CAP MEMBER FOR CARD EDGE CONNECTOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a cap member for a card edge connector, and more particularly, to a cap member for a card edge connector for a pick and place process.

2. Description of the Related Art

Electronic devices have already become indispensable holdings in our daily life. To meet the large quantity requirements of the electronic devices, the speed of producing the electronic devices is usually a major critical issue, and automation technology usually is one effective solution for such issue.

For light and small components, suction means is normally used to hold the components for assembly during transportation. Some card edge connectors having openings or slots facing upward cannot be handled using the suction means without a pickup plate laid over the openings or slots. U.S. 2009/0,191,736A1 discloses a card edge connector with a vertically disposed, plate-like pick-up member. The pick-up member includes a connect portion, a pick-up portion horizontally disposed above the connect portion, and a pair of fixing portions disposed at opposite ends of the connect portion. Such a vertically disposed, plate-like pick-up member does not easily remain vertical to keep the pick-up portion horizontally held for suction means, and therefore ribs on the fixing portions abutting against inner walls of respective latch portions are provided.

However, interference between the ribs and the inner walls of the latch portions may deform the housing, causing poor coplanarity of solder tails of terminals. Further, the pick-up portion is higher than the fixing portions and the latches of the card edge connector, consequently affecting the

stability of the assembly of the pick-up member and the card edge connector during a pick and place process. Moreover, the pick-up members disclosed in U.S. 2009/0,191,736A1 do not cover the central slot of a card edge connector. Thus, the terminals arrayed along the central slot may easily be contaminated after the card edge connector is placed on a printed circuit board and during the soldering process and transportation.

In light of the above-mentioned issues, a new cap member, which does not deform the housing of a card edge connector, facilitates stable manipulation during the pick and place process, and protects terminals assembled in the housing from contamination, is required.

SUMMARY OF THE INVENTION

An objective of the present invention is to provide a new and improved cap member, which does not deform the housing of a card edge connector, facilitates stable manipulation during the pick and place process, and protects terminals assembled in the housing from contamination.

In order to achieve the above objective, the present invention proposes a cap member for a card edge connector, which comprises a housing and a pair of latch members. The housing includes two oppositely disposed end portions and a card receiving slot extending between the end portions. The latch members are pivotally movable within the respective end portions. Each latch member includes an ejection portion disposed close to a bottom of the card edge connector and a locking portion opposed to the ejection portion. The cap member comprises a bottom surface, a top surface, and a pair of side plates. The bottom surface is configured to be laid over the card receiving slot and to be dimensioned to conceal the card receiving slot. The top surface faces oppositely relative to the bottom surface and is configured for engagement with a vacuum nozzle. The side plates are respectively disposed adjacent to two opposite sides of the bottom surface and are located with respect to the end portions. Each side plate includes a lateral leading edge and an extension section, wherein the extension section

protrudes beyond the bottom surface for engagement with the ejection portion to pivotally move the latch member such that the lateral leading edge is between the respective locking portion and the respective ejection portion when the bottom surface is positioned over the card receiving slot.

BRIEF DESCRIPTION OF THE DRAWINGS

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

FIG. 1 is a perspective view showing a cap member mounted on a card edge connector according to one embodiment of the present invention;

FIG. 2 is a perspective view showing a cap member being inserted into a card edge connector according to one embodiment of the present invention;

FIG. 3 is an exploded perspective view of FIG. 2;

FIG. 4 is an exploded perspective view of a card edge connector according to one embodiment of the present invention;

FIG. 5 is a perspective view showing the bottom surface of a cap member according to one embodiment of the present invention;

FIG. 6 is an enlarged perspective view, depicted by the dashed rectangle "A" of FIG. 3, showing a side plate according to one embodiment of the present invention;

FIG. 7 is a top view showing a cap member according to one embodiment of the present invention;

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

FIG. 9 is an enlarged perspective view showing the engagement between a side plate and a latch member according to one embodiment of

the present invention;

FIG. 10 is an enlarged perspective view showing a side plate locked by a latch member according to one embodiment of the present invention;

FIG. 11 is a top view showing the assembly of a cap member and a card edge connector according to one embodiment of the present invention;

FIG. 12 is a cross-sectional view along line W-W of FIG. 11;

FIG. 13 is a front view showing the assembly of FIG. 11;

FIG. 14 is a cross-sectional view along line Z-Z of FIG. 13;

FIG. 15 is a cross-sectional view along line Y-Y of FIG. 13; and

FIG. 16 is a cross-sectional view along line X-X of FIG. 13.

