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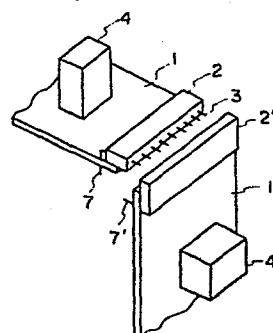
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54 Connector device for use between printed-circuit boards.

57 For easy interconnection of two printed-circuit boards, a connector device is composed of a male connector having connector pins and mounted on an end of one of the printed-circuit boards, and a female connector having connector pin sockets and mounted on an end of the other printed-circuit board. The printed-circuit boards are put together perpendicularly to each other with the connector pins fitted respectively in the connector pin sockets. The printed-circuit boards are interconnected mechanically and electrically by the connector device.

Fig. 5



TITLE OF THE INVENTION

CONNECTOR DEVICE

FOR USE BETWEEN PRINTED-CIRCUIT BOARDS

BACKGROUND OF THE INVENTION

5 The present invention relates to a connector device for use between printed-circuit boards, and more particularly to a connector device for use between two printed-circuit boards extending perpendicularly to each other.

10 Electronic devices have printed-circuit boards in most cases. In certain applications, printed-circuit boards with electronic components mounted thereon are disposed in perpendicular relation to each other and interconnected for signal transmission therebetween. A
15 connecting arrangement is illustrated in Fig. 1 of the accompanying drawings. Printed-circuit boards 1 with parts 4 installed thereon have on their ends male connectors 2 having connector pins 3. A back panel 5 has a plurality of female connectors 2' with connector
20 pin sockets 3'. For connection, the printed-circuit boards 1 are brought perpendicularly toward the back panel 5 until the connector pins 3 on the male connectors 2 are inserted into the sockets 3',
25 respectively, in the female connectors 2'. Another set of plural printed-circuit boards 1 is also mounted on the back panel 5. The printed-circuit boards 1 thus mounted on the back panel 5 are interconnected by connectors thereof for signal transmission therebetween.

There are some instances in which no back panel is used, and printed-circuit boards are coupled in perpendicular relation to each other with mounted components exposed to the exterior to provide easy access for adjustment. Fig. 2 of the accompanying drawings shows one such connecting arrangement. A pair of printed-circuit boards 1, 1' with electronic components 4, 4' attached thereto are interconnected perpendicularly to each other, and connectors 2, 2' on ends of the printed-circuit boards 1, 1' are coupled by a cable 6. This connecting construction however is disadvantageous in that attaching the cable 6 is a troublesome task, and the proportion of the cost of the cable 6 to the overall cost of the connecting means including the connectors cannot be negligible.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a connector device for use between printed-circuit boards which is free of the foregoing prior problems, and can interconnect the printed-circuit boards with ease.

According to the present invention, a connector device comprising a first printed-circuit board with electronic components mounted thereon, a second printed-circuit board with electronic components mounted thereon, a male connector mounted on an end of the first printed-circuit board and having at least one connector pin, a female connector mounted on an end of the second

printed-circuit board and having at least one connector
pin socket, the first and second printed-circuit boards
being mechanically and electrically interconnectable
with each other in substantially perpendicular relation
5 with the at least one connector pin fitted in the at
least one connector pin socket.

With this arrangement, the horizontal and
vertical printed-circuit boards can easily be inter-
connected to provide electrical connection between the
10 connectors through a simple operation. Since no cable
connector is needed, the entire connector device is less
costly to construct. Any electronic component on the
printed-circuit boards thus coupled together is exposed
for easy adjustment thereof.

15 The above and other objects, features and
advantages of the present invention will become more
apparent from the following description when taken in
conjunction with the accompanying drawings in which
preferred embodiments of the present invention are shown
20 by way of illustrative example.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side elevational view of a
conventional connecting arrangement in which
printed-circuit boards are mounted on a back panel;

25 Fig. 2 is a side elevational view of another
prior connecting arrangement in which printed-circuit
boards are interconnected in perpendicular relation to
each other;

Fig. 3 is a side elevational view of printed-circuit boards to be coupled by a connector device of the present invention;

Fig. 4 is a side elevational view of the printed-circuit boards shown in Fig. 3 which are interconnected;

Fig. 5 is a perspective view of the printed-circuit boards of Fig. 3 prior to their being interconnected;

Fig. 6 is is a side elevational view of printed-circuit boards to be coupled by a connector device according to another embodiment of the present invention;

Fig. 7 is a side elevational view of the printed-circuit boards illustrated in Fig. 3 which are interconnected;

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A connector device according to an embodiment of the present invention will be described with reference to Figs. 3 through 5.

