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(54) Title: DEVICE HAVING A SINGLE-SIDED PRINTED CIRCUIT BOARD

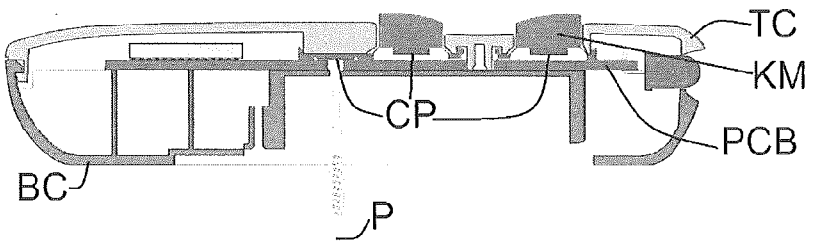

Fig. 3

(57) Abstract: A device comprising a single-sided printed circuit board (PCB) having a non-metallized hole, and a connection area (CA) close to the non-metallized hole on a metallized side of the single-sided printed circuit board. The present invention provides a conducting bridge (CP) from the connection area (CA) and at least partially covering the non-metallized hole, for allowing the connection area (CA) to be contacted, e.g. by a probe (P), from a non- metallized side of the single-sided printed circuit board (PCB) through the non-metallized hole.

Device having a single-sided printed circuit board

FIELD OF THE INVENTION

The invention relates to a device having a single-sided printed circuit board.

BACKGROUND OF THE INVENTION

Single-sided printed circuit boards are known in the art, and have the advantage that they are cheaper than double-sided printed circuit boards. However, the obvious disadvantage of a single-sided printed circuit board is that connections are only possible at one side. While metallized vias or holes through the printed circuit board are known as well, such metallized holes also result in a price increase. For general background information on printed circuit boards (alternatively called printed wiring boards), reference is made to the Wikipedia article at http://en.wikipedia.org/wiki/Printed_wiring_board, incorporated herein by reference.

SUMMARY OF THE INVENTION

It is, inter alia, an object of the invention to provide a relatively low-cost device having a single-sided printed circuit board that can still be contacted from the other side without using a metallized via. The invention is defined by the independent claims. Advantageous embodiments are defined in the dependent claims.

One aspect of the invention provides a device comprising a single-sided printed circuit board having a non-metallized hole, and a connection area close to the non-metallized hole on a metallized side of the single-sided printed circuit board; and a conducting bridge from the connection area and at least partially covering the non-metallized hole, for allowing the connection area to be contacted (e.g. by a probe) from a non-metallized side of the single-sided printed circuit board through the non-metallized hole.

The invention is advantageously applied in a remote control device, in which case the connection bridge can be formed by part of a key-mat having a carbon print area that forms the connection bridge. The probe can be used for testing purposes, or for allowing the IC to be programmed. In a similar way, it is possible to make a reset button at the bottom side of a single-sided printed circuit board if that reset button bridges two connection areas on the wired top side of the printed circuit board via respective connection bridges.

These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1A and 1B show exploded views of a remote control device in accordance with an embodiment of the invention; and

Figs. 2 and 3 show other views of a remote control device in accordance with an embodiment of the invention.

DESCRIPTION OF EMBODIMENTS

In the various figures, the reference signs have the following meanings:

TC	top casing of the remote control device
KM	key-mat
B	button on the key-mat
CP	carbon print area on the bottom of the key-mat
PCB	printed circuit board
CA	connection area on the printed circuit board
BC	bottom casing of the remote control device
BL	battery lid
P	probe

The figures show various views of a remote control device in accordance with an embodiment of the invention. The embodiment is a rather simple remote control, with buttons B for channel up, channel down, volume up, volume down, and a standby button. Of course, the invention can alternatively be used with remote controls having more buttons. When a button is pressed down, a carbon print area CP on the lower side of the key-mat KM makes a connection on the printed circuit board PCB by bridging two contact areas (in this embodiment, these contact areas are represented by half circles; contact areas having other shapes are alternatively possible). The printed circuit board PCB has several other components customary for a remote control device, such as an integrated circuit and an infra-red light emitting diode.

