

Patent
99-071 SGSPECIFICATIONBOARD MOUNTED EDGE CARD CONNECTOR WITH EJECTOR MECHANISMField of the Invention

5 This invention generally relates to the art of electrical connectors and, particularly, to an edge card connector mountable on a primary circuit board and including an improved ejector mechanism for a secondary circuit board and which accommodates a boardlock of the connector.

10 Background of the Invention

One type of electrical connector commonly is called an "edge card" connector in that it includes an elongated housing having an elongated slot for receiving, edgewise, a printed circuit board. The connector includes
15 a plurality of terminals mounted along one or both sides of the slot for making electrical contact with circuit traces adjacent the edge of the circuit board.

Edge card connectors have been developed to provide a connection between a main or primary printed
20 circuit board, commonly referred to in the art as a "motherboard", and a secondary or smaller printed circuit board, commonly referred to in the art as a "daughterboard". For instance, these secondary printed circuit boards may be added to an electronic device, such
25 as a computer, during or after the initial manufacture or securement of the connector on the primary circuit board.

Edge card connectors of the character described above typically include a number of components other than the terminals mounted in the connector housing. For
30 instance, one or more ejector mechanisms are provided on the connector housing, usually at one or both opposite ends of the card-receiving slot, to facilitate ejecting the edge card or daughterboard from the connector. Fasteners often are provided on the connector housing to secure the housing



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to the primary circuit board or motherboard. These fasteners often are referred to in the art as "boardlocks". The connector housing typically is molded of dielectric material such as plastic or the like, and the boardlocks may be separately stamped and formed metal components.

Space or "real estate" on motherboards most often is at a premium. Consumers prefer smaller electronic devices and, therefore, when assembly components, such as daughterboards, are spaced closer together on the motherboard, the overall device is more compact and more desirable to the consumer. Unfortunately, when such additional components as ejector mechanisms, boardlocks and the like are employed on the connector housing, these components require considerable space outside the bounds of the daughterboard, yet these components are highly desirable for effective use of the edge card connector. The present invention is directed to solving these space problems by providing an ejector mechanism which is designed to envelop a boardlock mechanism and, thereby, reduce the overall dimensions of the connector.

Summary of the Invention

An object, therefore, of the invention is to provide a new and improved edge card connector having at least one boardlock for mounting the connector on a primary or mother circuit board, along with at least one ejector mechanism to facilitate ejecting the edge card or daughter circuit board from the connector.

In the exemplary embodiment of the invention, an electrical connector is disclosed for connecting conductive pads on a daughter circuit board to conductors on a mother circuit board. The connector includes an insulative housing having side walls defining an elongated slot for receiving an edge of the daughter circuit board. The housing has an ejector recess at one end of the elongated slot, along with a fastener-receiving portion adjacent the recess. A plurality of terminals are mounted on the



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housing and include contact portions along the elongated slot for engaging the conductive pads on the daughter circuit board. The terminals have tail portions projecting from the housing for engaging the conductors on the mother circuit board. A fastener or boardlock is mounted in the fastener-receiving portion of the housing and includes an engaging section for fastening the connector to the mother circuit board. An ejector is mounted in the ejector recess of the housing for movement relative thereto. The ejector includes an ejection surface for engaging the daughter circuit board to eject the daughter circuit board in response to movement of the ejector. A groove is provided in the ejector for enveloping at least a portion of the fastener-receiving portion of the housing.

As disclosed herein, the ejector includes a downwardly extending beam having a groove in a side thereof. Specifically, the groove and the enveloped fastener-receiving portion of the housing are located on an outer side of the beam, and the ejection surface is located on an inner side of the beam. The ejector includes a pair of pivot trunnions on opposite lateral sides thereof engageable with pivot recesses in the housing to mount the ejector on the housing for pivotal movement relative thereto. At least a portion of the beam of the ejector is generally U-shaped in lateral cross-section to envelop three sides of the fastener-receiving portion of the housing.

The fastener-receiving portion of the housing includes a hole for receiving the fastener or boardlock. The fastener is fabricated of metal material and includes barbs for skiving into the fastener-receiving portion bounding the through hole. The engaging section of the fastener comprises a locking portion projecting from the housing for locking engagement in a hole in the mother circuit board. The locking portion is bifurcated to define a pair of board-locking legs.



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Finally, the ejector may include a latch portion spaced from the ejection surface. The latch portion may cooperate with an appropriate latch surface on the daughter circuit board to latchingly engage the board and hold the
5 board in the elongated slot of the connector housing.