DETAILED DESCRIPTION OF THE INVENTION

Hereinafter, embodiments of the present invention are described in detail with reference to the attached drawings.

As illustrated in FIGS. 1 to 4, the embodiment of the present proposes a cap member 1 configured to be provided on an card edge connector 2 to allow the card edge connector 2 to be automatically picked and placed using a vacuum nozzle or a suction head instead of a robotic gripper.

As shown in FIG. 4, the card edge connector 2 of the present embodiment may comprise an elongated housing 21, which includes a pair of oppositely disposed end portions 211 and a card receiving slot 212 formed on a mating surface 213 and longitudinally extending between the end portions 211, a plurality of terminals 22 disposed beside and along two longitudinal sides of the card receiving slot 212 with contact portions 221 protruding into the card receiving slot 212 for contact with pads arrayed on a printed circuit card (not shown) inserted into the card receiving slot 212, and a pair of latch members 23 pivotally movable within the respective end

portions 211. Each end portion 211 can include a groove 214 facing inward and aligned with the card receiving slot 212. Further, the housing 21 can include a plurality of openings 215 formed on the mating surface 213 and oppositely disposed along the card receiving slot 212, and each of the plurality of openings 215 communicates to a respective terminal receiving cavity configured for housing the respective one of the plurality of terminal 22.

Further, each terminal 22 includes a tail portion 222 that can project downward and outward relative to the insulating housing 21 to form a surface-mount configuration. Alternatively, each terminal 22 may include a tail portion 222 that can project downward and beyond the insulating housing 21 to form a through-hole pin configuration insertable into a respective hole on a printed circuit board.

Referring to FIG. 4 again, each latch member 23 pivotally moves within the respective end portions 211 relative to a pair of pivot pins 231 separately disposed on opposite side surfaces of the latch members 23. Each latch member 23 includes an ejection portion 232 configured to move near the bottom of the card edge connector 2 and a locking portion 233 oppositely disposed relative to the ejection portion 232.

Referring to FIGS. 1 to 3, the cap member 1 is adapted to rest on the mating surface 213, covering or concealing the card receiving slot 212 and openings 215 on the mating surface 213, with a top surface 111 horizontally arranged for engagement with a vacuum nozzle or a suction head. Therefore, due to the concealment of the card receiving slot 212, the cap member 1 of the present embodiment can not only be provided for a pick and place process, but also can prevent the terminals 22 from contamination after the card edge connector 2 is mounted on a printed circuit board and during a soldering process. However, although the entire mating surface 213 is covered or concealed by the cap member 1 in the present embodiment, in another embodiment of the present invention the cap member only covers a portion of the card receiving slot 212, where the

plurality of terminals 22 are circumferentially arrayed.

As shown in FIGS. 3 and 5, the cap member 1 comprises a top surface 111, a bottom surface 121 and a pair of side plates 13. The top surface 111 and the bottom surface 121 can be similar yet face in opposite directions, and be disposed substantially parallel to each other. The bottom surface 121 is configured to be positioned over the card receiving slot 212 and can be dimensioned to conceal at least a portion of the card receiving slot 212 where the plurality of terminals 22 are circumferentially arrayed. In other words, the bottom surface 121 may have a width, in the transverse direction, greater than the width of the card receiving slot 212, and have a length at least longer than the extent of the arrayed terminals 22 along the longitudinal direction of the housing 21. In another embodiment, the bottom surface 121 can be dimensioned to conceal the entire mating surface 213 of the card edge connector 2.

As illustrated in FIG. 3, the side plates 13 are respectively disposed adjacent to two opposite sides 122 in the longitudinal direction of the bottom surface 12, oriented perpendicular to the bottom surface 12 and located with respect to the end portions 211. As shown in FIG. 6, each side plate 13, which includes a lateral leading edge 131 and an extension section 132, is configured to extend through the respective groove 214 with the lateral leading edge 131 residing within the respective end portion 211 as shown in FIG. 2. Each extension section 132 protrudes beyond the bottom surface 12 such that the extension section 132 is located inside the housing 21 and below the mating surface 213 when the cap member 1 is placed on the mating surface 213.

