

CARD EDGE CONNECTOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The present invention relates to a card edge connector, and more particularly, to a card edge connector including a boardlock having a flake portion projecting therefrom and disposed parallel to the longitudinal direction thereof.

2. Description of the Related Art

10 Electrical connectors use mounting pegs or boardlocks to position the electrical connectors on a printed circuit board and to hold the terminals thereof to the printed circuit board. Generally, the mounting pegs or boardlocks are soldered so as to provide sufficient holding strength.

FIG. 1 shows a plurality of conventional boardlocks 3 configured to fix a card edge connector 1 to the printed circuit board 2. Each boardlock 3 includes a pair of fork-like legs 31 for insertion into a respective opening 21 in a printed circuit board 2 with their respective barbs 311 biting into the inner wall defining the respective opening 21. The biting barbs 311 may not provide required holding strength, so the fork-like legs 31 are soldered into the respective openings 21 to meet such holding-strength requirement. 15 Normally, such a fork-like leg design may cause molten solder to barely contact the opening 21 and to form a solder joint therein. However, such a solder joint cannot provide sufficient holding strength to fix the card edge connector 1 to the printed circuit board 2 and to secure the connection of electrical terminals 4. Even worse, the electrical connection of the electrical terminals 4 may fail due to cracks formed in the solder joints of the electrical terminals 4 and disengagement of the electrical terminals 4 after several repetitions of insertion and removal of electrical card modules. 20 25

U.S. Patent No. 5,478,257 discloses a retention device for connecting a

first member to a second member. The retention device has an end with two spaced cantilever arms adapted to be inserted into a hole of the second member to be fixed therein. Each arm has an exterior cam surface having an arcuate shape with a solder reflow area therebetween. Similar to the above example, the retention device is fixed by a solder joint formed merely in the hole, resulting in insufficient holding strength.

In summary, the boardlocks of conventional electrical connectors cannot be properly soldered to obtain sufficient holding strength, and such a disadvantage is required to be improved.

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SUMMARY OF THE INVENTION

An objective of the present invention is to provide a new and improved card edge connector having boardlocks that can be properly soldered to obtain sufficient holding strength.

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In order to achieve the above objective, a card edge connector configured for mounting on a printed circuit board comprises an insulating housing and a pair of first boardlocks each including a flake portion having an upper section and a lower section. The insulating housing comprises two opposite end portions spaced apart from each other in a longitudinal direction, a pair of relief cavities spaced apart from each other along the longitudinal direction, and a pair of retention holes. Each relief cavity is defined by a plurality of side surfaces and a bottom surface, and each retention hole is formed on the bottom surface. A retaining portion extends from the upper section and is configured to be securely received by the respective retention hole. Each side surface defining the relief cavity is spaced apart from the upper section of the respective flake portion by a distance sufficiently small to facilitate the wicking of liquid solder by capillary action.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described according to the appended drawings in

which:

FIG. 1 illustrates a card edge connector having a plurality of boardlocks each with a pair of fork-like legs;

5 FIG. 2 is a perspective view showing a card edge connector assembled with a pair of first boardlocks and a second boardlock according to one embodiment of the present invention;

FIG. 3 is a perspective view showing a card edge connector receiving a printed circuit card according to one embodiment of the present invention;

10 FIG. 4 is a perspective view showing a card edge connector and a separate printed circuit card according to one embodiment of the present invention;

FIG. 5 is a perspective view showing a second boardlock and a cavity for holding the second boardlock according to one embodiment of the present invention;

15 FIG. 6 is a perspective view showing a first boardlock, an accommodating cavity, and a stepped cavity for holding the first boardlock according to one embodiment of the present invention;

FIG. 7A is a bottom view of the card edge connector of FIG. 3;

FIG. 7B is a cross-sectional view along line X-X of FIG. 7A;

20 FIG. 7C is a cross-sectional view along line W-W of FIG. 7A;

FIG. 7D is a cross-sectional view along line Z-Z of FIG. 7A;

FIG. 7E is a cross-sectional view along line Y-Y of FIG. 7A; and

FIG. 8 is a front view showing a soldered first boardlock according to one embodiment of the present invention.

25 **DETAILED DESCRIPTION OF THE INVENTION**

Hereinafter, embodiments of the present invention are described in detail with reference to the attached drawings. Referring to FIG. 2, an improved boardlock system comprising first boardlocks 54 and a second boardlock 55 is proposed for a card edge connector 5 for securing the card edge connector 5 to a printed circuit board 6 including a plurality of elongated slits 62, an aperture 63, and a plurality of pairs of contact pads 61 arranged between the elongated slits 62 in a longitudinal direction indicated by an arrow "X" according to one embodiment of the present invention.

