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- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
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Published:

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(54) Title: A PRINTED CIRCUIT BOARD CONNECTOR

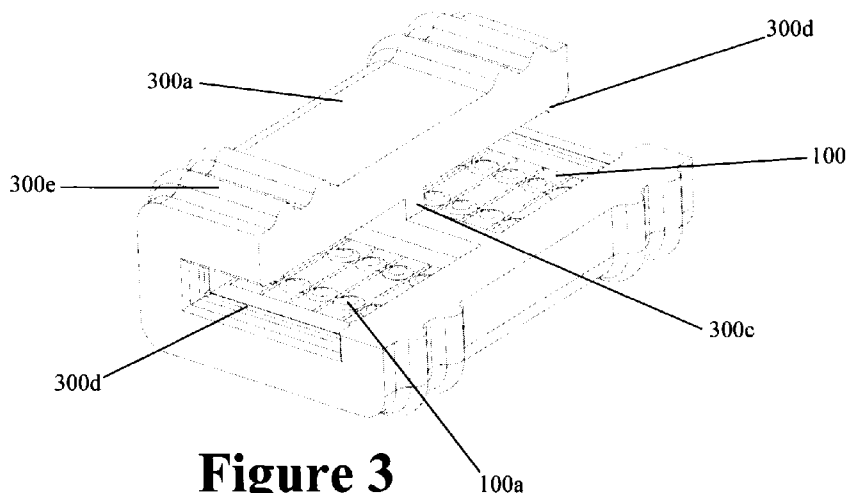


Figure 3

(57) Abstract: The present invention relates to a device to connect two printed circuit boards (200) in series with waterproof solderless characteristics. The present invention comprises a metal connector (100) housed in an elastomeric holder (300) which having a slot (300b) through the elastomeric holder (300) to receive the two printed circuit boards (200) from each end.

Description

Title of Invention: A PRINTED CIRCUIT BOARD CONNECTOR

[1] **FIELD OF INVENTION**

[2] The present invention relates to a device for connecting two printed circuit boards in series.

[3] **BACKGROUND OF THE INVENTION**

[4] Printed circuit board is considered one of the most fundamental components in an electronic device. Some electronic devices have more than one printed circuit board to operate, thus requires those printed circuit boards to be connected. One of the examples of the connector is US 7,497,697, where it relates to a connector includes a socket in which first contacts are provided parallel to an opening edge portion and a plug which has a flat shape capable of fitting in the opening edge portion of the socket. The plug includes second contacts provided parallel to positions corresponding to the first contacts in the plug. A guide portion is provided in either the opening edge portion of the socket or an outer peripheral edge portion of the plug. However, it is found that one of the obvious drawbacks of this prior art is it does not provide waterproof connection.

[5] The common problem to interface the contact between two separate printed circuit boards assembly while having waterproof capability are: lack of modularity in design due to many uniqueness of features in order to ensure contact is successful between different boards, too many degree of customization therefore increase in price and decrease utilization flexibility, many constraint or attributes to consider like gap allowance, force requirement to ensure sealing in order to meet challenging waterproof design, not the simplest integration of two connecting devices and also installation and un-installation for maintenance, and the usage of standard off-the-shelf part is impracticable due to many constraints like no. of contacts, size and geometry.

[6] Therefore it is a need for an invention which provides solutions to above drawbacks.

[7] **SUMMARY OF THE INVENTION**

[8] According to an aspect of the present invention, the present invention relates to a printed circuit board connector comprising: a metal connector (100) having a dimple (100a) on each end to connect two printed circuit boards (200); characterized in that the metal connector (100) is housed by an elastomeric holder (300) providing waterproof solderless-but-firmer hold of the connection between the two printed circuit boards (200). The elastomeric holder (300) further comprising: an enclosure (300a) having a slot (300b) through the enclosure (300a), wherein the slot (300b) receives the printed circuit board (200) from each end; the metal connector (100) is fixed inside the enclosure (300a); a retainer wall (300c) to separate the two printed circuit boards (200)

from directly joining in series; inner bump feature (300d) inside the enclosure (300a) to force the printed circuit board to stay firm inside; outer bump feature (300e) on the body of the enclosure (300a); and chamfers (300f) as a guide feature for ease of assembly of the printed circuit boards (200).