Specifically, as shown in FIGS. 3 and 5, the cap member 1 can comprise, but is not limited to comprising, a top plate 11 and a bottom plate 12, wherein the top surface 111 is located on the top plate 11 and the bottom surface 121 is located on the bottom plate 12. The top plate 11 and the bottom plate 12 can be, for example, substantially identical, and are disposed in parallel and aligned vertically. As shown in FIGS 3, 13 and 14,

a plurality of ribs 14 and a spine 15 are provided to connect the top plate 11 and the bottom plate 12, and can be arranged to increase the rigidity of the cap member 1. Specifically, the spine 15 can be centrally positioned and extend along the longitudinal direction of the top plate 11 or the bottom plate 12 as shown in FIG. 14. Referring back to FIG. 3, the plurality of ribs 14 can be symmetrically arranged, equally spaced, and transversely extending from two opposite sides of the spine 15. The outer surfaces of the two opposite distal ribs 14 can be aligned with the respective edges of the top plate 11 and the bottom plate 12 to define edge surfaces 16. Each of the side plates 13 is attached to the respective edge surface 16, with a pair of corner supports 17 to enforce its stability of attachment.

Referring to FIG. 3 again, the top surface 111 can be disposed close to the bottom surface 121 to lower the total height of the assembly of the cap member 1 and the card edge connector 2, increasing the stability of handling during the pick-and-place process. In the present embodiment, the top surface 111 can be at any position below the upper edge 133 of the side plate 13 along the direction perpendicular to the bottom surface 121. To enhance the strength of the portion of the side plate 13 protruding beyond the top surface 111, a plurality of corner supports 17 are disposed at the corners between the surfaces of the side plate 13 and the top surface 111.

Referring to FIG. 7, on the top surface 111, a central mark 112 and an orientation mark 113 for indication to prevent incorrect orientation installation can be provided. The central mark 112 is for indicating the central position or the center of gravity of the cap member 1 and the card edge connector 2. The orientation mark 113 is disposed closer to one side plate 13, which is configured to be placed at the side of the long bay of the card edge connector 2, than to another side plate 13.

Referring to FIG. 8, the cap member 1 may further comprise a protuberance 114 having a size insertable into the card receiving slot 212 as shown in FIG. 14. The protuberance 114 is located at a position such that it is able to interfere with a polarized rib 216 (FIG. 3) when the cap member 1

is inserted with improper orientation.

As shown in FIGS. 9 and 10, the extension section 132 is configured to engage the ejection portion 232 of the latch members 23 to pivotally move the locking portion 233 toward the cap member 1 when the cap member 1 is being installed on the mating surface 213 of the card edge connector 2. The extension section 132 is dimensioned to be able to continuingly engage and push the ejection portion 232 downward when the latch members 23 are being pivotally rotated from an unlock position as shown in FIG. 9 to a lock position as shown in FIG. 10.

Specifically, referring to FIGS. 9-12, when the cap member 1 is placed into the card edge connector 2, the bottom edge 134 of the extension section 132 engages the ejection portion 232 of the latch members 23. Before the cap member 1 is completely inserted, the ejection portion 232 moves along and against the bottom edge 134. Simultaneously, the locking portion 233 is pivotally moved toward the respective side plate 13 until it is in such a position that the lateral leading edge 131 is between the locking portion 233 and the ejection portion 232, and the locking portion 233 is located above the upper edge 133 as shown in FIG. 12. As such, the cap member 1 is locked and can be used for a pick and place operation. Alternatively, when the cap member 1 is to be removed, a force is applied on the handle portion 234 to rotate the latch member 23 so that the locking portion 233 can be moved away from the cap member 1 and the ejection portion 232 can move the cap member 1 upward. When the locking portion 233 is away from the upper edge 133 of the side plate 13, the cap member 1 can be taken out.

Referring to FIGS. 4 and 12, the card edge connector 2 may further comprise a pair of pillar members 24 respectively disposed within the end portions 211. With the assistance of the pillar members 24, the cap member 1 can be stopped from moving along the longitudinal direction of the housing 21 after it is installed. In the present embodiment, the lateral leading edge 131 of each side plate 13 can extend adjacent to the respective pillar member 24 so as to ensure the cap member 1 is securely held with the

card edge connector 2.

Referring to FIGS. 13 and 16, after the cap member 1 is inserted, each side plate 13 extends through the respective groove 214 as shown in FIG. 1. Usually, the thickness of the side plate 13 is designed smaller than the width of the groove 214 so that there is no interference between the side plate 13 and the side walls defining the groove 214. Therefore, the cap member 1 does not have the issue of poor coplanarity with the solder tails of terminals.

