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(54) Title: SIDE MOUNTABLE USB RECEPTACLE CONNECTOR

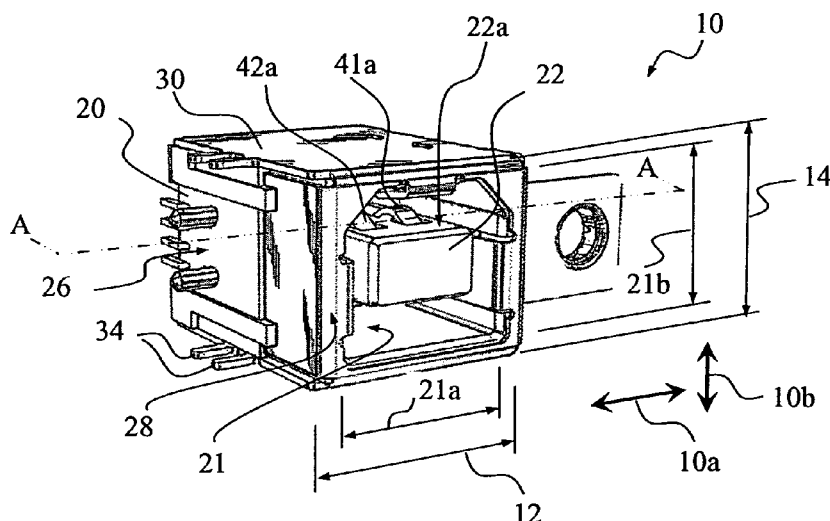


FIG. 1

(57) Abstract: A USB receptacle connector has a housing and a shell enclosing the housing. The housing has a mating face which forms a recess for receiving a counterpart USB plug connector, and a tongue in the recess having a first surface and an opposite second surface both parallel to a width direction of the housing. A first group of contact terminals each has a contact end disposed on the first surface. A second set of contact terminals each has a contact end disposed on the second. Each of the first and second sets of contact terminals has a mounting end which extends out of the housing and disposed on a mounting face which is perpendicular to the width direction of the housing. Such a connector is suitable for mounting in a very tight space which may be even narrower than the width dimension of the shell.





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SIDE MOUNTABLE USB RECEPTACLE CONNECTOR

TECHNICAL FIELD

5 The present invention relates to an electrical connector. In particular, it relates to a Universal Serial Bus (USB) receptacle connector.

BACKGROUND

10 Universal Serial Bus (USB) receptacle connectors are used in electronic systems such as computers or audio-visual devices to provide an interface to communicate with peripheral devices. In certain applications or electronic systems, the space available for mounting a USB receptacle connector is very tight, which may even be narrower than the width dimension of a standard USB
15 receptacle connector. To provide USB interface connections at such a tight space, substantial changes to the physical structures and dimensions of the present standard USB receptacle connector becomes necessary. However, such changes can make the connector no longer able to mate with counterpart standard plug connectors and in turn, the plug connectors will have to be modified
20 too, which may result in inconvenience to the usage of these electronic devices. In addition, such dimensional changes may also degrade the electrical performances of the connector.

25 It is therefore desirable to provide a USB receptacle connector suitable for such tight spaces of electronic devices without the need to modify the counterpart plug connectors.

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SUMMARY OF INVENTION

Disclosed therein are USB receptacle connectors according to embodiments of the present invention, which are structured for being mounted on a PCB with very tight space limitations.

In one embodiment, a USB receptacle connector includes a housing and a shell enclosing the housing. The housing has a mating face which forms a recess for receiving a counterpart USB plug connector, and a tongue in the recess having a first surface and an opposite second surface both oriented parallel to a width direction of the housing. A first set of contact terminals each has a contact end disposed at the first surface of the tongue. A second set of contact terminals each has a contact end disposed at the second surface of the tongue. Each of the first and second sets of contact terminals has a mounting end which extends out of the housing and disposed on a mounting face which is perpendicular to the width direction of the housing. Such a connector is suitable for mounting in a very tight space which may be even narrower than the width dimension of the shell. In the meantime the overall structure of the connector is maintained to meet industrial standards and compatibility and the electrical performances are not compromised.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects and advantages of the present invention will be described in detail with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a USB receptacle connector according to one embodiment of the present invention.

