A special USB connector which can accommodate PCBA with discrete components soldered on the frontal portion of PCBA is disclosed. The components can be positioned inside the USB connector. A carrier is utilized for PCBA support within a special USB connector used for compact USB devices and sliding motion.
USB CONNECTOR AND METHOD OF MANUFACTURE

FIELD OF THE INVENTION

[001] The present invention relates generally to a USB connector and more specifically to a USB connector which can accommodate a printed circuit board assembly (PCBA).

BACKGROUND OF THE INVENTION

[002] USB connectors are utilized in a variety of environments for connecting devices to computer systems or other types of processing systems. A common USB connector utilizes a printed circuit board, with all core and discrete components soldered onto one or both sides. Figure 1 is a diagram of a conventional USB connector 10. This type of connector, a standard USB connector 14 with a metal shield 12 is soldered onto the front of the same PCB board. The size of the metal shield is standard, where the opposite side of its 4-contact area 16 contain no components. US Patent No. 7,297,024, entitled "Universal-Serial-Bus (USB) Flash-Memory Device with Metal Wrap Formed Over Plastic Housing," issued Nov. 20, 2007, describes an elongated USB casing device which is fully either plastic or metal wrapped with no sliding carrier or switching mechanism. The printed circuit board is encapsulated in resin and then placed on a molded plastic casing.

[003] In another example, US Patent No. 7,094,074, entitled "Manufacturing Methods for Ultra-Slim USB Flash-Memory Card with Supporting Dividers or
Underside Ribs," issued Aug. 22, 2006, discloses an ultra slim device without a metal shield. All core and discrete components are soldered on a PC board and then enveloped in a plastic casing composed of top and bottom casing parts. This is not a standard USB connector and so it oftentimes has to be specifically adapted to the computer system.

[004] Another manufactured device without a standard USB connector with a metal shield is disclosed with the core components in an unpackaged die form-factor with an intent to reduce the size. The PC board substrate is composed of such dies and discrete components soldered onto the PC board encapsulated in resin finishing. Then the device is covered by an external plastic casing.

[005] The absence of a USB connector with metal shield causes high wear-out durability and quality issues. Also, if the device is too long, it will not be as rigid and sturdy. When the plastic is used for casing, and the device is inserted and extracted repeatedly by the user into the female USB port, there is increased wear. This results in loosened or weakened inserted when the thickness of the plastic is such that when the device wear out.

[006] In addition, with all of these prior art systems, there is a need for some kind of encapsulation process, such as resin encapsulation or the like, which is utilized to protect the part. This resin encapsulation costs money and requires longer manufacturing time and there are still reliability and quality issues.

[007] Accordingly, what is needed is a system and method that overcomes the above-identified issues. The system should be cost-effective, easily
adaptable, minimizing the length of the device, and utilized with USB-connector type systems. The present invention addresses such a need.

SUMMARY OF THE INVENTION

[008] A special USB connector which can accommodate PCBA with discrete components soldered on the frontal portion of PCBA is disclosed. The components can be positioned inside the USB connector. A carrier is utilized for PCBA support within a special USB connector used for compact USB devices and sliding motion.

BRIEF DESCRIPTION OF THE DRAWINGS

[009] Figure 1 illustrates a conventional USB connector.

[010] Figure 2 illustrates a first embodiment of the USB connector in accordance with the present invention.

[011] Figure 3 illustrates a carrier for containing the USB connector of Figure 2.

[012] Figure 4 illustrates a second embodiment of a USB connector in accordance with the present invention.

[013] Figure 5A illustrates a carrier for containing the USB connector of Figure 4.

[014] Figure 5B is a flow chart containing the assembly process of the USB connector of Figure 4.
Figure 6 illustrates a third embodiment of a USB connector in accordance with the present invention.

Figure 7A illustrates a carrier for the USB connector of Figure 6.

Figure 7B is a flow chart containing the assembly process of the USB connector of Figure 6.

Figure 8A is a top view of the printed circuit board with 4-contacts.

Figure 8B is a bottom view of the printed circuit board.

Figure 9 is a view of the USB connector in combination with the bottom and top view of the printed circuit board.

DETAILED DESCRIPTION

The present invention relates generally to a special USB connector and more specifically to a USB connector which can accommodate a printed circuit board assembly (PCBA). The following description is presented to enable one of ordinary skill in the art to make and use the invention and is provided in the context of a patent application and its requirements. Various modifications to the preferred embodiments and the generic principles and features described herein will be readily apparent to those skilled in the art. Thus, the present invention is not intended to be limited to the embodiments shown, but is to be accorded the widest scope consistent with the principles and features described herein.
A USB connector in accordance with the present invention can house a printed circuit board assembly (PCBA) with four metal contacts on one side, and discrete components on the other inside of the PCB. This PCBA extends all the way to the front of the connector, where its frontal edge rests on the connector's frontal support(s).