In addition, because the width of the card receiving slot 212 is greater than the width of the groove 214 as shown in FIG. 15, the cap member 1 might be easily swayed. Therefore, a pair of bulge parts 135 is provided on the respective side surfaces of the extension section 132 as shown in FIGS. 6 and 15. The bulge part 135 is positioned where the section of the side surface of the extension section 132 is inserted in the card receiving slot 212. Each bulge part 135 can extend toward the upper edge 133 and beyond the bottom surface 121 of the cap member 1 as the cap member 1 is installed. Similarly, the bulge parts 135 do not interfere with the side walls defining the card receiving slot 212 such that no force is exerted on the housing 21.

Referring to FIG. 12, as discussed above, no interference occurs between the side plates 13 and the housing 21, and when the cap member 1 is inserted, a small gap can exist between the locking portion 233 and the upper edge 133 such that the cap member 1 can slightly move when it is locked by the two latch members 23.

In summary, the present invention proposes a cap member for placement on a card edge connector for a pick and place process. The cap member does not mechanically interfere with the card edge connector so that no deformation occurs on the housing of the card edge connector. The cap member includes a bottom surface capable of concealing the card receiving slot such that the terminals in the card edge connector can be protected from contamination. The top surface for suction can be close to

the bottom surface so as to facilitate the stability of the handling of the assembly of the cap member and the card edge connector.

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 cap member for a card edge connector, wherein:

the card edge connector comprises:

a housing having oppositely disposed end portions,

a card receiving slot extending between the end portions, and

two latch members pivotally movable within the respective end portions, each latch member having an ejection portion close to a bottom of the card edge connector and a locking portion opposed to the ejection portion, and

the cap member comprises:

a bottom surface configured to be laid over the card receiving slot and to be dimensioned to conceal the card receiving slot;

a top surface facing opposite relative to the bottom surface and configured for engagement with a vacuum nozzle; and

a pair of side plates respectively disposed adjacent to two opposite sides of the bottom surface and located with respect to the end portions, each side plate having a lateral leading edge and an extension section;

wherein the extension section protrudes beyond the bottom surface for engagement with the ejection portion to pivotally move the latch member, and the lateral leading edge is between the respective locking portion and the respective ejection portion when the bottom surface is positioned over the card receiving slot.

2. The cap member of Claim 1, wherein the card edge connector comprises a plurality of terminals longitudinally disposed along two sides of the card receiving slot, and the bottom surface is dimensioned to conceal at least a portion of the card receiving slot where the plurality of terminals are circumferentially arrayed.

3. The cap member of Claim 1, wherein the housing comprises a mating surface, on which the card receiving slot is formed, and a plurality of openings formed on the mating surface and oppositely disposed along the card receiving slot, wherein the bottom surface is dimensioned to conceal the plurality of the openings.

4. The cap member of Claim 1, wherein the top surface is below an upper edge of the side plate along a direction perpendicular to the bottom surface.

5. The cap member of Claim 1, further comprising a plurality of bulge parts, wherein each of the plurality of bulge parts is disposed at a position on a side surface of the respective extension section, located within the card receiving slot when the cap member is installed.

6. The cap member of Claim 1, further comprising a protuberance disposed on the bottom surface, wherein the housing comprises a polarized rib disposed within the card receiving slot, and the protuberance cooperates with the polarized rib to prevent the cap member from incorrect orientation.

7. The cap member of Claim 1, wherein the card edge connector further comprises a pair of pillar members respectively disposed within the end portions, wherein each side plate extends adjacent to the respective pillar member.

8. The cap member of any one of Claims 1 to 7, further comprising a top plate and a bottom plate, wherein the top surface is on the top plate and the bottom surface is on the bottom plate.

9. The cap member of Claim 8, further comprising a spine and a plurality of ribs transversely extending from the spine, wherein the spine and the plurality of ribs connect the top plate and the bottom plate.

10. The cap member of Claim 9, further comprising an orientation mark disposed on the top surface for indicating installation orientation.

11. The cap member of Claim 10, further comprising a central mark disposed on the top surface for indicating the center of gravity of the cap member.

12. The cap member of Claim 9, further comprising a plurality of corner supports disposed at corners between surfaces of each side plate and the top surface.

13. The cap member of claim 1 wherein

the lateral leading edge of each side plate is positioned between the locking portion and ejector portion of each corresponding latch plate when the cap member is attached to the card edge connector, and

each latch member is pivotable within the respective end portion to allow disengagement of the cap member from the card edge connector.