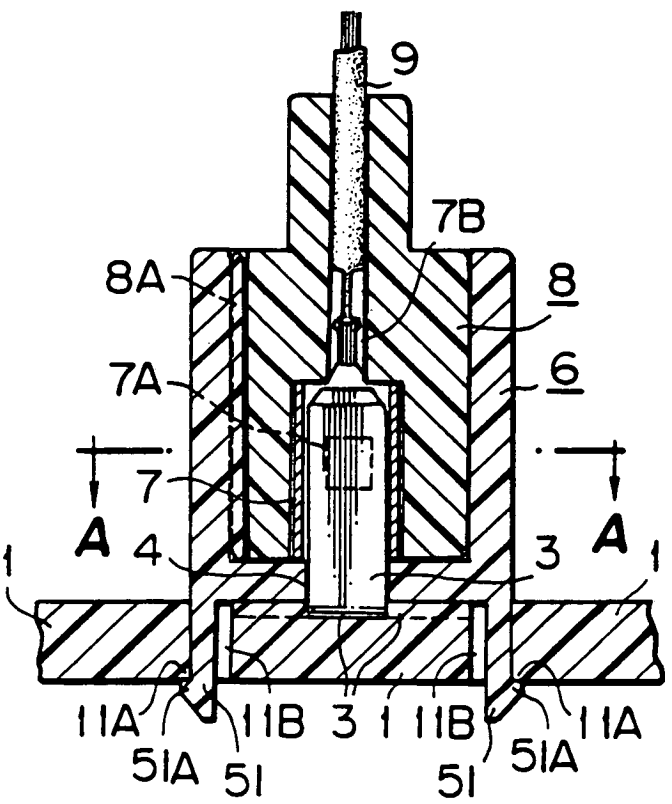


FIG. 5B

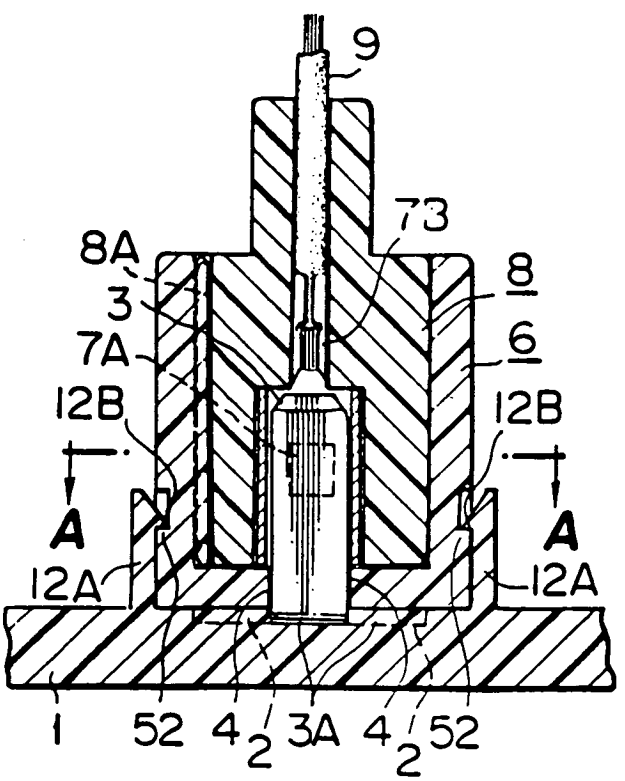


FIG. 6A

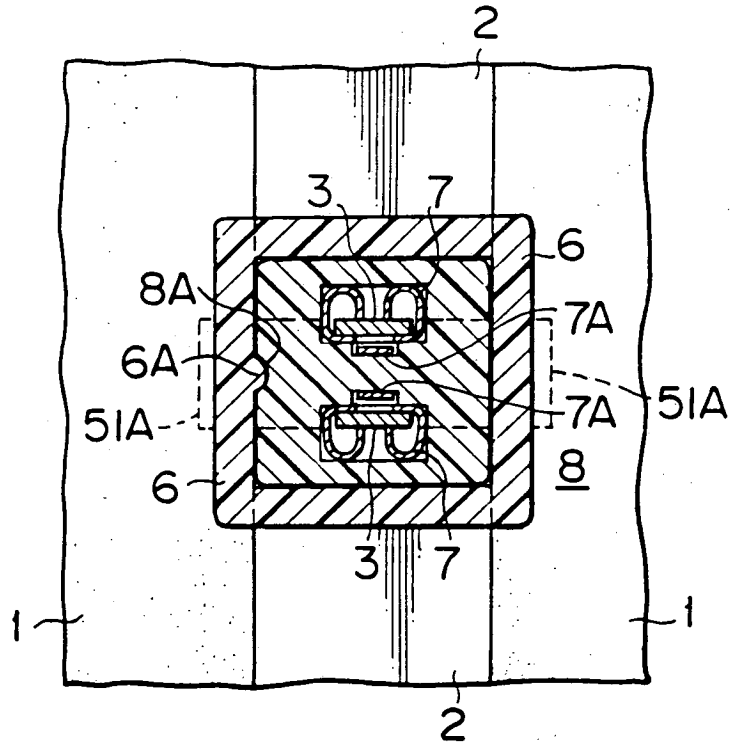
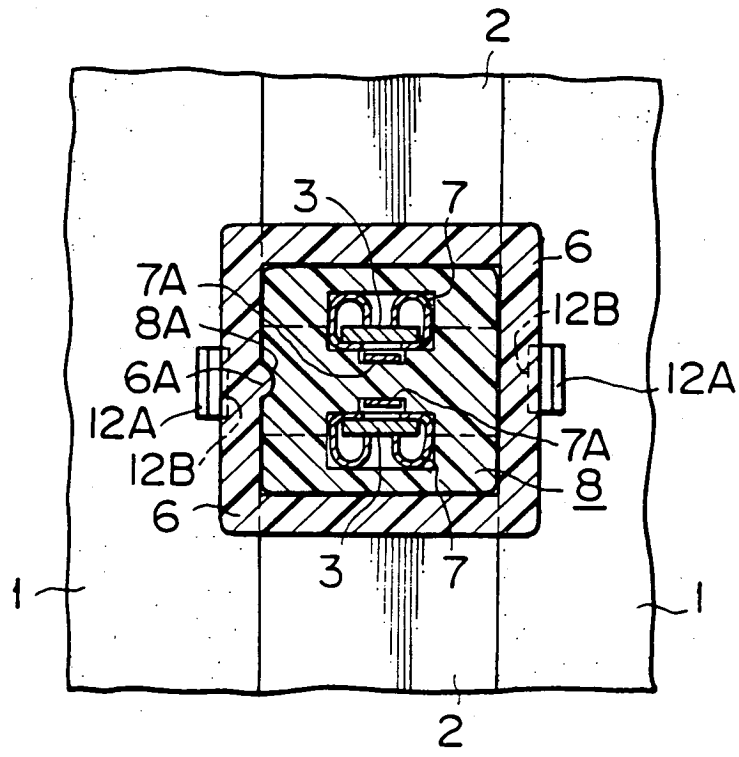