[9] The elastomeric holder (300) is used to prevent water intrusion onto the metal connector (100) and the printed circuit boards (200) therefore preventing short-circuit from happening and also protecting the component on the board from oxidization. The inner bump feature (300d) inside the enclosure (300a) provides sealing engagement between the enclosure (300a) and the printed circuit boards (200). Meanwhile, sealing engagement of the enclosure (300a) with the surrounding wall is provided by the outer bump feature (300e) on the body. The slot on the elastomeric enclosure is having chamfers (300f) as a guide feature for ease of assembly of the printed circuit boards (200).

[10] The metal connector (100) is used to make a direct contact with the printed circuit boards (200) contact that requires no soldering. It is designed and shaped for the simplest manufacturing process without complicated sheet metal forming involved. The connector (100) is independent of any number of contact point required, geometry, planarity and distance in between. The dimple (100a) on each of the contact surface is to ensure positive physical touch and continuous electrical connectivity.

[11] **BRIEF DESCRIPTION OF THE DRAWINGS**

[12] **Figure 1** illustrates a metal connector (100) of the present invention in loose form.

[13] **Figure 2** illustrates an elastomeric holder (300) of the present invention in loose form.

[14] **Figure 3** illustrates a cross-section side view of the assembled printed circuit holder of the present invention.

[15] **Figure 4** illustrates two printed circuits in-connection via the printed circuit board connector of the present invention.

[16] **Figure 5** illustrates a cross-section top view the assembled printed circuit holder of the present invention.

[17] **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

[18] Generally, the present invention relates to a printed circuit board connector comprising: a metal connector (100) having a dimple (100a) on each end to connect two printed circuit boards (200); characterized in that the metal connector (100) is housed by an elastomeric holder (300) providing water-proof solderless-but-firmer hold of the connection between the two printed circuit boards (200). This provision is illustrated in **Figure 1**, **Figure 2**, **Figure 3**, and **Figure 4**. The elastomeric holder (300) further comprising: an enclosure (300a) having a slot (300b) through the enclosure (300a), wherein the slot (300b) receives the printed circuit board (200) from each end; the metal connector (100) is fixed inside the enclosure (300a); a retainer wall (300c) to

separate the two printed circuit boards (200) from directly joining in series; inner bump feature (300d) inside the enclosure (300a) to force the printed circuit board to stay firm inside; outer bump feature (300e) on the body of the enclosure (300a); and chamfers (300f) as a guide feature for ease of assembly of the printed circuit boards (200). The location of chamfers (300f) is illustrated in **Figure 5**.

- [19] The elastomeric holder (300), having the elastomer compression properties, continuously inducing positive compression force on the printed circuit board (200) whereby it prevents water intrusion onto contacts and the printed circuit board (200) therefore preventing short-circuit from happening and also protecting the component on the board from oxidization as every component or feature of the elastomeric holder would fill any gap during assembly due to its elastic character. The natural rubber properties of the elastomer holder (300) also ensures the enclosure (300a) slot provides secure and firm sealing engagement between the enclosure (300a) and the printed circuit boards (200). Properly designed, the elastomeric enclosures (300a) continuously grip and seal the printed circuit boards (200) which its grip is firm as if the printed circuit boards (200) are fixed with soldering connections. Having the elastic character, the elastomeric holder (300) can be shaped with a guide feature on shoulders to guide and ease of assembly into a host/carrier.
- [20] The metal connector (100) is used to make a direct contact with the printed circuit board contact that requires no soldering. It is designed and shaped for the simplest manufacturing process with no complicated sheet metal forming involved. The metal connector (100) has at least a dimple (100a) at the end to ensure positive physical contact and electrical connectivity. The metal connector (100) having optimally designed and shaped for the simplest manufacturing process for integrating with the elastomeric enclosure, is independent of any number of contact point required, geometry, planarity and distance in between.
- [21] The slot (300b) on the elastomeric holder (300) is having chamfers (300f) as a guide feature for ease of assembly of the printed circuit board (200) while the retainer wall (300c) is deliberately designed to act as stopper to prevent the PCB from hitting each other when fully inserted.
- [22] The present invention features straight sheet metal with no complicated forming as a means to connect between two boards. This can eventually benefit the host as the host design can be miniaturized and meeting space constraint requirement.
- [23] Although the invention has been described with reference to particular embodiment, it is to be understood that the embodiment is merely illustrative of the principles and applications of the present invention. It is therefore to be understood that numerous modifications may be made to the illustrative embodiment that other arrangements may be devised without departing from the scope of the present invention as defined

by the appended claims.

