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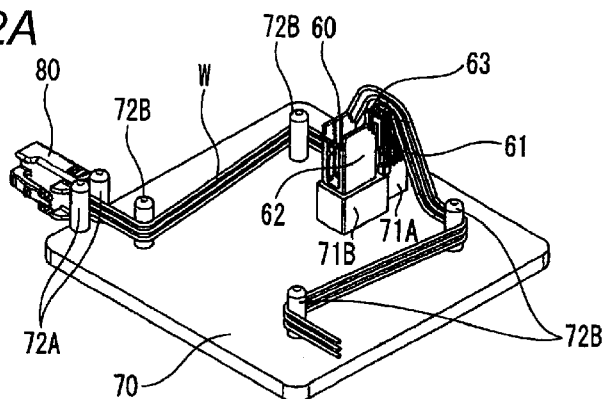
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(54) Title: WIRE CABLING METHOD AND WIRE CABLING JIG USED THEREIN

FIG. 2A



(57) Abstract: In a wire cabling jig 70 having a flat plate body, a holder pedestal 71A on which a holder 61 of a connector 60 including the holder 61 and a cover 62 is placed and fixed is attached, and cylindrical wire positioning pins 72B are erected on one side with the holder pedestal 71A sandwiched between the wire positioning pins 72B, and connector positioning pins 72A are erected in the vicinity of the wire positioning pin 72B present on one end.

DESCRIPTION

WIRE CABLING METHOD AND WIRE CABLING JIG USED THEREIN

5 Technical Field

The present invention relates to a wire cabling method for mounting a coated electric wire in a connector of an interior illuminating apparatus for vehicle, and a wire cabling jig used in the method.

10

Background Art

It is publicly known that electrical connection between electric wires received in a connector without having a conducting component in the inside is made using a crimp member
15 (see Patent literature 1). Fig. 12 shows a connector structure described in Patent literature 1. In Fig. 12, a connector A includes a cover B for crimp and by this cover B for crimp, an electric wire W1 and a contact C are crimped to make electrical connection between the electric wire W1 and the
20 contact C.

Citation List

Patent literature

Patent literature 1: JP-A-2006-147273

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A conventional connector of an electric wire crimp type is means for pressing into a crimp groove of each contact of the housing side by directly pressing a crimp cover for holding plural electric wires on a housing, and has an effect when the number of electric wires crimped and connected is small, but when the number of electric wires is large, a great operation force is required and there was a problem point that crimp work cannot be done unless a dedicated jig for crimp is used. Therefore, there was a problem of being difficult to manufacture a wire harness in the field etc. in which the dedicated jig for crimp was not ready.

Summary of Invention

Technical Problem

An object of the invention is to provide a wire cabling jig to a connector capable of accurately and easily determining a position of attachment of a cover to an electric wire, and a method for using the jig.

Solution to Problem

In order to achieve the object described above, the invention of a wire cabling method using a wire cabling jig for mounting an electric wire in a connector of an interior illuminating apparatus for vehicle is characterized by (1), and the wire cabling jig for the method is characterized by

(2) to (4).

(1) A wire cabling method, comprising:

placing a connector including a holder and a cover on
a wire cabling jig which is provided with a holder pedestal
5 for installing the holder, a wire positioning pin located on
one side of the holder pedestal and a connector positioning
pin in a vicinity of the wire positioning pin, by installing
the holder on the holder pedestal;

abutting the connector on the connector positioning pin;

10 bringing electric wires extending from the connector
into sliding contact with a side surface of the wire positioning
pin;

laying the electric wires on grooves of the holder
installed on the holder pedestal;

15 bringing the electric wires into sliding contact with
a side surface of another wire positioning pin; and

fitting the cover into the holder in a state of strongly
pulling ends of the electric wires to a side opposite to the
holder pedestal.

20 (2) A wire cabling jig with a flat plate body, comprising:

a holder pedestal on which a holder of a connector
including the holder and a cover is placed and fixed;

cylindrical wire positioning pins erected on opposite
sides of the holder pedestal; and

25 a connector positioning pin erected in a vicinity of the

wire positioning pin.

(3) In the invention of (2) described above, a holder positioning protrusion upward projecting from the holder pedestal is provided.

5 (4) In the invention of (2) or (3) described above, a pair of electric wire presses is erected in the vicinities of opposite sides of the holder pedestal sandwiched between the electric wire presses.

10 Advantageous Effects of Invention

According to (1) described above, the slack of the electric wires can be reduced easily, and a position of attachment of the holder and the cover to the electric wires can be determined easily and accurately.

15 According to (2) described above, the plural electric wires respectively extending from the connector fixed by the connector positioning pin are gathered and are twisted around each of the wire positioning pins and are turned around and are laid on the grooves of the holder installed on the holder
20 pedestal and are further twisted around the wire positioning pins and are routed and the distal end of the electric wires is strongly pulled in an opposite direction and thereby, the slack of the electric wires can be reduced easily.

According to (3) described above, the holder can easily
25 be positioned in the holder pedestal using the holder

positioning protrusion.

According to (4) described above, the electric wires aligned vertically can easily be turned around to the electric wires aligned horizontally by using a pair of electric wire presses.

Brief Description of Drawings

Figs. 1A to 1C are a view showing a method for mounting electric wires in a connector assembled to an interior illuminating apparatus for vehicle of Fig. 5 using a jig based on a first embodiment, and Fig. 1A is a perspective view of a state before assembling the connector, and Fig. 1B is a perspective view of a state of temporarily fixing the connector on the jig, and Fig. 1C is a perspective view of a state before mounting the electric wires in the connector.

Figs. 2A to 2C show a method for mounting the electric wires in a second connector mounted in the interior illuminating apparatus for vehicle, and Fig. 2A is a perspective view of a state just before assembling the electric wires to the second connector, and Fig. 2B is a perspective view of the completion of temporary fixing of the electric wires, and Fig. 2C is a perspective view of the completion of mounting of the second connector.

Figs. 3A and 3B are views showing mounting of the second connector in the interior illuminating apparatus for vehicle,

and Fig. 3A is a back perspective view showing a state before mounting, and Fig. 3B is a back perspective view showing a state of the completion of mounting.

Figs. 4A to 4C show a wire cabling jig according to a second embodiment, and Fig. 4A is a perspective view of a state before mounting a second connector, and Fig. 4B is a perspective view of a state of assembling electric wires to the second connector, and Fig. 4C is a perspective view of the completion after the electric wires are mounted in the second connector and are covered with a cover.

Fig. 5 is an exploded perspective view showing an interior illuminating apparatus for vehicle targeted for the invention.

Figs. 6A to 6C show a state of mounting a second connector obtained by the invention in the interior illuminating apparatus for vehicle of Fig. 5, and Fig. 6A is a back perspective view showing a state before mounting the second connector, and Fig. 6B is a plan view seen from the back showing a state of the completion of mounting, and Fig. 6C is a sectional view taken on line A-A of Fig. 6B.

Figs. 7A to 7C are views showing a state of mounting a metal fitting and a bus bar of the interior illuminating apparatus for vehicle, and Fig. 7A is a back perspective view showing a state before mounting the metal fitting and the bus bar, and Fig. 7B is a back perspective view showing a state of the completion of mounting, and Fig. 7C is an enlarged view of part

A of Fig. 7B.

Figs. 8A to 8C are views showing a state of mounting a switch of the interior illuminating apparatus for vehicle, and Fig. 8A is a back perspective view showing a state before mounting, and Fig. 8B is a back right perspective view showing a state of the completion of mounting, and Fig. 8C is a back left perspective view showing a state of the completion of mounting.

Figs. 9A and 9B are views showing a state of mounting a switch knob of the interior illuminating apparatus for vehicle, and Fig. 9A is a front perspective view showing a state before mounting the switch knob, and Fig. 9B is a front perspective view showing a state of the completion of mounting.

Figs. 10A and 10B are views showing a state of mounting a bulb (electric lamp bulb) of the interior illuminating apparatus for vehicle, and Fig. 10A is a front perspective view showing a state before mounting the bulb, and Fig. 10B is a front perspective view showing a state of the completion of mounting.

Figs. 11A and 11B are views showing a state of mounting a lens of the interior illuminating apparatus for vehicle, and Fig. 11A is a front perspective view showing a state before mounting the lens, and Fig. 11B is a front perspective view showing a state of the completion of mounting.

Figs. 12A and 12B show a connector of a conventional art, and Fig. 12A is a perspective view, and Fig. 12B is a sectional

view taken on line D-D of Fig. 12A.

Fig. 13 is a back perspective view of an interior illuminating apparatus for vehicle of the prior invention.

5 Description of Embodiments

First, an interior illuminating apparatus for vehicle targeted for the invention will be described briefly with reference to the drawings. In Figs. 5 and 6A to 6C, an interior illuminating apparatus 10 for vehicle is attached to a
10 partition wall board (a roof board) for partitioning a vehicle room of a vehicle, and broadly includes substantially a rectangular lens 20, a vertically long switch knob 30, substantially a rectangular housing 40, and a bus bar 50.

A bulb receiving chamber 41 is formed in the front side
15 40F of the housing 40, and a bulb 41B which is a light source is assembled to the center of the bulb receiving chamber 41, and a lateral part of the housing 40 is provided with a switch receiving chamber 42, and the switch knob 30 is slidably assembled from the front side 40F.

