United States Patent

[11] **3,634,813**

[72] Inventor **Bruno Baumanis**
River Forest, Ill.

[21] Appl. No. **14,315**
[22] Filed **Feb. 26, 1970**
[45] Patented **Jan. 11, 1972**

[73] Assignee **Molex Products Company**
Downers Grove, Ill.

[54] **ELECTRICAL CONNECTOR**
4 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** ..... **339/156 R,** 339/184 M, 339/221 M
[51] **Int. Cl.** **H01r 13/64**
[50] **Field of Search** ..... 339/17 R, 17 C, 17 CF, 17 L, 17 LM, 17 M, 17 N, 17 LC, 151, 154, 156, 176 M, 176 R, 184–187, 193–195, 218, 220, 221, 217 R, 217 S, 198 R, 198 E, 198 H, 198 S, 198 P, 17 E

[56] **References Cited**

UNITED STATES PATENTS

2,658,182	11/1953	Jackson et al.	339/45
3,002,175	9/1961	Bertram et al.	339/126
3,364,455	1/1968	Nodfelt	339/90

FOREIGN PATENTS

101,485	4/1968	Netherlands	339/17 C
88,991	4/1921	Switzerland	339/198 R

Primary Examiner—Stephen J. Novosad
Assistant Examiner—Lawrence J. Staab
Attorney—Olson, Trexler, Wolters & Bushnell

ABSTRACT: A multiple contact connector comprises a thin insulating wafer including a plurality of apertures therethrough, each of which receives and rigidly supports a longitudinal electrical contact member. The apertures and supported contact members are arranged in a given array so that common ends of the contact members may be inserted into printed circuit board apertures arranged in the same array for electrical connection therewith. The other common ends of the connecting members are connected to a cooperating socket for coupling external electrical components to the printed circuit board.

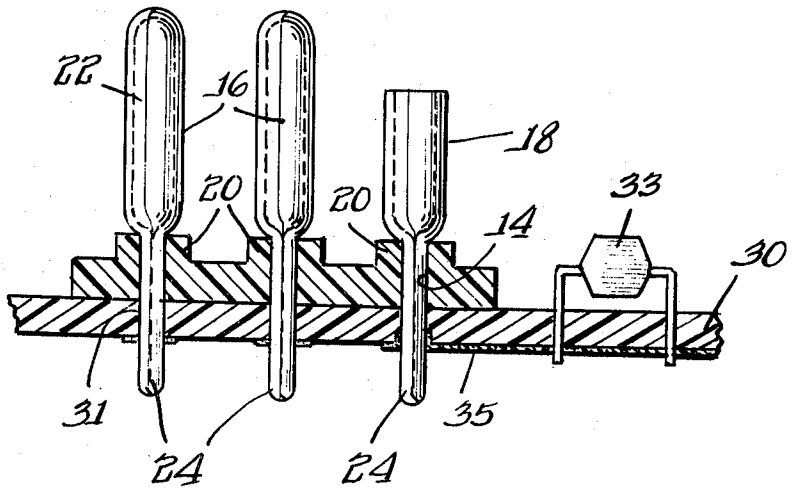


Fig. 1.

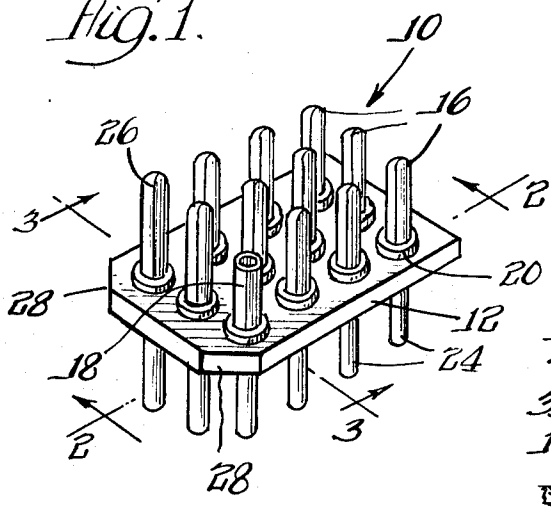


Fig. 2.