Claims

- [Claim 1] A printed circuit board connector comprising:
a metal connector (100) having a dimple (100a) on each end to connect two printed circuit boards (200);
characterized in that
the metal connector (100) is housed by an elastomeric holder (300) providing water-proof solderless-but-firmer hold of the connection between the two printed circuit boards (200).
- [Claim 2] A printed circuit board connector as claimed in Claim 1, wherein the elastomeric holder (300) further comprising:
an enclosure (300a) having a slot (300b) through the enclosure (300a), wherein the slot (300b) receives the printed circuit board (200) from each end;
the metal connector (100) is fixed inside the enclosure (300a);
a retainer wall (300c) to separate the two printed circuit boards (200) from directly joining in series;
innerbump feature (300d) inside the enclosure to force the printed circuit board to stay firm inside;
outerbump feature (300e) on the body of the enclosure (300a); and
chamfers(300f) as a guide feature for ease of assembly of the printed circuit boards (200).

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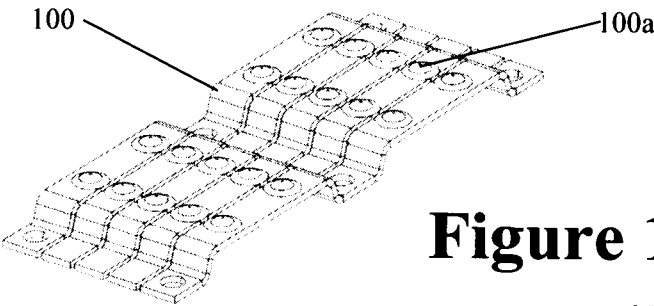