In accordance with the present embodiment of the invention, there is also a carbon print area CP on the key-mat KM that is not below a button B, but that serves to make a connection between a probe P if and when inserted from the bottom side of the printed circuit board, through a hole in the bottom casing BC and a matching hole in the printed

circuit board PCB, to a connection area CA on the top side of the single-sided printed circuit board PCB.

As shown in Figs. 2 and 3, the top casing TC of the remote control device in accordance with the embodiment of the invention is preferably formed such that the carbon print area above the hole in the printed circuit board PCB is firmly pressed onto the connection area, so that if and when the probe P is inserted through the hole and touches the carbon print, it gets a good connection with the connection are.

It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. In the shown embodiment, the connection area CA is a circle around the hole in the printed circuit board PCB. Alternatively, it may be a metalized area adjacent to just one side of the hole. The carbon print areas CP do not need to have a circle shape, and they do not need to cover the entire hole as long as they ensure that a connection is made between a probe P inserted through the hole and the connection area CA. The bottom side of the key-mat KM may alternatively have metallized contact areas instead of carbon print areas, as all what matters is that an electrical connection can be made so that a conducting bridge is formed. While the invention is illustrated by means of an embodiment formed by a remote control device, the invention can be used with any device having a single side printed circuit board that needs to be contacted from the other side. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. The word "comprising" does not exclude the presence of elements or steps other than those listed in a claim. The word "a" or "an" preceding an element does not exclude the presence of a plurality of such elements.

CLAIMS:

1. A device comprising:

a single-sided printed circuit board (PCB) having a non-metallized hole, and a connection area (CA) close to the non-metallized hole on a metallized side of the single-sided printed circuit board; and

a conducting bridge (CP) from the connection area (CA) and at least partially covering the non-metallized hole, for allowing the connection area (CA) to be contacted from a non-metallized side of the single-sided printed circuit board (PCB) through the non-metallized hole.

2. A device as claimed in claim 1, wherein the device is a remote control device further comprising a key-mat (KM) having a carbon print area (CP), and the conducting bridge is formed by said carbon print area (CP).