Fig. 2 is a perspective bottom view of Fig. 1.

Fig. 3 is a partial cross-sectional perspective view of Fig. 1 along cut line A-A, with the shell omitted.

Fig. 4 is a perspective back view of Fig. 4.

Fig. 5 is a perspective view showing the contact terminals of the USB
5 receptacle connector of Fig. 1.

Fig. 6 shows a USB receptacle connector of Fig. 1 when to be mounted to
a printed circuit board.

10 Fig. 7 shows a USB receptacle connector of Fig. 6 when mounted to a
printed circuit board.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

15 As shown in Figs. 1 to 5, a USB type B receptacle connector 10 according
to one embodiment of the present invention has a housing 20, a shell 30 partially
enclosing housing 20, and four contact terminals 41, 42, 43 and 44 disposed in
housing 20. Housing 20 has a mating face 28 which forms a recess 21 for
receiving a counterpart USB plug connector (not shown), and a support member
20 in the form of a tongue 22 disposed in recess 21. Recess 21 is generally a
rectangular shape with a recess width 21a and recess height 21b which is slightly
smaller than width 21a according to USB type B receptacle standard. For the
purpose of illustration, a direction parallel to width 21a is referred to in the context
as width direction 10a of connector 10, and a direction parallel to height direction
25 21b is referred to as height direction 10b of connector 10. Following the
dimensional relationship of recess width 21a and recess height 21b, connector
height 14 is also slightly smaller than connector width 12.

Each of contact terminals 41 and 42 respectively has a contact end 41a
30 and 42a disposed on the top or first surface 22a of tongue 22. Contact terminals
43 and 44 each has a respective contact end 43a and 44a disposed on the bottom
or second surface 22b of tongue 22. Contact terminals 41, 42, 43, and 44 each

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has a retention portion 41c, 42c, 43c and 44c at middle part thereof, to fix each contact terminal to housing 20. Contact ends 41a and 42a are aligned along a first horizontal row 46a, and contact ends 43a and 44a are aligned along a second horizontal row 48a, as shown in Fig. 5, according to USB type B receptacle standard. This configuration provides connector 10 with standard mating face with counterpart USB plugs.

To mount connector 10 onto a printed circuit board (PCB) which has a very limited layout or tight mounting space, contact terminals 41, 42, 43 and 44 are extended in a backward direction 68 away from mating face 28 (Fig. 4), and further extended from retention portions 41c, 42c, 43c and 44c along a side direction 66 toward a side surface 26 of housing 20, and terminated at respective mounting ends 41b, 42b, 43b and 44b disposed outside side surface 26. Mounting legs 34 of shell 30 and posts 24 of housing 20 are also extended from the same side surface 26, for positioning and fixing the connector 10 to PCB 50. This arrangement makes side surface 26 a mounting face for mounting connector 10 to PCB 50, as shown in Figs 6 and 7.

Referring back to Figs. 4 and 5, contact end 41a of contact terminal 41 and contact end 42a are disposed in one horizontal row 46a and in a same horizontal plane which is perpendicular to both mating face 28 and mounting face 26. However, retention portions 41c and 42c of contact terminals 41 and 42 are disposed in different two horizontal planes 46b and 47b which are perpendicular to both mating face 28 and mounting face 26. This structure can be formed by deforming one or both the retention portion 41c of first contact terminal 41 and retention portion 42c of second contact terminal 42 away from each other. According to one embodiment, the contact end and the retaining portion of one of the first set of contact terminals are disposed in a same horizontal plane which is coplanar with the top or first surface 22a of tongue 22, and the contact end and the retaining portion of the other one of the first set of contact terminals are disposed in different horizontal planes. According to another embodiment, the contact end and the retaining portion of both contact terminals of the first set are

disposed in different horizontal planes. Retention portions 43c and 44c of third and fourth contact terminals 43 and 44 can be arranged in a similar manner.