Figure 1

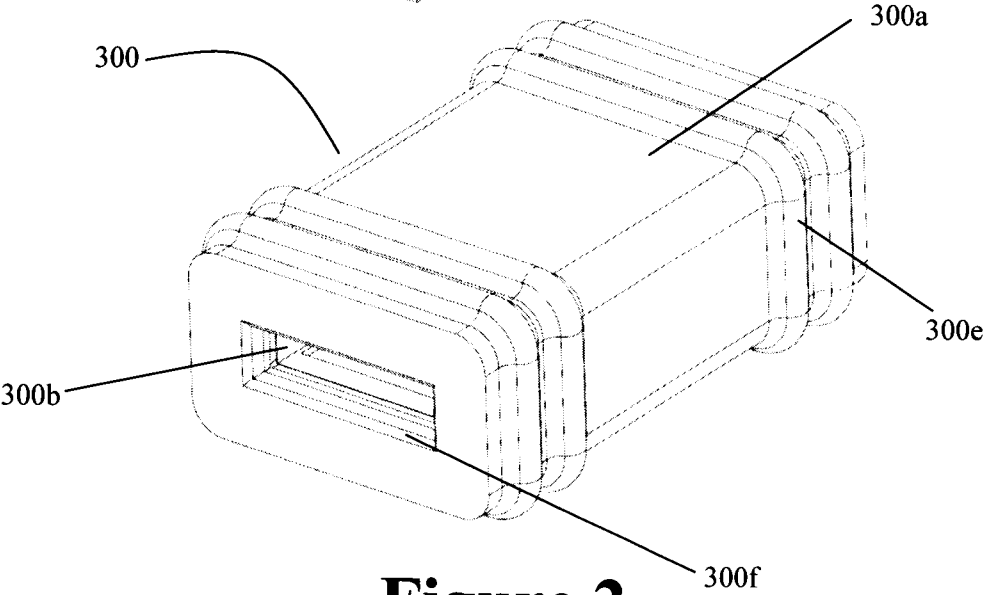


Figure 2

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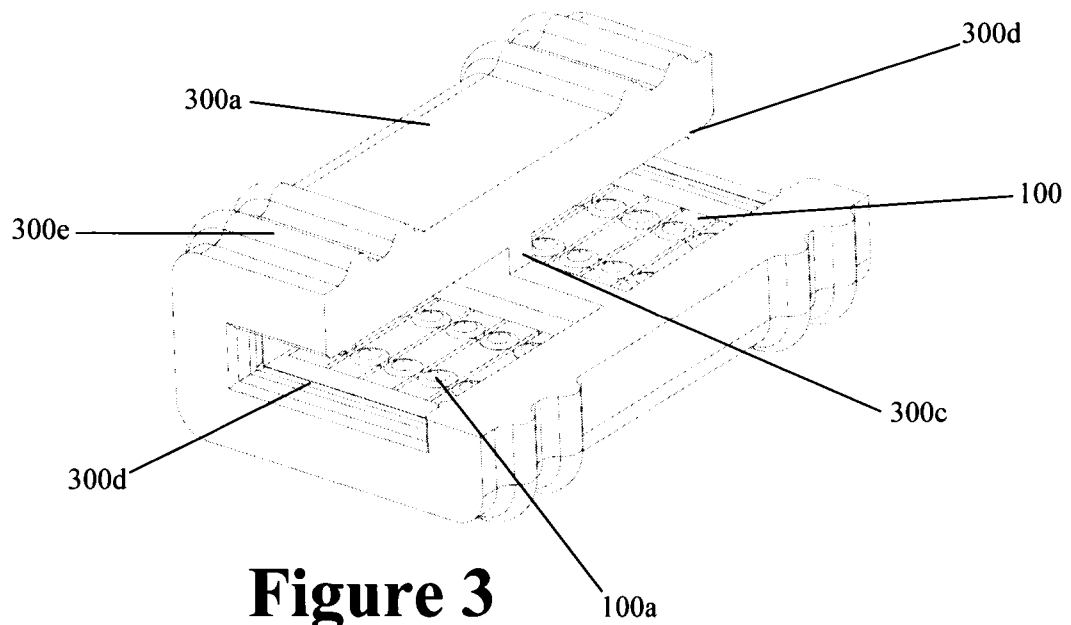