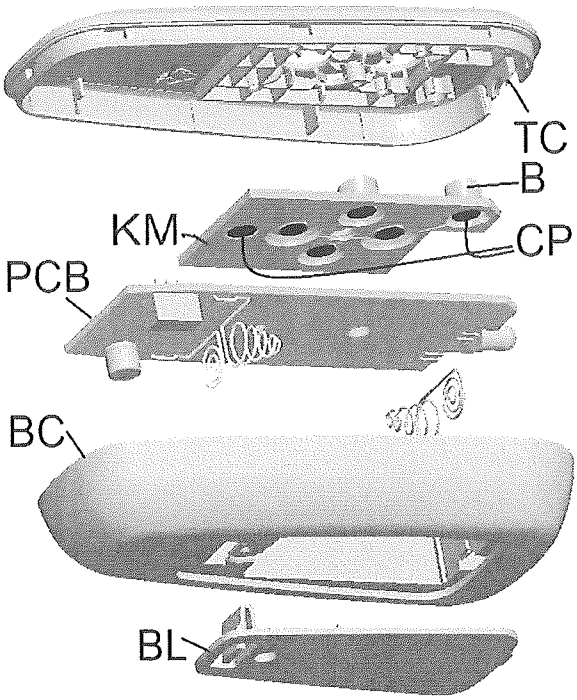

Fig. 1A

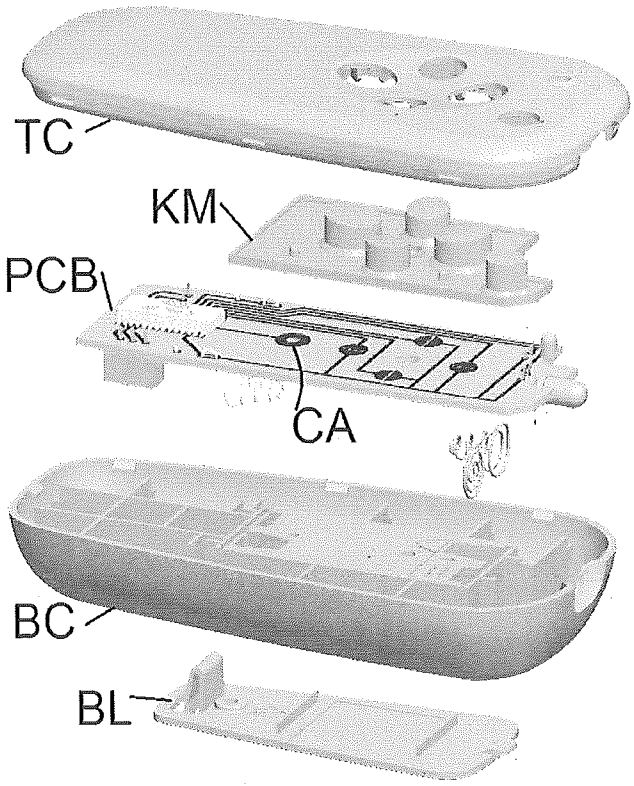

Fig. 1B

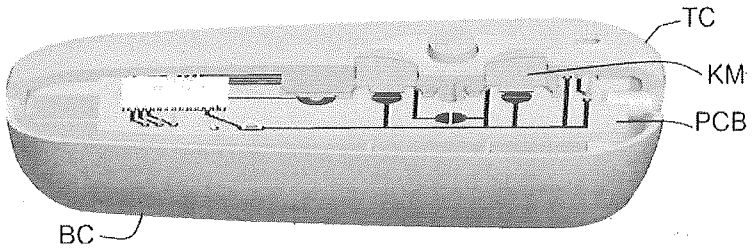

Fig. 2

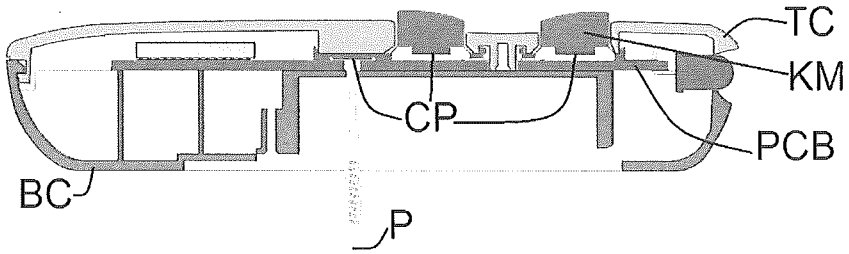

Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SG2015/000137

A. CLASSIFICATION OF SUBJECT MATTER

H05K 1/00 (2006.01) H01R 9/00 (2006.01)

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)

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)

Databases: EPODOC, WPI, INSPEC. Keywords: Single sided, PCB, hole, non-metallic, bridge and similar keywords.

Google Patents, Google Scholar & Esp@cenet were also searched with similar keywords as above.

Keywords for Applicant inventor search in Google Patents, Google Scholar & Esp@cenet:

Home control singapore pte ltd , TEO ENG KIM, PCB, single, hole, link and similar keywords.

AUSPAT and IP Australia internal databases: Applicant/Inventor name search.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

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

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
6 October 2015	06 October 2015
Name and mailing address of the ISA/AU	**Authorised officer**
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustralia.gov.au	Riju Jacob AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. 0262832220

INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. **PCT/SG2015/000137**
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 8115108 B2 (SAKAI) 14 February 2012 abstract, col 2 lines 51-64, col 3 lines 12-15, col 4 lines 38-56, col 10 line 48- col 12 line 27 and figures 7(a)-7(d)	1, 2
A	US 7618846 B1 (PAGAILA et al.) 17 November 2009 Whole document	1, 2
A	US 5883335 A (MIZUMOTO et al.) 16 March 1999 Whole document	1, 2

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/SG2015/000137**

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
US 8115108 B2	14 February 2012	None	
US 7618846 B1	17 November 2009	None	
US 5883335 A	16 March 1999	None	

End of Annex

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.