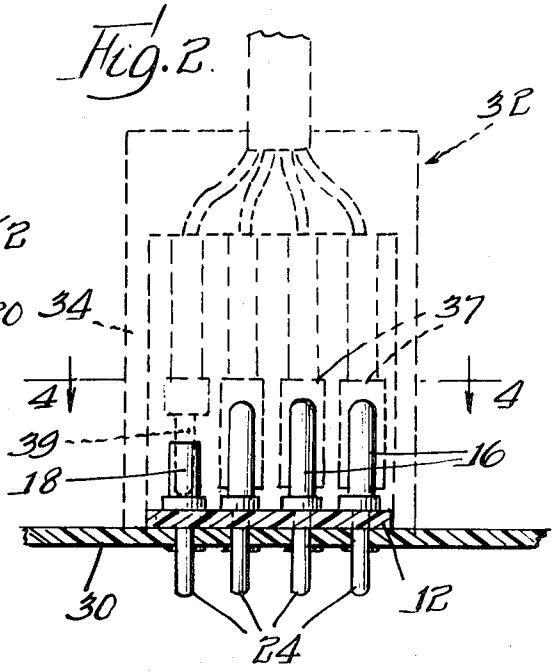


Fig. 3.

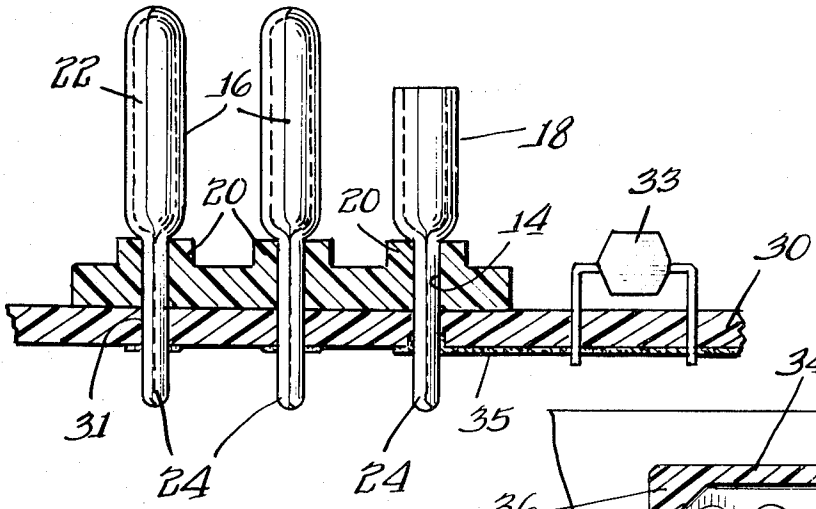
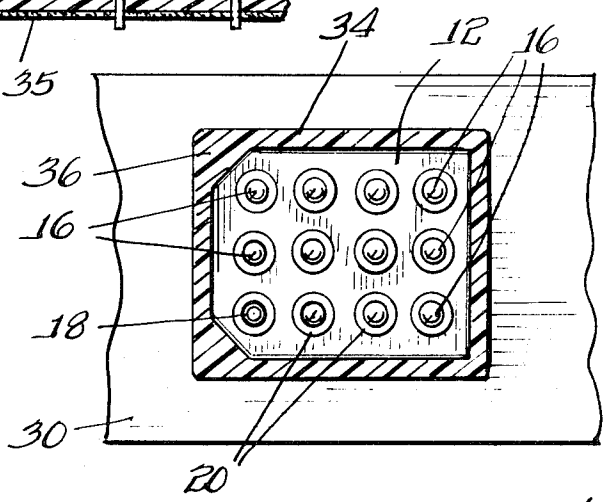


Fig. 4.



Inventor
Bruno Baumanis
By: Olson, Trexler, Wolters & Bushnell attys.

ELECTRICAL CONNECTOR

SUMMARY OF THE INVENTION

This invention relates generally to connecting devices and more particularly to electrical connectors for coupling miniaturized electrical components.

The electronics art has made much progress towards miniaturizing electronic circuits. The most recent achievement is the integrated circuit which comprises dozens of miniature electronic components mounted on a single substrate which is no larger than a playing card. With the advent of the integrated circuit came the problem of externally connecting its various electrical components, which problem is further characterized by the fragile nature of the integrated circuit.

