

Feb. 17, 1970

G. H. GLUNTZ

3,496,523

ELECTRICAL CONNECTING SYSTEM AND CONNECTOR

Filed Feb. 20, 1967

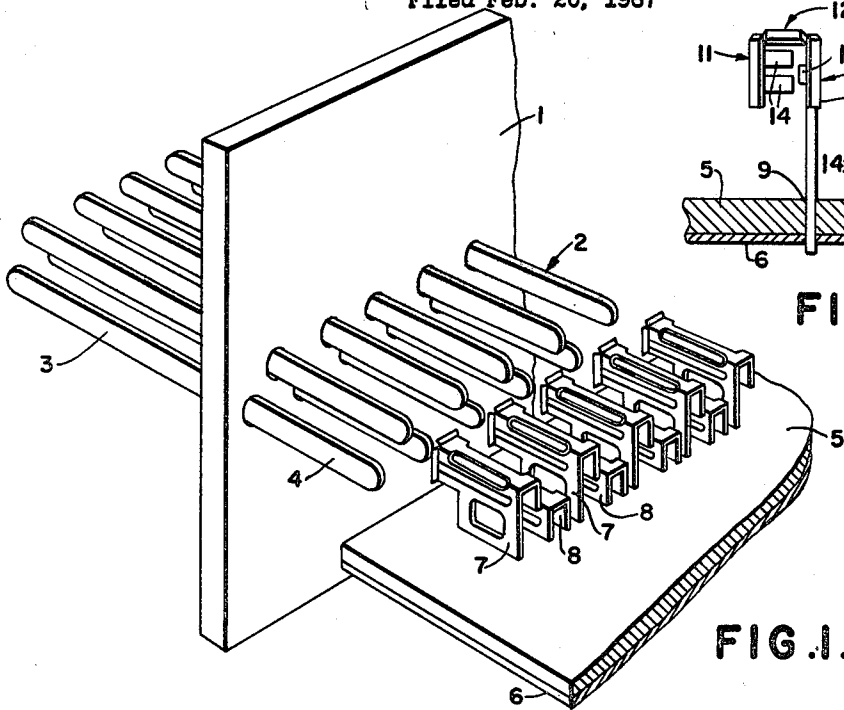
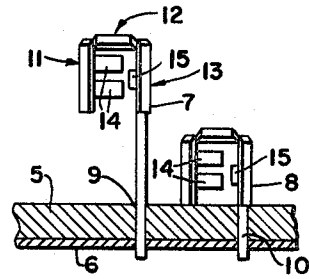


FIG. 2.

FIG. 1.

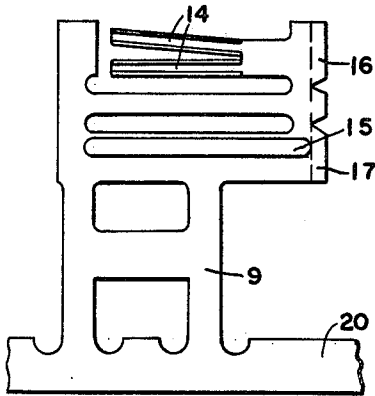


FIG. 7

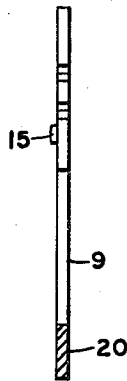


FIG. 8.

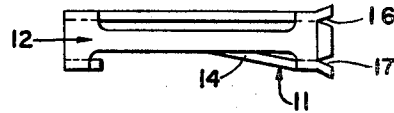


FIG. 3.

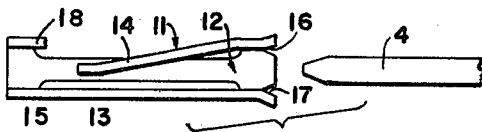


FIG. 5.

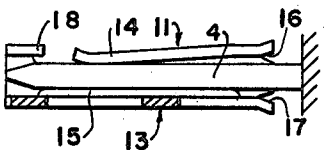


FIG. 6.