2
3
7
6
8A
7A
6A
51A
7A
51A
8
6
3
7
1
1
2

FIG. 6B


2
3
7
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7A
8A
12B
6A
12A
12A
7A
12B
8
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3
7
1
1
2

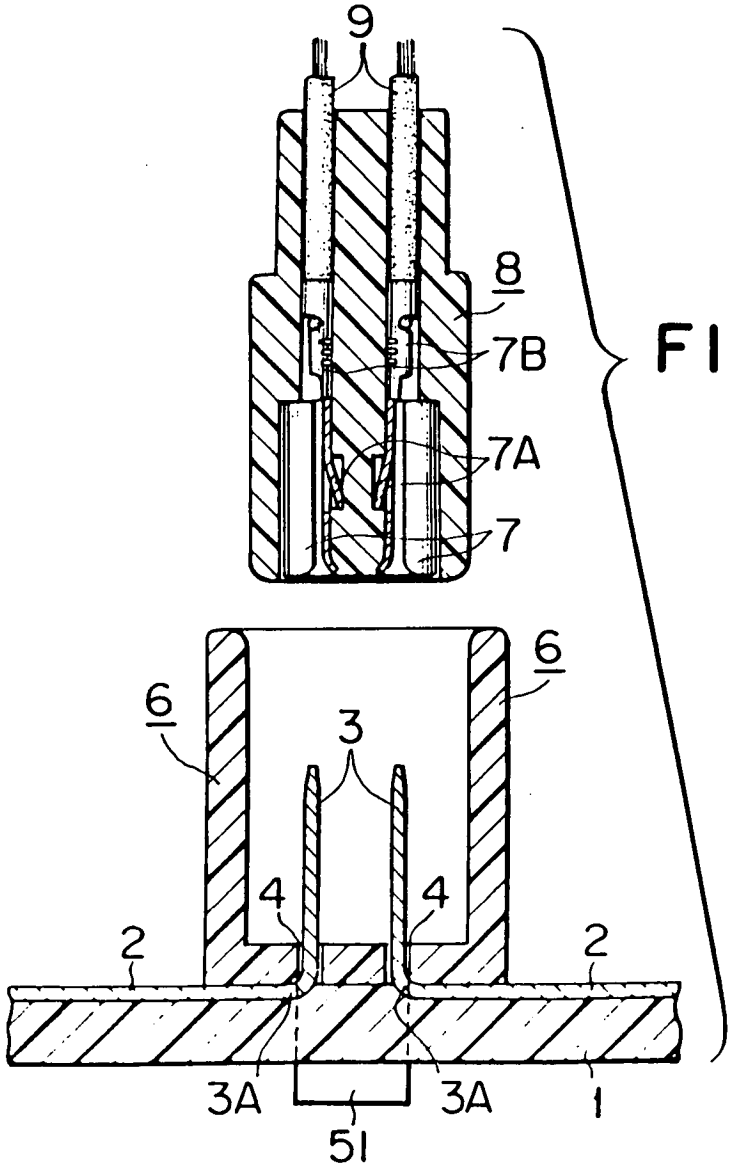


FIG. 7A

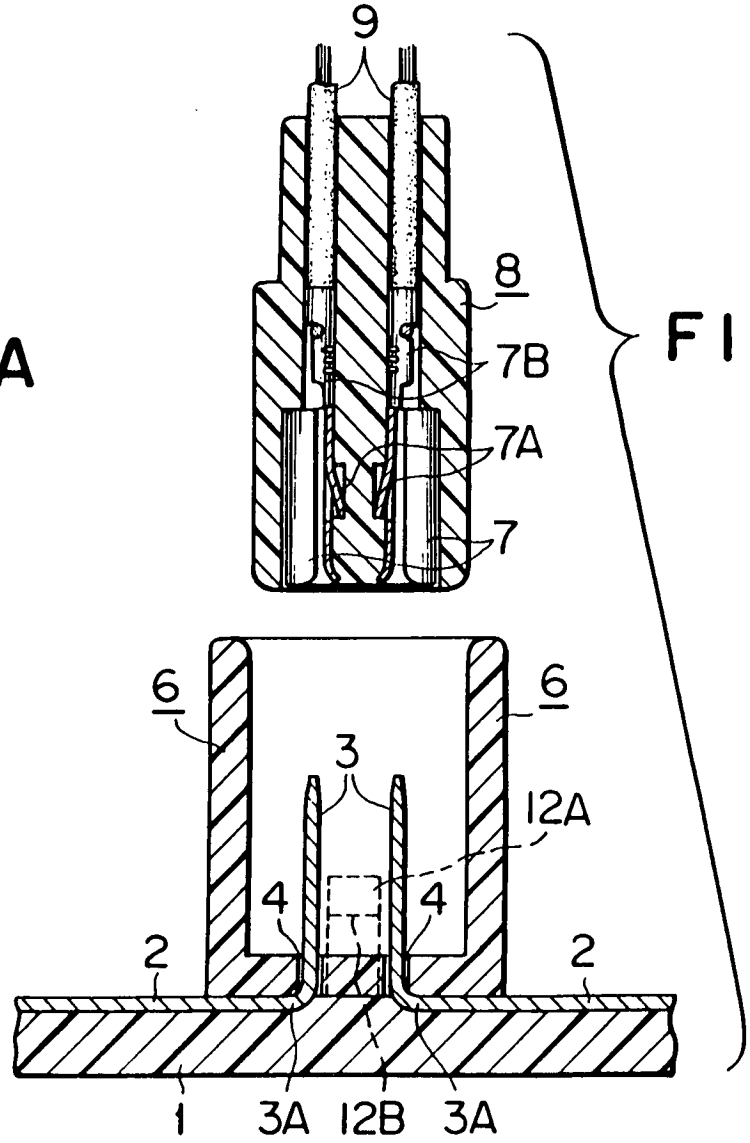