Other objects, features and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings.



Patent
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The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with its objects and the advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify like elements in the figures and in which:

FIGURE 1 is a perspective view of an electrical connector embodying the concepts of the invention;

FIGURE 1A is an enlarged perspective view of the ejector end of the connector;

FIGURE 2 is a side elevational view of the connector;

FIGURE 3 is a top plan view of the connector;

FIGURE 4 is a top plan view of the connector housing;

FIGURE 5 is a bottom plan view of the connector housing;

FIGURE 6 is an enlarged section taken generally along line 6-6 of Figure 2;

FIGURE 7 is an enlarged section taken generally along line 7-7 of Figure 2;

FIGURE 8 is a view similar to that of Figure 1A, with the ejector and the boardlock removed;

FIGURE 9 is a perspective view of the ejector, looking toward the inner side thereof;

FIGURE 10 is a perspective view of the ejector, looking toward the outer side thereof;

FIGURE 11 is a view of the ejector similar to that of Figure 9, along with surrounding portions of the connector housing; and

FIGURE 12 is a view similar to that of Figure 11, but of an alternate embodiment of the ejector.



Patent
99-071 SGDetailed Description of the Preferred Embodiments

Referring to the drawings in greater detail, and first to Figures 1-3, the invention is embodied in an electrical connector, generally designated 14, for connecting conductive pads on an edge card or daughter circuit board (not shown) to conductors on a mother circuit board 16 (Fig. 2). The connector includes a dielectric or insulative housing, generally designated 18, mounting a plurality of terminals, generally designated 20, along with a plurality of fasteners or boardlocks, generally designated 22, and an ejector, generally designated 24.

More particularly, housing 18 is elongated and includes a pair of side walls 26 defining an elongated slot 28 for receiving an edge of the daughter circuit board as is known in the art. The housing is a one-piece structure unitarily molded of dielectric material such as plastic or the like. A pair of ears 30 project upwardly of the housing inside ejector 24, and the ears may include interior detents 32 for guiding the daughter circuit board when inserted into slot 28.

Referring to Figures 4 and 5 in conjunction with Figures 1-3, housing 18 includes an ejector recess 34 which is generally U-shaped to define a pair of side recess portions 34a. The generally U-shaped ejector recess surrounds three sides of a fastener-receiving portion 36 which, in essence, projects into the ejector recess.

Terminals 20 (Fig. 1A) include contact portions 20a along opposite sides of card-receiving slot 28 as best seen in Figure 6. The contact portions engage the conductive pads on the edge card or daughter circuit board when inserted into slot 28. The terminals have tail portions 20b projecting from the bottom of connector housing 18 for insertion into appropriate holes in mother circuit board 16 for engagement with the conductors on the board and/or in the holes. The terminals are stamped and formed of sheet metal material, and tail portions 20b are



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configured to define four rows of terminal tails as seen best in Figure 6.

Figure 7 shows one of the fasteners or boardlocks 22 mounted within a hole 38 in fastener-receiving portion 36 of housing 18. The boardlock is stamped and formed of sheet metal material and includes side barbs 22a for skiving into the plastic material bounding hole 38 in fastener-receiving portion 36. The boardlock includes a bifurcated engaging section defining a pair of boardlocking legs 22b for locking engagement within an appropriate mounting hole in mother circuit board 16. The boardlock further includes a bifurcated insertion section defining a pair of retention legs 22c. The legs 22c have inwardly directed barbs 22d for skiving into a section 36a of the fastener-receiving portion 36.

Figure 8 shows that side recess portions 34a of ejector recess 34 extend through the adjacent end wall of housing 18 so that end side wall portions 26a of the housing side walls can flex outwardly in the direction of arrows "A". An upwardly opening channel 40 is formed on the inside of each end side wall portion 26a leading to a pivot recess or hole 42 through the end side wall portion, for purposes to be described hereinafter.

