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Goodman et al.

[11] **3,853,379**

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[54] **PRINTED CIRCUIT BOARD CONNECTOR ASSEMBLY**

[75] Inventors: **David S. Goodman**, Orange; **Jack E. Langenbach**, Newport Beach, both of Calif.

[73] Assignee: **International Telephone and Telegraph Corporation**, New York, N.Y.

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[52] **U.S. Cl.** ..... **339/75 MP**, 317/101 DH, 339/65, 339/91 R, 339/176 MP

[51] **Int. Cl.** **H01r 13/54**

[58] **Field of Search** ..... 339/17, 65, 66, 74, 91, 339/176, 75; 200/153 LA; 317/101 DH

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Primary Examiner—Joseph H. McGlynn
Attorney, Agent, or Firm—Thomas L. Peterson

[57] **ABSTRACT**

An assembly is provided in which a printed circuit board is inserted into a supporting frame for engagement with an electrical connector with zero insertion force. After the printed circuit board is mounted on the frame, electrical contacts in the connector are cam actuated to make electrical engagement with associated contacts on the printed circuit board. A card guide is slidably mounted on the frame for guiding the printed circuit board contacts into juxtaposition with the connector contacts on the frame. A cam for actuating the contacts is carried by the card guide. A lever mounted on the frame shifts the card guide to cam actuate the contacts. The lever latches the printed circuit board in the frame. Lifting the lever releases the cam actuated contacts and the latching arrangement, thus allowing the printed circuit board to be removed from the frame.

26 Claims, 11 Drawing Figures

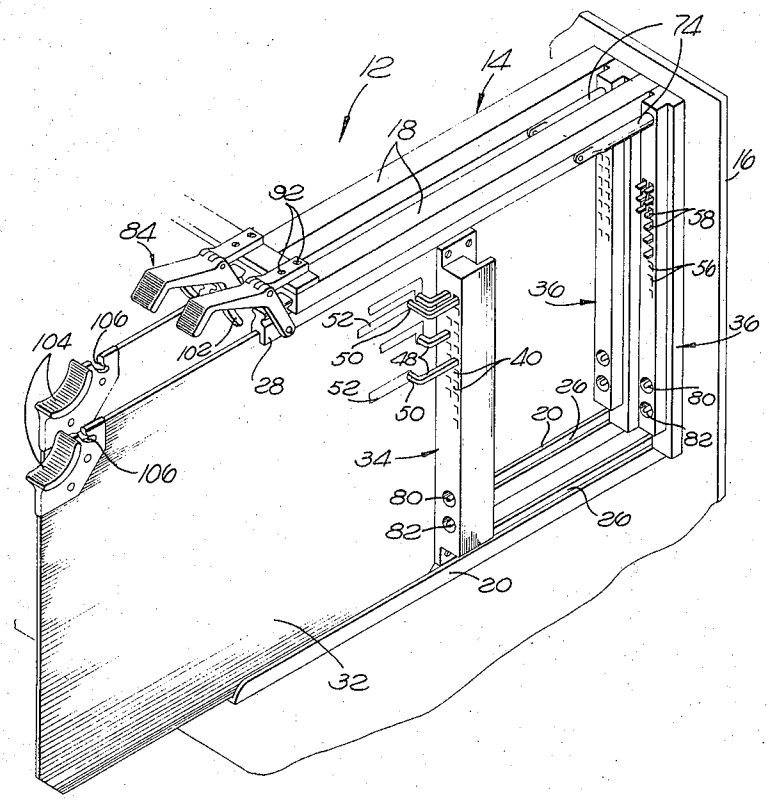


FIG. 1.