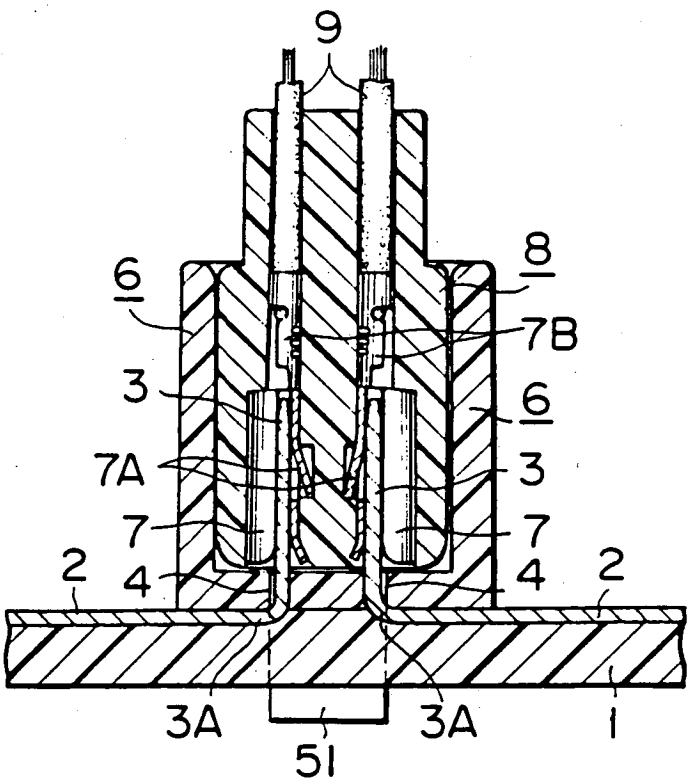


FIG. 7B

FIG. 8A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7B
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6
7A
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7
7
2
4
4
2
3A
3A
1
51

FIG. 8B

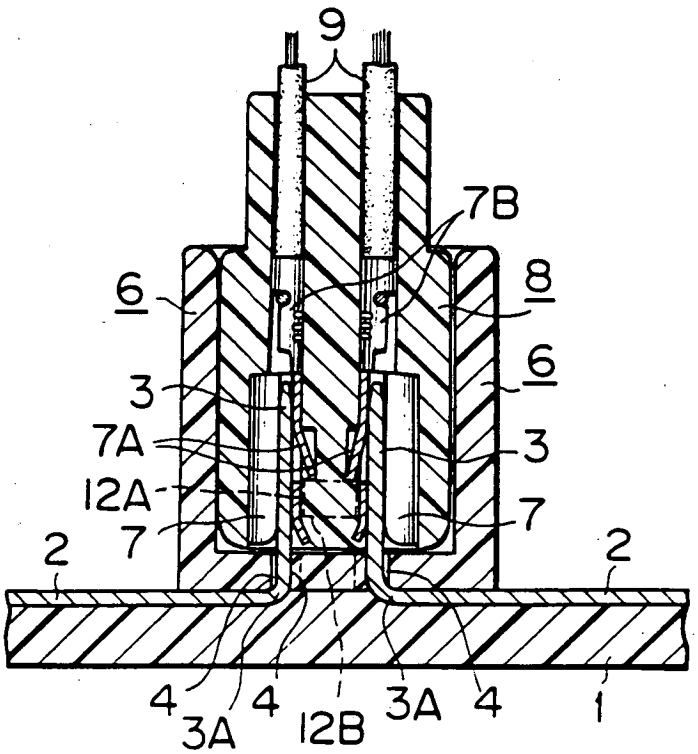
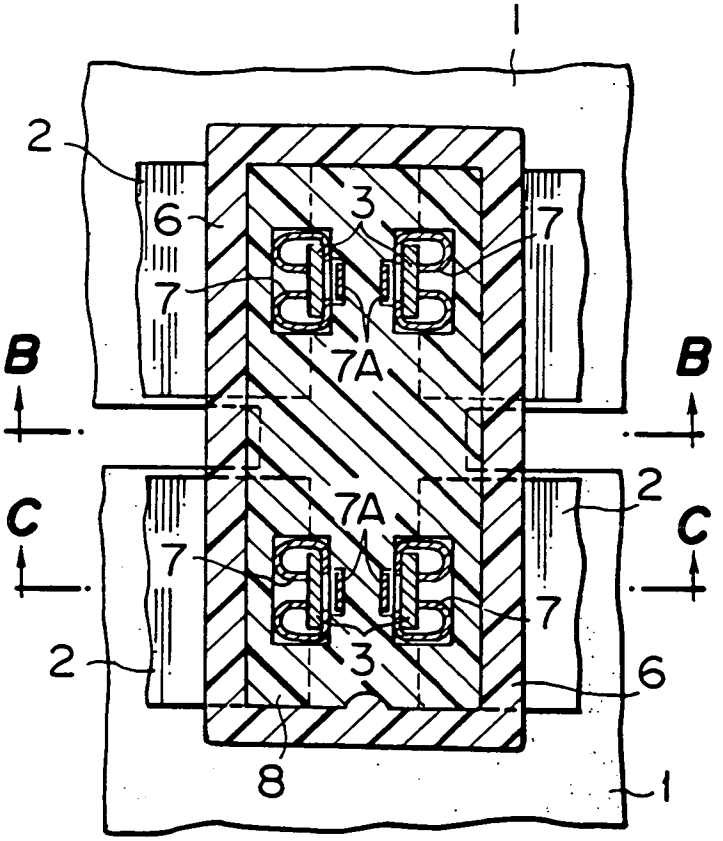

