ABSTRACT: Electrical connector apparatus including a mechanically actuated linear cam bar adapted to provide contact closure and contact wipe for the contacting elements connecting to the edge connectors of a printed circuit board. A frame supporting the main circuit board includes a drawbolt device which causes a linear cam bar to move in a forward and backward direction. Cam surfaces on the cam bar transmit a vertical downward movement to a connector housing to cause the contacts to make with the edge connectors of a printed circuit card inserted therein. After the contacts are made, sets of pins operated by a second cam surface on the cam bar function to move the card vertically upward to produce a wiping action between the edge connector on the card and the pin contacts in the connecting board.
ELECTRICAL CONNECTOR HOUSING WITH MEANS PRODUCING CONTACT WIPE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to electrical connector apparatus of the type adapted to complete a plurality of circuits substantially simultaneously with actuating apparatus for forcibly producing contact wipe after a circuit board or the like has been introduced into a connector housing.

2. Description of the Prior Art

Various arrangements exist in the prior art for releasably receiving, holding and making electrical edge connections with printed circuit boards or panels having a plurality of printed circuits thereon. Such connector devices are finding an increasing number of applications in data processing equipment as the electrical and control circuits become more numerous. The boards may have to be inserted and withdrawn from the edge connectors many times. The ever-increasing trend towards microminiaturization, diminitive wires and close lead spacing, as well as the fragile nature of the boards and circuitry thereon, introduces considerable difficulty in the handling of the boards. Further, means to provide a wipe action of sufficient magnitude to remove any surface oxide film, dust particles or other foreign substances, on the connector members to enable a suitable contact of low electrical resistance, has introduced other problems such as reliability in the electrical connections and the manufacturing of such apparatus within acceptable economic tolerances.

SUMMARY OF THE INVENTION

A primary object of the present invention is to overcome the above-noted difficulties by providing a unique electrical connector housing with mechanical actuated apparatus for producing contact wipe after a circuit board or the like has been inserted into the connector housing. The present invention provides a circuit board edge connector assembly comprising a connector housing adapted to accommodate one or more such printed circuit boards and provided with a plurality of connectors for connecting with the edge connectors of the printed circuit boards, and a mechanically actuated linear cam bar adapted to first move the housing so as to cause the contact closure followed by the movement of other means that function to motivate the printed circuit boards in a manner that will produce wipe action between the edge connectors on the printed circuit boards and the connectors within the connector housing.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a isometric and fragmentary view of an electrical connector housing assembly with means to produce contact closure and wipe according to the present invention.

FIG. 2 is a isometric view of the cam actuated connector housing pull and printed circuit board push mechanism.

FIG. 3 is a side elevational view with partial fragmentary showing of a portion of the electrical connector housing assembly and illustrating the connector housing in an open position.

FIG. 4 is a side elevational view of the electrical connector housing assembly with the housing and mechanism in a contact closed before wipe position.

FIG. 5 is a side elevational view of the electrical connector housing assembly with the housing and apparatus in a contact closed after wipe position.

FIG. 6 is an enlarged showing of a portion of the linear cam bar illustrating the inclined planes principle for actuating the connector housing through three discrete positions.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig. 7 is a sectional view along the line 7-7 of FIG. 3 showing the actuation of pin connectors by the connector housing so as to contact the edge connectors of a printed circuit card.

Structure

Referring to the drawings, in FIG. 1 there is shown a preferred embodiment for an electrical connector housing assembly adapted to accommodate one or more insertable printed circuit boards or cards in end-to-end relationship thereby forming a row of printed circuit cards. It may be noted that while only a single row of printed circuit cards is shown, other accommodating arrangements are possible for a plurality of rows of printed circuit cards in side-by-side relationship.

The assembly comprises a frame 10 to which is attached a dielectric element 11 that in turn has affixed thereto a pin interface 12 and a pin carrier 13. The pin carrier 13 supports opposing rows of pin connector elements 14 that are adapted to make electrical connections with the edge connectors 15a of a printed circuit board 15 inserted between the pairs of opposing rows of pins 14. A single row of pins 14 could be adapted to connect one side of a printed circuit board or card without departing from the spirit of this invention. The function of the pin interface 12 and the pin carrier 13 is to enable electrical connections with other equipment of a data processing system not shown herein.

The connector housing assembly also includes a plurality of pin separator elements 16 of dielectric material embraced by housing 17. The housing 17 is attached at various points throughout its length to housing drawbar elements 18 by means of screws 19.

Referring to FIG. 2, the housing drawbar assembly comprises the drawbar element 18 affixed to a shaft 20 on which the pulldown cam element 21 is slidable mounted and retained by an adjust nut 22. A contact wipe pusher assembly including a pair of card push pins 23 attached to a push cam element 24 is also slidably supported on shaft 20. The housing drawbar and contact wipe pusher assemblies are movably mounted within apertures in the frame 10.