Accordingly, a general object of the present invention is to provide a novel and improved device for electrically uniting various electrical components.

A more specific object of the present invention is to provide a novel and improved connecting device which electrically couples the miniaturized components of a circuit board such as an integrated circuit to external electrical components.

STill another object of the present invention is to provide a novel and improved electrical connecting device which is small in size, light in weight and sturdy in construction so that it can be reliably used with a fragile circuit board such as an integrated circuit.

Still another object of the present invention is to provide an electrical connecting device of the above-described type which is economical to make.

These and other objects and features of the invention will become more apparent from a reading of the following descriptions.

The foregoing problems are overcome and the foregoing objectives are attained by providing a thin plate or wafer of molded insulating material such an nylon which includes therethrough a plurality of apertures arranged in a given array. Each aperture receives and rigidly supports a longitudinal electrical contact member which is provided for coupling one electrical component to another. The wafer includes on one side thereof a plurality of integrated collars, each of which extends around the periphery of a corresponding aperture and contact member for assuring rigidity to the connecting device. In actual operation, corresponding ends of the contact members are inserted into similarly aligned apertures of a circuit board for electrically connecting the various components thereon to the connector members. Various external electrical components may then be coupled to the circuit board components through a receptacle which is cooperatively engaged to the otherwise free ends of the connecting members.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a perspective view of a multiple contact connecting device according to the invention;

FIG. 2 is a side sectional view of the connecting device taken along line 2—2 of FIG. 1, the connecting device being shown cooperating with a circuit board and connecting plug;

FIG. 3 is a side sectional view of the connecting device taken along line 3—3 of FIG. 1, the connecting device being supported on a circuit board; and

FIG. 4 is a sectional view of the connecting device taken along line 4—4 of FIG. 2.

DETAILED DESCRIPTION

Referring now in detail to the drawing, wherein like numerals indicate like components, a multicontact connecting device constructed in accordance with the present invention is indicated generally by the reference numeral 10. The connecting device comprises a substantially rectangular molded plate or wafer 12 having therethrough a plurality of apertures 14 which are arranged in a given array and which may be provided during a molding operation or subsequently punched or drilled out thereafter. Each of the apertures receives therethrough either a male electrical contact member 16 or a female electrical contact member 18.

The plate or wafer 12 is constructed of a hard insulating material, preferably nylon, and is approximately three thirty-seconds of an inch thick. This dimension is merely stated for exemplary purposes in order to show the thinness of the wafer and it is not to be interpreted as a limitation thereof. The thinness is important for the following reasons. FIrstly no substantial thickness is added to a circuit board or integrated circuit when the connecting device is applied thereto, thereby maintaining a low profile when attached to a circuit board, as will be seen hereinafter. Secondly, only a small amount of material is used which in turn reduces the cost of making the device. Thirdly, a reduction in material decreases the weight of the device which in itself is critical when the fragile nature of the circuit board is taken into consideration.

In order to maintain its rigidity, the wafer includes, on one side thereof, a plurality of integrated collars 20, each of which extends around the periphery of a corresponding aperture 14. In addition to adding to the general stiffness of the wafer, the collars provide greater surface area for the contact members to adhere to, which in turn aids in holding the contact members in place.

The plurality of male contact members 16 and female member 18, as stated above, are arranged in a given array which as shown in the embodiment herein is four parallel and laterally spaced rows with three contact members in each row. It is to be understood, however, that neither the number of contact members nor their position relative to each other is critical. Any number may be provided and arranged in any desired manner. For example, there can be six members rather than 12 as shown, or there can be 10 contact members arranged in a circular array.

The contact member 16 comprises a hollow cylindrical top portion 22 which is integrally and spherically capped at the top end and which sharply tapers at its bottom end to form an integrally connected cylindrical bottom portion or neck 24 which is inserted through an aperture 14 until the sharply tapered bottom of top portion 22 rests upon a corresponding integrated collar 20, the bottom portion being of sufficient length so as to extend a substantial distance out the bottom of wafer 12. While the aperture is of sufficiently small diameter so as to snugly receive the bottom portion, an adhesive material such as glue may be applied to the inner surface within the aperture prior to insertion of the contact member for insuring a rigid fit.