As shown in Fig. 3, a printed-circuit board 1 with electronic components 4 disposed thereon has a male connector 2 mounted at one end. Although only one electronic component 4 is shown, a plurality of electronic parts such as capacitors, resistors, coils, transistors and the like are normally installed on the printed-circuit board 1.

The male connector 2 has an array of connector pins 3 (Fig. 5) projecting from the end of the printed-

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circuit board 1. The connector pins 3 are coupled to
lead wires 7 fixed to a casing of the male connector 2
and leading to the reverse side of the printed-circuit
board 1, where the lead wires 7 are soldered to printed
5 wires thereon. The male connector 2 is thus secured
mechanically to the printed-circuit board 1 with the
connector pins 3 connected electrically to the
printed-circuit board 1.

A printed-circuit board 1' to be connected to the
10 printed-circuit board 1 has electronic components 4'
installed thereon and a female connector 2' mounted on
one end. Although only one electronic component 4' is
shown, a plurality of electronic parts such as
capacitors, resistors, coils, transistors and the like
15 are normally installed on the printed-circuit board 1'.

The female connector 2' has an array of connector
pin sockets 3' defined therein. The connector pin
sockets 3' are coupled to lead wires 7' fixed to a
casing of the female connector 2' and leading to the
20 reverse side of the printed-circuit board 1', where the
lead wires 7' are soldered to printed wires thereon.
The female connector 2' is thus secured mechanically to
the printed-circuit board 1' with the connector pin
sockets 3' connected electrically to the printed-circuit
25 board 1'.

The connector pins 3 and the connector pin
sockets 3' are shaped to provide interfitting coupling
engagement with each other.

To connect the printed-circuit boards 1, 1' perpendicularly, the printed-circuit board 1 with the male connector 2 is brought horizontally toward the printed-circuit board 1' with the female connector 2',
5 as shown in Fig. 4, and the printed-circuit boards 1, 1' are then put together so that the connector pins 3 will be fitted respectively in the connector pin sockets 3'. At this time, the lead wires 7, 7' on the printed-circuit boards 1, 1' are electrically connected to each
10 other through the connectors 2, 2'. The printed-circuit boards 1, 1' as they are just about to be joined are shown in Fig. 5.

Figs. 6 and 7 are illustrative of a connector device according to another embodiment of the present
15 invention.

As shown in Fig. 6, a printed-circuit board 10 with electronic components 40 disposed thereon has a female connector 20 mounted at one end. Although only one electronic component 40 is shown, a plurality of
20 electronic parts such as capacitors, resistors, coils, transistors and the like are normally installed on the printed-circuit board 10.

The female connector 20 has an array of connector pin sockets 30' defined therein. The connector pin
25 sockets 30' are coupled to lead wires 70 fixed to a casing of the female connector 20 and leading to the reverse side of the printed-circuit board 10, where the lead wires 70 are soldered to printed wires thereon.

The female connector 20 is thus secured mechanically to the printed-circuit board 10 with the connector pin sockets 30' connected electrically to the printed-circuit board 10.

5 A printed-circuit board 10' to be connected to the printed-circuit board 10 has electronic components 40' installed thereon and a male connector 20' mounted on one end. Although only one electronic component 40' is shown, a plurality of electronic parts such as
10 capacitors, resistors, coils, transistors and the like are normally installed on the printed-circuit board 10'.

The male connector 20' has an array of connector pins 30 projecting from the end of the printed-circuit board 10'. The connector pins 3 are coupled to lead
15 wires 70' fixed to a casing of the male connector 20' and leading to the reverse side of the printed-circuit board 10', where the lead wires 70' are soldered to printed wires thereon. The male connector 20' is thus secured mechanically to the printed-circuit board 10'
20 with the connector pins 30 connected electrically to the printed-circuit board 10'.

The connector pins 30 and the connector pin sockets 30' are shaped to provide interfitting coupling engagement with each other.

25 To connect the printed-circuit boards 10, 10' perpendicularly, the printed-circuit board 10 with the female connector 20 is brought horizontally toward the printed-circuit board 10' with the female connector 20',

as shown in Fig. 7, and the printed-circuit boards 10, 10' are then put together so that the connector pins 30 will be fitted respectively in the connector pin sockets 30'. The lead wires 70, 70' on the printed-circuit
5 boards 10, 10' are electrically connected to each other through the connectors 20, 20'.