20 Also, one lateral part of the housing 40 is provided with a first connector 43 projecting to the lateral part of the housing 40. A second connector 60 (described below in Fig. 3) to which electric wires (wire harnesses) W are fixed is fitted into this first connector 43. A metal clip 44 (Fig.
25 5) for attaching the interior illuminating apparatus 10 for

vehicle to the partition wall board of the room inside of the vehicle is fixed to the other lateral part opposite to the first connector 43 of the housing 40. A switch 42R (Fig. 6A) in synchronization with the switch knob 30 is assembled from the back side 40R to the inside of the switch receiving chamber 42, and the bus bar 50 (Figs. 1A to 1C) which is a circuit for electrically connecting the switch 42R, the bulb 41B, etc. is assembled and fixed to the back side 40R of the housing 40. In one end of the bus bar 50, plural crimp blades 51 are individually longitudinally arranged in parallel and the crimp blades 51 are mounted and fixed inside the first connector 43.

Next, electrical connection by the crimp blades 51 will be described using Figs. 6A to 6C.

The second connector 60 to which the electric wires W are fixed is fitted into the first connector 43. The switch 42R and the bus bar 50 are fixed to the back side 40R of the housing 40, and the crimp blades 51 of the bus bar 50 are fixed to the first connector 43. When the second connector 60 is inserted and fitted into the first connector 43, the crimp blades 51 bite into a coat resin layer of the electric wires W to change to a state in which the crimp blades 51 are electrically connected to the electric wires W as shown in Fig. 6C.

In this state, mounting of the interior illuminating apparatus 10 for vehicle is completed.

(1) Figs. 7A to 7C are views showing a state of mounting a metal fitting and the bus bar of the interior illuminating apparatus for vehicle, and Fig. 7A is a back perspective view showing a state before mounting, and Fig. 7B is a back perspective view showing a state of the completion of mounting, and Fig. 7C is an enlarged view of part A of Fig. 7B. In Figs. 7A to 7C, the metal clip 44 is engaged and fixed to an engaging groove 44R provided on a side surface opposite to the first connector 43 of the housing 40, and the bus bar 50 is mounted and fixed to the whole back side 40R of the housing 40. After the bus bar 50 is temporarily fixed to plural protrusions 40T formed on the back side 40R, the bus bar 50 is fixed to the back side 40R by a thermal welding method for melting the tops of the protrusions 40T.

(2) Figs. 8A to 8C are views showing a state of mounting the switch of the interior illuminating apparatus for vehicle, and Fig. 8A is a back perspective view showing a state before mounting the switch, and Fig. 8B is a back right perspective view showing a state of the completion of mounting, and Fig. 8C is a back left perspective view showing a state of the completion of mounting. The switch 42R is mounted and fixed from the back side 40R of the housing 40 to the inside of the switch receiving chamber 42 provided in the housing 40.

(3) Figs. 9A and 9B are views showing a state of mounting the switch knob of the interior illuminating apparatus for

vehicle, and Fig. 9A is a front perspective view showing a state before mounting the switch knob, and Fig. 9B is a front perspective view showing a state of the completion of mounting. The switch knob 30 is slidably mounted inside the switch receiving chamber 42 from the front side 40F of the housing 40 so as to hide the inside of the switch receiving chamber 42 so as to be able to operate in synchronization with the switch 42R.

(4) Figs. 10A and 10B are views showing a state of mounting the bulb of the interior illuminating apparatus for vehicle, and Fig. 10A is a front perspective view showing a state before mounting the bulb, and Fig. 10B is a front perspective view showing a state of the completion of mounting. The bulb 41B is mounted in substantially the center of the bulb receiving chamber 41 from the front side 40F of the housing 40 and is electrically connected to the bus bar 50.

(5) Figs. 11A and 11B are views showing a state of mounting the lens of the interior illuminating apparatus for vehicle, and Fig. 11A is a front perspective view showing a state before mounting the lens, and Fig. 11B is a front perspective view showing a state of the completion of mounting. The lens 20 is mounted in the housing 40 by engaging plural engaging pieces 20S formed in both end sides of the lens 20 with engaging protrusions 40S formed in both end sides of the housing 40 so as to hide the housing 40 from the front side 40F of the housing

40. In that case, an opening 21 bored in the lens 20 makes peripheral contact with a side surface of the switch knob 30.

The whole configuration of the interior illuminating apparatus for vehicle targeted for the invention and the main components constructing the apparatus have been described
5 above.

Next, a wire cabling jig according to the invention for mounting electric wires in the second connector 60 with electric wires fitted into the first connector 43 described
10 in Fig. 6 and an electric wire mounting method using the jig will be described.

In Fig. 1A, the second connector 60 includes a holder 61 and a cover 62 joined to the end of this holder 61 by a hinge. The holder 61 is provided with plural grooves 63 on which
15 electric wires W are laid. A wire cabling jig 70 according to the invention is provided with a pedestal 71 for second connector on which the holder 61 and the cover 62 are respectively placed in the vicinity of one edge on a centerline of the wire cabling jig 70. Numeral 71A of the pedestal 71
20 for second connector is a holder pedestal 61, and numeral 71B is a cover pedestal 62. Then, a holder positioning protrusion 71T upward projecting from the holder pedestal 71A is provided.

Further, two kinds of positioning pins 72 (pin 72A and pin 72B) are erected on the wire cabling jig 70. One kind of
25 pins is two connector positioning pins 72A for positioning a

third connector 80, and is provided on the other edge of the wire cabling jig 70. The other kind of pins is plural (four in Figs. 1A to 1C) wire positioning pins 72B for positioning the electric wires, and is provided on the vicinities of four
5 corners of the wire cabling jig 70.

Plural (three in Figs. 1A to 1C) electric wires W respectively extend in a horizontal direction from the top and bottom of the third connector fixed by the connector positioning pins 72A for the third connector 80, and each of
10 the electric wires W is vertically gathered and is twisted around each of the wire positioning pins 72B as it is and is turned 90 degrees around and is routed at the four corners of the wire cabling jig 70 and the distal end of each of the electric wires W is strongly pulled in a direction opposite
15 to the third connector 80 and thereby, the slack of the electric wires can be reduced.

A method for using the wire cabling jig according to the invention will be described in detail using Figs. 1A to 1C and 2A to 2C.

20 (1) In the first step of an assembly method, the holder 61 of the second connector 60 is brought just above the holder positioning protrusion 71T (see Fig. 1A).

(2) The holder 61 is lowered below a void arrow of Fig. 1A and is inserted into the holder positioning protrusion 71T, and
25 the second connector 60 is temporarily fixed on the pedestal

71 for second connector (see Fig. 1B).

(3) The third connector 80 with plural electric wires W is brought just above a pair of connector positioning pins 72A for the third connector 80, and the three vertical electric
5 wires W extend in a direction of straight traversing on the wire cabling jig 70 (Fig. 1C).

(4) The whole third connector 80 with electric wires W is lowered below a void arrow of Fig. 1C, and the third connector 80 is abutted on the outsides (the side opposite to the wire
10 cabling jig 70) of the connector positioning pins 72A for the third connector 80, and the portion of the electric wires W of the root of the third connector 80 is pinched between the positioning pins 72A for third connector (Fig. 2A).

(5) Thereafter, the portion of the three vertical electric
15 wires W extending from the third connector 80 is sequentially moved along side surfaces of the four wire positioning pins 72B, 72B, 72B, 72B and is turned around. In that case, the electric wires W are loosely laid on the plural grooves 63 of the holder 61 temporarily fixed on the holder pedestal 71A on
20 the way (Fig. 2A).

(6) When the end of the portion of the three vertical electric wires W extending from the third connector 80 is strongly pulled in an arrow direction F of Fig. 2B (direction opposite to the
third connector 80), the slack of the electric wires W is
25 reduced by the wire positioning pins 72B and also the electric

wires W loosely laid on the plural grooves 63 of the holder 61 are tightly fixed in each of the grooves 63 (Fig. 2B).

(7) In this state, the cover 62 is folded back at a hinge part and the holder 61 is covered with the cover 62 and thereby,

5 the electric wires W are pinched by the holder 61 and the cover 62 and the electric wires W are fixed inside the second connector 60. By this step, mounting of the electric wires W in the second connector 60 is completed (see Fig. 2C). Thus,

the wire cabling jig 70 is provided with the holder pedestal

10 71A, the cover pedestal 71B, the connector positioning pins

72A and the wire positioning pins 72B, and the electric wires

W are held in the grooves 63 of the inside of the holder 61

in a state of no slack using the connector positioning pins

72A for the third connector 80, the wire positioning pins 72B

15 and the holder pedestal 71A, and the holder 61 is covered with

the cover 62 present on the cover pedestal 71B to fit the cover

62 into the holder 61, so that there is no room for occurrence

of slack of the electric wires W and therefore, a position of

attachment of the holder and the cover to the electric wires

20 can be determined accurately.

When the second connector 60 (Fig. 3A) to which the electric wires W described above are fixed is inserted into the first connector 43 of the housing 40 of the interior illuminating apparatus 10 for vehicle in which each component

25 is mounted, the second connector 60 is fitted into the first

connector 43 (Fig. 3B) and also the crimp blades 51 (Fig. 5) bite into the coat resin layer of the electric wires W to crimp the electric wires W (Fig. 6C), so that a state in which the electric wires W are electrically connected to the bus bar 50 is obtained (see Figs. 3A and 3B). By the above procedure, a method for assembling the interior illuminating apparatus 10 for vehicle is completed.

Thus, even when there is no metal component for conduction inside the holder 61 of the second connector 60, the crimp blades 51 directly bite into the coat resin layer of the electric wires W to crimp core wires of the electric wires W, so that a metal component for conduction, for example, a conventional female terminal can be omitted.

Figs. 4A to 4C show a second embodiment of a wire cabling jig 70.

The second embodiment is characterized in that the vicinities of both sides of a pedestal 71 for second connector of the wire cabling jig 70 are provided with a pair of electric wire presses 73 for regulating movement of electric wires W.