Referring to FIGS. 2 to 4, the card edge connector 5 may comprise an elongated insulating housing 51 having two oppositely disposed end portions 511 spaced apart from each other in the longitudinal direction "X" and an upward-facing card-receiving slot 512 extending between the two end portions 511 for receiving the insertion edge portion 71 of a vertically-oriented printed circuit card 7.

A plurality of pairs of electrical terminals 53 are arrayed in the card edge connector 5, with their contact portions (not shown) projecting into the card-receiving slot 512 for mechanically and electrically engaging the contact pads 711 disposed on the insertion edge portion 71 of the printed circuit card 7. Each electrical terminal 53 also comprises a tail portion 531 extending laterally below the card edge connector 5 and configured to be soldered on a respective contact pad 61 on the printed circuit board 6.

A polarizing rib 513 can be disposed within and unequally divide the card-receiving slot 512, aligning with a cut 712 formed on the insertion edge portion 71 to prevent improper installation of the printed circuit card 7. Each end portion 511 is configured to receive a respective pivotally movable latch-ejector member 52 for ejecting or latching the printed circuit card 7.

Referring to FIG. 5, the second boardlock 55 comprises a retaining portion 551 and a pair of arm portions 552 extending from the retaining portion 551. The pair of arm portions 552 can be spaced apart from each

other in a direction transverse to the longitudinal direction indicated by the arrow "X." The retaining portion 551 may comprise a pair of oppositely protruding projections 5511. Each arm portion 552 may comprise a barbed part 5521 and an arm projection 5522 disposed adjacent to one projection 5511 of the retaining portion 551. The barbed part 5521 is configured such that the second boardlock 55 can be anchored in the aperture 63 in the printed circuit board 6 of FIG. 2.

Correspondingly, a middle cavity 514 having a cross section elongated in a direction transverse to the longitudinal direction "X" is formed on the bottom of the insulating housing 51 for receiving the retaining portion 551 and a part of each arm portion 552 of the second boardlock 55. Specifically, the middle cavity 514 can be, for example, located below the polarizing rib 513.

Referring to FIG. 6, each first boardlock 54 can be a plate-like piece with an arrowhead-shaped configuration. Each first boardlock 54 comprises a flake portion 541 having an upper section 5412 and a lower section 5413, and a retaining portion 542 extending from the upper section 5412 of the flake portion 541. The retaining portion 542 may comprise a pair of laterally projecting first barbed projections 5421 and a pair of laterally projecting second barbed projections 5422, wherein the pair of first barbed projections 5421 are disposed closer to the distal end of the retaining portion 542. Each flake portion 541 is held to the printed circuit board 6 with the lower section 5413 thereof being soldered to the respective elongated slit 62.

Correspondingly, a plurality of relief cavities 515 are formed on the bottom of the card edge connector 5, configured to partially accommodate the respective flake portions 541 of the first boardlocks 54. In each relief cavity 515, a retention hole 516 is formed on the bottom surface 5151 defining the relief cavity 515. The retention hole 516 is configured to securely receive the respective retaining portion 542 of the first boardlock 54. In the present embodiment, the plurality of relief cavities 515 are

respectively formed on the bottoms of the end portions 511.

Referring to FIGS. 5, 7A, 7B, and 7C, the middle cavity 514 can be defined by two inward-facing major side surfaces 5141 and two inward-facing minor side surfaces 5142, wherein each major side surface 5141 may include a groove 5143 extending inward from the entrance of the middle cavity 514. The projecting projections 5511 of the retaining portion 551 may engage respectively the minor side surfaces 5142 in an interference fitted manner so that the second boardlock 55 can be firmly secured to the insulating housing 51. In addition, the arm projections 5522 of the arm portions 552 can be configured for frictional engagement with the respective minor side surfaces 5142. In other words, the arm projections 5522 of the arm portions 552 can respectively abut against the minor side surfaces 5142 or can be respectively slightly interference fitted with the minor side surfaces 5142.

Moreover, in the present embodiment, the barbed parts 5521 of the arm portions 552 are configured to respectively engage two longitudinally-spaced opposite wall surfaces 631 defining the aperture 63 in the printed circuit board 6 in a slightly interference fitted manner so that the card edge connector 5 can be anchored to the printed circuit board 6. In another embodiment, the barbed part 5521 can elastically abut against the inner surface defining the aperture 63. In addition, in another embodiment, the two arm portions 552 can be snapped through the aperture 63 so that the barbed parts 5521 can be located on the opposite side of the printed circuit board 6, and therefore, the insulting housing can be secured on the printed circuit board 6. In the present embodiment, the aperture 63 can have an elongated shape and be oriented in a direction transverse to the longitudinal direction "X."