Extending from respective retention portions 41c, 42c, 43c and 44c along side direction 66, there are disposed, in respective same horizontal plane 46b, 47b, 48b and 49b, mounting ends 41b, 42b, 43b and 44b of contact terminals 41, 42, 43, and 44. In the present embodiment, mounting ends 41b, 42b, 43b and 44b are arranged along a single alignment row 45 which is perpendicular to first surface 22a of tongue 22.

As shown in Fig. 6, posts 24 and legs 34 are also extended along the same direction as the mounting ends of the contact terminals, for inserting into respective through holes 52 and 53 of PCB 50.

As shown in Fig. 7, by configuring side surface 26 as a mounting face of connector 10, the height 14 occupies the width limits of PCB 50. As such, the available mounting space 55 of PCB, which maybe even smaller than the width 12 of connector 10, can well accommodate connector 10 with a standard width 12. Modification for counterpart plug connectors is not required.

List of reference numerals

10	Connector
10a	width direction
10b	height direction
12	connector width
14	connector height
20	housing
21	recess
21a	width
21b	height
22	tongue

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	22a	top / first surface
	22b	bottom / second surface
	24	post
	26	mounting face
5	28	mating face
	30	shell
	34	leg
	41, 42, 43, 44	contact terminal
	41a, 42a, 43a, 44a	contact end
10	41b, 42b, 43b, 44b	mounting end
	41c, 42c, 43c, 44c	retention portion
	45	alignment row
	46a	first horizontal row
	48a	second horizontal row
15	46b, 47b, 48b and 49b	horizontal plane
	50	PCB
	52, 53	through hole
	55	available mounting space
	66	side direction
20	68	backward direction

CLAIMS**1. A USB receptacle connector comprising:**

a housing having

a mating face for receiving a counterpart USB plug connector;

a mounting face for mounting the connector to a circuit board, and

a tongue in the housing having a first surface and an opposite

second surface both oriented parallel to a width direction of the housing;

a first set of contact terminals each having a contact end disposed on the first surface of the tongue;

a second set of contact terminals each having a contact end disposed on the second surface of the tongue;

characterized in that the mounting face is perpendicular to the width direction of the housing.

2. The USB receptacle connector of claim 1, wherein each of the first and second sets of contact terminals having a mounting end disposed on the mounting face, and wherein the contact terminals are aligned in a single row.

3. The USB receptacle connector of claim 2, wherein the single row is perpendicular to the first surface of the tongue.

4. The USB receptacle connector of claim 1, wherein each of the first and second sets of contact terminals has a retaining portion between the mating end and the mounting end for fixing the contact terminal to the housing, wherein the retaining portions of the first set of contact terminals are disposed in different horizontal planes.

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5. The USB receptacle connector of claim 4, wherein the retaining portions of the second set of contact terminals are disposed in different horizontal planes.

5 6. The USB receptacle connector of claim 5, wherein the retaining portions of all the contact terminals are disposed in different horizontal planes.

10 7. The USB receptacle connector of claim 4, wherein the first set of contact terminals has two contact terminals, the contact end and the retaining portion of one of the first set of contact terminals are disposed in a same horizontal plane which is coplanar with the first surface of the tongue, and the contact end and the retaining portion of the other one of the first set of contact terminals are disposed in different horizontal planes.