Figure 3

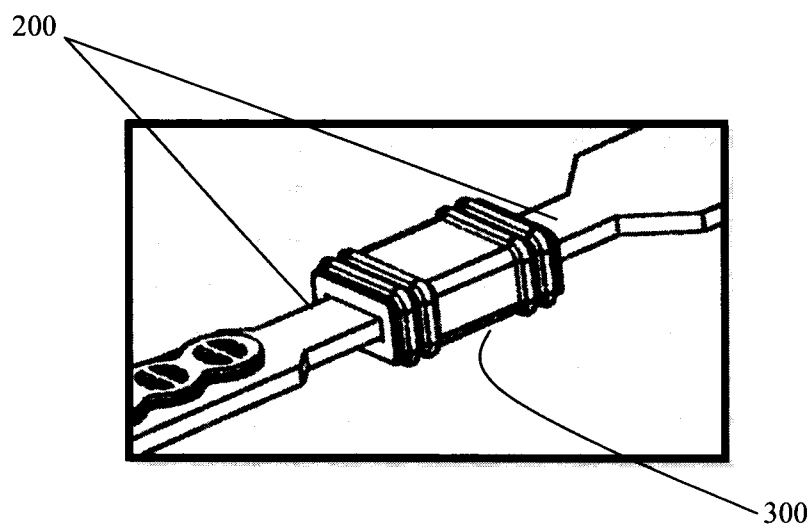


Figure 4

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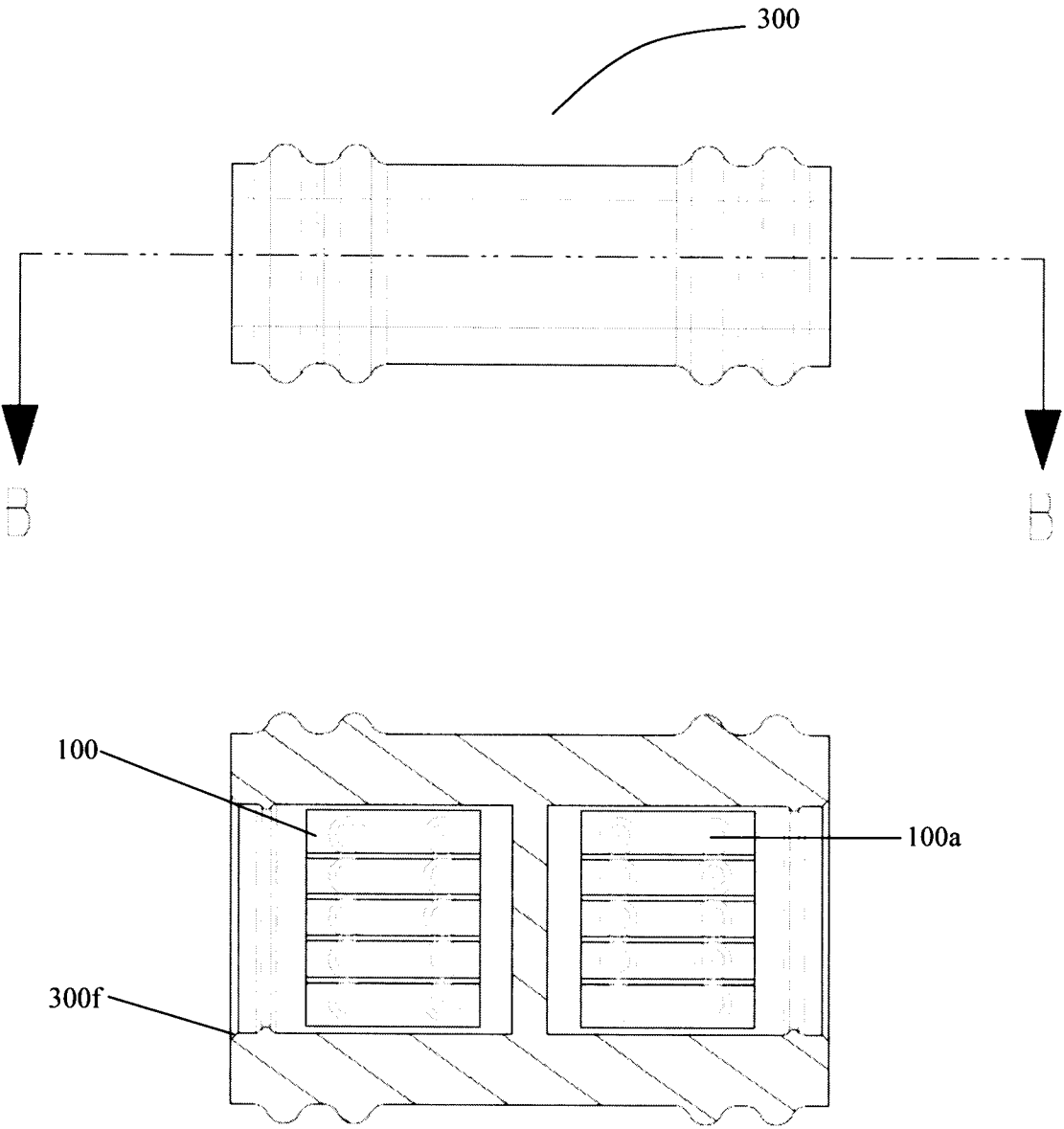


Figure 5

INTERNATIONAL SEARCH REPORT

International application No

PCT/MY2014/000140

A. CLASSIFICATION OF SUBJECT MATTER

INV. H01R12/71 H01R12/73 H01R13/52 H01R43/24
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 H05K

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	JP H10 144275 A (NIPPON DENKI SAITAMA KK) 29 May 1998 (1998-05-29)	1
Y	the whole document	2
X	US 4 660 920 A (SHIBANO YASUJI [JP]) 28 April 1987 (1987-04-28) columns 3-5; figures 2-5	1
Y	US 2012/088388 A1 (OKANO MASATO [JP] ET AL) 12 April 2012 (2012-04-12) paragraphs [0018]-[0023], [0027]-[0028], [0035]-[0037], figures 1-3	2
A	CN 201 893 469 U (BYD CO LTD) 6 July 2011 (2011-07-06) abstract	1,2
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Further documents are listed in the continuation of Box C.



See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

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Date of the actual completion of the international search

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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No

PCT/MY2014/000140

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2011/090652 A1 (WEE JONG-CHEON [KR] ET AL) 21 April 2011 (2011-04-21) the whole document -----	1,2
A	US 2011/230074 A1 (SCHMIDT MATHIAS [US] ET AL) 22 September 2011 (2011-09-22) the whole document -----	1,2

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/MY2014/000140

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP H10144275 A	29-05-1998	JP 2895011 B2 JP H10144275 A	24-05-1999 29-05-1998
US 4660920 A	28-04-1987	JP S6243479 U US 4660920 A	16-03-1987 28-04-1987
US 2012088388 A1	12-04-2012	JP 5565790 B2 JP 2011014253 A KR 20120031505 A TW 201112521 A US 2012088388 A1 WO 2011002880 A1	06-08-2014 20-01-2011 03-04-2012 01-04-2011 12-04-2012 06-01-2011
CN 201893469 U	06-07-2011	NONE	
US 2011090652 A1	21-04-2011	US 2011090652 A1 US 2014083761 A1	21-04-2011 27-03-2014
US 2011230074 A1	22-09-2011	CN 103098314 A EP 2548266 A2 JP 5222439 B2 JP 2013522846 A KR 20120125668 A TW 201203731 A US 2011230074 A1 US 2012276768 A1 WO 2011115788 A2	08-05-2013 23-01-2013 26-06-2013 13-06-2013 16-11-2012 16-01-2012 22-09-2011 01-11-2012 22-09-2011