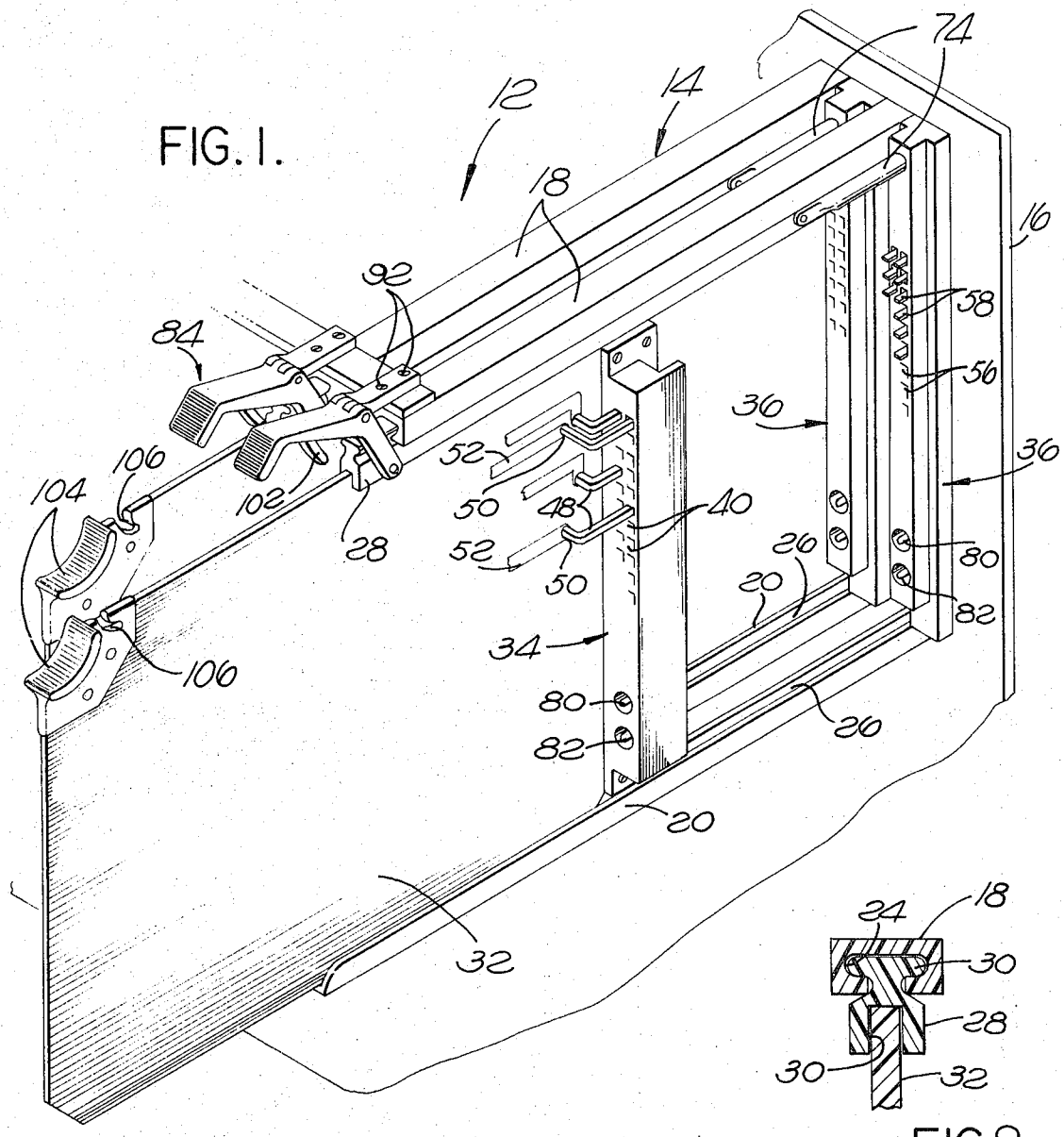


FIG. 8.

FIG. 6.

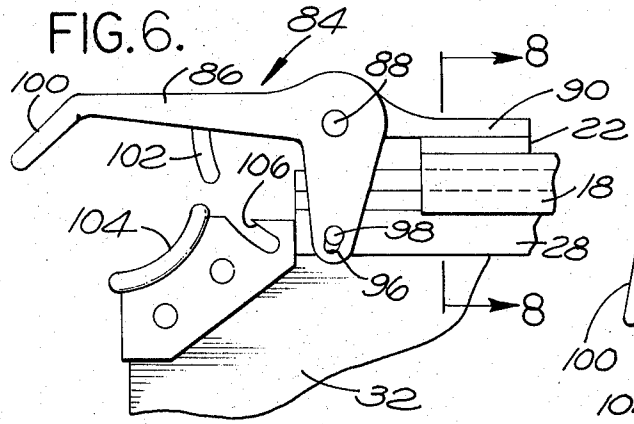


FIG. 7.

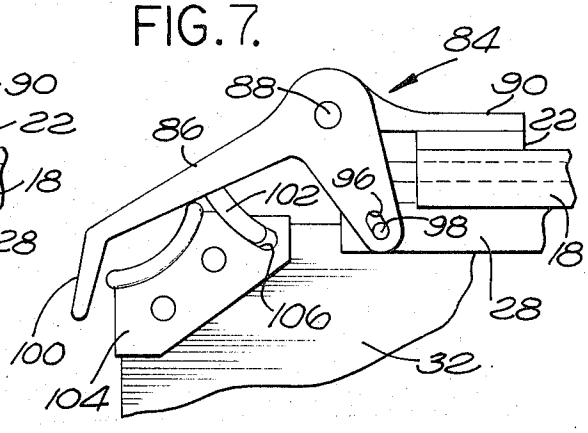


FIG.2.

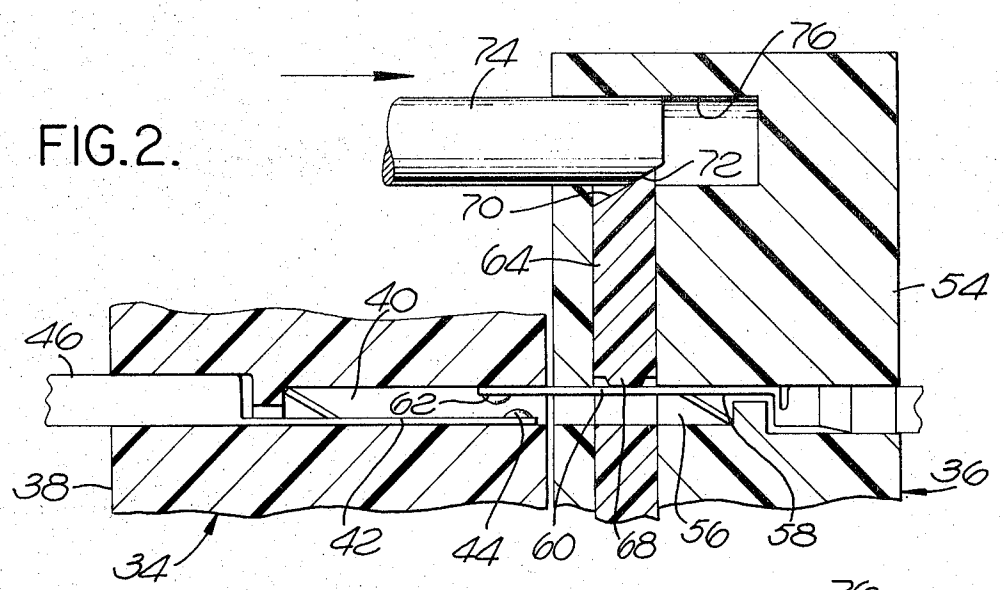


FIG.3.