9
7B
6
8
6
3
7A
3
12A
7
2
7
2
4
3A
4
12B
3A
4
1

FIG. 9A


1
2
6
3
7
7
7A
B
B
C
C
7A
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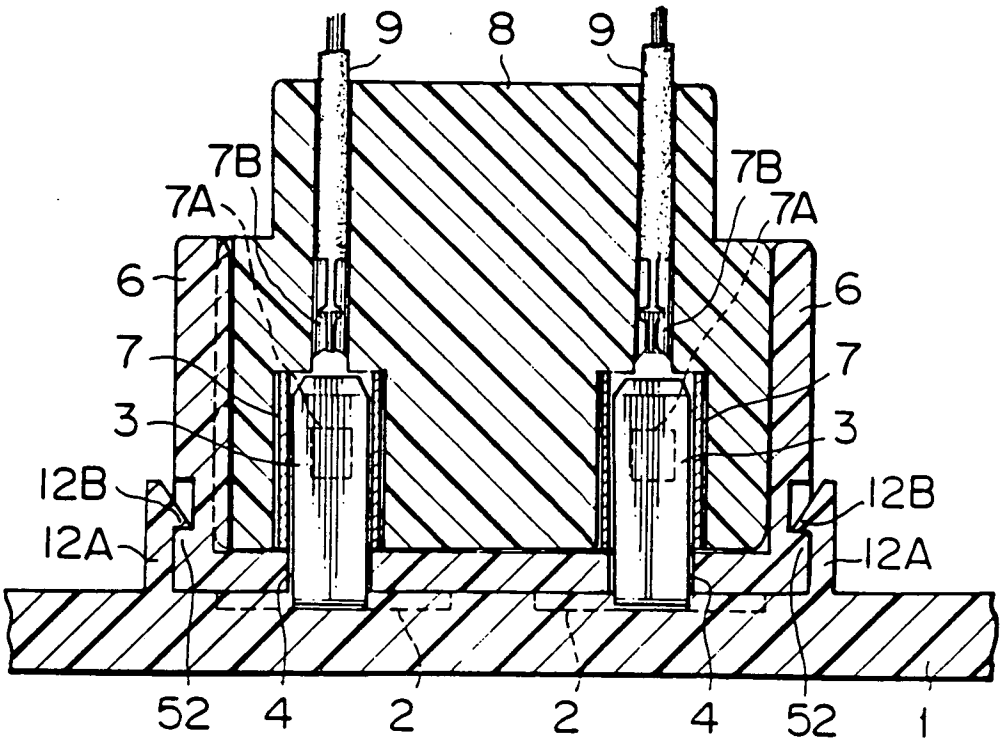
8
1

FIG. 9B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8
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7B
7A
7B
7A
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3
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12B
12B
12A
12A
52
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2
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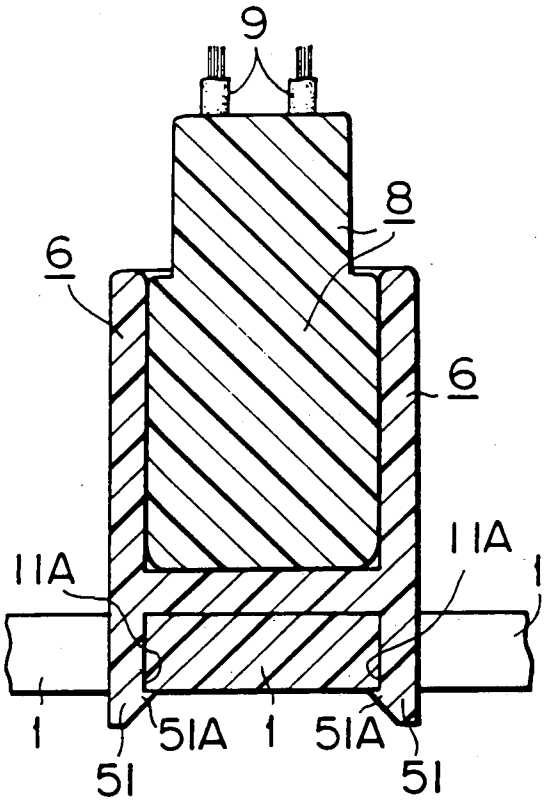
52
1