The electric wire press 73 includes a vertical part 73A, an extension part 73B extending slightly downward in a horizontal direction from the top of the vertical part 73A, and a guide part 73C extending upward from the top of the extension part 73B. It becomes easy to guide the electric wires W to the lower side of the extension part 73B of this

electric wire press 73 by the guide part 73C extending upward,
and the electric wires W are lifted up from the extension part
73B toward a side surface of the pedestal 71 for second
connector and thereby, the electric wires W vertically aligned
5 previously can be horizontally aligned by the electric wire
press 73, so that it becomes easy to insert the electric wires
W into grooves 63 horizontally arranged in a holder 61.

The electric wire presses 73 support the electric wires
W and regulate movement, positional deviation and slack of the
10 electric wires W, and when one end of the electric wires W is
pulled using a third connector 80 as a fixed end, it becomes
easy to surely insert the electric wires W into the grooves
63 and it becomes easy to cable the electric wires W to the
wire cabling jig 70 and also, mounting workability of a second
15 connector 60 improves.

Prior to the present invention, an invention is developed
and filed an application (patent application No. 2009-268928)
(hereinafter called "prior invention").

According to the prior invention, time-consuming distal
20 end processing or a jig for crimp dedicated to manufacture of
a wire harness is not required and a manufacturing cost of the
wire harness can be reduced and there is no loss of quality
due to damage etc. to a terminal at the time of cabling the
wire harness, and a connector capable of improving reliability
25 is obtained.

Fig. 13 is a perspective view of a housing including a holder receptive part according to the prior invention. Fig. 13 shows a state in which an electric wire holder including the holder receptive part is vertically inserted and a shaft part for attachment of the electric wire holder engages with a holder pivot part of the holder receptive part. In Fig. 13, an interior illuminating apparatus 100 for vehicle includes a housing 400, and the back side 400R of the housing 400 is provided with a first connector 430. In this first connector 430, a bus bar 500 is fixed and also multiple crimp blades 510 are arranged. On the other hand, a second connector 600 for pinching electric wires W2 by a holder 610 and a cover 620 turns around a turning shaft 600S and makes contact with the first connector 430 and the second connector 600 is fitted into the first connector 430 and thereby, the multiple crimp blades 510 bite into the respective corresponding electric wires W2 to make electrical connection.

According to the interior illuminating apparatus 100 for vehicle according to the prior invention, the second connector 600 could be turned around the turning shaft 600S to make contact with the first connector 430, so that time-consuming distal end processing or the jig for crimp dedicated to manufacture of the wire harness is not required and the manufacturing cost of the wire harness can be reduced and there is no loss of quality due to damage etc. to the terminal at

the time of cabling the wire harness and reliability can be improved.

However, in the prior invention, there was a problem point of being difficult to accurately determine a position
5 of attachment of the holder and the cover to the electric wire.

Industrial Applicability

According to the wire cabling jig according to the invention, the plural electric wires respectively extending
10 from the connector fixed by the connector positioning pins are gathered and are twisted around each of the wire positioning pins and are turned around and are laid on the grooves of the holder installed on the holder pedestal and are further twisted around the wire positioning pins and are routed and the distal
15 end of the electric wires is strongly pulled in an opposite direction and thereby, the slack of the electric wires can be reduced easily. Therefore, a position of attachment of the holder and the cover to the electric wires can be determined easily and accurately by fitting the cover into the holder in
20 a state of reducing the slack of the electric wires.

Reference Signs List

10: INTERIOR ILLUMINATING APPARATUS FOR VEHICLE
20: LENS
25 30: SWITCH KNOB

- 40: HOUSING
- 41: BULB RECEIVING CHAMBER
- 42: SWITCH RECEIVING CHAMBER
- 42R: SWITCH
- 5 43: FIRST CONNECTOR
- 44: METAL FITTING CLIP
- 50: BUS BAR
- 51: CRIMP BLADE
- 60: SECOND CONNECTOR
- 10 61: HOLDER
- 62: COVER
- 63: GROOVE
- 70: WIRE CABLING JIG
- 71: PEDESTAL FOR SECOND CONNECTOR
- 15 71A: HOLDER PEDESTAL
- 71B: COVER PEDESTAL
- 71T: HOLDER POSITIONING PROTRUSION
- 72: POSITIONING PIN
- 72A: CONNECTOR POSITIONING PIN FOR THIRD CONNECTOR
- 20 72B: WIRE POSITIONING PIN
- 73: ELECTRIC WIRE PRESS
- 73A: VERTICAL PART
- 73B: EXTENSION PART
- 73C: GUIDE PART
- 25 80: THIRD CONNECTOR

W: ELECTRIC WIRE (WIRE HARNESS)

CLAIMS

1. A wire cabling method, comprising:

placing a connector including a holder and a cover on
5 a wire cabling jig which is provided with a holder pedestal
for installing the holder, a wire positioning pin located on
one side of the holder pedestal and a connector positioning
pin in a vicinity of the wire positioning pin, by installing
the holder on the holder pedestal;

10 abutting the connector on the connector positioning pin;
bringing electric wires extending from the connector
into sliding contact with a side surface of the wire positioning
pin;

laying the electric wires on grooves of the holder
15 installed on the holder pedestal;

bringing the electric wires into sliding contact with
a side surface of another wire positioning pin; and

fitting the cover into the holder in a state of strongly
pulling ends of the electric wires to a side opposite to the
20 holder pedestal.

2. A wire cabling jig having a flat plate body, comprising:

a holder pedestal on which a holder of a connector
including the holder and a cover is placed and fixed;

25 cylindrical wire positioning pins erected on opposite

sides of the holder pedestal; and

a connector positioning pin erected in a vicinity of the wire positioning pin.

5 3. A wire cabling jig as claimed in claim 2, further comprising a holder positioning protrusion upward projecting from the holder pedestal.

10 4. A wire cabling jig as claimed in claim 2 or 3, wherein a pair of electric wire presses are erected in vicinities of opposite sides of the holder pedestal sandwiched between the electric wire presses.