While in the illustrated embodiments only one connector 2, 20 is mounted on the end of the printed-circuit board 1, 10 and also only one connector 2', 20'
10 is mounted on the end of the printed-circuit board 1', 10', a plurality of spaced connectors may be installed on each printed-circuit board.

With the arrangement of the present invention, the horizontal and vertical printed-circuit boards can
15 easily be interconnected to provide electrical connection between the connectors through a simple operation. Since no cable connector is needed, the entire connector device is less costly to construct. Any electronic component on the printed-circuit boards
20 thus coupled together is exposed for easy adjustment thereof.

Although certain preferred embodiments have been shown and described, it should be understood that many changes and modifications may be made therein without
25 departing from the scope of the appended claim.

CLAIMS.

1. A connector device comprising:

(a) a first printed-circuit board with electronic components mounted thereon;

5 (b) a second printed-circuit board with electronic components mounted thereon;

(c) a male connector mounted on an end of said first printed-circuit board and having at least one connector pin;

10 (d) a female connector mounted on an end of said second printed-circuit board and having at least one connector pin socket; and

(e) said first and second printed-circuit boards being mechanically and electrically interconnectable with
15 each other in substantially perpendicular relation with said at least one connector pin fitted in said at least one connector pin socket.

Fig. 1

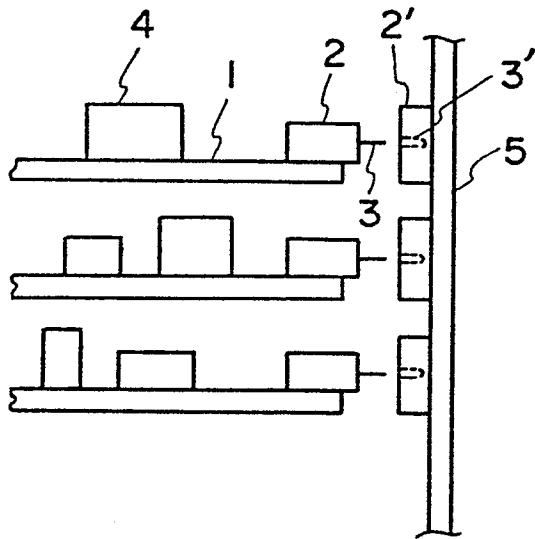


Fig. 2

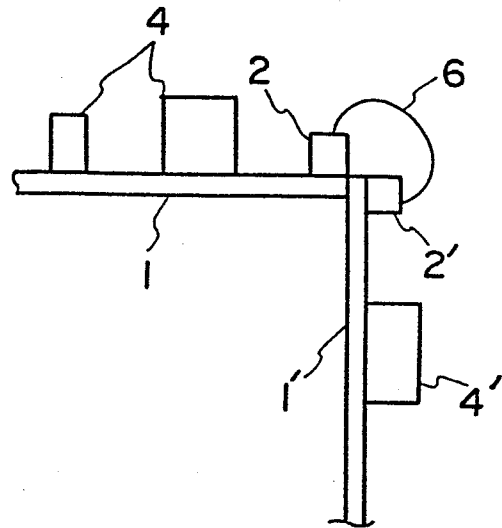


Fig. 3

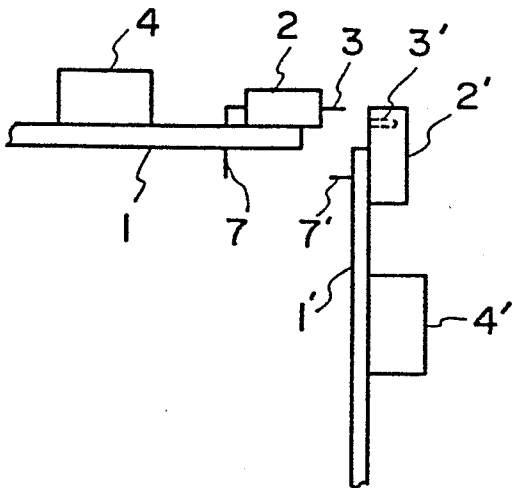
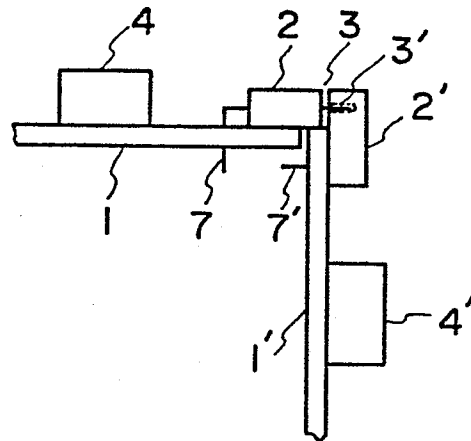