FIG. 10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8
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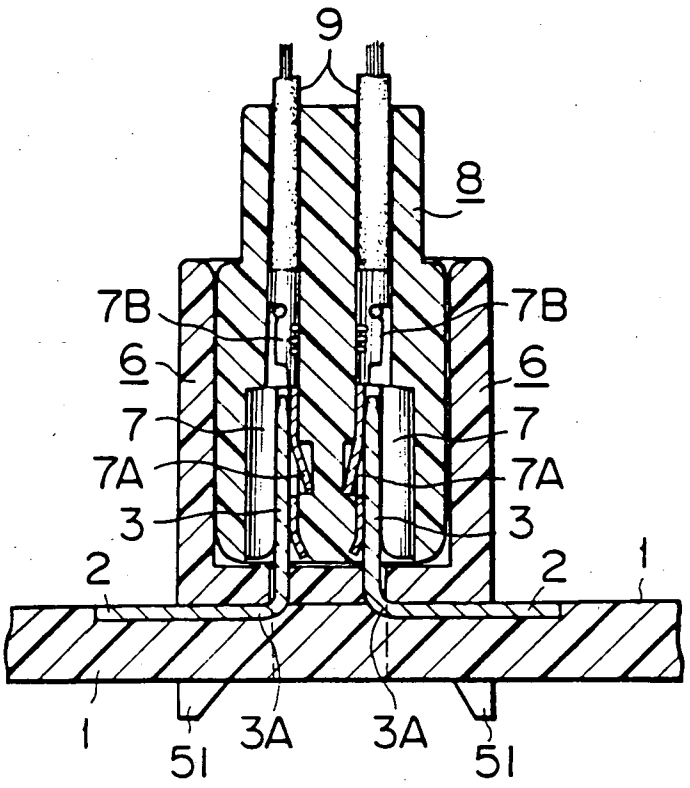
6
11A
11A
1
1
51A
1
51A
51
51

FIG. 11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8
7B
7B
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7A
7A
3
3
2
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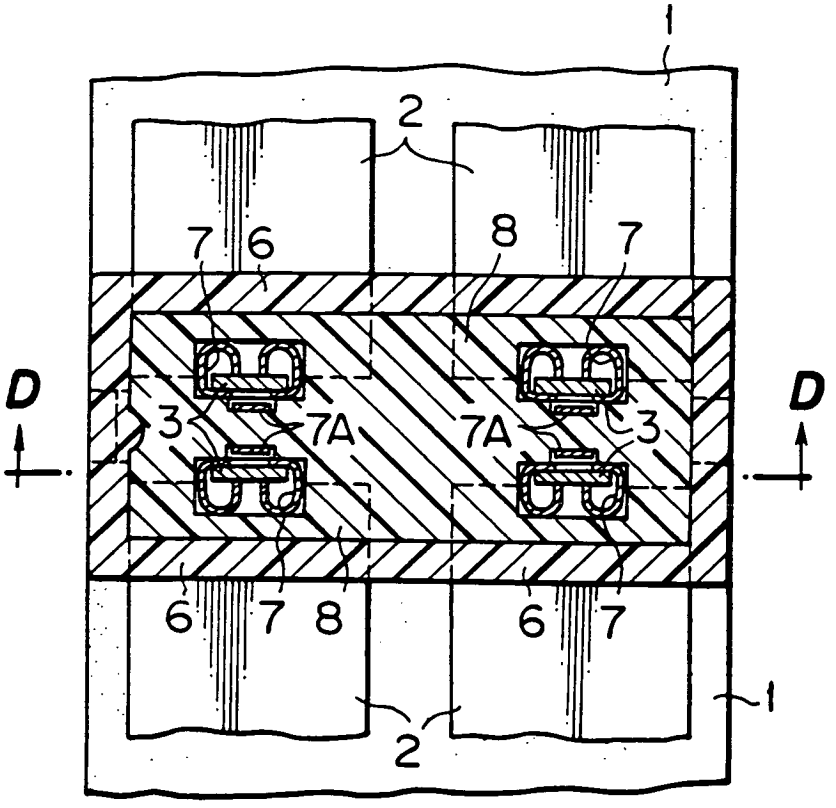
1
1
3A
3A
51
51

FIG. 12


1
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7A
7A
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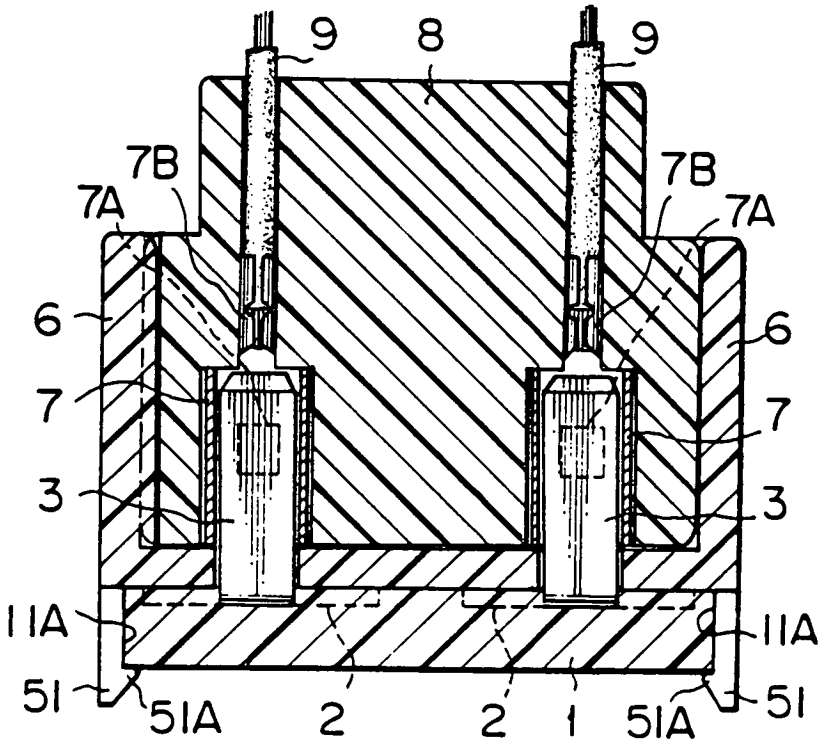
2

FIG. 13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7B
7A
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7A
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7
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3
11A
11A
51
51A
2
2
1
51A
51

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ELECTRICAL CONNECTOR DEVICE

The present invention relates to an electrical connector device and, more particularly, to an electrical connector device in which the base portions of conductor strips bent upwardly from a narrow conductor strip (generally referred to as BUS bar) are firmly fixed by way of apertures formed in the bottom of a tubular insulating member. More particularly, the BUS bar is immobilised between the bottom surface of the tubular insulating member and the surface of an insulating base member so as to prevent the tabs from being deformed or displaced by an external force.

