

BOARDLOCK AND ELECTRICAL CONNECTOR USING THE SAME

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The present invention relates to a boardlock, and more particularly, to a boardlock having a stabilizer feature to prevent an electrical connector using the same from rocking when the electrical connector is installed on a printed circuit board.

2. Description of the Related Art

10 Electrical connectors are positioned and secured onto printed circuit boards prior to soldering of terminals received within the electrical connectors to the printed circuit boards. Various boardlocks are developed to secure the electrical connectors. However, the boardlocks generally suffer from some shortcomings.

15 FIG. 1 shows a cross-sectional view of a first traditional boardlock. As shown in FIG. 1, the first traditional boardlock is a conventional fork lock 1. The fork lock 1 held by an electrical connector 2 is inserted into an opening 32 defined by a wall 31 of a printed circuit board 3 so as to secure the electrical connector 2 on the printed circuit board 3. The wall 31 defining
20 the opening 32 fully deflects the fork lock 1 and biting points 4 are formed at places close to the bottom surface of the printed circuit board 3 when a thicker printed circuit board 3 is used. Because the biting points 4 are close to the bottom surface 33 of the printed circuit board 3, delamination of the printed circuit board 3 easily occurs.

25 FIG. 2 shows a cross-sectional view of the first traditional boardlock mounted on a thin printed circuit board. As shown in FIG. 2, when the fork lock 1 is inserted into a thin printed circuit board 3', the wall 31 defining the opening 32 slightly deflects the fork lock 1 by engaging the neck portions

11 of the fork lock 1. However, such slightly deflecting engagement may not be able to firmly secure the electrical connector 2 to the printed circuit board 3', and the electrical connector 2 may be prone to rocking instability during a soldering process.

5 FIG. 3 shows a cross-sectional view of a second traditional boardlock disclosed in U.S. Pat. No. 5,120,257. The boardlock 5 comprises a ramp 51 and a barb 52. The ramp 51 causes an interference fit with a wall defining an opening through a printed circuit board. The barb 52 is configured to dig into the wall defining the opening while the boardlock 5 is withdrawn from
10 the opening. However, the boardlock 5 requires larger insertion force due to larger contact areas between the wall defining the opening and the boardlock 5, and also due to the V shaped configuration.

 FIG. 4 shows a cross-sectional view of a third traditional boardlock disclosed in U.S. Pat. No. 5,989,064. The boardlock 6 as shown in FIG. 4
15 has a closed loop shape, which includes four arms 61 serially connected to one another. The boardlock 6 has rigidity necessary for electrical connector alignment and securing purposes. However, due to the rigidity of the boardlock 6, the insertion force of the boardlock 6 is high, and if such a boardlock 6 is utilized in a smaller board opening than that it is suitable for,
20 the insertion force required to secure the boardlock 6 will increase to an undesired level.

 In accordance with the above-mentioned issues, conventional boardlocks suffer from some shortcomings, and therefore a new boardlock, which requires less insertion force and which can be mounted on printed
25 circuit boards with different thicknesses, is required.

SUMMARY OF THE INVENTION

 An objective of the present invention is to provide a new and improved boardlock that requires less insertion force, provides high retention force, has a stable feature, and is suitable for printed circuit boards of different

thicknesses.

In order to achieve the above objective, according to one embodiment, the present invention proposes a boardlock for securing an electrical connector to a printed circuit board that comprises a housing retention section, a first section, a reversely bent section, and a second section. The housing retention section is configured for engaging the electrical connector. The first section extends from the housing retention section and includes at least one extruding portion. The extruding portion protrudes outward from a peripheral side edge of the first section and is able to engage with an inner wall defining a respective opening on the printed circuit board. The reversely bent section includes two end portions, wherein the first section extends to join one end portion of the bent section. The second section extends from the other end portion of the bent section. The second section includes a distal end and a side edge engageable with the inner wall defining the opening.

In accordance with another embodiment, the present invention proposes an electrical connector, which comprises an insulating housing comprising at least one cavity, a plurality of electrical terminals extending from the insulating housing and mating with contact sites on a printed circuit board, and at least one above-described boardlock that extends from the insulating housing and is configured for holding the insulating housing to the printed circuit board.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described according to the appended drawings in which:

FIG. 1 shows a cross-sectional view of a first traditional boardlock;

FIG. 2 shows a cross-sectional view of the first traditional boardlock mounted on a thin printed circuit board;

FIG. 3 shows a cross-sectional view of a second traditional boardlock disclosed in U.S. Pat. No. 5,120,257;

FIG. 4 shows a cross-sectional view of a third traditional boardlock disclosed in U.S. Pat. No. 5,989,064;

5 FIG. 5 is a perspective view showing an electrical connector 7 according to one embodiment of the present invention;

FIG. 6 is a perspective exploded view showing an electrical connector according to one embodiment of the present invention;