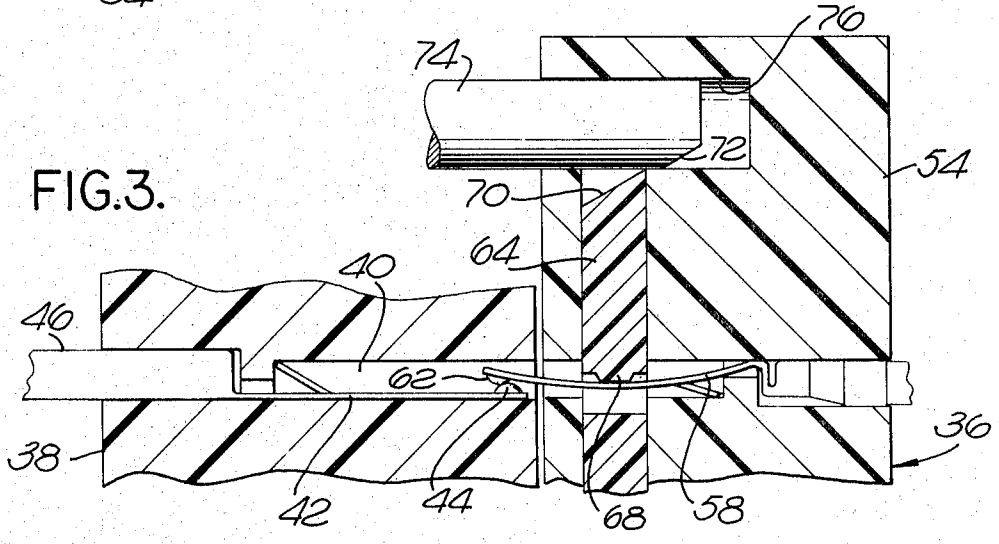


FIG.4.

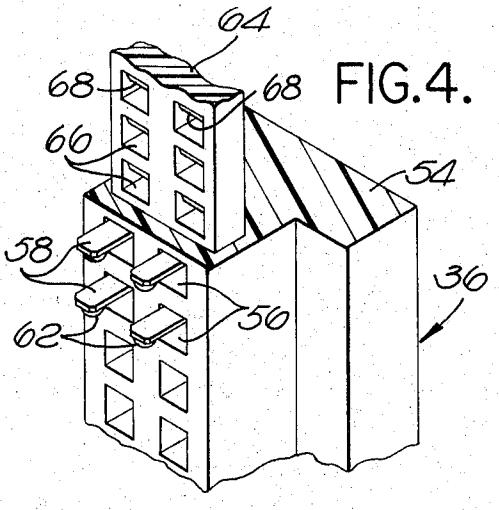
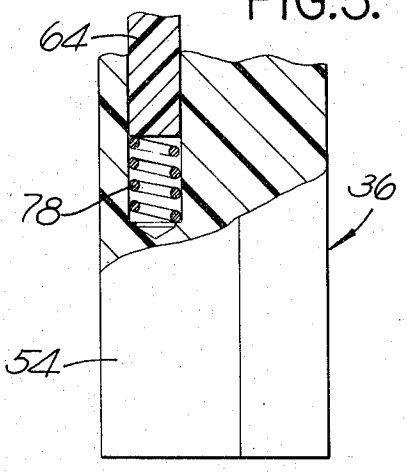


FIG.5.



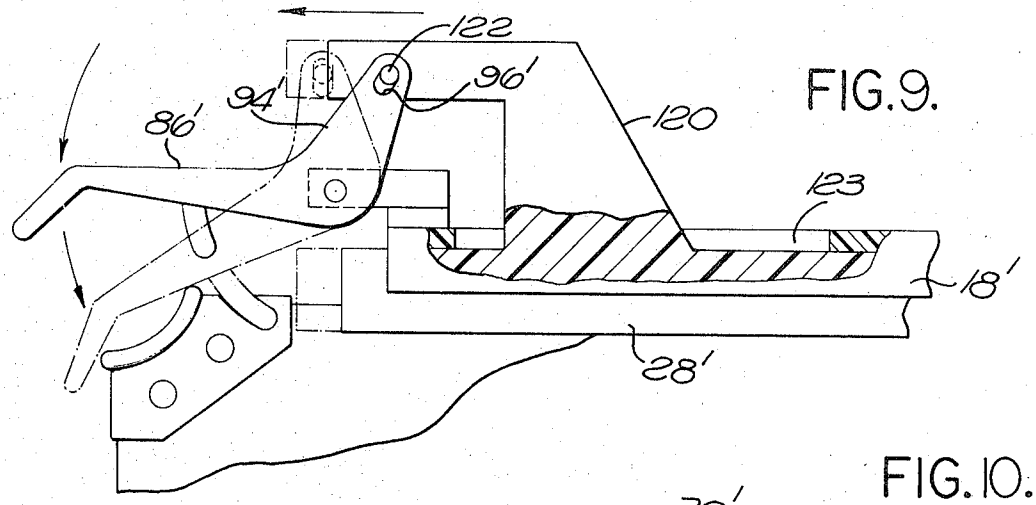


FIG. 9.

FIG. 10.