A linear cam bar 25 is movably mounted within a lower portion of frame 10. A cam actuating drawbolt 26 is rotatably supported in the end portion of the frame 10 and functions to provide the linear cam bar 25 with a forward and backward motion. The linear cam bar 25 is retained within frame 10 by means of guide plate 27.

Operation

In FIG. 3 the electrical connector housing assembly is shown with the linear cam bar 25 in its number one or opened position (see also FIG. 6) in which the linear cam bar 25 is moved to its rightmost location. In this position, the housing 17 is ready to receive a printed circuit card or board 15 with its edge connector edge downward and inserted between the opposing rows of connector pins 14. When the printed circuit card 15 is fully inserted manually and under biasing means (not shown) applied to the opposite edge of the printed circuit card, the outward corners and lower edge of the card will come in touch with the upper end of the card push pins 23. As the cam actuating bolt 26 is rotated so as to move the linear cam bar 25 towards the left, the housing pull down cam 21 will rise on the inclined ramp of the lower side of the linear cam bar 25 thereby pulling the housing 17 in a downward direction and forcing the pin connectors 14 into electrical contact with the edge connectors on the printed circuit card 15 (FIG. 7).

When the pull down cam 21 completed its climb of the inclined ramp, the pin connectors will be fully closed, which is position 2 of FIG. 6.

Now, as the linear cam bar 25 continues to move in the leftward direction, the push cam element 24 will rise along the inclined ramp of the upper surface of the linear cam bar 25 thereby causing the contact wipe pusher assembly to move up-
wards. This action causes the printed circuit card 15 to be forcibly urged upwards thereby providing a wipe action of sufficient magnitude to remove any surface oxide film, dust particles, or other foreign substances on the electrical connecting members so as to produce low electrical resistance between the cooperating electrical members.

To release the printed circuit cards 15, the cam actuating bolt 26 is rotated in the opposite direction. As the housing pull down cam 21 approaches the position to open point, position 1 (FIG. 6) the housing bias spring 30 will cause the housing pull down assembly to move in the upward direction thereby releasing the printed circuit card 15.

A salient feature of the structure and its operation is that edge connectors on a printed circuit card are: (1) not subjected to frictional wear during insertion into the housing; and (2) after contacts are closed there is only a minimum of frictional wear, that which is necessary to produce contact wipe; and (3) there is no frictional wear during opening of the contacts and removal of the card from the housing. This enables a much longer and useful card life.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that the foregoing and other changes in form and details may be made therein.

We claim:
1. A multiple contact connector assembly for providing low and substantially uniform contact resistance between the individual contacts of the assembly and conductor elements of a printed circuit card, the combination comprising:
   a. a frame,
   b. a pin interface element attached to the frame,
   c. a pin carrier which supports opposing rows of pin connector elements that are adapted to make electrical connections with the edge conductors of a printed circuit card inserted between the pairs of opposing rows of pin connector elements being electrically coupled to the pin interface element,
   d. a connector housing assembly embracing the pin connector elements,
   e. a first cam controlled means connected with said connector housing assembly for moving the housing assembly in a direction that will bias the pin connectors into electrical contact with the edge conductors on the printed circuit card, and
   f. a second cam controlled means adapted to engage an innermost edge of the printed circuit card and forcibly urge it between the closed connecting elements to remove any foreign substances on the electrical connecting elements and thereby produce low electrical resistance between the cooperating electrical elements.

2. A multiple contact connector assembly as defined in claim 1 including third cam controlled means for releasably disconnecting the printed circuit card from the pin connector elements.

3. Electrical edge connecting apparatus for a plurality of printed circuit cards and the like, the combination comprising:
   a. a base member,
   b. an electrical pin carrier board attached to the base member and having opposing rows of pin connector elements extending from the board that are adapted to make electrical connections with edge conductors of the printed circuit cards inserted between the pairs of opposing rows of pin connector elements,
   c. a housing member embracing the edge connecting pins on the pin carrier board,
   d. a linear cam bar slidably mounted within the base member,
   e. means to actuate the linear cam bar in a forward and backward direction,
   f. a first means controlled by the linear cam bar when moved in a forward direction coupled with the housing member and operative to cause the housing member to bias the free ends of the edge connecting pins into contact with edge connecting elements of the printed circuit cards inserted between the opposing rows of connecting pins,
   g. a second means controlled by the linear cam bar when moved in a forward direction and operative to engage the edges of the printed circuit cards and forcibly urge them between the closed contact elements to remove any foreign substance and thereby produce low electrical resistance between the cooperating electrical elements.

4. Electrical edge connecting apparatus for a plurality of printed circuit cards and the like as defined in claim 3 wherein the first means controlled by the movement of the linear cam bar in a backward direction is operative to releasably disconnect the printed circuit cards from the pin connector elements.

5. Electrical edge connecting apparatus for a plurality of printed circuit cards and the like as defined in claim 4 further including a pin interface element electrically connected with the pin connector elements in the pin carrier board and which functions to establish electrical connections with other electrical equipment.