10 FIG. 7 is a perspective view showing a boardlock according to one embodiment of the present invention;

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

FIG. 9 a cross-sectional view along line A-A of FIG. 5 according to one embodiment of the present invention;

15 FIG. 10 is a cross sectional view showing a boardlock inserted into a respective opening of a thick printed circuit board according to one embodiment of the present invention; and

20 FIG. 11 is a cross sectional view showing a boardlock inserted into a respective opening of a thin printed circuit board according to one embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Hereinafter, embodiments of the boardlock of the present invention that requires less insertion force and is suitable for printed circuit boards in different thicknesses will be described in detail with reference to the
25 attached drawings. As illustrated in FIGS. 5 and 6, an electrical connector 7, mounted on a printed circuit board 8, is configured to receive a card vertically oriented. The electrical connector 7 comprises an insulating

housing 71, a plurality of electrical terminals 72 received within the insulating housing 71, a pair of ejection mechanisms 73 respectively disposed at two ends of the insulating housing 71, and a plurality of boardlocks 74. The insulating housing 71 comprises a receptacle 75 for receiving a card and a polarizing rib 76 transversely disposed in the receptacle as shown in FIG. 6. The electrical terminals 72 are provided within the insulating housing 71 and arrayed in pairs along the insulating housing 71. Each of the electrical terminals 72 comprises a contact portion 721 that bows into the receptacle 75; and a pin portion 722 that extends straight downward. The contact portions 721 are electrically coupled to the respective contact pads of the card when the card is received within the receptacle 75.

The pin portions 722 of the electrical terminals 72 and the boardlocks 74 extend from a bottom side 77 of the insulating housing 71 downward. The printed circuit board 8 comprises a plurality of contact sites 81 and a plurality of openings 82 disposed with respect to the boardlocks 74. The contact sites 81 are mated with the pin portions 722 of the electrical terminals 72. After the pin portions 722 of the electrical terminals 72 are soldered to the contact sites 81, the signal transmission paths between the electrical terminals 72 and circuits on the printed circuit board 8 are established. The electrical connector 7 is held or secured on the printed circuit board 8 by the boardlocks 74 received within the respective openings before the electrical terminals 72 are soldered. The electrical connector 7 can be equipped with at least one boardlock 74. In the present embodiment, the electrical connector 7 comprises three boardlocks 74, and one boardlock 74 is disposed at a place below the polarizing rib 76.

Referring primarily to FIG. 7 and FIG. 8, but also to FIG. 5, the boardlock 74 comprises a housing retention section 741, a first section 742, a reversely bent section 743, and a second section 744. The first section 742 extends from a bottom edge 7411 of the housing retention section 741 downward. The reversely bent section 743 comprises two inward-bent end

portions 7431 and 7432. The first section 742 extends to join the end portion 7431 of the bent section 743. The second section 744 extends from the other end portion 7432 of the bent section 743 and is approximately oriented toward the housing retention section 741. Specifically, the second
5 section 744 extends toward the housing retention section 741 and slightly outward so that the distal end portion 7441 can engage the inner wall defining a respective receiving opening 82.

Referring to FIG. 7 and FIG. 8, the housing retention section 741 comprises barb portions 7413 and 7414. The barb portions 7413 and 7414
10 extend from the side edge 7412 of the housing retention section 741 separately. In the present embodiment, the housing retention section 741 has a symmetrical configuration as shown in FIG. 8. The first section 742 has a wide base portion 7421 attached to the housing retention section 741, and the width of the first section 742 decreases as the first section 742
15 extends away from the housing retention section 741. Such a configuration causes the first section 742 to be more rigid. The first section 742 further comprises at least one extruding portion 7422. The extruding portion 7422 protrudes outward from a peripheral side edge 7423. The distance L_1 between the top edge of the extruding portion 7422 and the bottom edge
20 7411 is the same as the distance L_2 between the top edge of the second section 744 and the bottom edge 7411. The bent section 743 comprises a considerably wide flat portion 7433 so that the bent section 743 has a substantially U-shaped configuration. Compared to the traditional boardlock in FIG. 3, which has a V-shaped configuration, the boardlock 74
25 of the present invention requires a lower insertion force, and can be more stable due to the U-shaped configuration.

Referring to FIG. 9, the insulating housing 71 further comprises a plurality of cavities 711. Each cavity 711 receives the housing retention section 741 of the respective boardlock 74 such that some barb portions of
30 the housing retention section 741 are fixed by being interfered with and fitted into the inner wall defining the cavity 711. In the present

embodiment, a pair of barb portions 7414 fit into the inner wall defining the cavity 711. The bent section 743 has two tapered side edges 7434 so as to cause the bent section 743 to have a considerably smaller leading edge 7435 compared to the diameter of the opening 82. With a smaller leading edge 7435, the boardlock 74 can easily be inserted into the respective opening 82 without a precise alignment.