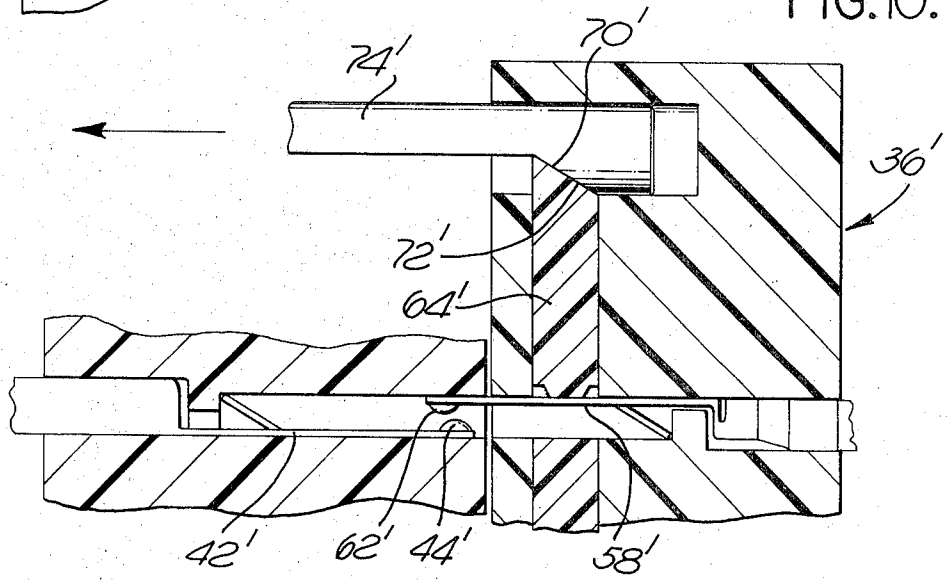
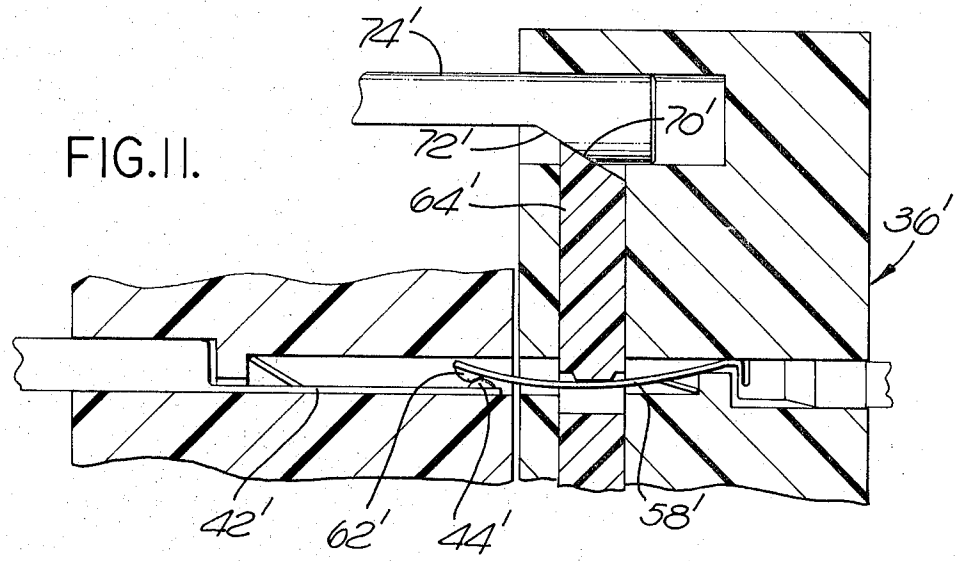


FIG. 11.



PRINTED CIRCUIT BOARD CONNECTOR ASSEMBLY

BACKGROUND OF THE INVENTION

This invention relates generally to a printed circuit board connector assembly and, more particularly, to a connector assembly in which the force required to insert a printed circuit board therein is substantially zero.

The advent of computer technology, and the utilization of computer technology in the design and development of electronic equipment, has increased manyfold the number of printed circuit boards and other connector assemblies utilized in electronic equipment. Complete and functional modular circuits may be mounted on a single circuit board and associated with other circuit boards, each of which carries a functional modular circuit. The combination of cooperatively related circuit boards form a complete electronic component. Electrical connection is made to the contact terminals on each circuit board or plug connector through resilient metallic contact members supported on a contact carrier member. Conventional circuit board and plug connector sockets usually utilize opposed resilient contacts normally biased toward the circuit board or plug connector and are arranged to be impinged upon by the edge of the circuit board or plug when inserted into the socket. One difficulty presented by this conventional type electrical socket is that the force required to be imposed on the circuit board or plug to effect displacement of the resilient contact fingers is excessive, making it difficult to insert a circuit board or plug, and imposing forces on the circuit board or plug which might be better eliminated. Therefore, there has been a need for an electrical socket assembly into which circuit boards or electrical plug connectors may be inserted with very low or zero insertion force.

Typical arrangements of low insertion force printed circuit board connectors are found in the following U.S. Pat. Nos. 3,329,926; 3,475,717; 3,478,301; 3,495,132; 3,526,869; and 3,553,630. The techniques disclosed in the aforementioned patents for obtaining a low or zero force insertion of the connector have not been proved sophisticated enough in all applications for continual repeated use. Further, wear on printed circuit board pads or contacts due to excessive wiping action upon full insertion depth of the printed circuit board has been a drawback to some of these types of connectors. Moreover, the mechanics of the arrangements utilized have been unreliable due to their lack of ruggedness. Further, typically, prior art techniques employ a rotary cam for cam-actuating movable contacts in the connector to engage with the pads or contacts on a printed circuit board. However, due to space limitations in some applications, the use of a rotary cam is impractical.