Japanese Utility Model Examined Publication No. 58-10306 discloses a connector housing as a kind of the electrical connector device of the type mentioned above.

This known connector housing accommodates a plurality of female bi-polar terminals which fit at their one end on a plurality of parallel male terminals. The connector housing has a frame which opens at its upper and lower ends and partition walls which extend perpendicularly to the longitudinal walls of the frames so as to define a plurality of terminal receiving chambers. Tapered guide surfaces are formed on the lower ends of the left and right side walls and on the lower ends of the partition walls which are positioned

out of alignment with the lower end opening of the frame.

In use, a separately prepared cover plate having a central bore is fastened by screws to a circuit board in such a manner that a flange radially extending from a lower portion of the frame is pressed by a portion of the cover plate around the central bore, thereby fixing the housing to the circuit board.

Thus, the known connector housing requires a separate cover plate, which makes the administration of parts difficult and raises the cost of the connector. Furthermore, fastening of the cover plate using screws is quite laborious particularly in a dark place or when the working space is restricted. In addition, it is necessary to use a special tool such as a screw driver.

In this known connector housing, it is impossible to fix the base portions of strips which are bent upwards from BUS bars by way of the lower surface of the housing. That is, the arrangement is such that the upper surface of the circuit board is pressed, at a portion spaced apart from the above-mentioned base portions of the strips, by the lower end of the tapered inner surface of the flange provided on the housing. Therefore, the strips are liable to be deformed or

displaced by an external force.

It would be desirable to be able to provide an electrical connector device in which the base portions of strips upwardly bent from BUS bars provided on an insulating base are pressed onto the surface of the insulating base by a tubular insulating member so as to prevent deformation or displacement of the strips, and providing means whereby the connector can be fixed without requiring a cover plate and screws, thus overcoming the above-described problems of the prior art.

According to the present invention, there is provided an electrical connector device comprising at least two elongate narrow conductor plates located on one side of an insulating base made of plastic, the conductor plates each terminating in end portions which are bent upwards so as to provide upwardly projecting conductor strips, a tubular insulating member having a bottom surface provided with apertures for receiving therein the conductor strips, the tubular insulating member being coupled with the insulating base by means of at least one resilient tab, and a male engaging member having female connector members adapted to fit on the conductor strips, the arrangement being such that the base portions of the conductor strips are clamped between the portions of the bottom surface of the tubular insulating member surrounding the apertures and the surface of the insulating base.

In one embodiment of the invention, the insulating base is provided with at least one resilient tab which projects upwards therefrom, and the tubular insulating member is provided with retaining steps capable of retaining the or each resilient tab of the insulating base.

In an alternative embodiment, the tubular insulating member is provided with at least one resilient tab capable of engaging with lower edges of the insulating base.

Thus it will be appreciated that the base portions of the conductor strips bent upwardly from the BUS bars are strongly clamped between the upper surface of the insulating base and the lower surface of the tubular insulating member around the apertures, as a result of the engagement between the tubular insulating member and the insulating base, so that unintentional deformation or displacement of the conductor strips is prevented despite application of an external force such as that force exerted when, for example, the female connector members are brought into or out of contact with the conductor strips.

In addition, the tubular insulating member is fastened by a snap fit without requiring a cover plate

and a tool, by virtue of the engagement between the resilient tabs and the edges of the insulating base or the retaining steps of the insulating member.

The invention will be described further by way of example with reference to the accompanying drawings in which:

Fig. 1A and Fig. 1B are exploded perspective views of the first and the second embodiments of the invention, respectively, wherein an insulating base, a tubular insulating member and a male engaging member are separated from one another;

Figs. 2A and 2B are vertical sectional views of the first and the second embodiments of the invention, respectively;

Figs. 3A and 3B are perspective views of the first and the second embodiments of the invention, respectively, wherein the tubular insulating member is fitted to the insulating base;

Figs. 4A and 4B are vertical sectional views of the first and the second embodiments;

Figs. 5A and 5B are vertical sectional views of the first and the second embodiments, respectively, with the male engaging member inserted into the tubular insulating member;

Figs. 6A and 6B are cross-sectional views taken along the lines A-A of Figs. 5A and 5B, respectively;

Figs. 7A and 7B are vertical sectional views of the first and the second embodiments, taken at different planes from the vertical sectional views in Figs. 4A and 4B;

Figs. 8A and 8B are vertical sectional views of the first and the second embodiments, taken at different planes from the vertical sectional views in Figs. 5A and 5B;

Fig. 9A is a cross-sectional view of a different embodiment;

Fig. 9B is a vertical sectional views of the embodiment shown in Fig. 9A;

Figs. 10 and 11 are vertical sectional views taken along the lines B-B and C-C of Fig. 9A;

Fig. 12 is horizontal sectional views of a different embodiment; and

Fig. 13 is a vertical sectional views taken along the line D-D of Fig. 12.

A first embodiment will be described with reference to the drawings.