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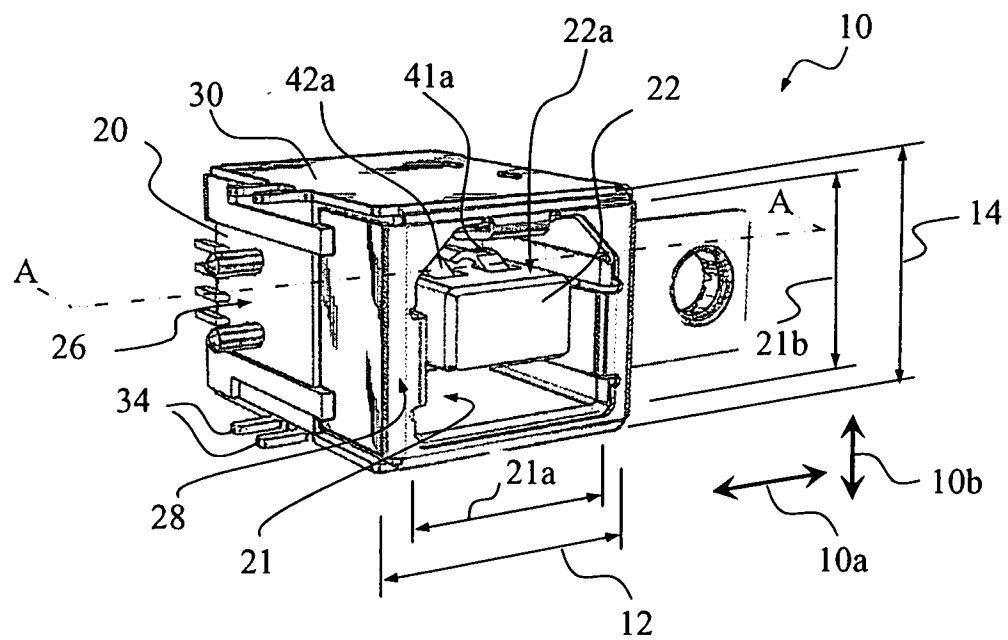


FIG. 1