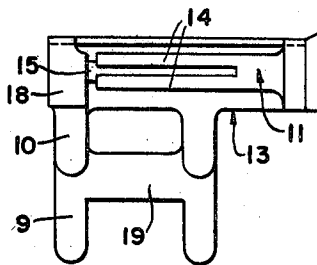


FIG. 4.

1

3,496,523

ELECTRICAL CONNECTING SYSTEM AND CONNECTOR

Glenn Harlan Gluntz, Harrisburg, Pa., assignor to
AMP Incorporated, Harrisburg, Pa.

Filed Feb. 20, 1967, Ser. No. 617,214

Int. Cl. H01r 33/74

U.S. Cl. 339—192

11 Claims

ABSTRACT OF THE DISCLOSURE

The disclosure herein relates to an electrical connecting system for use with modules and the like which connect the modules quickly and effectively to conductors on primary circuit devices such as mother cards, circuit boards and the like. This is accomplished by providing a circuit board or the like with the circuit on one side of the board and the connectors on the other side, the connectors being offset alternately in a raised and then a lowered position, the connectors being designed for mating with a male member on a separate plug board or the like. The connector on the printed circuit board is U-shaped and includes a bifurcated spring member for providing pressure against the male contact member inserted therein. The female member also can include a swage or bevelling at its outer end for receiving of the male member to facilitate entry thereof. The female member is gold plated and the lower level connectors are positioned flush with the printed circuit board.

This invention relates to an improvement in electrical connecting systems and more particularly to an electrical connecting system for connecting electrical modules to conductors on primary circuit devices such as mother cards, printed circuit boards and the like.

Electrical connecting systems for the interconnection of printed circuit boards and the like to switch boards and the like have been known in the art. A typical system of this type is disclosed in the patent to W. R. Evans numbered 3,270,251. Electrical connecting systems of the type disclosed and claimed in the above patent have found great commercial success. However, as in all systems, certain shortcomings do appear and certain improvements are always possible. The connecting system of the above described patent is designed so that the female connector elements are gold plated during the forming and insertion operations, thereby requiring that rejects be discarded after the gold plating operation and increasing the cost of manufacture. The female connector member of the subject patent also includes a pair of springs, one on each side of the connector member, this requiring a relatively costly operation. In addition, the female connector members are spaced along single rows at the same height rather than being offset, thereby requiring large spaces between connectors to prevent short circuiting between adjacent connectors and diminishing the number of connectors that can be positioned per unit area of the circuit board.

In accordance with the electrical connecting system of the present invention, the above identified shortcomings of the prior art as well as other shortcomings, some of which will be specifically mentioned hereinbelow and others which will become apparent to those skilled in the art, are provided wherein the female connector members

2

are so designed that they can be formed prior to gold plating and be easily plated at all spots thereon after the formation of the conductor, thereby allowing for the removal of rejects prior to the gold plating operation. In addition, a single bifurcated spring is provided which produces a wiping action on the male contact member at two positions and thereby will provide good electrical connection in the event of dirt etc., as in the two spring members of the prior art. In addition, the bifurcated spring is easily maintained in operating position by stop elements or the like and is easily machined as a single element. The electrical connecting system of the present invention further includes staggered female members thereon, alternate female connectors being in raised and lowered positions to provide a close packing thereof without electrically short circuiting of adjacent female connectors. The electrical connecting system also includes bevels or swages at the point of insertion of the male members to facilitate entrance thereof.

It is therefore an object of this invention to provide an electrical connecting system which is more economical to produce than the systems of the prior art.

It is a further object of this invention to provide an electrical connecting system for use with printed circuit boards and the like having a high connector packing density relative to prior art systems.

It is a still further object of this invention to provide a female electrical connector member for an electrical connecting system having a bifurcated spring element to provide economical and reliable contact to a male post or member.

It is a yet further object of this invention to provide a female connector member for electrical connecting systems which has an open bottom portion and is therefore easily plated at all points thereon after final formation thereof.