In order to overcome the attendant disadvantages of the prior art printed circuit board connectors, there is provided by the present invention an assembly which eliminates the high insertion and extraction forces often required in prior art arrangements. During the insertion and extraction, there is basically no force applied to the printed circuit board contacts. The wear on the printed circuit board contacts is overcome due to the elimination of the force the spring contact normally exerts against the forward end of the printed circuit board contacts when the latter are inserted and extracted. The cam actuated movable contacts are activated by a cam which is reciprocally movable in the direction of the printed circuit board card guide, thus making better use of available space than rotary cam actuators of the type utilized in prior art connectors. The connector is rugged and allows numerous insertions and extractions of the printed circuit board. In addition, the printed circuit board contacts may not be inserted into the connector without the cam actuated contacts being inactivated, thus preventing any damage to either set of contacts upon initial insertion of the board into the assembly. Further, the board cannot be removed from the assembly without the cam-actuated contacts being inactivated.

SUMMARY OF THE INVENTION

In accordance with the present invention there is provided a printed circuit board connector in which one or more printed circuit boards may be mounted in a supporting frame. The frame is provided with a card guide which guides the printed circuit board contacts into juxtaposition with a set of contacts fixedly mounted at one end of the frame. When the printed circuit board is initially mounted in the frame, the contacts thereon are in spaced relation with respect to the contacts carried by the frame. The card guide is slidably mounted on the frame and carries a cam which engages a plate that is slidable in a plane extending perpendicular to the path of movement of the cam. this plate has surfaces which engage individual contacts mounted on either the printed circuit board or the frame. Actuation of the cam in one direction shifts the plate laterally to move one set of contacts in tandem into engagement with the other set of contacts. Movement of the cam in the opposite direction releases the contacts from engagement with each other, thus allowing the printed circuit board to be freely withdrawn from the frame. Thus, insertion and extraction of the printed circuit board contacts with respect to the fixed contacts carried by the frame is effected with low or zero force. Since the cam is reciprocally movable in the direction of movement of the printed circuit board, it may be actuated by a lever mechanism mounted on the outer end of the frame, thus utilizing less space than that required by conventional printed circuit board connectors utilizing rotary cam actuators. Also, the lever mechanism may be arranged to allow insertion and withdrawal of the printed circuit board into and from the frame only when the contacts are in their inactivated position, thus eliminating the possibility of excessive wear occuring between the two sets of contacts at the time of insertion or withdrawal of the board.

Other aspects and advantages of the invention will become more apparent from the following description taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary perspective view of the printed circuit board connector assembly of the present invention showing two printed circuit boards partially inserted into the frame of the assembly.

FIG. 2 is a fragmentary partial section through the two connector members of the assembly shown in their mated position, with their contacts disengaged;

FIG. 3 is similar to FIG. 2 but showing the contacts in their engaged position;

FIG. 4 is a fragmentary perspective view of the fixed connector member with portions broken away to illustrate the contact actuating plate for the contacts therein;

FIG. 5 is a fragmentary partial vertical section of the lower end of the fixed connector member showing a spring for biasing the contact actuating plate upwardly;

FIG. 6 is a fragmentary side elevational view of the assembly illustrated in FIG. 1 with the printed circuit board in its fully inserted position in the frame and a latching lever in its lifted position;

FIG. 7 is similar to FIG. 6 but showing the latching lever in its lowered position;

FIG. 8 is a vertical sectional view taken along line 8—8 of FIG. 6;

FIG. 9 is a partial vertical sectional view similar to FIGS. 6 and 7 but showing a modified form of a latching lever mechanism in accordance with the present invention; and

FIGS. 10 and 11 are fragmentary, vertical sectional views similar to FIGS. 2 and 3 showing the structure of the connector members utilized in the embodiment illustrated in FIG. 9.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings in detail, there is illustrated in FIGS. 1–8 the preferred embodiment of the present invention. Referring to FIG. 1, the printed circuit board assembly of the present invention, generally designated 12, comprises a printed circuit board supporting frame 14 which is mounted on a panel 16. The frame includes a plurality of spaced, parallel pairs of tracks 18 and 20, only two pair being shown in FIG. 1 by way of illustration. The ends of the tracks opposite the panel 16 are interconnected by a cross member 22. The track 18 if formed with a groove 24 which faces a slot 26 formed in the corresponding track 20. An elongated card guide member 28 is formed with a tongue 30 which is slidably engaged in a groove 28 in track 18. The card guide member is formed with a slot 30 which opens in the direction of the slot 26. A printed circuit board 32 is slidable into each pair of slots 26 and 30.

A connector member 34 is fixedly mounted at one end of the printed circuit board 32. The connector member is adapted to mate with a second connector member 36 which is fixedly mounted on the panel 16 adjacent to the frame 14. The printed circuit board 32 is inserted into the slots 26 and 30 in the frame with the connector member 34 aligned with connector member 36 mounted on the panel 16 so that the respective contacts in the cconnector members will be in juxtaposition when the connector members are mated.

Referring now to FIGS. 2 and 3, the connector member 34 comprises an insulator housing 38 formed with a plurality of openings 40 therein. Each opening contains an individual contact 42 which is formed with a contacting surface 44 disposed within the opening 40. Each contact 42 terminates in a terminal portion 46 which extends outwardly from the rear of the opening 40 and is bent at right angles as best seen in FIG. 1. The end 48 of each terminal portion has an interference fit with a plated through hole 50 formed in the printed circuit board 32. A conductive layer 52 joins each of the plated through holes 50 in a manner well known in the art. Only four of such contact terminal portions 46 are illustrated in FIG. 1 for purposes of clarity. It is, of course, understood that normally there will be provided a contact in each of the openings 40 in the insulator 38.