Referring to Figs. 1A and 2A, the first embodiment of the

electrical connector device of the present invention has electrical connector device of the present invention has the following parts: elongated narrow metal conductor plates 2 provided by, for example, embedding on one side of an insulating base 1 made of plastic, the conductor plates 2 being bent upward at, for example, their ends so as provide upwardly projecting conductor strips 3, a tubular insulating member 6 made of heat-resistant plastic such as 66 nylon having a bottom provided with apertures 4 for receiving the conductor strips 3 as shown in Figs. 2A and 7A, the tubular insulating member 6 sides thereof capable of engaging with, for example, lower edges 11A of an aperture 11B of insulating base 1 as shown in Figs.

3A and 4A; and a heat-resistant male engaging member 8 having female connector members 7 made of a resilient metallic sheet and adapted to fit on the conductor strips 3; wherein the base portions 3A of the conductor strips 3 are clamped between the portions of the lower surface of the bottom of the tubular insulating member 6 around the apertures 4 and the surface of the insulating base 1, as shown in Figs. 4A, 7A and 8A.

In these Figures, numeral 11B denotes the aperture formed in the insulating base so as to provide edges 11A for retaining hooks 51A of the resilient tabs 51.

Numeral 7A denotes a retaining claw for retaining the female

connecting member 7 in the male engaging member 8 in a manner shown in Fig. 7A.

Numeral 9 denotes lead lines which are covered with insulating sheathes and electrically connected to the female connecting member 7 at fitting portioned to the female connecting members 7 at fitting portions 7B as shown in Figs. 2A and 7A.

Numerals 6A and 8A denote, respectively, a projection and recess which are formed on the tubular insulating member 6 and the male engaging member in a manner shown in Fig. 3A, for the purpose of ensuring insertion of the male engaging member in correct orientation.

The tubular insulating member 6 with the bottom can have a circular cross-section though it is illustrated to have a rectangular cross-section in the drawings.

The male engaging member 8 also can have a cylindrical hollow structure correspondingly.

In the illustrated embodiment, there are two narrow conductor tabs3.

This, however, is only illustrative and the invention can be carried out with only one conductor plate 2 and one conductor strip 3, or two, three or more conductor plates and corresponding number of conductor strips as shown in Figs. 10 to 13.

In such cases, the number of the female connector members 7, as

well as the constructions of the male engaging member 8 and the tubular insulating member 6 are suitably determined in conformity with the number of the conductor strips.

In the arrangements shown in Figs. 10 to 13, it is not necessary to form an aperture such as the aperture 11B.

Namely, inwardly facing hooks 51A, 51A of the resilient tabs 51, 51 can engage with the side edges 11A, 11A of the base 1 so that the tubular insulating member can be fastened to protrude upright from the base 1.

The assembly procedure is as follows.

The insulating base 1, the tubular insulating member 6 and the male engaging member 8 are first separated from one another as shown in Figs. 1A and 2A.

Then, the tubular insulating member 6 is lowered with its resilient tabs 51 sliding along the wall of the aperture 11B in the insulating base 1 into engagement with the lower edges 11A, as shown in Figs. 3A and 4A.

Thus, the resilient tabs 51 are deflected inwardly due to the tapered outer surfaces of the hook portions 51A, 51A thereof and, when the hooks 51A,51A have passed the aperture 11B, the resilient tabs 51 are released to expand outward, thus attaining a snap fit of the hook portions 51A, 51A on the lower edges 11A, 11A around the aperture 11B in the insulating base 1.

It is thus possible to fasten the tubular insulating member in a single snapping action.

In this state, the base portions 3A of the conductor strips 3 upwardly bent from BUS bars 2 are strongly clamped between the upper surface of the insulating base 1 and the lower surface of the bottom of the tubular insulating member 6 around the ertures 4, as a result of the engagement between the resilient tabs 51 of the tubular insulating member 6 and the edges 11A of the insulating base 1, so that unintentional deformation or displacement of the conductor strips 3 is prevented despite application of an external force which is exerted when, for example, the female connector members 7 are brought into or out of contact with the conductor strips.

It will be seen that, in this state, the narrow conductor plates, i.e., BUS bars 2, are electrically connected to an external circuit through the conductor strips 3 integral therewith, the female connector members 7 and the lead lines 9.

A second embodiment of the invention will be described with reference to the drawings.

The second embodiment of the electrical connector device comprises the following parts, as shown in Figs. 1B and 2B: elongated narrow metal conductor plates 2 provided by, for example, embedding on one side of an insulating base 1 made of

plastic, the conductor plates 2 being bent upward at, for example, their ends so as provide upwardly projecting conductor strips 3, the insulating base having resilient tabs 12A, 12A projecting upward therefrom; a tubular insulating member 6 having a bottom provided with apertures 4 for receiving the conductor strips 3 as shown in Figs. 2B and 7B, the tubular insulating member 6 also having retaining steps 52, 52 capable of retaining the resilient tabs 12A, 12A of the insulating base 1 as shown in Figs. 3B and 4B; and

male engaging member 8 having female connector members 7 made of resilient metal sheets and adapted to fit on the conductor strips as shown in Figs. 5B and 6B; wherein the base portions 3A of the conductor strips 3 are clamped between the portions of the lower surface of the bottom of the tubular insulating member 6 around the apertures 4 and the surface of the insulating base 1, as shown in Figs. 4B, 7B and 8B.

In these Figures, numeral 7A denotes a retaining claw for retaining the female connecting member 7 in the male engaging member 8 in a manner shown in Fig. 7B.

Numeral 9A denotes lead lines which are covered with insulating sheathes and electrically connected to the female connecting members 7 at fitting portions 7B as shown in Figs. 2B and 7A.

Numerals 6A and 8A denote, respectively, a projection and

recess which are formed on the tubular insulating member 6 and the male engaging member in a manner shown in Fig. 3B, for the purpose of ensuring insertion of the male engaging member in correct orientation.