The above objects and still further objects of this invention will become apparent to those skilled in the art when considered in view of the following description of a preferred embodiment thereof which is provided by way of example and not by way of limitation and the accompanying drawings wherein:

FIGURE 1 is a perspective view of an electrical connecting system in accordance with the present invention;

FIGURE 2 is a sectional view taken through an adjacent pair of female connectors of FIGURE 1;

FIGURE 3 is a top view of a female connector member in accordance with the present invention;

FIGURE 4 is a side view of the female connector members in accordance with the present invention;

FIGURE 5 is a bottom view of the female connector member in accordance with the present invention with a post positioned for entry therein;

FIGURE 6 is a bottom view of the female connector member in accordance with the present invention with a post inserted therein;

FIGURE 7 is a view of a blank to be utilized in the formation of the female member in accordance with the present invention; and

FIGURE 8 is a sectional view of FIGURE 7.

Referring now to FIGURE 1, there is shown an electrical connecting system in accordance with the present invention including a mother board 1 having a plurality of posts 2 extending therethrough and affixed therein,

each of the posts including a portion 3 on the side of the mother board remote from a printed circuit board 5 to which connection is to be made and a portion 4 which is to be utilized for connection with a female contact member. The portions 3 of the posts are utilized for connection to wires and the like in well-known manner.

The printed circuit board 5 includes a printed circuit 6 on the bottom thereof and a plurality of apertures extending therethrough for connection to the printed circuit 6. A plurality of female connector members 7 and 8 are positioned on the printed circuit board and have leads which extend through the apertures therein for connection to the printed circuit. The connector members 7 are in the raised position whereas the connectors 8 are in a lowered position, the members 7 and 8 being positioned alternately along a line on the printed circuit board. The positioning of the connector members 7 and 8 in this manner allows a close packing thereof without the problem of short circuiting across adjacent connectors. The connector members 7 and 8 are of a U-shape as better shown in FIGURE 2 and are positioned in the apertures in the printed circuit board 6 by means of a press fit. The connector members 7 and 8 are of a U-shape as better member thereof is flush with the board 5 and thereby provides a closed box for mating with a post or blade 4. The contact legs 9 and 10 of the connectors 7 and 8 respectively are then staked to the printed circuit board, if desired, to eliminate the necessity for soldering. It can be seen that the legs 9 are longer than the legs 10 in order to provide the staggered higher and lower positioned contact members as previously described. The fact that the male member positioned in the contact members 8 is trapped in the box on the lower level formed by the U-shaped contact and the printed circuit board 5 restricts the male member therein from movement and thereby restricts the male member of the contact members 7 from movement due to the common positioning of all of the posts or male members 4 in the mother board 1.

The U-shaped connector includes sides 11, 12 and 13, the side 11 including a bifurcated spring 14 formed therein. The side 13 includes a land portion 15 which moves the post 4 normal to the plane of the connector and against the spring member 14. The sides 11 and 13 of the connectors 7 and 8 form a bevel or swage 16 and 17 at the end thereof for receiving the post 4 to facilitate entrance of the post into the connector. The side 11 also includes a stop member 18 which can be extended inwardly even farther than shown in FIGURES 3 to 6, which prevents the spring member 14 from being forced outwardly beyond the stop element. This prevents over-stresses in the spring.

It will be noted that connectors 7 will have longer leg portions 9 than do the connectors 8. Furthermore, in order to properly position a connector 7 in the raised position relative to a connector 8, there is provided a metallic member 19 which connects the legs 9 and abuts the surface of the circuit board 5 when the legs 9 have been inserted to the point where the member 19 abuts the board. In this manner, the proper positioning of the connectors 7 relative to the connectors 8 can be easily maintained.