The connector member 36 also comprises an insulator housing 54 formed with a plurality of openings 56 which are aligned with the openings 40 in the connector member 34 when the two connector members are mated. A contact 58 is mounted in each of the openings 56. Each contact 58 includes an elongated beam portion 60 which extends outwardly from the opening 56 and terminates in a contacting surface 62. An insulator plate 64 is slidably mounted in the housing 54 for movement in a plane which is perpendicular to the slots 26 and 30 in the track 20 and card guide member 28, respectively. As seen in FIG. 4, the plate 64 is formed with a plurality of spaced apertures 66 through which the contacts 58 extend. A projection 68 is formed on one wall of each of the apertures 36 engaging the beam portion 60 of each contact 58. The upper end of the plate 64, as illustrated in FIG. 2, is formed with an inclined surface 70 which engages a similarly inclined surface 72 formed on the end of a cam member 74. This cam member is fixedly attached to the end of the card guide member 28 and extends into an opening 76 in the housing 54 of the connector member 36. As seen in FIG. 5, a coil spring 78 acts upon the bottom of the plate 64, urging the inclined surface 70 into engagement with the surface 72 on the cam member. Since the cam member is carried by the card guide member 28, it is movable in a path which is perpendicular to the path of movement of the plate 64.

As seen in FIG. 2, the plate 64 is normally positioned by the spring 78 such that the contacting surfaces 44 of the contacts 42 are out of engagement with the contacting surfaces 62 of the contacts 58. However, when the cam member 74 is shifted in the direction indicated by the arrow in FIG. 2, the surface 72 thereof, by its sliding contact with surface 70 on the plate 74, will urge the plate 64 downwardly to the position shown in FIG. 3 thereby shifting the contacts 58 in tandem so that the contacting surfaces 44 and 62 of the respective sets of contact will engage each other with a high unit force of contact. When the cam member is returned to its normal position illustrated in FIG. 2, the spring 78 will return the plate 64 to its uppermost position whereupon the contacting surfaces of the two sets of contacts will disengage. Thus, there is provided by this arrangement a zero insertion force electrical connector assembly. Reference may be had to U.S. Pat. No. 3,587,037, assigned to the assignee of the present application, which describes in greater detail the structure of the contacts and the slidable actuating plate therefor. However, the connector assembly of this invention differs from that disclosed in the aforementioned patent in that it employs a reciprocally slidable cam member that moves in a plane perpendicular to the contact actuating plate, rather than a cam which is rotated to effect engagement between the contacts of the two connector members.

If desired, the connector members 34 and 36 may be provided with mating power or coaxial contacts 80 and 82 which engage one another when the connector

members are initially mated and, thus, are not activated by the slidable actuating plate **64.**

From the foregoing, it will be appreciated that after the printed circuit board **32** is fully inserted into the frame **14** so that the connector members **34** and **36** mate with one another, the card guide member **28** must be shifted in the direction of the connector members to urge the cam **74** against the end of the plate **64** thereby actuating the plate to shift the contacts **58** in tandem to engage the contacts **42.** A latching mechanism, generally designated **84,** is provided for effecting such movement of the card guide member **28.** Such latching mechanism, as best seen in FIGS. **6** and **7,** comprises a lever **86** which is pivotally mounted by means of a pin **88** to a plate **90.** This plate is fixedly connected by screws **92** to the cross member **22** of the frame. The lever **86** is essentially in the form of a crank having a downwardly extending arm **94** formed with an elongated slot **96.** The outer end of the card guide member **28** extends beyond the end of the track **18** and carries a laterally extending pin **98.** This pin is received in the slot **96** to provide a pivotal connection between the lever **86** and the card guide member. The other end of the lever **86** opposite the arm **94** is formed with a downwardly extending finger **100.** An arcuate pawl **102** is formed on the bottom of the lever between the finger **100** and the pivot pin **88.**

A molded plastic or metal gripping member **104** is fixedly mounted on one corner of the printed circuit board **32** opposite the end of the board from connector member **34.** The member **104** is formed with an arcuate notch **106** which opens in the direction of the pawl **102** when the printed circuit board is inserted into the frame as seen in the FIG. **1.** The member **104** facilitates insertion and withdrawal of the printed circuit board into and from the frame **14.** When the printed circuit board **32** is fully positioned in the frame and the connector members **34** and **36** are mated, the lever **86** is pushed downwardly to the position illustrated in FIG. **7.** Downward movement of the lever **86** brings the pawl **102** into the notch **106.** Thus, the pawl and notch provide a mechanical interlock whereby the printed circuit board and connector halves must be in proper position before the lever **86** may be moved downwardly.

As will be appreciated from the foregoing, the slidable plate **64** is in its contact activating position when the lever **86** is in the downward position illustrated in FIG. **7.** In this position of the lever the finger **100** thereon is disposed in the path of the card guide slot **30,** thereby preventing insertion of a board **32** into the frame **14.** This assures that the board cannot be inserted into the frame when the contacts **58** are in their activated position. Likewise, the board cannot be removed from the frame until the contacts are inactivated by raising the lever **86** to the position illustrated in FIG. **6.** Thus, the lever **86** assures that there is not untimely insertion or withdrawal of the printed circuit board from the frame **14,** and serves to latch the board in the frame when the contacts are in their activated position. The board insertion and withdrawal operations are easily effected by the present invention, with a relatively simple arrangement, due to the fact that the slidable plate **64** is actuated to activate the contacts in the connector members by the simple push-pull or reciprocal movement of the cam member **74** which is carried by the slidable card guide member **28,** This arrangement requires only a relatively small space, thereby permitting a high-density packaging arrangement for printed circuit boards. In addition, the contact activating lever **86** is located on the front end of the frame for easy access rather than behind the panel **16** as in conventional connector assemblies.