Referring to Figures 9 and 10, ejector 24 includes a downwardly extending beam 44, with an enlarged head portion 46 at the top thereof. The head portion is engageable by an operator's finger or thumb to move the ejector. A pair of pivot trunnions 48 project outwardly from the opposite lateral sides of the ejector for engagement within pivot recesses 42 (Fig. 8). Figure 11 shows the ejector pivotally mounted to the housing. The beam of the ejector has an ejection surface 50 located on an inner side of the beam as seen in Figure 9 and a groove 52 located in the outer side of the beam as seen in Figure 10. Ejection surface 50 is engageable with the edge card or daughter circuit board to eject the daughter circuit board from elongated slot 28 in housing 18 in response to



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pivotal movement of the ejector about pivot trunnions 48 in the direction of arrow "B" (Fig. 1A). Groove 52 is effective to form beam 44 in a generally U-shaped configuration in lateral cross-section in the area of the groove. As shown in Figure 7, fastener-receiving portion 36 within ejector recess 34 is disposed within groove 52 whereby the U-shaped cross-section of the ejector beam envelops three sides of the fastener-receiving portion.

From the foregoing, it can be understood that the overall length of connector 16 can be effectively shortened by having ejector 24 substantially surround or envelop fastener-receiving portion 36 of the housing, along with the mounted fastener or boardlock. In addition, the sides of beam 44 which project outwardly along opposite sides of groove 52 in the beam allow the beam to have substantial thickness generally perpendicular to the pivot axis of the ejector to minimize breaking of the ejector beam.

Finally, Figure 12 shows an alternate embodiment of an ejector, generally designated 24A, which includes a latching projection 54 on the inner side of beam 44 spaced upwardly from ejection surface 50. Latch portion 54 projects into a latch notch 56 in a daughter circuit board 58 to hold the daughter circuit board in slot 28 of housing 18. When rotated in the direction B, the ejection surface 50 engages a bottom corner surface 60 of the daughter circuit board to facilitate ejecting the daughter circuit board from slot 28.

It will be understood that the invention may be embodied in other specific forms without departing from the spirit or central characteristics thereof. The present examples and embodiments, therefore, are to be considered in all respects as illustrative and not restrictive, and the invention is not to be limited to the details given herein.



Patent
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1. An electrical connector (14) for connecting conductive pads on a daughter circuit board (58) to conductors on a mother circuit board (16), comprising:

5 an insulative housing (18) having side walls (26) defining an elongated slot (28) for receiving an edge of the daughter circuit board, an ejector recess (34) at one end of the elongated slot, and a fastener-receiving portion (36) adjacent the recess;

10 a plurality of terminals (20) mounted on the housing and including contact portions (20a) along the elongated slot for engaging the conductive pads on the daughter circuit board and tail portions (20b) projecting from the housing for engaging the conductors on the mother circuit board;

15 a fastener (22) mounted in the fastener-receiving portion (36) of the housing and including an engaging section (22b) for fastening the connector to the mother circuit board; and

20 an ejector (24) mounted in the ejector recess (34) of the housing for movement relative thereto, the ejector including an ejection surface (50) for engaging the daughter circuit board to eject the daughter circuit board in response to movement of the ejector, and the ejector including a groove (52) for enveloping at least a portion
25 of the fastener-receiving portion (36) of the housing.

2. The electrical connector of claim 1 wherein said ejector (24) includes a downwardly extending beam (44) having said groove (52) in a side thereof.

30 3. The electrical connector of claim 2 wherein said groove (52) and said enveloped fastener-receiving portion (34) of the housing are located on an outer side of the beam (44) and said ejection surface (50) is located on an inner side of the beam.

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4. The electrical connector of claim 1 wherein said ejector (24) includes a pair of pivot trunnions (42) on opposite sides thereof engageable with pivot recesses (42) in the housing to mount the ejector on the housing for pivotal movement relative thereto.

5. The electrical connector of claim 1 wherein said ejector (24) is generally U-shaped in lateral cross-section to envelop three sides of said fastener-receiving portion (36) of the housing.

6. The electrical connector of claim 1 wherein said ejector (24A) includes a latch portion (54) spaced from said ejection surface (50) for latchingly engaging an appropriate latch surface (56) on the daughter circuit board (58).

7. The electrical connector of claim 1 wherein said fastener-receiving portion (36) of the housing includes a hole (30) for receiving said fastener.

8. The electrical connector of claim 7 wherein said fastener (22) is fabricated of metal material and includes barbs (22a) for skiving into the fastener-receiving portion (36) bounding the hole (30) therein.

9. The electrical connector of claim 1 wherein the engaging section (22b) of said fastener (22) comprises a locking portion projecting from the housing for locking engagement in a hole in the mother circuit board.

10. The electrical connector of claim 9 wherein said locking portion of the fastener (22) is bifurcated to define a pair of board-locking legs (22b).

