

CARD EDGE CONNECTOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a card edge connector, and more
5 particularly, to a card edge connector having a pair of latch-ejector members
formed of stamped metal material.

2. Description of the Related Art

Electronic apparatuses are integrated with many different electronic
components and electrical connectors for performing predetermined
10 functions. Card edge connectors are the electrical connectors commonly
provided in electronic apparatuses for receiving extra printed circuit cards
to expand the capabilities of the electronic apparatuses. In recent years, due
to the trend of portability, the electronic apparatuses are undergoing
significant reduction in size. As a result, the electronic components and the
15 connectors installed in the electronic apparatuses have to be manufactured
smaller in order to fit into the compact electronic apparatuses.

Usually, card edge connectors are equipped with ejection mechanisms
to safely remove the printed circuit cards received by the card edge
connectors, and latch/eject members are commonly adopted in the ejection
20 mechanisms for locking and ejecting printed circuit cards to and from the
card edge connectors. As shown in FIGS. 1A and 1B, an exemplary
latch/eject member 1 comprises an eject portion 11 for ejecting a printed
circuit card 2, a lock portion 12 for latching the printed circuit card 2, and
an actuator portion 13 for pivotally moving the latch/eject member 1 to
25 eject the printed circuit card 2. As the printed circuit card 2 is inserted, the
leading edge 21 of the printed circuit card 2 seats on the top surface 111 of
the eject portion 11. Traditionally, the latch/eject member 1 is formed of
plastic material, and to ensure that the eject portion 11 has adequate strength
for the ejecting operation, the eject portion 11 must be of a sufficient

thickness, which increases or a distance between the leading edge 21 of the printed circuit card 2 and the upper surface of the printed circuit board 3 or the printed circuit card's 2 seating height, preventing a possibility of further reducing the final height of the installed printed circuit card 2.

5 As shown in FIG. 2, U.S. Patent No. 5,211,568 discloses a latch member 4 stamped and formed from a metal blank. The latch member 4 comprises the two resilient, cantilevered engagement arms 41; however, these engagement arms 41 cannot have sufficient strength to effectively secure an installed printed circuit card. Moreover, a joint 42 positioned on
10 the bottom wall 43 engaging the leading edge of an installed printed circuit card during the eject operation may incur damage to the latch member 4.

 In summary, the plastic latch/eject member of prior designs cannot meet current requirements of compactness, and the traditional stamped and formed latch member design also has disadvantages. Therefore a new
15 latch/eject member for a card edge connector is required.

SUMMARY OF THE INVENTION

 An objective of the present invention is to provide a new and improved card edge connector having a latch-ejector member that can allow a reduced seating height for an installed printed circuit card.

20 In order to achieve the above objective, a card edge connector for receiving a printed circuit card including opposite side edge portions each having at least one notch and an insertion edge portion having a plurality of contact pads disposed thereon is disclosed according to one embodiment of the present invention. The card edge connector comprises an insulating
25 housing, a plurality of conductive terminals, and a pair of latch-ejector members. The insulating housing comprises opposite end towers and a card-receiving slot extending between the end towers. The conductive terminals are provided within the insulating housing and have contact portions protruding into the card-receiving slot for engaging the contact

pads on the printed circuit card. The latch-ejector member is able to move in a pivoting manner within the respective end tower and is formed by bending a stamped metal piece into a closed frame shape. Each latch-ejector member comprises a pair of first edge portions and an ejector portion. The pair of first edge portions are oppositely disposed and configured to jointly engage the respective one of the notches. The ejector portion is equally spaced between the first edge portions and is configured to engage a leading edge of the insertion edge portion of the printed circuit card to eject the printed circuit card from the card-receiving slot in response to pivoting the latch-ejector member, wherein the pair of first edge portions are bent to face toward the ejector portion and are connected to each other by a first butt joint.