FIG. 1A

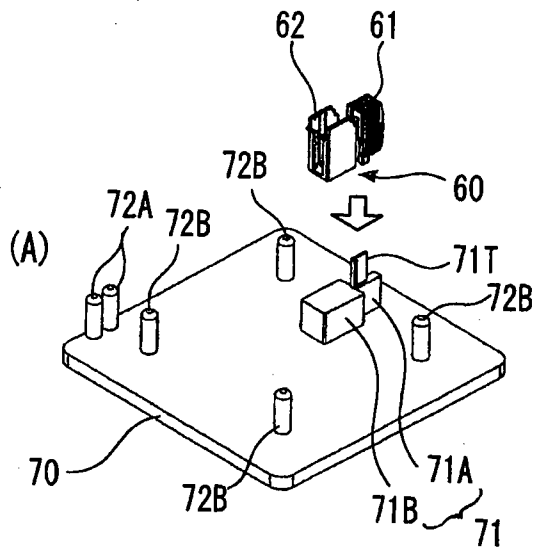


FIG. 1B

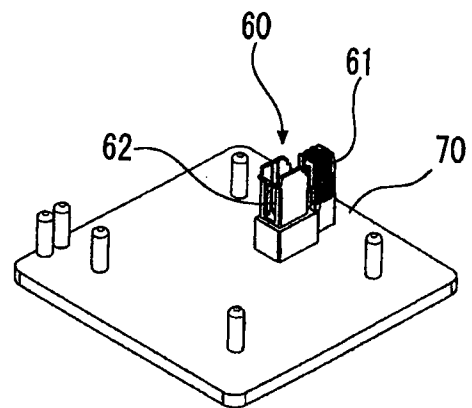


FIG. 1C

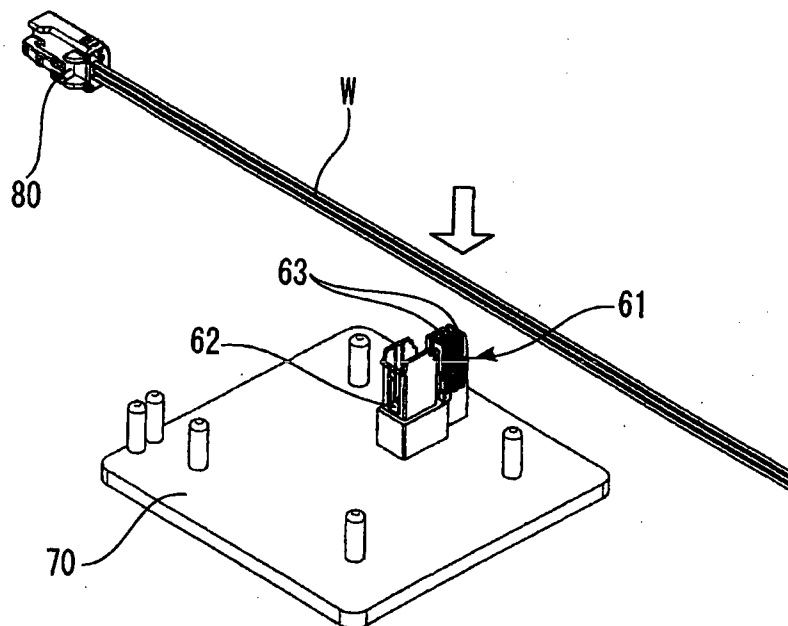


FIG. 2A

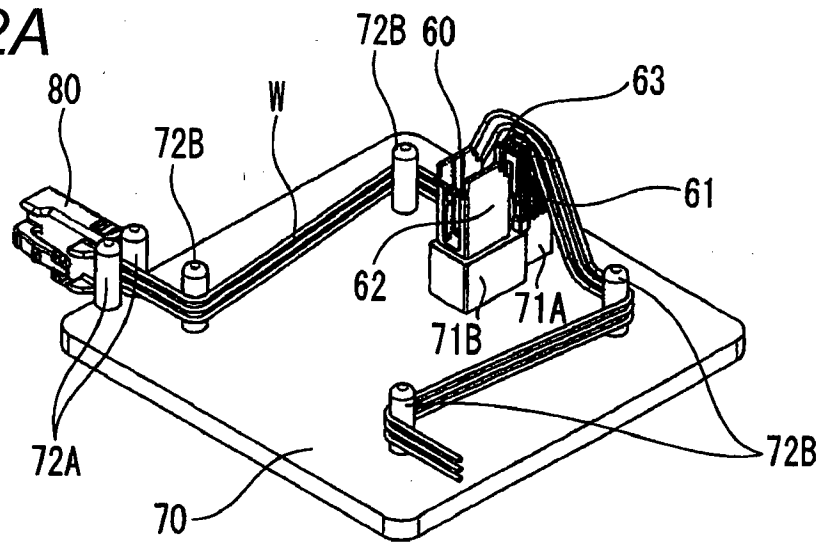


FIG. 2B

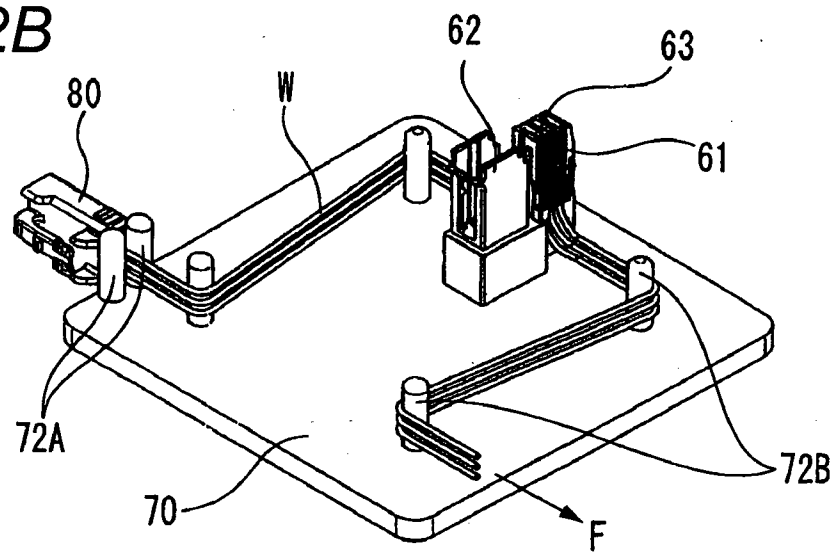


FIG. 2C

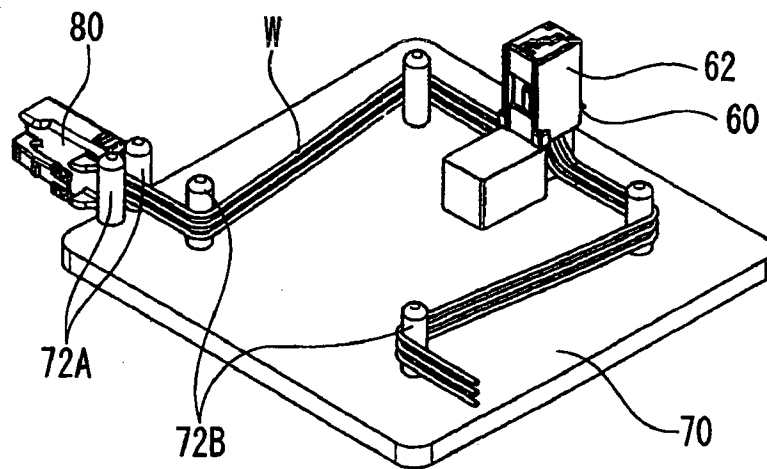


FIG. 3A

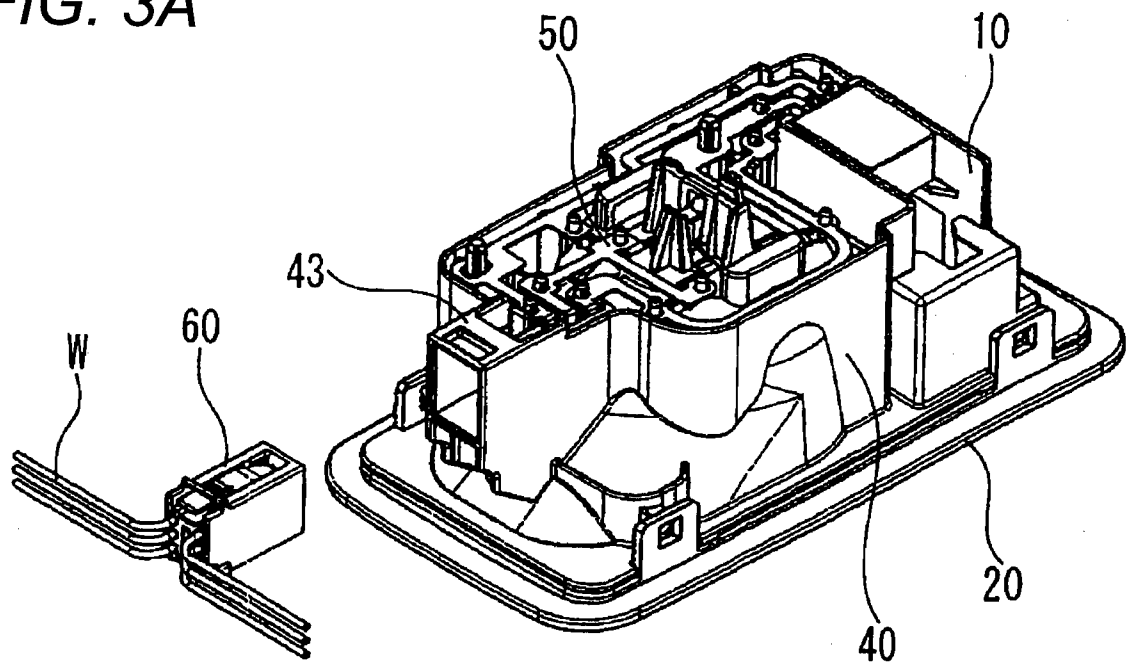


FIG. 3B

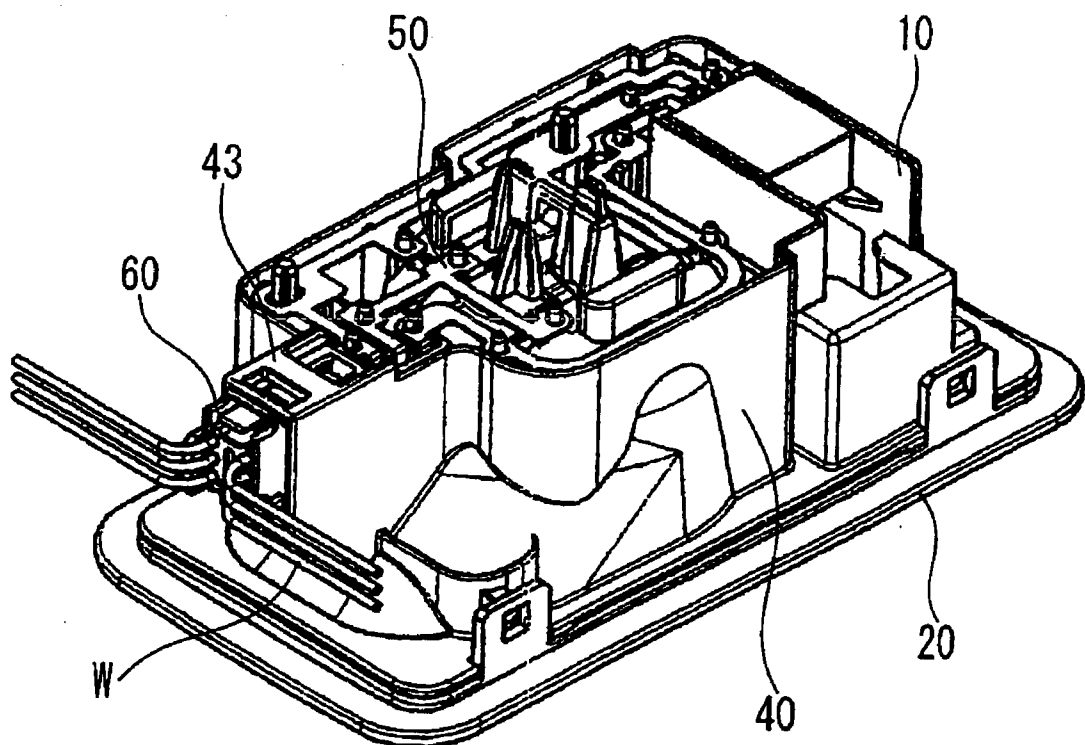


FIG. 4A

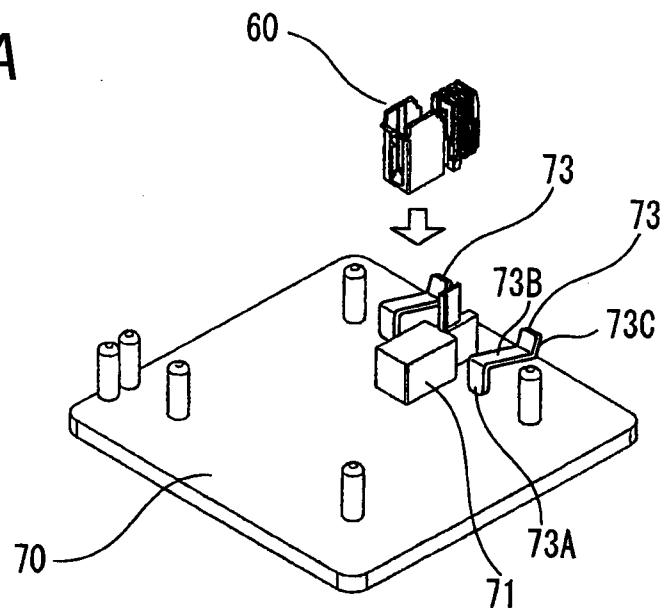


FIG. 4B

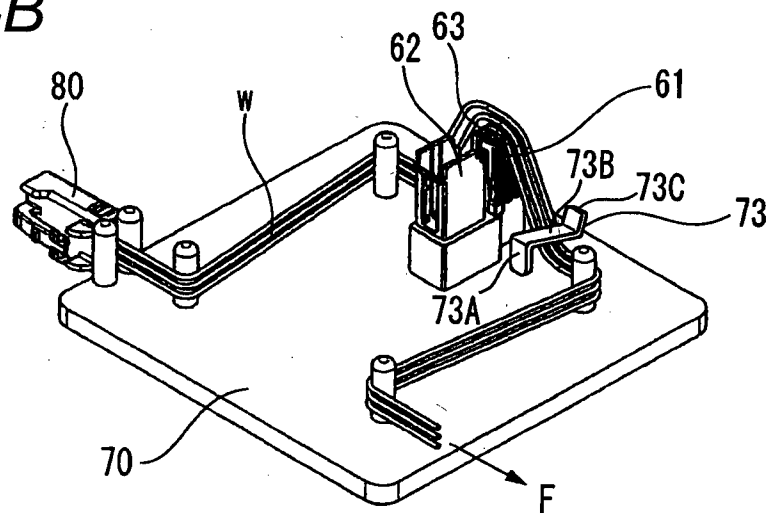