Any number of boards and latching mechanisms **84** may be provided on the frame **14.** If desired, the levers **86** may be ganged by connection to a common rod, not shown, which would allow the levers to be actuated simultaneously if desired.

Reference is now made to FIGS. **9–11** which illustrate a modified form of the invention. In this embodiment, the basic structure is as previously described and like numbers primed are used to indicate like or corresponding parts. In this embodiment, the cam member **74'** is shifted away than pushed toward the connector member as in the previous embodiment. As a consequence the inclined surfaces **70'** and **72'** on the plate **64'** and cam member **74',** respectively, are inclined in a direction opposite to the corresponding surfaces in the first embodiment of the invention described herein. In the position of the cam member **74'** illustrated in FIG. **10,** the contacting surfaces **44'** and **62'** of the contacts **42'** and **58',** respectively, are out of engagement. When the cam member **74'** is shifted in the direction indicated by the arrow in FIG. **10,** the inclined surface **72'** will act upon the surface **70'** to urge the plate **64'** downwardly to the position illustrated in FIG. **11,** thereby bringing the contacting surfaces **44'** and **62'** into engagement. Outward movement of the cam member **74'** to effect the actuation of the contacts in this embodiment is achieved by forming a projection **120** on the card guide member **28** that extends upwardly through a slot **122** mounted in the end of the projection **120.** When the lever **86'** is in the full line position illustrated in FIG. **9,** the cam member **74'** is in the position illustrated in FIG. **10.** When the lever **86'** is depressed to the position shown in phantom in FIG. **9,** the card guide member **28'** is moved outwardly in the track **18',** thereby shifting the cam member **74'** in the direction indicated by the arrow in FIG. **10.** Such shifting of the cam member moves the plate **64'** downwardly to activate the contacts in the two connector members.

Various other changes can be made in the form, details, arrangements and proportions of the various parts in the embodiments disclosed herein without departing from the spirit and scope of the invention. For example, the contacts **42** in the connector member **34** could be extended so that the contacting surfaces **62** of the contacts **58** could be disposed within the openings **56** in the mating connector member **36.** In addition, the contact plate **64** could be mounted in the connector member **34** for activating the contacts **42** rather than in the connector member **36.** In such an embodiment, the end of the plate **64** formed with the inclined surface **70** would extend through the upper end of the connector insulator housing **38** as viewed in FIG. **1** and the cam member **74** would be positioned on the card guide member **28** in an appropriate position to engage the surface **70.** In addition, the cam member **74** need not be necessarily carried by the card guide member **28** but rather could be directly pivotally connected to the lever **86** if appropriately mounted on track **18.** Other modifications will be apparent to those skilled in the art.

What is claimed is:

1. A printed circuit board connector assembly comprising:
a supporting frame including at least one pair of fixed tracks;
a card guide member slidably mounted on one of said tracks, said card guide member being formed with a slot therein facing a slot formed in the other track;
a printed circuit board slidably mounted in said slots, said printed circuit board having conductive layers thereon and a first connector member mounted on one end thereof;
a second connector member fixedly mounted adjacent to one end of said tracks;
said first connector member having a first set of contacts secured in individual openings therein, each contact of said first set of contacts having a contacting surface;
said second connector member having a second set of contacts secured in individual openings therein, each contact of said second set of contacts having a contacting surface;
the contacting surfaces of the contacts of one of said sets of contacts extending outwardly from the opening in their respective connector member in the direction toward the other connector member;
said first set of contacts being electrically connected to said conductive layers on said printed circuit board;
each of said contacts of said second set of contacts being associated with a contact of said first set of contacts and being spaced from said associated contact when said connector members are mated;
means for moving the contacts in one of said connector members in tandem causing said contacting surfaces of said first and second sets of contacts to engage after said first connector member is mated with said second connector member;
means carried by said slidable card guide member for actuating said moving means; and
latching means on said frame engageable with the other end of said printed circuit board for retaining said board in said slots with said first and second connector members mated.

2. An assembly as set forth in claim 1 wherein:
said latching means is operable to activate said actuating means.

3. An assembly as set forth in claim 2 wherein:
said actuating means is fixed to said card guide member adjacent one end thereof;
said latching means is pivotally connected to both said frame and the other end card guide member, shifting of said latching means in one direction effecting sliding movement of said card guide member on said track and, hence, movement of said actuating means.

4. An assembly as set forth in claim 3 wherein:
said contact moving means comprises an insulator plate slidably mounted in said one connector member; and
said actuating means comprises a cam operatively engageable with said plate, shifting of said latching means in said one direction moving said cam to shift said plate in one direction to being said first and second connector member contacting surfaces of said first and second sets of contacts into engagement.

5. As assembly as set forth in claim 4 including:
spring means biasing said plate in the opposite direction into engagement with said cam.

6. An assembly as set forth in claim 4 wherein:
said cam is movable in a plane perpendicular to the path of movement of said plate.

7. In printed circuit board connector assembly, at least one printed circuit board, a frame for supporting said board, means on said frame defining a slot for guiding said board, said board having conductive layers thereon and a first set of contacts associated with said layers, and a second set of contacts fixedly mounted adjacent one end of said frame in juxtaposition with said first set of contacts when said printed circuit board is mounted in said frame, the improvement which comprises:
a card guide member slidably mounted on said frame, said slot being formed in said card guide member;
said first and second sets of contacts being spaced from one another when said board is mounted in said frame;
means for moving one of said sets of contacts in tandem causing said two sets of contacts to engage; and
means carried by said slidable card guide for actuating said moving means.