Figure 2 illustrates a first embodiment of the USB connector 100 in accordance with the present invention. This embodiment of the USB connector 100 has two bends made at the front of the metal shield 104 to support PCBA to be inserted. In Figure 2, the connector 100 includes a connector core 102 which is inserted into a metal shield 104. The metal shield 104 includes metal prongs 103 to be inserted into a printed circuit board (not shown).

Figure 3 illustrates a carrier 120 for containing the USB connector of Figure 2. Figure 3 illustrates a carrier 120 which is utilized to insert the connector 100 into a computer or some other electronic device.

Figure 4 illustrates a second embodiment of a USB connector 200 in accordance with the present invention. In Figure 4, the connector 200 is similar to connector 100 of Figure 2, except there is a plastic rib 206 therein that is utilized with a connector core 202. Both the plastic support and the connector core 204 are inserted into the metal shield 202. Figure 5A illustrates a carrier 220 which is utilized to insert the connector 200 into a device. The embodiment of the USB connector 200 has the same, but with a plastic rib 206 attached to the metal shield 202 inside the frontal edge of the USB connector's metal shield 202 to
augment the two bends 203 for PCBA support. Figure 5A illustrates a carrier for containing the USB connector 200 of Figure 4.

[0026] Referring to Figures 2 and 4, the metal shields 108, 208 with two metal prongs 203 that attach to the perimeter of the PCB crimped at predetermined positions by a 90-degree angle and are then soldered on.

[0027] The process of assembly of the connectors 100 and 200 described in conjunction with flow chart 5B. First, a PCBA with all components is inserted into the rear of the USB connector with plastic internal part, via step 502. Next, two metal prongs fit on the perimeter of the PCBA and are soldered on for anchorage, via step 504. Then, a PCBA with the USB connector is slipped into plastic PCBA carrier and snapped in place, via step 506. Then, the assembly is placed into the external casing and sonic welded, via step 508.

[0028] Figure 6 illustrates a third embodiment of a USB connector in accordance with the present invention. Referring to Figure 6, a USB connector 300 is manufactured with a special plastic internal part 302 and an installation housing 304 that houses the PCBA with core components placed behind the USB connector 300, which discrete components are soldered on the frontal portion of the PCBA which is inserted into the rear of the USB connector 300. Figure 7A illustrates a carrier 320 for the USB connector 300 of Figure 6.

[0029] The assembly process is as follows, in accordance with a flow chart shown in Figure 7B. First, insert Special Plastic Internal part 302 to housing 304, via step 602. Next, insert PCBA with all components into rear of special USB
connector, via step 604. Then, two metal prongs 103 are soldered on to the
PCBA via step 606. Then, a plastic support carrier is inserted into bottom rear of
USB connector, via step 608. The PCBA is snapped into position, via step 610.
Finally, the assembly is then placed into external casing and then is sonic-welded
to complete the assembly, via step 612.

[0030] The operation of the connectors 100, 200 and 300 of Figures 2, 4 and
6, respectively when inserted in the carrier 120, 220 and 320 of Figures 3, 5A
and 7A respectively could be similar to, for example, that described in,
"Retractable Memory Drive," U.S Patent No. 7,422,454, which describes memory
drives such as drives with USB connectors which are frequently utilized to
portably transfer electronic data which is assigned to the assignee of the present
application and is incorporated by reference in its entirety herein.

[0031] A retractable memory drive in accordance with the present invention
comprises a top casing, a middle carrier, an electronic device such as a USB
thumb drive, and a bottom casing. A positioning device on the middle carrier has
a portion that protrudes outside the casing and operates like a button. The
location of the positioning device where the button is located has two key
attributes. First, there is a protrusion that acts as a lock with the casing. Second,
the area below the button is not rigid and so it gives way when pressure is
applied to the button.

[0032] The top and bottom casings provide a casing structure which includes
two detents. One detent is for locking the device with the connector in the
extended position, and one detent for locking the device with the connector in the
in position. This allows for just one press of the extended portion of the
positioning device to unlock it from its present position. When the device
reaches its new position it will automatically lock. There are also guide rails that
allow the middle carrier to remain in an appropriate position. The embodiment of
the USB connector has the same, but with a plastic rib attached to the metal
shield's inside the frontal edge of the USB connector's metal shield to augment
the two bends for PCBA support.

[0033] Figure 8A is a top view 400 of the printed circuit board. Bottom-rear
plastic PCBA support 402 is built as part of the front portion of the carrier. It is
deployed by inserting into the rear of the special USB connector, via on the
discrete components' side of PCBA.

[0034] Figure 8B is a top view of the printed circuit board. Top rear PCBA
plastic support is built into the special USB connector.