Fig. 4



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Fig. 5

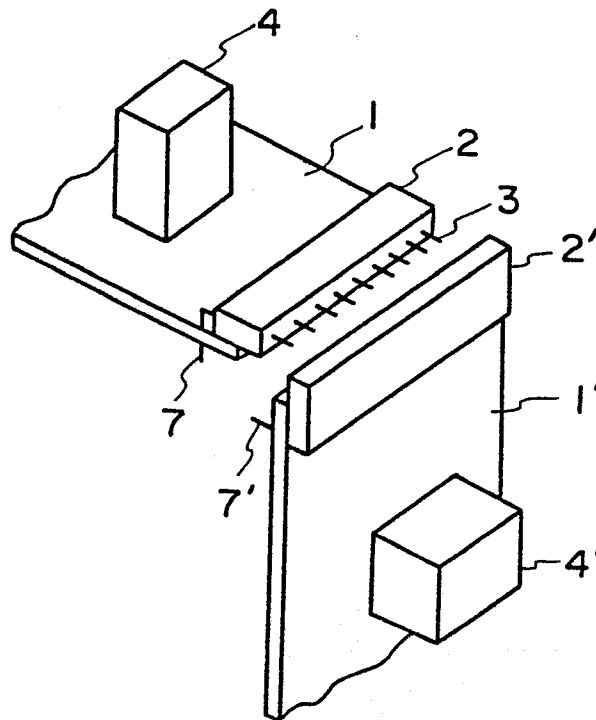


Fig. 6

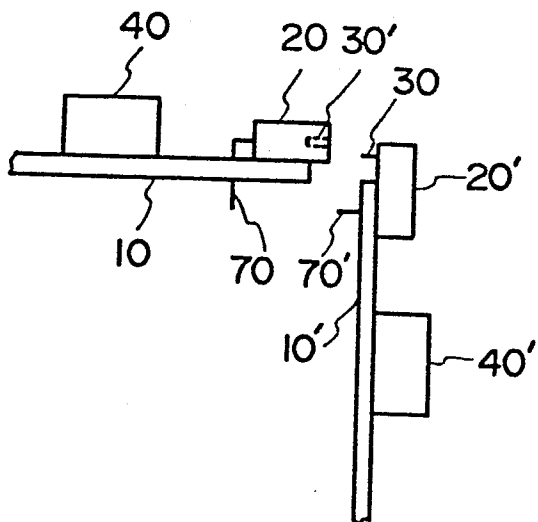
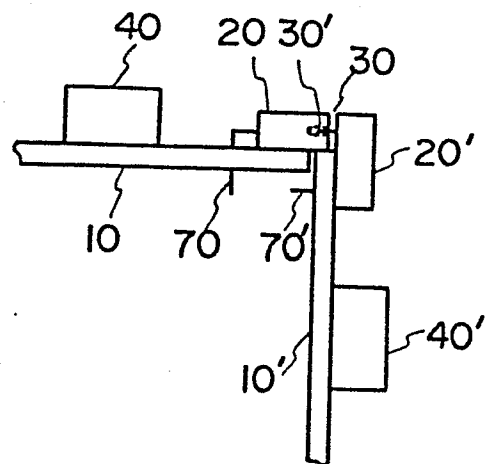


Fig. 7





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
X	DE-A-2 448 208 (BUNKER RAMO) * Page 7, lines 28-31; figure 2 *	1	H 01 R 23/68
X	DE-A-2 534 549 (LUMBERG) * Page 11, lines 12-16; figure 2 *	1	
X	FR-A-2 148 562 (DAIICHI DENSHI K.K.) * page 6, lines 35-38; figure 6b *	1	
X	GB-A- 840 762 (ELECTRIC & MUSICAL) * Page 3, lines 13-17; figure 4 *	1	
X	FR-E- 69 606 (SOCAPEX-PONSOT) * Page 1, right-hand column, paragraphs 10,11; page 2, left-hand column, right-hand column, paragraph 1; figures 1-4 *	1	TECHNICAL FIELDS SEARCHED (Int. Cl. 3) H 01 R
A	DE-A-1 690 247 (BUNKER-RAMO) * page 2, last paragraph; page 3, paragraph 1; figures 2,3 *	1	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 20-06-1983	Examiner LOMMEL A.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			