Referring to FIG. 10, when the boardlocks 74 are inserted into the respective openings 82, the extruding portions 7422 of the first sections 742 engage against the inner walls 83 defining the openings 82. Due to the rigidity of the first section 742, the extruding portions 7422 act as static lock barbs. The engagement between the first section 742 and the inner wall 83 only happens at the flat side edge 74221 of the extruding portions 7422 of the first sections 742 so that the insertion force is largely reduced. The first section 742, the bent section 743, and the second section 744 are deflected due to the compression forces exerted on the extruding portions 7422 of the first sections 742 and on the side edge 7442 of the distal end portion 7441 of the second section 744. The second section 744 has a distal end portion 7441 so that the second section 744 is sufficiently and easily flexible to be moved in comparison of the boardlock with a closed shape. The second section 744 has a corner 7443 pressing against the inner wall 83, and the corner 7443 and the extruding portions 7422 of the first sections 742 constitute a balanced biting feature. The boardlock 74 with the U-shaped configuration has a higher retention force. As the boardlock 74 is pulled out, the interference fit between the inner wall 83 and both the corner 7443 and the extruding portions 7422 increases so as to increase the retention force. The width of the bent section 743 is wide enough and hardly changes when the boardlock 74 is inserted so that when the boardlock 74 is inserted into a thick printed circuit board 8 as shown in FIG. 10, the bent section 743 can act as an effective stabilizer to prevent the boardlock 74 from rocking.

Referring to FIG. 11, when the boardlock 74 is inserted into a thin

printed circuit board 8', both locations where the extruding portions 7422 of the first sections 742 and the side edge 7442 of the distal end portion 7441 of the second section 744 engage the inner wall 83 are still away from the bottom surface 84 of the printed circuit board 8' so that the boardlock 74 of the present invention will not result in delamination of a printed circuit board when the boardlock 74 is used in a thin printed circuit board 8'. In summary, the boardlock of the present invention comprises a reversely bent section having two end portions, a first section extending from a housing retention section and joining one end portion of the bent section, and a second section extending from the other end portion of the bent section. The first section comprises an extruding portion engageable with an inner wall defining a respective opening on a printed circuit board. The second section comprises a distal end portion engageable with the inner wall defining the opening. The bent section makes the second portion flexible. The engaging positions of the extruding portion and the distal end portion on the inner wall of the opening are away from the bottom surface of the printed circuit board so that delamination of the printed circuit board does not occur. The design of the extruding portion lessens the required insertion force, and the cooperation of the extruding portion and the distal end portion increases the retention force of the boardlock. The bent portion has a stabilizing effect when the boardlock is applied for a thick 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 boardlock for holding an electrical connector to a printed circuit board, comprising:

a housing retention section for engaging the electrical connector;

5 a first section extending from the housing retention section and having at least one extruding portion, the extruding portion protruding outward from a peripheral side edge of the first section and engageable with an inner wall defining a respective opening on the printed circuit board;

10 a reversely bent section having two end portions, wherein the first section extends to join one end portion of the bent section; and

a second section extending from the other end portion of the reversely bent section, the second section having a distal end and a side edge engageable with the inner wall.

15 2. The boardlock of Claim 1, wherein the reversely bent section has a substantially U-shaped configuration.

3. The boardlock of Claim 2, wherein the second section comprises a corner at the distal end, and the corner is used to engage the inner wall.

20 4. The boardlock of Claim 3, wherein a top edge of the distal end portion and a top edge of the extruding portion are substantially the same distance from the housing retention section.

25 5. The boardlock of Claim 4, wherein the housing retention section comprises a plurality of barb portions extending from side edges of the housing retention section, wherein the barb portions interference fit within a respective cavity of the electrical connector when the housing retention section is inserted into the cavity.

6. An electrical connector, comprising:

an insulating housing comprising at least one cavity;

a plurality of electrical terminals extending from the insulating housing and mating with contact sites on a printed circuit board; and

5 at least one boardlock extending from the insulating housing and configured for holding the insulating housing to the printed circuit board, each boardlock comprising:

a housing retention section received within the respective cavity;

10 a first section extending from the housing retention section and having at least one extruding portion, the extruding portion protruding outward from a peripheral side edge of the first section and engageable with an inner wall defining a respective opening on the printed circuit board;

15 a reversely bent section having two end portions, wherein the first section extends to join one end portion of the bent section; and

a second section extending from the other end portion of the reversely bent section, the second section having a distal end and a side edge engageable with the inner wall.

20 7. The electrical connector of Claim 6, wherein the bent section has a substantially U-shaped configuration.

8. The electrical connector of Claim 7, wherein the second section comprises a corner at the distal end, and the corner is able to engage the inner wall defining the opening.

25 9. The electrical connector of Claim 8, wherein a top edge of the distal end portion and a top edge of the extruding portion are substantially the same distance from the housing retention section.

10. The electrical connector of Claim 9, wherein the housing retention section comprises a plurality of barb portions extending from side edges of the housing retention section, wherein the barb portions interference fit within the cavity.