Referring to FIGS. 7A, 7D, and 7E, the flake portion 541 of the first boardlock 54 is configured to project outward from the insulating housing 51 and extends widthwise in a direction parallel to the longitudinal direction "X" as shown in FIG. 7D. The relief cavity 515 can be elongated along the

longitudinal direction "X" as well and configured to accommodate the flake portion 541 with gaps surrounding the flake portion 541. As shown in FIG. 6, the relief cavity 515 can have a cross section perpendicular to an insertion direction of the first boardlock 54, having an elongated shape. In addition, the retaining portion 542 of each first boardlock 54 is received by a retention hole 516. Each retention hole 516 is defined by a pair of inward-facing, longitudinally spaced stepped side surfaces 5160 each including an inner surface section 5161 and an outer surface section 5162, wherein the inner surface section 5161 protrudes inward relative to the outer surface section 5162. The pair of first barbed projections 5421 of the retaining portion 541 can project less than the pair of second barbed projections 5422 such that the pair of first barbed projections 5421 can be respectively interference fitted with the two inner surface sections 5161, yet not make contact with the outer surface sections 5162 when they pass through the space between the outer surface sections 5162. Moreover, the pair of barbed projections 5422 can be configured for frictional engagement with the respective outer surface sections 5162. Specifically, the pair of barbed projections 5422 can be configured to be slightly interference fitted with the respective outer surface sections 5162 or can be configured to respectively abut against the outer surface sections 5162.

The printed circuit board 6 comprises a pair of elongated slits 62 each configured to be elongated along the longitudinal direction "X" and to receive the respective the flake portions 541 of the first boardlocks 54. The flake portion 541 of each first boardlock 54 can be configured to be constrained to move along the respective elongated slit 62. In other words, the two inward-facing major side surfaces 621 defining each elongated slit 62 are spaced apart from each other such that the respective first boardlock 54 can freely move in a direction parallel to the two inward-facing major side surfaces 621 without interference, yet is constrained to move in a direction transverse to the major side surfaces 621. Furthermore, the two inward-facing short side surfaces 622 defining each elongated slit 62 are spaced apart from each other such that the respective first boardlock 54 can

move, during a soldering process, along the longitudinal direction "X" so as to accommodate the longitudinal thermal expansion of the insulating housing 51 relative to the printed circuit board 6.

Referring to FIG. 8, each relief cavity 515 is defined by a bottom surface 5151 and a plurality of side surfaces 5152, which surround the upper section 5412 of the retaining portion 542 of the respective inserted first boardlock 54. In the present embodiment, each side surface 5152 is spaced apart from the respective upper section 5412 by a distance sufficiently small such that solder 8 can be wicked upward and into the relief cavity 515 as shown by the arrows 9 in FIG. 8 so that a large solder fillet 81 can be formed around the upper section 5412. Such a large solder fillet 81 can strengthen the engagement between the first boardlock 54 and the printed circuit board 6, and therefore the secure connection of terminals 53 disposed in the card edge connector 5 to the contact pads 61 on the printed circuit board 6 can be ensured.

Referring to FIG. 7E, between each of two major side surfaces 621 and the flake portion 541, small gap may exist such that molten solder can be wicked therein. Furthermore, referring to FIG. 8, the flake portion 541 may comprise a plurality of slots 5410 and 5411, which are aligned along the extension direction of the retaining portion 542 of the first boardlock 54. Solder 8 can fill into the plurality of slots 5410 and 5411 so as to improve the strength of soldering. In the present embodiment, each of the slots 5410 and 5411 can have an elongated shape with two round end portions. In addition, the slot 5410 closest to the retaining portion 542 is configured to be partially positioned within the respective relief cavity 515 and partially positioned within the respective slit 62 so as to further increase the size of the solder fillet 81.

In summary, the card edge connector 5 disclosed according to one embodiment of the present invention comprises a pair of first boardlocks 54 each including a flake portion 541 and an insulating housing 51 having a pair of relief cavities 515 partially receiving the respective flake portions 541

and defined by a plurality of side surfaces 5152. Each side surface 5152 defining the relief cavity 515 is spaced apart from the respective flake portion 541 by a distance sufficiently small to facilitate the wicking of liquid solder by capillary action so that a large solder fillet can be formed, increasing the strength of the soldering between the insulating housing and the printed circuit board.