BRIEF DESCRIPTION OF THE DRAWINGS

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

FIG. 1A illustrates a traditional latch/eject member;

FIG. 1B is a cross-sectional view partially showing a traditional card edge connector;

FIG. 2 illustrates a traditional latch member disclosed in U.S. Patent No. 5,211,568;

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

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

FIG. 5 is an exploded perspective view of a card edge connector according to one embodiment of the present invention;

FIG. 6 is a perspective view showing terminals respectively received within cavities according to one embodiment of the present invention;

FIG. 7 is a perspective view of a latch-ejector member according to one embodiment of the present invention;

5 FIG. 8 is a perspective view showing one end tower of an insulating housing according to one embodiment of the present invention;

FIG. 9 is a top view showing a latch-ejector member installed in the respective end tower according to one embodiment of the present invention;

FIG. 10 is a cross-sectional view along line Z-Z of FIG. 9;

10 FIG. 11 is a cross-sectional view along line Y-Y of FIG. 9;

FIG. 12 is a perspective view showing the engagement between a printed circuit card and a latch-ejector member in an unlocked position according to one embodiment of the present invention;

15 FIG. 13 is a front view of the printed circuit card and the latch-ejector member of FIG. 12;

FIG. 14 is a perspective view showing the engagement between a printed circuit card and a latch-ejector member in a locked position according to one embodiment of the present invention; and

20 FIG. 15 is a front view of the printed circuit card and the latch-ejector member of FIG. 14.

DETAILED DESCRIPTION OF THE INVENTION

Hereinafter, embodiments of the present invention are described in detail with reference to the attached drawings. As illustrated in FIG. 3, the card edge connector 7 is configured to be mounted on a printed circuit board 5, and to receive a vertically oriented printed circuit card 6 locked by two latch-ejector members 73 in a straight, locked position.

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Referring to FIGS. 4 and 5, the card edge connector 7 may comprise an elongated insulating housing 71 having two oppositely disposed end towers 711 and an upward-facing card-receiving slot 712 extending between the two end towers 711 for receiving the insertion edge portion 61 of a printed circuit card 6. A polarizing rib 713 can be disposed within and unequally divide the card-receiving slot 712. Each end tower 711 has a hollow interior configured to receive a respective latch-ejector member 73.

Referring to FIG. 4, the printed circuit card 6 includes an insertion edge portion 61 and a plurality of contact pads 62 spaced along the insertion edge portion 61. Furthermore, the insertion edge portion 61 may include a cut 64 disposed with respect to the polarizing rib 713 in the card-receiving slot 712 for cooperating with the polarizing rib 713 to prevent incorrect installation of the printed circuit card 6. The printed circuit card 6 also includes two opposite side edge portions 63 each including at least one notch 631 for a latching purpose.

Referring to FIGS. 4 to 6, the insulating housing 71 may include a plurality of cavities 714 spaced along two facing longitudinal sides 715 defining the card-receiving slot 712. Each cavity 714 is configured to receive a conductive terminal 72. Each conductive terminal 72 may comprise a contact portion 721, an extending portion 722, a retaining portion 723, and a surface mount tail portion 724.

Specifically, the extending portion 722 and the tail portion 724 are disposed on opposite sides of the retaining portion 723, and the contact portion 721 extends from the extending portion 722. The tail portion 724 protrudes beyond the bottom of the insulating housing 71 and is bent to project beyond an adjacent elongated side of the insulating housing 71. Correspondingly, a plurality of contact pads 52, as shown in FIG. 5, are disposed on the printed circuit board 5, configured to allow the tail portions 724 to be surface mounted thereon.

Referring back to FIG. 6, each main wall surface 7141 partially

defining a respective cavity 714 includes a groove 7142 disposed away from the card-receiving slot 712 and adjacent to the bottom of the insulating housing. Each retaining portion 723 may comprise barbs 7231 and 7232 disposed on the opposite edge surfaces thereof configured to interference fit with the bottom surfaces defining the respective, inward-facing grooves 7142, and may also comprise a plurality of projections 7233 disposed on a surface thereof configured to interference fit with a side surface defining the respective groove 7142.

The extending portion 722 initially extends straight in the respective cavity 714 and is then inversely bent to form a bent section 7221, which is located opposed to the retaining portion 723 and adjacent to the top of the insulating housing 71. The bent section 7221 includes an end, from which the contact portion 721 extends. The contact portion 721 extends obliquely downward, partially protruding into the card-receiving slot 712, with the distal end thereof bent inward or back toward the cavity 714 or away from the card-receiving slot 712.

Referring to FIG. 7, the latch-ejector member 73 can be formed by bending a stamped metal piece into a closed frame with a substantially rectangular cross section. Each latch-ejector member 73 comprises an ejector portion 731 and a pair of first edge portions 732. The ejector portion 731 is configured to engage a leading edge 611 of the insertion edge portion 61 of the printed circuit card 6 to eject the printed circuit card 6 from the card-receiving slot 712 in response to pivoting the latch-ejector member 73. In particular, an edge 7311 of the ejector portion 731 can be rounded for preventing the printed circuit card 6 from damage during insertion or ejection operation.