Referring now to FIGURES 7 and 8, there is shown a blank which has been stamped out to provide a form from which the connectors in accordance with the present invention are provided. The blank shown in FIGURES 7 and 8 is designed specifically for manufacture of the connector 7 but it can be seen that, with minor modifications, this blank could be made for manufacture of a connector 8. The blank includes the bifurcated spring member 14 and the bevelled portions 16 and 17 which are still in the unbevelled state as shown. The blank also includes a carrier 20 which is utilized for holding the contact member after the contact member has been properly formed and prior to the plating operation. The contact member is then held by this carrier member 20 while

the plating of gold thereon takes place. The blank is provided from any of the well-known conductive connector material and the plating would preferably be a nickel plating over which a gold plating is placed.

The connectors 7 may be partially closed in at the bottom thereof to form a box shape by including a flap on the blank of FIGURE 7 which extends downward from the side 13 into the aperture formed by the side 13, the leg portions 9 and the member 19. This flap would not provide a complete closure so that the gold plating may still take place as above described.

The member 19 can also be replaced by a rest tab formed in the region 19. This tab would be provided by forming a metal piece depending downwardly from the region 19 which is bent normal to the legs 9 during formation of the connector. This tab would act as a stop or positioning member for the connector 7.

Though the invention has been described with respect to a particular preferred embodiment thereof, many variations and modifications thereof will immediately become apparent to those skilled in the art. It is therefore the intention that the appended claims be interpreted as broadly as possible in view of the prior art to include all such variations and modifications.

What is claimed is:

1. An electrical connector comprising a U-shaped body including a first side, a second side substantially normal to said first side and a third side substantially parallel to said second side, one of said sides including a bifurcated spring member formed therein and extending into the box formed by said three sides when in the relaxed condition, a raised area formed in the one of said second and third sides not including said spring, said raised area being disposed opposite said spring and extending into said box formed by said sides.

2. An electrical connector as set forth in claim 1 wherein an adjacent end portion of each of said second and third sides diverge outwardly from the axis of said box.

3. An electrical connector as set forth in claim 1 wherein said third side is longer than said second side, said third side including a pair of depending leg members for connection to a mounting board.

4. An electrical connector as set forth in claim 2 wherein said third side is longer than said second side, said third side including a pair of depending leg members for connection to a mounting board.

5. An electrical connector as set forth in claim 3 including a mounting board for mounting said connector, wherein said third side further includes means normal to said legs, integral therewith and positioned above the end portions of said legs for determining the height of said connector from said board.

6. An electrical connector as set forth in claim 4 including a mounting board for mounting said connector, wherein said third side further includes means normal to said legs, integral therewith and positioned above the end portions of said legs for determining the height of said connector from said board.

7. An electrical connector means comprising a mounting board, a plurality of connectors secured to the board, each connector being a U-shaped body with the open end of the U-shaped body facing the board, the legs forming the U being in contact with the board, an extension formed on one of the legs of the U extending through the board, means within the U-shaped body for contacting a male member inserted therein, the board forming a support for said member.

8. A device as defined in claim 7 in which the means on one of the legs includes a bifurcated spring formed in one of the legs and extending toward the other leg.

9. An electrical connector comprising a mounting board, a plurality of U-shaped connectors secured to the board with the open ends of the U in contact with the board, and an extension formed on one of the legs of the U extending through the board, a second plurality of U-

5

shaped connectors between said first mentioned plurality and means supporting said second plurality spaced from the board.

10. A device as defined in claim 9 wherein the distance between the connectors of said pluralities is less than the distance between the legs of the U.

11. A device as defined in claim 9 wherein the supporting means comprises an extension on one of the legs and stop means integral with the extension, the distance between the stop means and the end of the extension being greater than the thickness of the board.

5

10

6

References Cited

UNITED STATES PATENTS

2,834,951	5/1958	Aquillon et al.	339—217
3,179,912	4/1965	Huber et al.	339—17
3,270,251	8/1966	Evans	339—256 X
3,283,289	11/1966	Cobaugh	339—256

KENNETH DOWNEY, Primary Examiner

U.S. Cl. X.R.

339—17