The contact members 16 are preferably made from tin-plated brass sheet metal which is rolled so as to form the above-described shape and thereafter welded together as indicated by the welded section 26 extending the length of the contact member. While this has been found to be one of the most economical manners of making the contact member, it is to be understood that the invention is not limited either to the particular shape or the method of making it. For example, it may be a solid member or it may be a cylindrical member with an equal diameter cross section throughout its entire length.

It is to be noted that the female contact member 18 is constructed in the same manner as described with respect to the male member except that the head of top portion 22 is severed so as to expose the hollow interior thereof.

As stated above, the plate or wafer 12 is substantially rectangular in shape. The wafer does, however, include two bevelled corners which along with single female contact member 18 provide a unique function to be described below.

Operationally, the wafer 12 is positioned against the substrate 30 of a circuit board such as an integrated circuit, so that bottom portions 24 of contact members 16 and 18 are inserted through cooperating apertures 31 in the substrate. This in turn electrically connects the contact members to the circuit boards' various electrical components 33 via conventional circuit board leads 35 which run along the bottom of the substrate as seen in FIG. 3. It is to be noted that because of the

relative thinness of the wafer very little thickness is added to the substrate. The importance of this is apparent when the need for miniaturization is taken into consideration. Also, since the connecting device is extremely light in weight, the fear of breaking the delicate substrate is reduced. After the connecting device **10** has been united with substrate **30** in the manner described above, a receptacle **32** is connected thereto in a manner described below for electrically joining the circuit boards' components to various external electrical components (not shown).

The socket **32**, which is only partially shown, forms no part of the invention and therefore will not be described in detail. It suffices merely to state that the receptacle includes a rectangular housing **34** which is opened at its bottom end for fitting snugly around the periphery of the plate or wafer **12** as seen in FIG. **4**. Two inside corners **36** of the housing are counter bevelled so as to cooperate with bevelled corners **28**. This provides assurance that the socket **32** will always be placed over the connecting device in the same manner for preserving the proper polarity.

The receptacle **32** further includes appropriate female terminals **37** arranged in the same array as that of the male contact members **16** so as to fit over and engage the top portions **22** of the contact members for making electrical connection therewith. The housing further includes a male terminal **39** which is positioned to enter in and engage female contact member **18** when the socket is positioned as seen in FIG. **2**. The provision of a female connecting member and a male terminal provides additional assurance that the proper polarity will always be maintained. While only one female contact member is shown, any arrangement of male and female contact members may be provided for preserving proper polarity.

An additional advantage to the connecting device **10** is directed toward the manner in which it is united with socket **32**. As stated above, the socket's housing **34** is positioned around the periphery of wafer **12**. This in turn inhibits lateral movement of the housing, which prevents the connected terminals and contact members from disengaging with each use or bending out of shape.

While a particular embodiment of the invention has been shown, it should be understood, of course, that the invention is not limited thereto since many modifications may be made. It is, therefore, contemplated to cover by the present application any such modifications as fall within the true spirit ands scope of the invention.

I claim:

1. A preassembled multiple contact connecting device comprising a flat insulating support member which is sufficiently thin to provide a low profile, said member having spaced-apart apertures extending therethrough in a given array, said support member including on one side thereof integral tubular collars, each collar extending around the periphery of a corresponding aperture for enhancing the rigidity of said member, an electrical contact in each aperture, each contact having an elongated first tubular portion extending in one direction from the member and a second tubular portion extending in the opposite direction from the member, said tubular portions being coaxial and with the second tubular portion being of a smaller diameter than the first tubular portion, the junction of said tubular portions being a sharp taper that rests on and is supported by one of said collars, the second tubular portion being snugly fitted into said holes respectively, said contacts including a female contact and male contacts, the end of each male contact that is remote from the sharp taper being closed, and the end of said female contact that is remote from the sharp taper being open.

2. A device according to claim **1** in which said first tubular portion of said female contact is shorter than said first tubular portion of said male contact.

3. A device according to claim **1** in which each contact is a rolled sheet metal member having a welded seam extending the full length thereof.

4. A device according to claim **1** including at least one bevelled corner of said support member to assist in connecting said support member to a receptacle with the proper polarity.

* * * * *