The pair of first edge portions 732, jointly configured to engage the respective one of the notches 631, are oppositely disposed, bent to face toward the ejector portion 731, and connected to each other by a first butt joint 733 so that the latch-ejector member 73 can be formed into a closed frame shape as shown in FIG. 7, wherein the ejector portions 731 are

equally spaced between the first edge portions 732. In the present embodiment, the first butt joint 733 comprises, but is not limited to, a dovetail joint. The latch-ejector member 73 can be made of metal or alloy such as stainless steel. In addition, the ejector portion 731, where the forces of insertion and rejection of the printed circuit card 6 are directly applied, does not include a joint. Therefore, there is no risk of disintegrating of the ejector portion 731.

Moreover, each latch-ejector member 73 may further comprise a pair of opposite second edge portions 734 respectively disposed adjacent to the first edge portions 732 and connected to each other by a second butt joint 735. The two second edge portions 734 are jointly configured for application of a force for pivoting the latch-ejector member 73. In particular, the second edge portions 734 can be disposed higher than the first edge portions 732, and one of the pair of second edge portions 734 may comprise a curved side tab section 7341 projecting from a side edge surface 7342 thereof downward and toward the first edge portions 732 for pivoting the latch-ejector member 73. In the present embodiment, the second butt joint 735 comprises, but is not limited to, a dovetail joint.

Furthermore, each latch-ejector member 73 comprises a pair of side portions 736, disposed on opposite sides of the ejector portion 731 and bent to face toward each other. Each side portion 736 is configured to connect a respective side of the ejector portion 731, a respective first edge portion 732, and a respective second edge portion 734. Each side portion 736 may further comprise a lead-in portion 738 disposed adjacent to the ejector portion 731. Two lead-in portions 738 can be disposed symmetrically and bent slightly inward or toward each other. The two lead-in portions 738 are configured to guide the insertion of the latch-ejector member 73 into the respective end tower 711. In addition, each side portion 736 may comprise an opening 737 for pivotal movement of the latch-ejector member 73 and a stamped projection 739 projecting outward as shown in FIG. 7, configured for temporarily holding the latch-ejector member 73 in a straight or locked

position. Particularly, the stamped projection 739 can be disposed adjacent to the first edge portion 732 and the front edge surface 7361 of the side portion 736 adjacent to the card-receiving slot 712.

Referring to FIGS. 8, 9, and 10, each end tower 711 comprises two side walls 7111 disposed symmetrically, facing toward each other, and extending in a direction along the longitudinal direction of the insulating housing 71. On the inner wall surface of each side wall 7111, a pivot pin 7112 and a bump 7113 are formed. Each pivot pin 7112 is configured to be inserted into the respective opening 737 of the latch-ejector member 73 such that each latch-ejector member 73 can move in a pivoting manner about the pivot pin 7112. Each bump 7113 is formed in the route where the respective stamped projection 739 travels and configured to prohibit the latch-ejector member 73 to move if no force is applied on either the ejector portion 731 or on the second edge portions 734 to make the stamped projections 739 to respectively push the side walls 7111 outward to allow the stamped projections 739 to move on the respective bumps 7113. Additionally, each end tower 711 may comprise a pillar member 7114, as shown in FIGS. 8, 10 and 11, aligned with the card-receiving slot 712 to limit the movement of the printed circuit card 6 along the longitudinal direction of the insulating housing 71.

As shown in FIGS. 12 and 13, the two side portions 736 are sufficiently spaced apart from each other to accommodate the pillar member 7114 therebetween. When no printed circuit card 6 is inserted, the latch-ejector member 73 is in an inclined position or an unlocked position with its ejector portion 731 positioned below the card-receiving slot 712, waiting for engaging the leading edge 611 of the printed circuit card 6. During insertion of the printed circuit card 6, the leading edge 611 pushes the ejector portion 731 downward and the rounded edge 7311 moves against the leading edge 611. If the insertion force is sufficiently large, the stamped projections 739 can pass the respective bumps 7113, and after that, the latch-ejector member 73 can continue to rotate until the first edge portions

732 enter into the respective notch 631 to lock the printed circuit card 6.