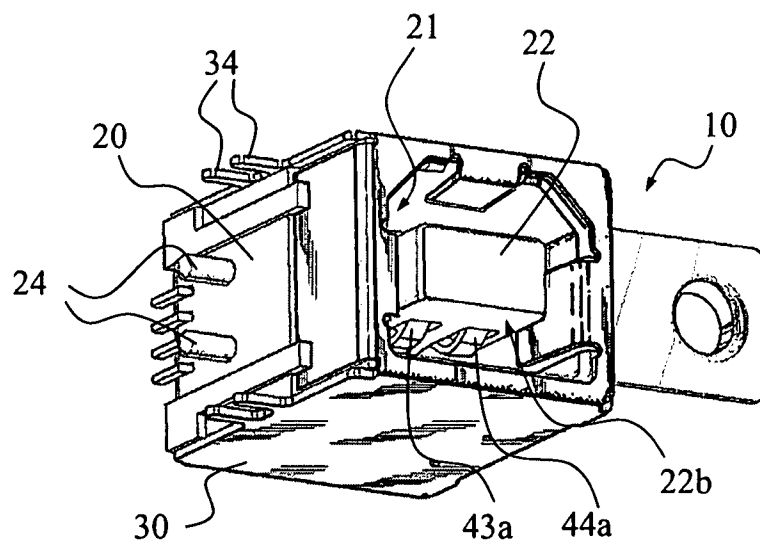
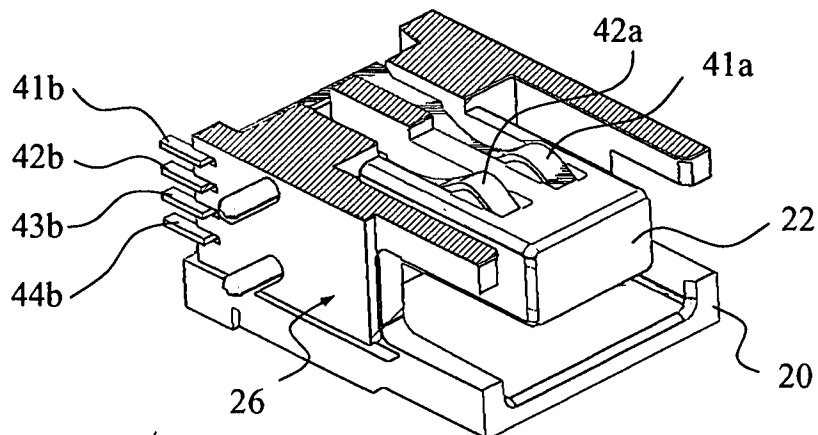
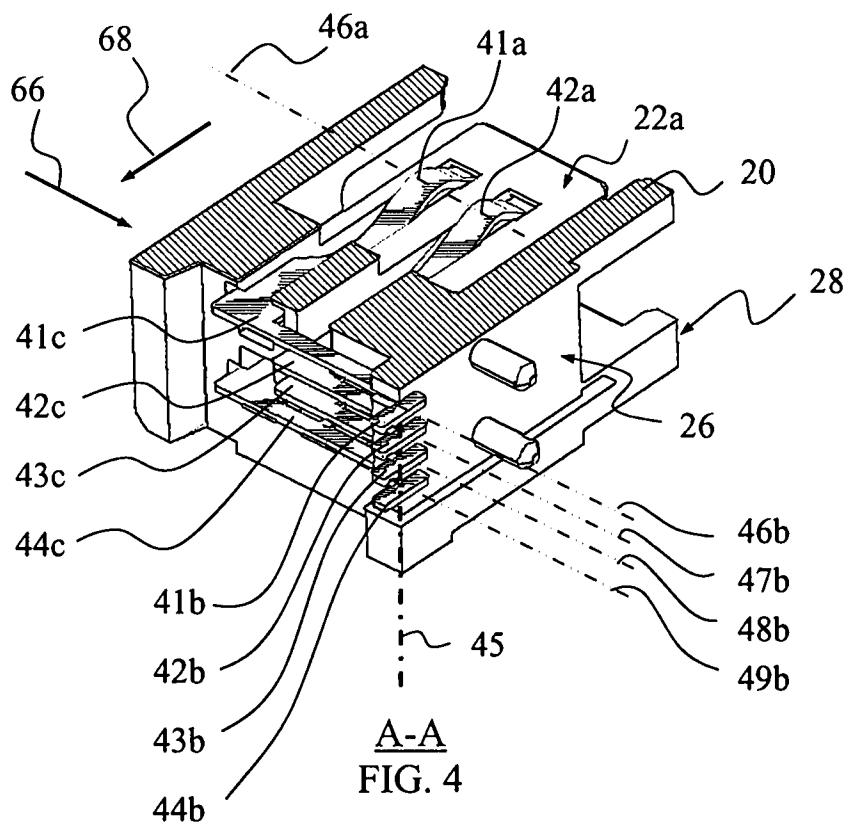