The tubular insulating member 6 with the bottom can have a circular cross-section though it is illustrated to have a rectangular cross-section in the drawings.

The male engaging member 8 also can have a cylindrical hollow structure correspondingly.

In the illustrated embodiment, there are two narrow conductor plates 2 and, hence, two upwardly projecting conductor tabs 3. This, however, is only illustrative and the invention can be carried out with only one conductor plate 2 and one conductor strip 3, or two, three or more conductor plates and corresponding number of conductor strips as shown in Figs. 9B. In such cases, the number of the female connector members 7, as well as the constructions of the male engaging member 8 and the tubular insulating member 6 are suitably determined in conformity with the number of the conductor strips, as shown in Fig. 9B.

The assembly procedure is as follows.

The insulating base 1, the tubular insulating member 6 and the male engaging member 8 are first separated from one another as shown in Figs. 1B and 2B.

Then, the tubular insulating member 6 is lowered towards the resilient tabs 12A, 12A from the upper side of the insulating base 1, keeping the retaining steps 52, 52 in alignment with the resilient tabs 12A, 12A.

Thus, the resilient tabs 12A, 12A are deflected inwardly due to the tapered outer surfaces of the hook portions thereof and, thereafter, the resilient tabs 12A, 12A are released to expand outward, thus attaining a snap fit of the hook portions 12B, 12B of the resilient tabs 12A, 12A on the retaining steps 52, 52 on the tubular member 6.

It is thus possible to fasten the tubular insulating member 6 in a single snapping action.

In this state, the base portions 3A of the conductor strips 3 upwardly bent from BUS bars 2 are strongly clamped between the upper surface of the insulating base 1 and the lower surface of the bottom of the tubular insulating member 6 around the apertures 4, as a result of the engagement between the resilient tabs 12A, 12A and the retaining steps 52, 52 on the tubular insulating member 6, conductor strips 3 is prevented despite application of an external force which is exerted when, for example, the female connector members 7 are brought into or out of contact with the conductor strips.

It will be seen that, in this state, the narrow conductor plates, i.e., BUS bars 2, are electrically connected to an

external circuit through the conductor strips 3 integral therewith, the female connector members 7 and the lead lines 9.

As will be understood from the foregoing description, the present invention offers the following advantages.

In the assembly of the electrical connector device of the first embodiment, the tubular insulating member 6 is lowered with its resilient tabs 51 sliding along the walls of the aperture 11B in the insulating base 1 into engagement with the lower edges 11A so that the resilient tabs 51 are deflected inwardly due to the tapered outer surfaces thereof and are then released to expand outward, thus attaining a snap fit of the hook portions 51A, 51A on the lower edges 11A, 11A of the insulating base 1, whereby the tubular insulating member 6 can be fastened to the insulating base 1 by a single snapping action.

Thus, the fixing of the tubular insulating member can be conducted without requiring laborious works such as driving of screws with a screw driver and without requiring any additional part such as a cover plate.

Thus, the assembly can easily be conducted even in the dark or a restricted place, thus contributing to a reduction in the cost.

In addition, the base portions 3A of the conductor strips 3 upwardly bent from BUS bars 2 are strongly clamped between the

upper surface of the insulating base 1 and the lower surface of the bottom of the tubular insulating member 6 around the apertures 4, as a result of the engagement between the resilient tabs 51 on the tubular insulating member 6 and the edges 11A of the insulating base 1, so that unintentional deformation or displacement of the conductor strips 3 is prevented despite application of an external force which is exerted when, for example, the female connector members 7 are brought into or out of contact with the conductor strips.

Referring now to the second embodiment, in the assembly of the electrical connector device, the tubular insulating member 6 is lowered towards the resilient tabs 12A, 12A from the upper side of the insulating base 1, keeping the retaining steps 52, 52 in alignment with the resilient tabs 12A, 12A, so that the resilient tabs 12A, 12A are deflected inwardly due to the tapered outer surfaces of the hook portions thereof and, thereafter, the resilient tabs 12A, 12A are released to expand outward, thus attaining a snap fit of the hook portions 12B, 12B of the resilient tabs 12A, 12A on the retaining steps 52, 52 on the tubular member 6, whereby the tubular insulating member can be fastened by a single snapping action.

In this state, the base portions 3A of the conductor strips 3 upwardly bent from BUS bars 2 are strongly clamped between the

upper surface of the insulating base 1 and the lower surface of the bottom of the tubular insulating member 6 around the apertures 4, as a result of the engagement between the resilient tabs 12A, 12A and the retaining steps 52, 52 on the tubular insulating member 6.

Thus, the second embodiment offers the same advantages as those produced by the first embodiment.

CLAIMS

1. An electrical connector device comprising at least two elongate, narrow conductor plates located on one side of an insulating base made of plastic, the conductor plates each terminating in end portions which are bent upwards, so as to provide upwardly projecting conductor strips, a tubular insulating member having a bottom surface provided with apertures for receiving therein the conductor strips, the tubular member being coupled with the insulating base by means of at least one resilient tab, and a male engaging member having female connector members adapted to fit on the conductor strips, the arrangement being such that the base portions of the conductor strips are clamped between the portions of the bottom surface of the tubular insulating member surrounding the apertures and the surface of the insulating base.

2. An electrical connector device as claimed in claim 1 in which the insulating base is provided with at least one resilient tab which projects upward therefrom, and the tubular insulating member is provided with corresponding retaining steps capable of retaining the or each resilient tab of the insulating base to couple the tubular insulating member and the insulating base together.

3. An electrical connector device as claimed in claim 1 in which the tubular insulating member is provided with at least one resilient tab capable of engaging with lower edges of the insulating base to couple the tubular insulating member and the insulating base together.

4. An electrical connector device substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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Title ELECTRICAL CONNECTOR DEVICE

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