Referring to FIGS. 14 and 15, after the printed circuit card 6 is installed, the printed circuit card 6 seats on the ejector portions 731 and a part of side edge portion 63 between the notch 631 and the leading edge 611 is enclosed by the side portions 736, the first edge portion 732, and the ejector portion 731. Because the latch-ejector member 73 is made of a stamped metal piece with tensile strength much higher than that of plastic material, the thickness of the ejector portion 731 can be drastically reduced. A thin ejector portion 731 can still sustain the insertion force without causing permanent deformation. Therefore, due to the large reduction of the thickness of the ejector portion 731, the seating height of a printed circuit card 6 can be significantly reduced.

In summary, the card edge connector of the present invention comprises a latch-ejector member 73, which is formed of a stamped metal piece and can have a thin ejector portion 731 so that the seating height of the printed circuit card 6 can be drastically reduced. Moreover, the joint of the latch-ejector member 73 is not positioned at the ejector portion 731, and therefore, the risk of disintegration of the ejector portion 731 can be eliminated.

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 for receiving a printed circuit card, the printed circuit card including opposite side edge portions each having at least one notch, and an insertion edge portion having a plurality of contact pads disposed thereon, the card edge connector comprising:

an insulating housing comprising two opposite end towers and a card-receiving slot between the end towers;

a plurality of conductive terminals provided within the insulating housing and having contact portions protruding into the card-receiving slot for engaging the contact pads on the printed circuit card; and

a pair of latch-ejector members each movable in a pivoting manner within the respective one of the end towers and formed by bending a stamped metal piece into a closed frame shape, each latch-ejector member comprising:

a pair of first edge portions oppositely disposed and configured to jointly engage the respective one of the notches; and

an ejector portion equally spaced between the first edge portions and configured to engage a leading edge of the insertion edge portion of the printed circuit card to eject the printed circuit card from the card-receiving slot in response to pivoting the latch-ejector member;

wherein the pair of first edge portions are bent to face toward the ejector portion and connected to each other by a first butt joint.

2. The card edge connector of Claim 1, wherein each latch-ejector member further comprises a pair of second edge portions respectively disposed adjacent to the first edge portions and connected to each other by a second butt joint, and the pair of second edge portions are jointly configured for application of a force for pivoting the latch-ejector member.

3. The card edge connector of Claim 2, wherein each latch-ejector member comprises a pair of side portions disposed on opposite sides of the ejector portion, and each connects with the respective first edge portion and the respective second edge portion.

5 4. The card edge connector of Claim 3, wherein each side portion comprises an opening and each end tower comprises two side walls each including a pivot pin formed on an inner wall surface of the side wall, wherein each opening is configured to rotatably receive the respective pivot pin.

10 5. The card edge connector of Claim 4, wherein each side portion further comprises a stamped projection projecting outward and the inner wall of each side wall further comprises a bump disposed with respect to and engageable with the stamped projection, wherein the stamped projection and the bump are cooperatively configured for temporarily
15 holding the latch-ejector member.

6. The card edge connector of Claim 5, wherein the stamped projection is disposed adjacent to the first edge portion and to a front edge surface of the side portion adjacent to the card-receiving slot.

20 7. The card edge connector of Claim 6, wherein the second edge portions are disposed higher than the first edge portions.

8. The card edge connector of Claim 7, wherein one of the pair of second edge portions comprises a curved side tab section projecting downward and toward the first edge portions therefrom.

25 9. The card edge connector of Claim 8, wherein each side portion further comprises a lead-in portion disposed adjacent to the ejector portion and bent slightly inward.

10. The card edge connector of Claim 9, wherein the first and second butt joints comprise a dovetail joint.

11. The card edge connector of Claim 10, wherein each conductive terminal comprises a contact portion, an extending portion
5 having a inversely-bent bent section, a retaining portion, and a surface mount tail portion, wherein the extending portion and the surface mount tail portion are disposed on opposite sides of the retaining portion, the bent section located opposite the retaining portion includes an end, and the contact portion extends from the end of the bent section with a distal end
10 extending away from the card-receiving slot.

12. The card edge connector of Claim 11, wherein the insulating housing comprises a plurality of cavities for receiving the respective conductive terminal, wherein each retaining portion is configured to be interference fitted with the respective cavities.

13. The card edge connector of Claim 12, wherein each end tower
15 comprises a pillar member aligned with the card-receiving slot to limit the movement of the printed circuit card along a longitudinal direction of the insulating housing, wherein the side portions of each latch-ejector member are spaced apart to accommodate the respective pillar member.

14. The card edge connector of Claim 13, wherein an edge of the
20 ejector portion engageable with the printed circuit card is rounded.