8. An assembly as set forth in claim 7 including:
lever means mounted on said frame operable to activate said actuating means.

9. An assembly as set forth in claim 8 including:
pawl means carried by said lever means insertable into a notch formed in said board only when ssid first and second sets of contacts are in juxtaposition.

10. An assembly as set forth in claim 8 wherein:
said lever means is pivotally connected to both said frame and said card guide member, shifting of said lever means in one direction effecting sliding movement of said card guide member on said track and, hence, movement of said actuating means.

11. An assembly as set forth in claim 10 wherein:
said contact moving means comprises an insulator plate slidably mounted for movement in a plane perpendicular to said card guide member; and
said actuating means comprises a cam operatively engageable with said plate, and shifting of said lever means in said one direction moving said cam to shift said plate in one direction to bring said first and second sets of contacts into engagement.

12. An assembly as set forth in claim 11 including:
spring means biasing said plate in the opposite direction into engagement with said cam.

13. As assembly as set forth in claim 11 wherein:
said first and second sets of contacts are housed in first and second mateable connector members, respectively; and
said lever means is operable to activate said actuating means only when said first and second connector members are mated.

14. A connector assembly for a printed circuit board having a first connector member mounted thereon, a plurality of contacts secured in individual openings in said connector member with each said contact having a contacting surface comprising:

a support frame including at least one pair of fixed tracks;

a card guide member slidably mounted on one of said tracks, said card guide member being formed with a slot therein facing a slot formed in the other track, said slots being adapted to slidably receive said printed circuit board;

a second connector member fixedly mounted adjacent to one end of said tracks, said second connector member having a plurality of contacts received in individual openings therein, each said second connector member contact having a contacting surface;

the contacting surfaces of one of said connector members extending outwardly from their respective openings in the direction toward the other connector member;

each of said contacts in said second connector member being associated with a contact in said first connector member and being spaced from said associated contact when said connector members are mated;

an insulator plate mounted for sliding movement in said second connector member in a plane perpendicular to said card guide member, said plate having surfaces thereon engageable with individual contacts in said second connector member, movement of said plate in one direction causing said contacts in said second connector member to shift in tandem thereby bringing said first and second connector member contacting surfaces into engagement after said first connector member is mated with said second connector member; and

cam means carried by said card guide member operatively engageable with said plate, said cam means moving said plate in said one direction upon sliding movement of said card guide member in a predetermined direction.

15. An assembly as set forth in claim **14** including:

spring means biasing said plate in the opposite direction into engagement with said cam means.

16. An assembly as set forth in claim **14** including:

lever means on said frame operable to slide said card guide member is said predetermined direction.

17. An assembly as set forth in claim **16** including:

pawl means carried by said lever means insertable into a notch formed in said printed circuit board only when said connector members are mated.

18. A connector assembly comprising:

a connector member having a plurality of contacts therein;

an insulator plate mounted for sliding movement in said connector member, said plate having surfaces engageable with said contacts, sliding movement of said plate in one direction shifting said contacts in tanedm in said direction.

support means extending generally perpendicular from said connector member adjacent the opposite ends thereof defining facing slots adapted to slidably receive a printed circuit board having a plurality of contacts thereon for engaging said first-mentioned contacts after said plate is moved in said one direction; and

cam means mounted on said support means for sliding movement in a direction perpendicular to the path of movement of said plate, said cam means being operatively engageable with said plate, sliding movement of said cam means in a predetermined direction moving said plate in said one direction to thereby shift said first-mentioned contacts in tandem, for engagement with said contacts on said printed circuit board.

19. An assembly as set forth in claim **18** wherein:

said supporting means includes a card guide member formed with one of said slots and slidably mounted for movement in a direction perpendicular to said path of movement of said plate, said cam means being carried by said card guide member.

20. An assembly as set forth in claim **19** including:

lever means on said support means for moving said card guide member in said predetermined direction.

21. An assembly as set forth in claim **18** including:

lever means on said support means movable between first and second positions movement of said lever means from said first to said second position causing said cam means to move in said predetermined direction; and

said lever means being formed with blocking, means, in said second position of said lever means said blocking means preventing insertion of said printed circuit board into said support means.

22. An assembly as set forth in claim **21** including:

pawl means carried by said lever means, said pawl means being insertably into a notch in said printed circuit board when said lever means is in said position.

23. A printed circuit board connector assembly comprising:

a printed circuit board having conductive layers thereon and a first set of contacts associated with said layers;

a frame having means thereon defining a slot for slidably receiving said board;

a second set of contacts fixidly mounted adjacent one end of said frame and spaced from said first set of contacts when said board is mounted in said frame.

means for moving one of said sets of contacts in tandem causing said two sets of contacts to engage;

cam means reciprocally movably in a path extending in the same direction as said slot, movement of said cam means in a predetermined direction actuating said moving means; and

lever means on said frame for reciprocally moving said cam means.

24. An assembly as set forth in claim **23** wherein:

said lever means is pivotally movable between first and second positions, movement of said lever means from said first position to said second position causing said cam means to move in said predetermined direction.

25. An assembly as set forth in claim **24** wherein:

said lever means is formed with blocking means, in said second position of said lever means said blocking means preventing insertion of said board into said frame.

26. An assembly as set forth in claim **24** including:

a notch formed in said board; and

pawl means carried by said lever means insertable into said notch when said lever means is in said second position, one side of said pawl means engaging with one side of said notch to prevent withdrawal of said board from said frame.

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