The above-described embodiments of the present invention are intended to be illustrative only. Numerous alternative embodiments may be devised by persons skilled in the art without departing from the scope of the following claims.

What is claimed is:

1. A card edge connector configured for mounting on a printed circuit board, the card edge connector comprising:

an insulating housing comprising:

5 two opposite end portions spaced apart from each other in a longitudinal direction;

a pair of relief cavities spaced from each other along the longitudinal direction, each relief cavity being defined by a plurality of side surfaces and a bottom surface; and

10 a pair of retention holes each formed on the bottom surface defining the respective relief cavity; and

a pair of first boardlocks each including a flake portion having an upper section and a lower section, and a retaining portion extending from the upper section and configured to be securely received by the respective retention hole, wherein each side surface defining the relief cavity is spaced
15 apart from the upper section of the respective flake portion by a distance sufficiently small to facilitate the wicking of liquid solder by capillary action.

2. The card edge connector of Claim 1, wherein the flake portion
20 of each first boardlock further comprises a plurality of slots aligned along an extension direction of the retaining portion of the first boardlock.

3. The card edge connector of Claim 2, wherein the printed circuit board further comprises two slits each configured to hold the lower section of the respective flank portion in a soldering manner.

25 4. The card edge connector of Claim 3, wherein one of the plurality of slots of each first boardlock closest to the retaining portion is configured to be partially positioned within the respective relief cavity and

partially positioned within the respective slit.

5. The card edge connector of Claim 4, wherein a cross section of the relief cavity perpendicular to an insertion direction of the first boardlock has an elongated shape.

5 6. The card edge connector of Claim 5, wherein the flake portion of each first boardlock extends widthwise in a direction parallel to the longitudinal direction.

7. The card edge connector of Claim 6, wherein the flake portion of each first boardlock is configured to be constrained to move along the
10 respective slit to accommodate longitudinal thermal expansion of the insulating housing relative to the printed circuit board during a soldering process.

8. The card edge connector of Claim 7, further comprising a second boardlock disposed between the pair of first boardlocks and
15 configured to securely hold the insulating housing to the printed circuit board.

9. The card edge connector of Claim 8, wherein the second boardlock includes oppositely disposed barbed parts for interference fitting an aperture in the printed circuit board.

20 10. The card edge connector of Claim 9, wherein each retaining portion of the first boardlock comprises a pair of laterally projecting first barbed projections for interference fitting into the respective retention hole.

11. The card edge connector of Claim 10, wherein each retaining
25 portion of the first boardlock comprises a pair of laterally projecting second barbed projections configured for frictional engagement with the respective retention hole, wherein the pair of first barbed projections are disposed

closer to a distal end of the retaining portion and project less than the pair of second barbed projections.

5 12. The card edge connector of Claim 11, wherein each retention hole is defined by a pair of oppositely-disposed stepped side surfaces each including an inner surface section and an outer surface section, wherein the inner surface section protrudes inward relative to the outer surface section, wherein the pair of first barbed projections of the retaining portion are configured to be respectively interference fitted with the two inner surface sections and not make contact with the outer surface sections.

10 13. The card edge connector of Claim 12, wherein the pair of second barbed projections are configured for frictional engagement with the respective outer surface sections.

15 14. The card edge connector of Claim 13, wherein the second boardlock comprises a pair of arm portions spaced from each other in a direction transverse to the longitudinal direction and each arm portion includes the respective barbed part.

20 15. The card edge connector of Claim 14, wherein the insulating housing further comprises a middle cavity and the second boardlock comprises a retaining portion including a pair of oppositely protruding projections configured for interference fitting with the middle cavity.

 16. The card edge connector of Claim 15, wherein each arm portion comprises an arm projection configured for frictional engagement with the middle cavity.

25 17. The card edge connector of Claim 16, wherein the aperture includes an elongated shape and is oriented in a direction transverse to the longitudinal direction.

18. The card edge connector of Claim 17, wherein the insulating housing comprises a polarizing rib disposed in the card-receiving slot, and the second boardlock is disposed below the polarizing rib.

5 19. The card edge connector of Claim 18, further comprising a plurality of pairs of electrical terminals arrayed in the card edge connector and a card-receiving slot extending between the two opposite end portions, wherein each terminal comprises a contact portion projecting into the card-receiving slot and a tail portion extending laterally below the insulating housing.

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