[0035] Figure 9 is a view of the USB connector 500 in combination with the
bottom and top view of the printed circuit board. Referring to Figure 9, the use of
a special plastic PCBA carrier 502, which is the front part of carrier 120, with
plastic PCBA support 504 is placed in a position that gives PCBA support and
protection of discrete components placed on the PCB (frontal part, under the 4
contact-pin).

Advantages
The special USB connector, along with sliding carrier mechanism for higher reliability and quality of device, allows for the following advantages.

1. The use of a specially designed USB connector with metal shield that improves and enhances the Electromagnetic Interference (EMI) and Electrostatic discharge (ESD) of the present invention. The metal shield enables the placement of discrete components under the USB connector's four contact pins in a protected way. Strong PCBA support is now achieved by the metallic frontal supports and plastic support blocks placed within the metal shield.

2. The use of a PCBA carrier will not only render a sliding lock mechanism, but also provide for frontal PCBA support and protection for discrete components placed on the PC Board on the opposite side of the PCBA under the USB connector's four contact pins. Such a device simply strengthens the device's insertion area, and increases durability and quality of device.

Although the present invention has been described in accordance with the embodiments shown, one of ordinary skill in the art will readily recognize that there could be variations to the embodiments and those variations would be within the spirit and scope of the present invention. Accordingly, although the present invention is disclosed in conjunction with a USB connector one of ordinary skill in the art readily recognizes that the present invention could be utilized with a variety of connectors and that use would be within the spirit and scope of the present invention. Accordingly, many modifications may be made.
by one of ordinary skill in the art without departing from the spirit and scope of
the appended claims.
CLAIMS

What is claimed is:

1. A USB connector comprising:
   a connector core; and
   a metal shield for surrounding the connector core, the metal shield
   including prongs which are attachable to a printed circuit board.

2. The USB connector of claim 1 which includes a guiding mechanism, the
   guiding mechanism including a latching mechanism to secure a printed circuit
   board.

3. The USB connector of claim 1 which includes a sliding mechanism with a
   special carrier.

4. The USB connector of claim 1 which includes a metal contact to improve
   electrostatic discharge (ESD) and Electromagnetic Interference (EMI) properties.

5. The USB connector of claim 1 including a plastic rib to provide additional
   frontal support for the connector.

6. The USB connector of claim 1 wherein the connector is held within a
   carrier.
7. The USB connector of claim 1 wherein a plurality of discrete components are provided on the printed circuit board on a side opposite the contact area on the printed circuit board; wherein the discrete components are protected by the metal shield.

8. The USB connector of claim 1 wherein the connector core includes a plastic internal part and an installation housing that includes a printed circuit board assembly (PCBA), the discrete components of the PCBA being placed behind the connector.

9. A memory drive comprising:
   a casing including a carrier portion; and
   a USB connector within the carrier portion; the USB connector comprising; a connector core; and a metal shield for surrounding the connector core, the metal shield including metal prongs which are attachable to a printed circuit board.

10. The memory drive of claim 9 which includes a guiding mechanism, the guiding mechanism including a latching mechanism to secure a printed circuit board.

11. The memory drive of claim 9 which includes a sliding mechanism with a special connector.
12. The memory drive of claim 9 which includes a metal contact to improve electrostatic discharge (ESD) and Electromagnetic Interference (EMI) properties.

13. The memory drive of claim 9 including a plastic rib to provide additional frontal support for the connector.

14. The memory drive of claim 9 wherein the casing is retractable.

15. The memory drive of claim 9 wherein a plurality of discrete components are provided on the printed circuit board on a side opposite the contact area of the printed circuit board; wherein the discrete components are protected by the metal shield.

16. The memory drive of claim 9 wherein the connector core includes a plastic internal portion and an installation housing that includes a printed circuit board assembly (PCBA), the discrete components of the PCBA being placed behind the connector.

17. A carrier system comprising:
   
a carrier; and
   
a printed circuit board (PCB) support for providing support for a PCB and providing protection for discrete components placed on the PCB.
18. The carrier system of claim 17 wherein the PCB support comprises a plastic frontal support block.
A PCBA with all components is inserted into the rear of the US connector with plastic internal part.

Two metal prongs fit on the perimeter of the PCBA and are soldered on for anchorage.

The PCBA with connector is slipped into plastic carrier and snapped into place.

Assemble into external casing and sonic welded.

FIG. 5B
1. Insert special plastic internal part to housing (602)
2. Insert PCBA with all components into rear of special USB connector (604)
3. Soldered two metal prongs to PCBA (606)
4. Plastic support of carrier is inserted into bottom rear of special USB connector (608)
5. Snap PCBA in position (610)
6. Place carrier in casing and sonic weld (612)

FIG. 7B
INTERNATIONAL SEARCH REPORT

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A CLASSIFICATION OF SUBJECT MATTER
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B FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
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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)
PatBase, Google Patent Search

C DOCUMENTS CONSIDERED TO BE RELEVANT

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