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11. An electrical connector (14) for connecting conductive pads on a daughter circuit board (58) to conductors on a mother circuit board (16), comprising:

5 an insulative housing (18) having side walls (26) defining an elongated slot (28) for receiving an edge of the daughter circuit board, an ejector recess (34) at one end of the elongated slot, and a fastener-receiving portion (36) adjacent the recess, the fastener-receiving portion including a fastener mounting hole (38);

10 a plurality of terminals (20) mounted on the housing and including contact portions (20a) along the elongated slot for engaging the conductive pads on the daughter circuit board and tail portions (20b) projecting from the housing for engaging the conductors on the mother
15 circuit board;

a fastener (22) mounted in the hole (38) in the fastener-receiving portion (36) of the housing and including an engaging section (22b) for fastening the connector to the mother circuit board; and

20 an ejector (24) pivotally mounted in the ejector recess (34) of the housing, the ejector including a downwardly extending beam (44), an ejection surface (50) on an inner side of the beam for engaging the daughter circuit board to eject the daughter circuit board in response to
25 pivotal movement of the ejector, a groove (52) in an outer side of the beam for enveloping at least a portion of the fastener-receiving portion (36) of the housing, and a pair of pivot trunnions (48) on opposite lateral sides of the beam engageable with pivot recesses (42) in the housing.



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12. The electrical connector of claim 11 wherein at least a portion of said beam (44) is generally U-shaped in lateral cross-section to envelop three sides of said fastener-receiving portion (36) of the housing.

5 13. The electrical connector of claim 11 wherein said ejector (24A) includes a latch portion (54) spaced from said ejection surface (50) for latchingly engaging an appropriate latch surface (56) on the daughter circuit board (58).

10 14. The electrical connector of claim 11 wherein said fastener (22) is fabricated of metal material and includes barbs (22a) for skiving into the fastener-receiving portion (36) bounding the hole (30) therein.

15 15. The electrical connector of claim 11 wherein the engaging section (22b) of said fastener (22) comprises a locking portion projecting from the housing for locking engagement in a hole in the mother circuit board.

20 16. The electrical connector of claim 15 wherein said locking portion of the fastener (22) is bifurcated to define a pair of board-locking legs (22b).

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5 17. An edge card connector (14) for providing an electrical connection between a primary circuit member (16) and a printed circuit card (58), an edge of said circuit card being insertable into and removable from the connector, comprising:

10 a dielectric housing (18) having an elongated card slot (28) for receiving said circuit card edge therein, and a generally U-shaped ejector recess (34) at one end of the slot surrounding three sides of a fastener-receiving portion (36);

a plurality of terminals (20) mounted on the housing along the card slot (28) for engaging said circuit card upon insertion thereof into said card slot;

15 a fastener (22) mounted in the fastener-receiving portion (36) of the housing and including an engaging section (50) for fastening the connector to the primary circuit member; and

20 an ejector (24) movably mounted in the ejector recess (34) with an ejection surface (50) for engaging the circuit card to eject the circuit card in response to movement of the ejector, and the ejector including a generally U-shaped section disposed in the U-shaped ejector recess (34) about said three sides of the fastener-receiving portion (36) of the housing.

25 18. The edge card connector of claim 17 wherein said U-shaped section of the ejector (24) is located in a downwardly extending beam (44) having said ejection surface (50) located on an inner side thereof.





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5 19. The edge card connector of claim 17 wherein said ejector (24) includes a pair of pivot trunnions (48) on opposite sides thereof engageable with pivot recesses (42) in the housing to mount the ejector on the housing for pivotal movement relative thereto.

10 20. The edge card connector of claim 17 wherein said ejector (24A) includes a latch portion (54) spaced from said ejection surface (50) for latchingly engaging an appropriate latch surface (56) on the printed circuit card (58).

21. The edge card connector of claim 17 wherein said fastener-receiving portion (36) of the housing includes a hole (30) for receiving said fastener.

15 22. The edge card connector of claim 21 wherein said fastener (22) is fabricated of metal material and includes barbs (22a) for skiving into the fastener-receiving portion (36) bounding the hole (30) therein.

20 23. The edge card connector of claim 17 wherein the engaging section (22b) of said fastener (22) comprises a locking portion projecting from the housing for locking engagement in a hole in the primary circuit member.

24. The edge card connector of claim 23 wherein said locking portion of the fastener (22) is bifurcated to define a pair of board-locking legs (22b).