FIG. 2

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A-A
FIG. 3



A-A
FIG. 4

3/4

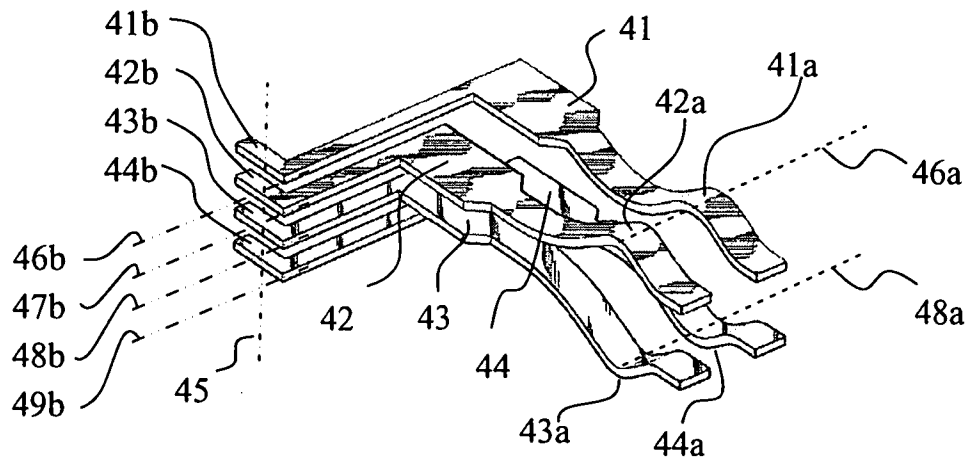


FIG. 5

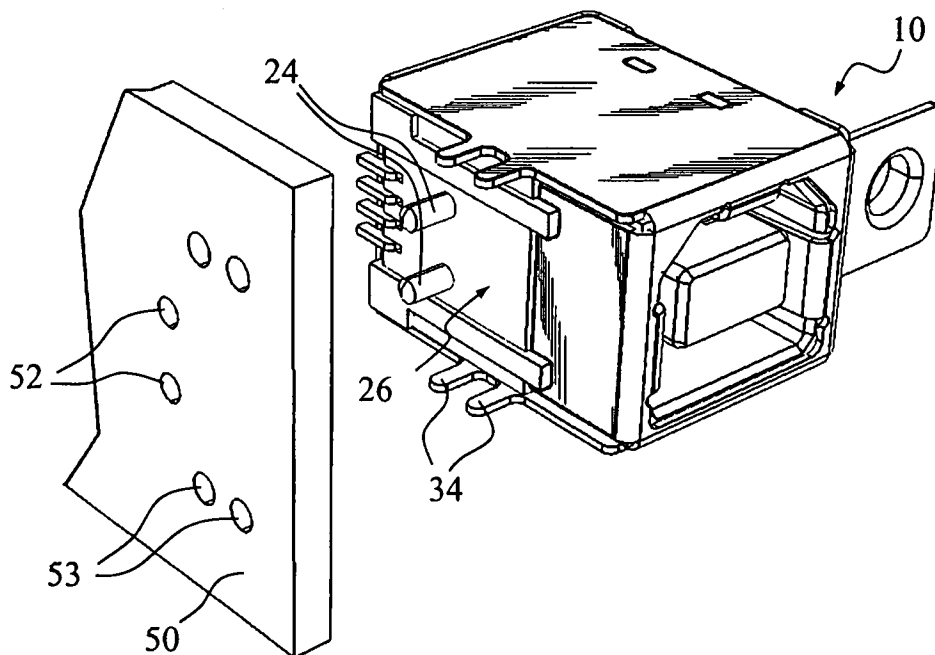


FIG. 6

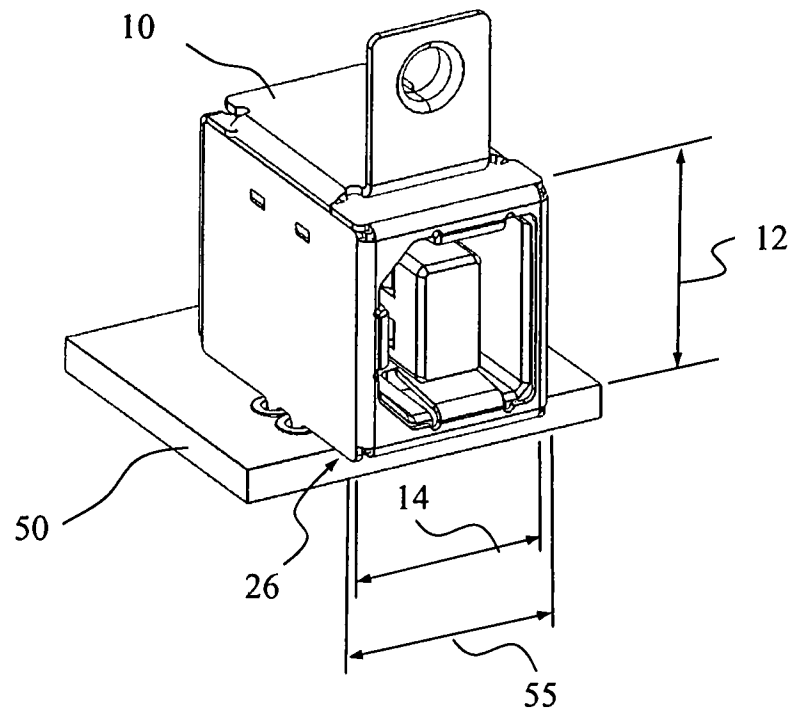


FIG. 7