FIG. 4C

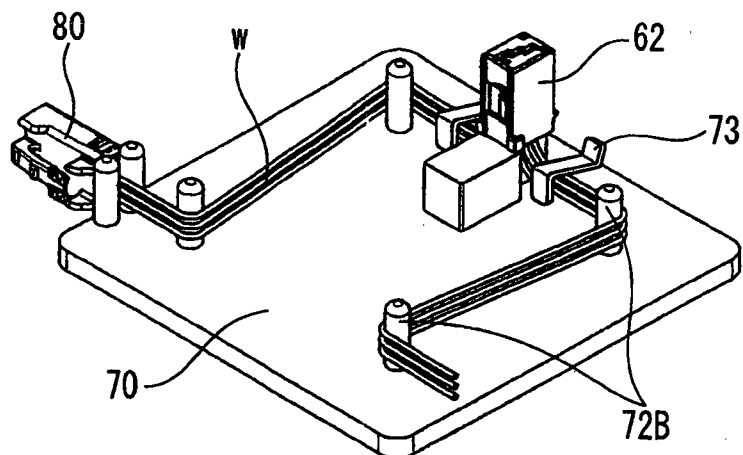


FIG. 5

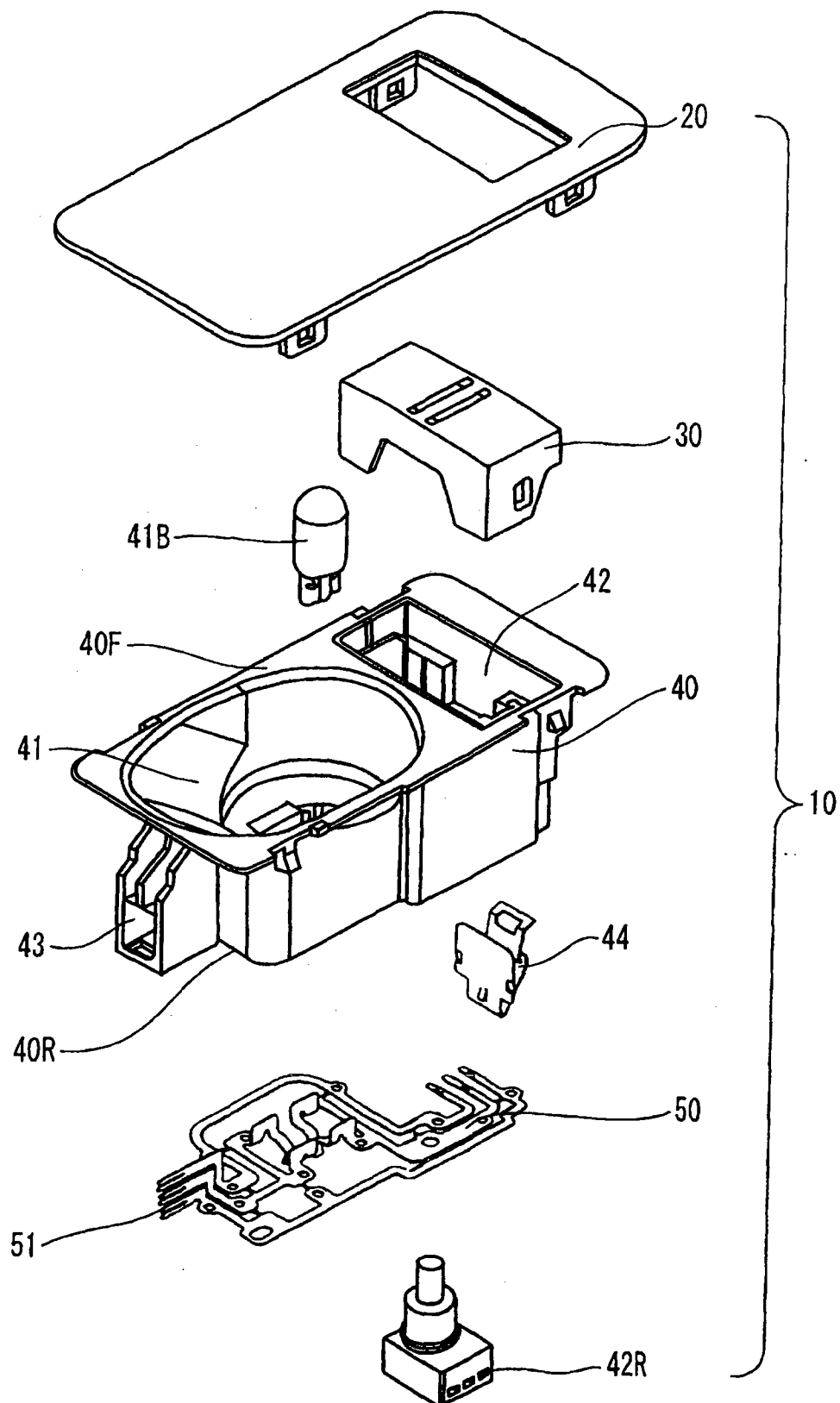


FIG. 6A

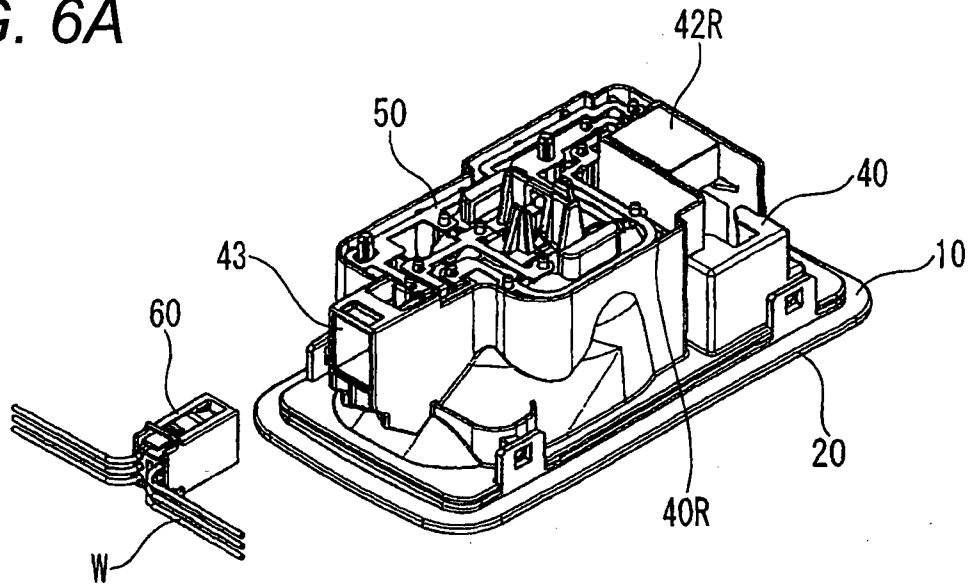


FIG. 6B

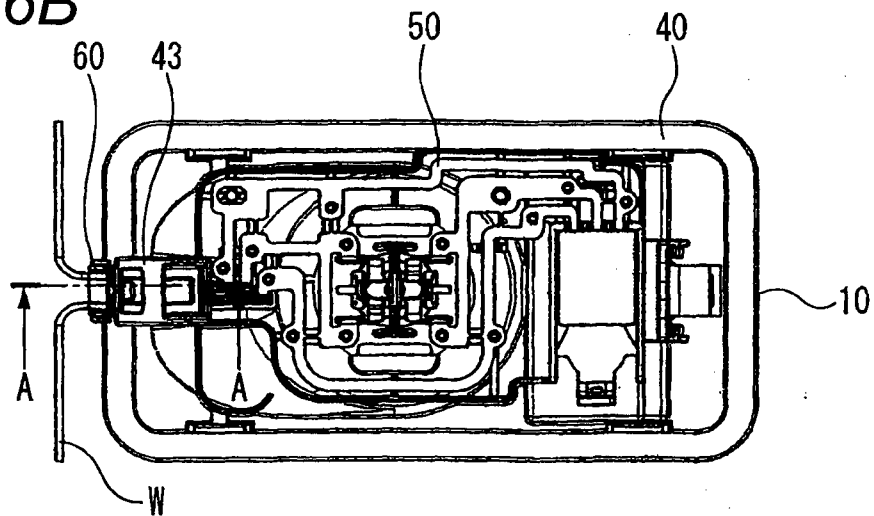


FIG. 6C

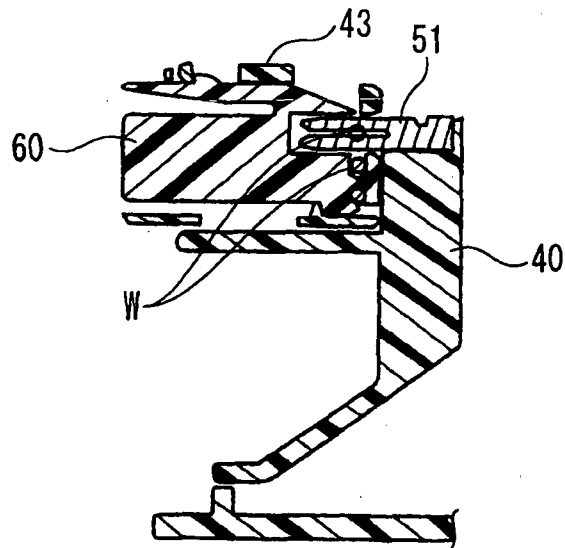


FIG. 7A

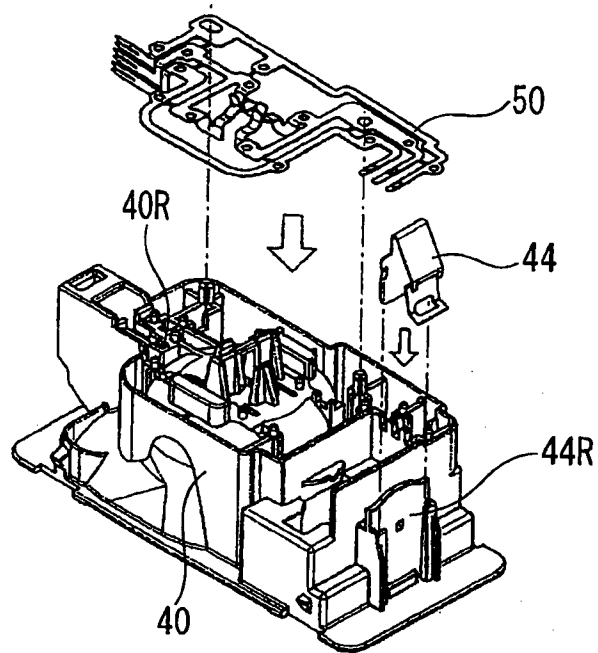


FIG. 7B

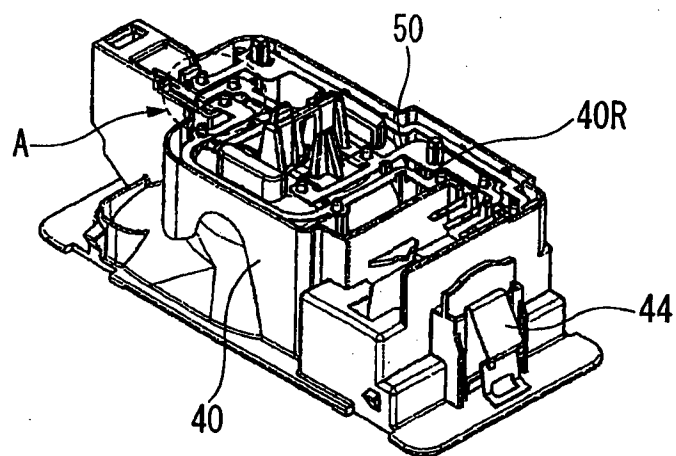


FIG. 7C

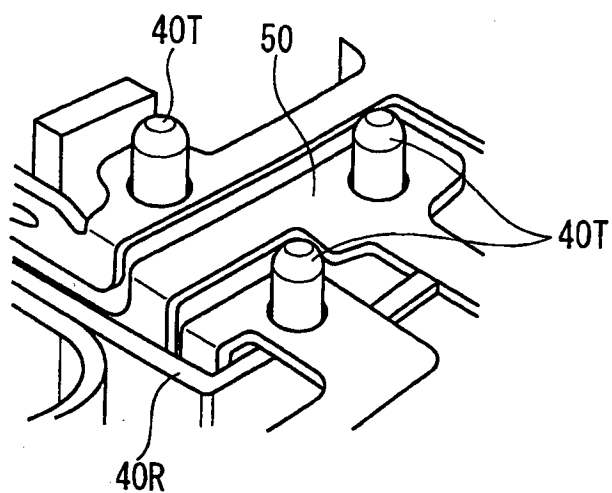


FIG. 8A

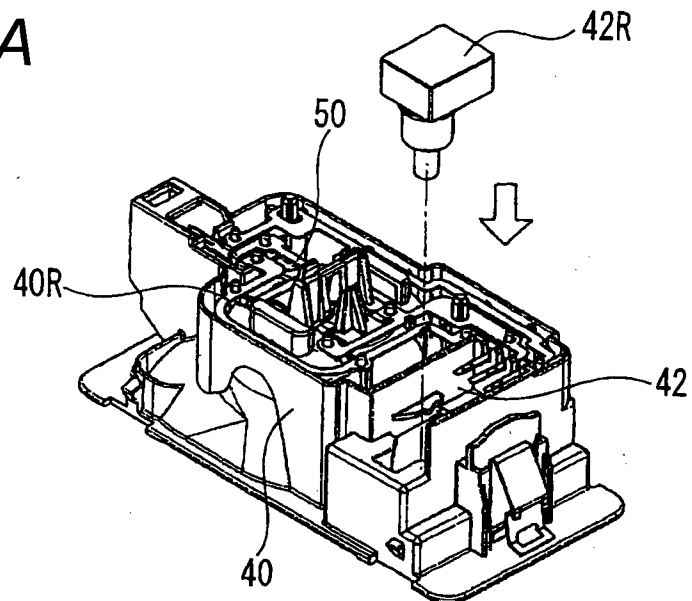


FIG. 8B

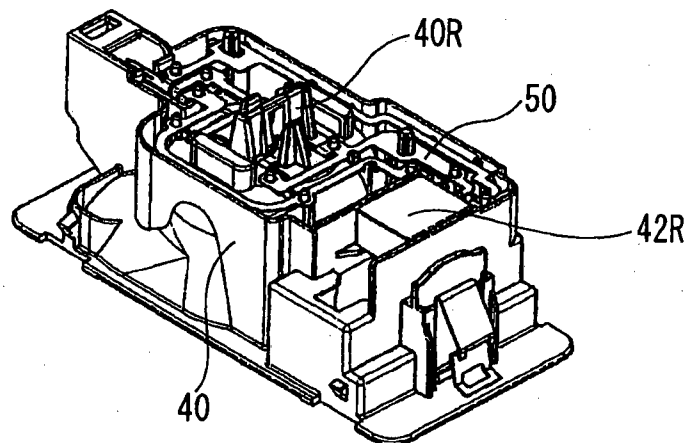


FIG. 8C

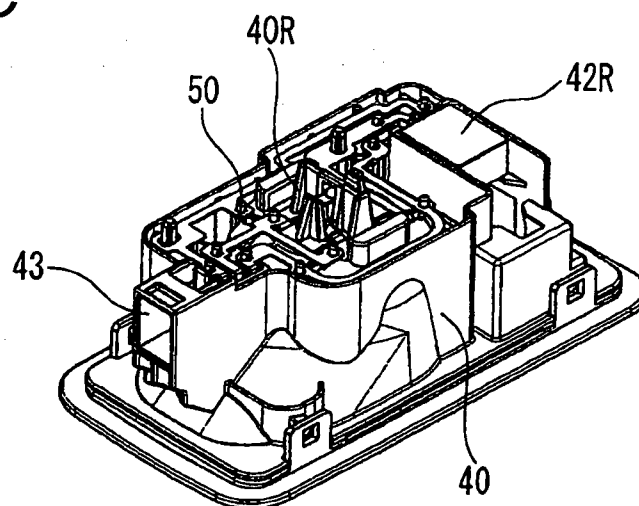


FIG. 9A

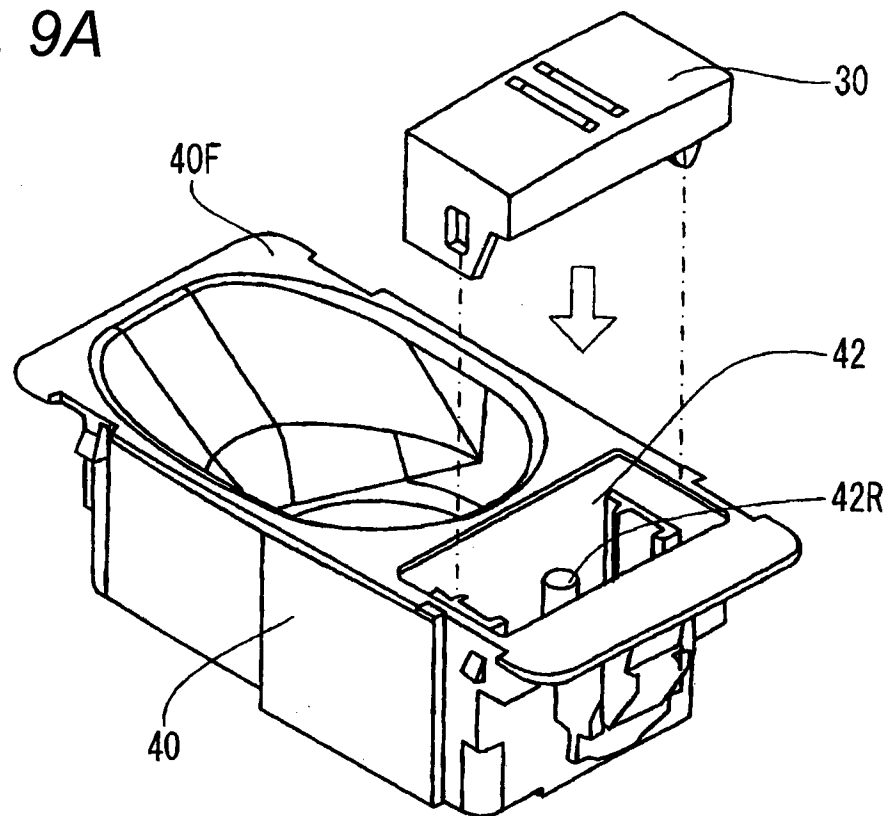


FIG. 9B

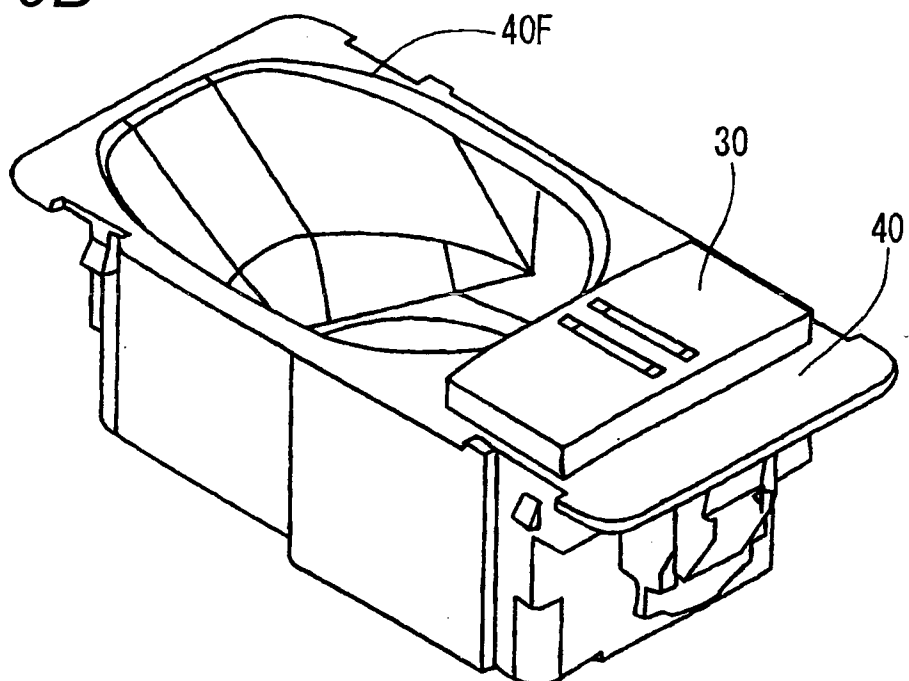


FIG. 10A

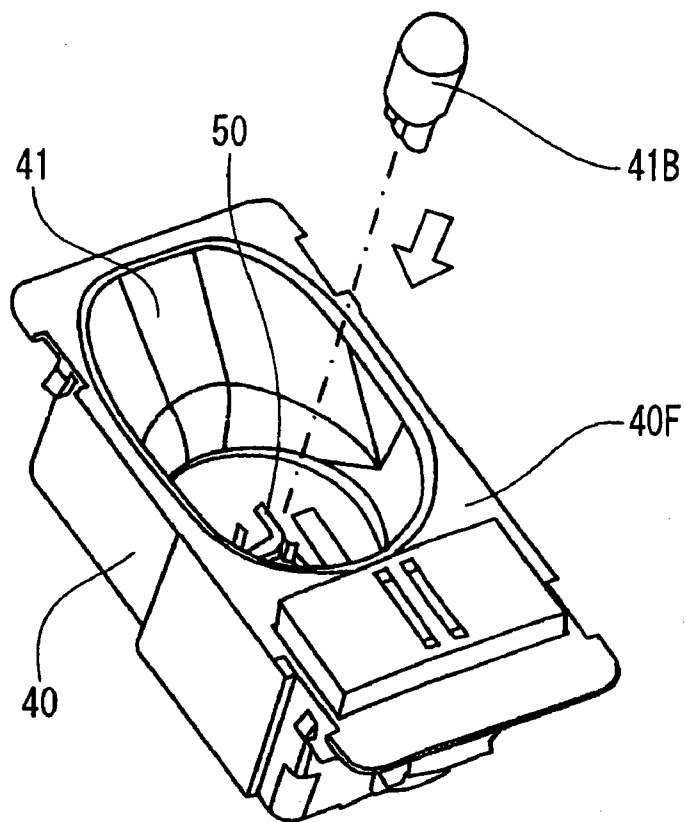


FIG. 10B

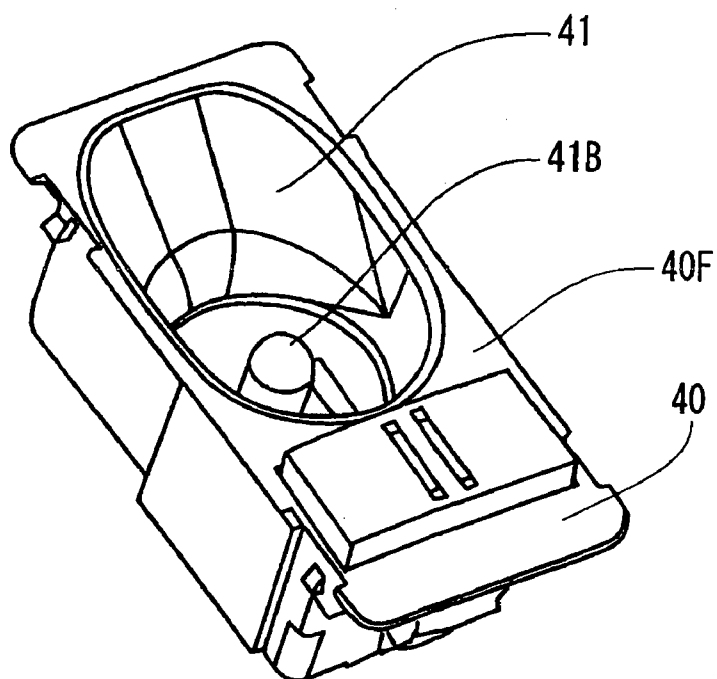


FIG. 11A

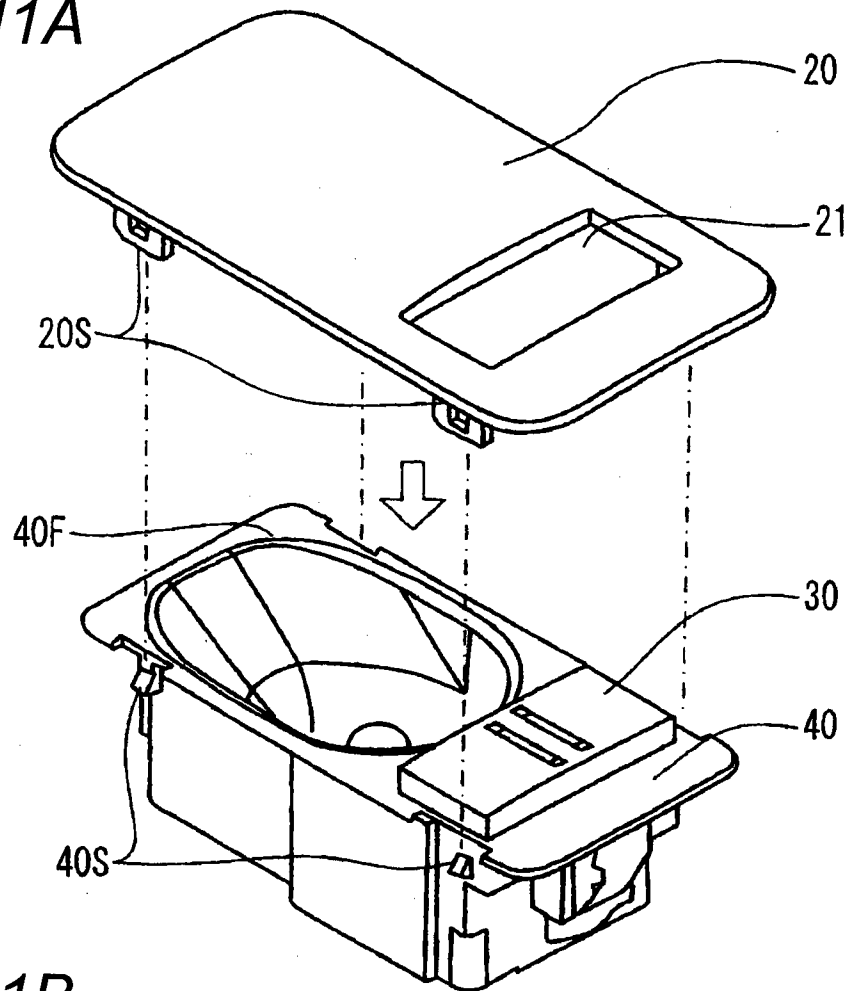


FIG. 11B

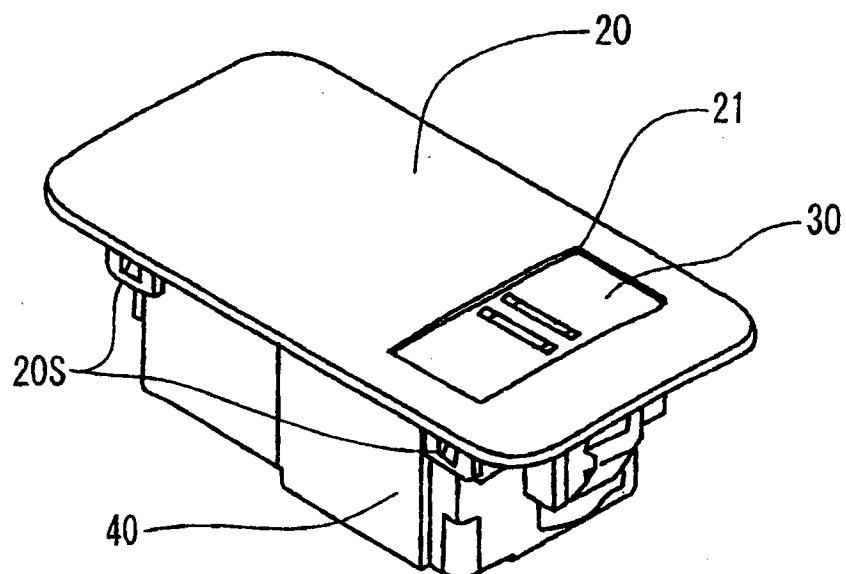


FIG. 12A

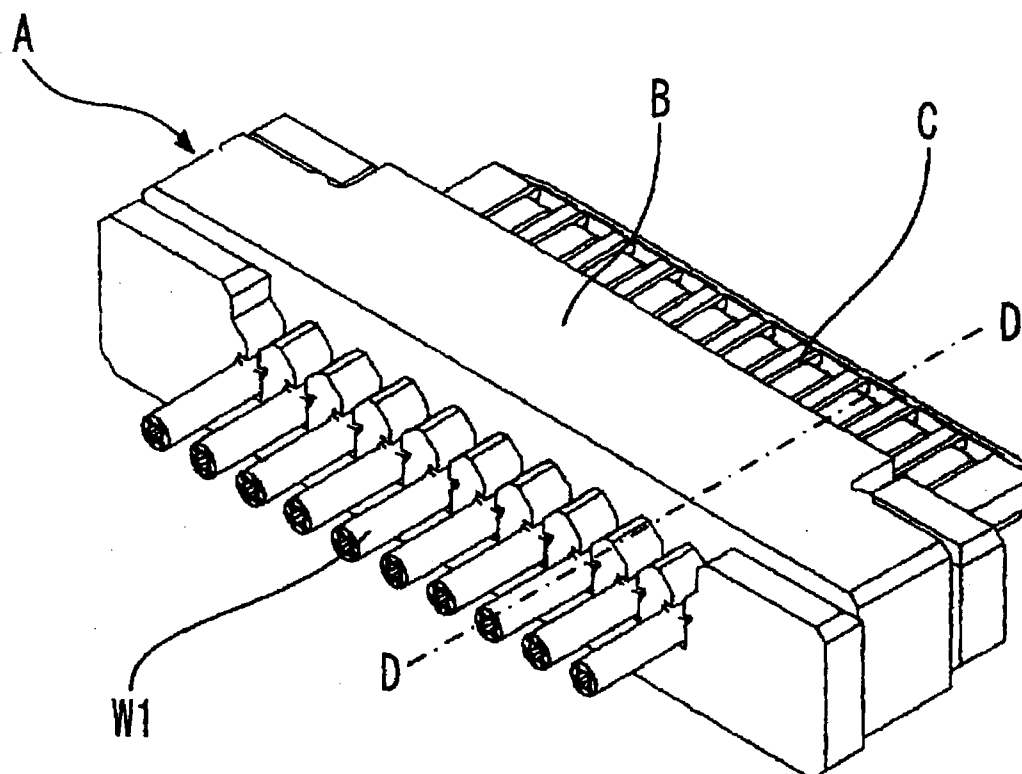


FIG. 12B

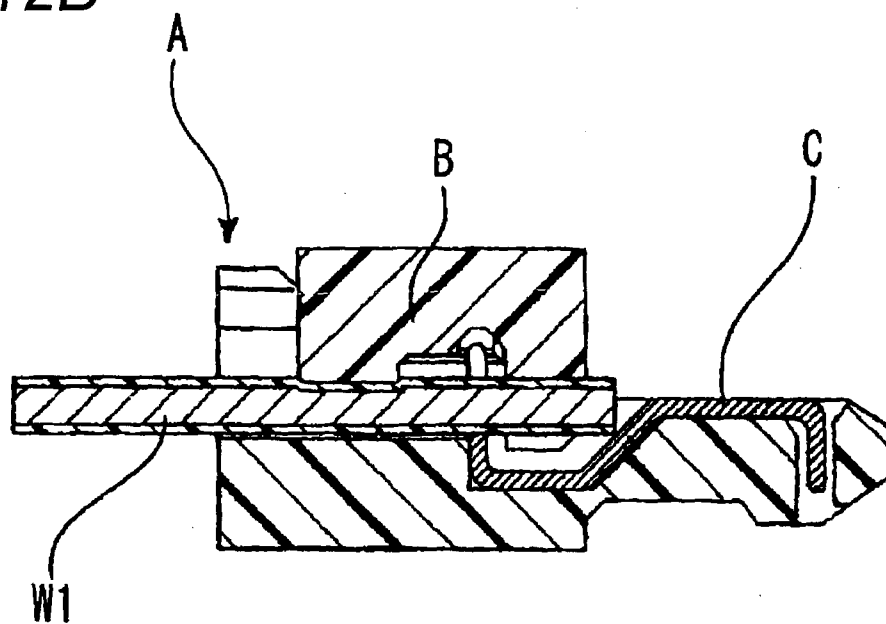
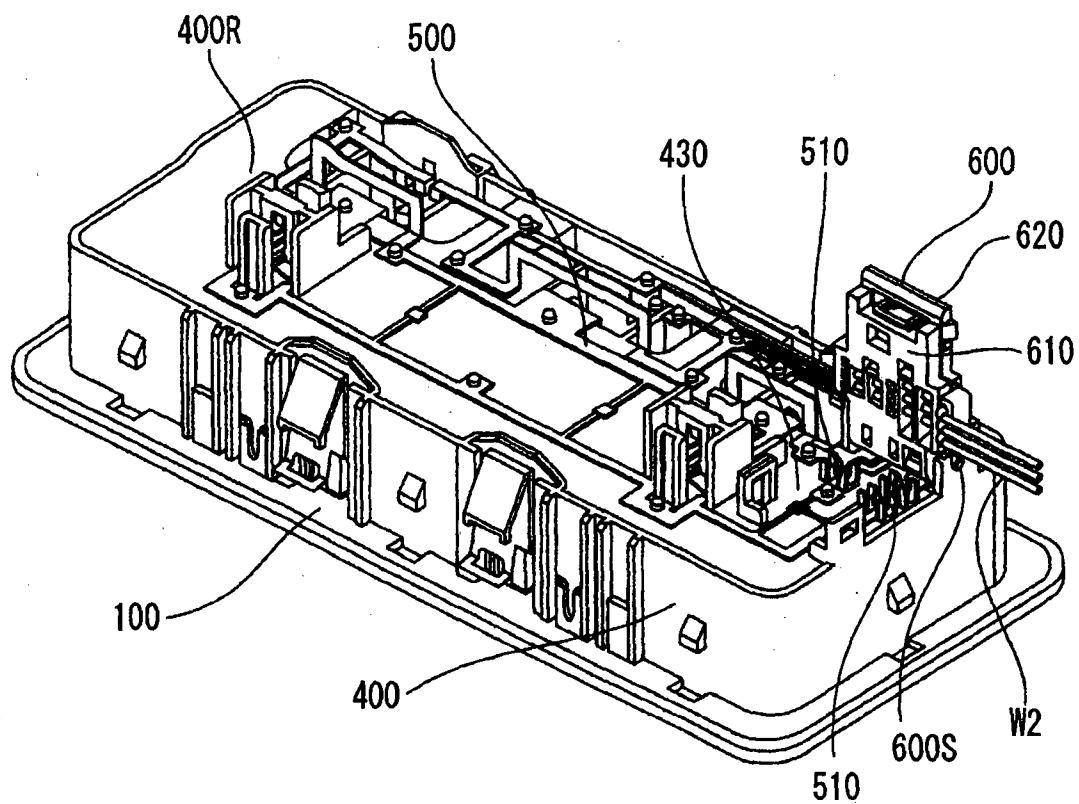


FIG. 13



INTERNATIONAL SEARCH REPORT

International application No

PCT/JP2012/059124

A. CLASSIFICATION OF SUBJECT MATTER

INV. H01R43/28

ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H01R

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 124 548 A (SUZUKI KOUTARO [JP] ET AL) 26 September 2000 (2000-09-26)	2
A	abstract; figure 1	1
A	----- EP 0 403 350 A1 (AEROSPATIALE [FR] EUROCOPTER FRANCE [FR]) 19 December 1990 (1990-12-19)	1,2
A	abstract; figure 11	
A	----- US 5 363 549 A (HECKER JACK D [US]) 15 November 1994 (1994-11-15)	2
A	figures 2,9	
A	----- JP 2006 147273 A (KEL KK) 8 June 2006 (2006-06-08)	1
	cited in the application	
	abstract	



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

29 June 2012

Date of mailing of the international search report

10/07/2012

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Authorized officer

Corrales, Daniel

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/JP2012/059124

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