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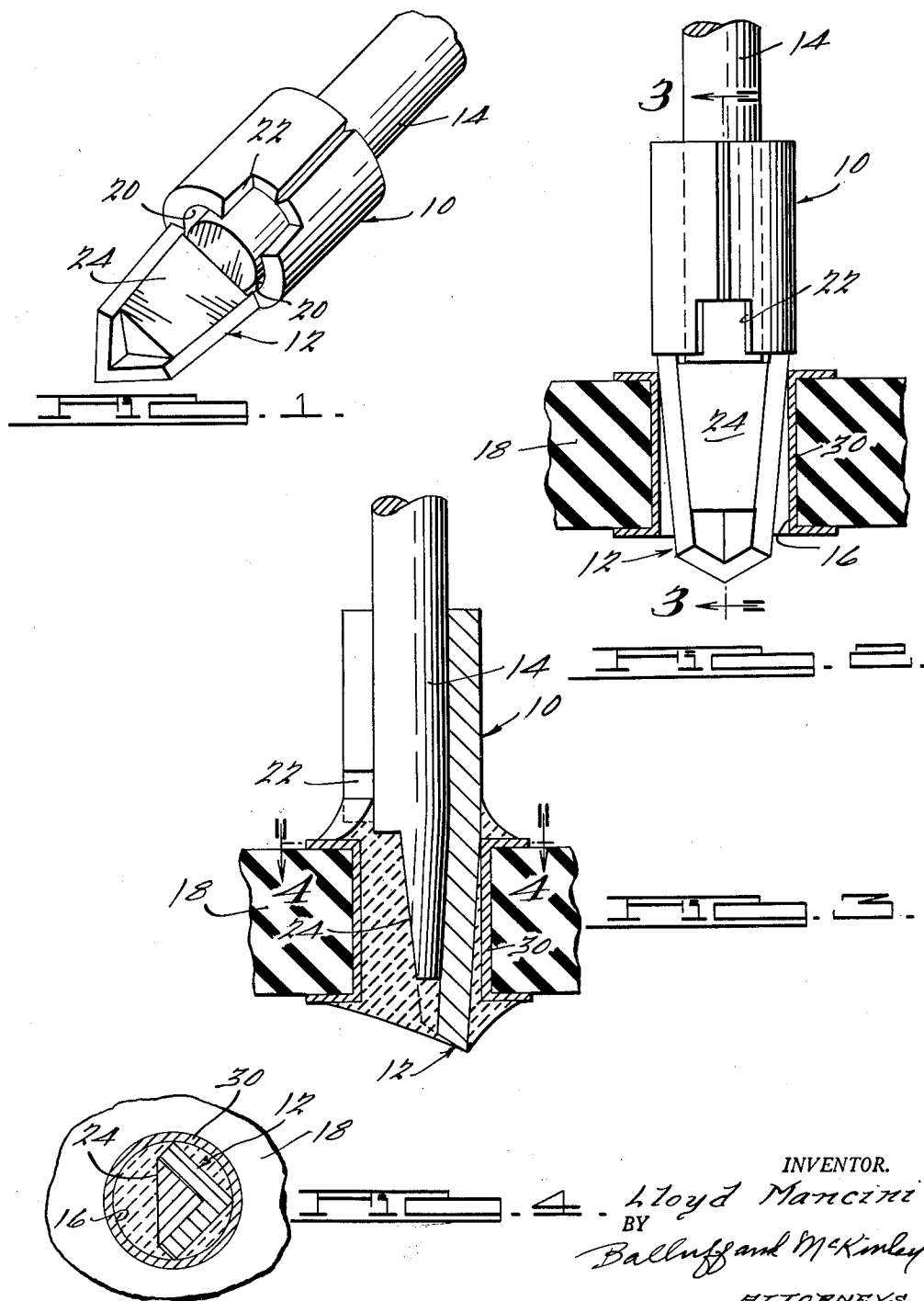
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3,096,393

ELECTRICAL CONNECTION AND TERMINAL FOR MAKING THE SAME

Filed Oct. 14, 1959

2 Sheets-Sheet 1



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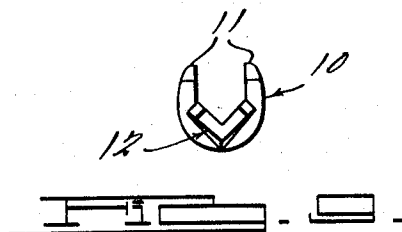
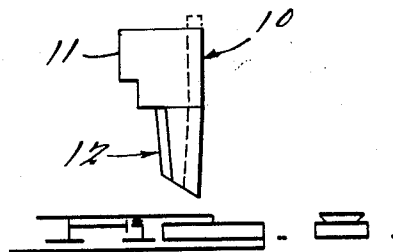
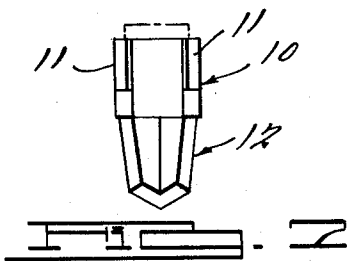
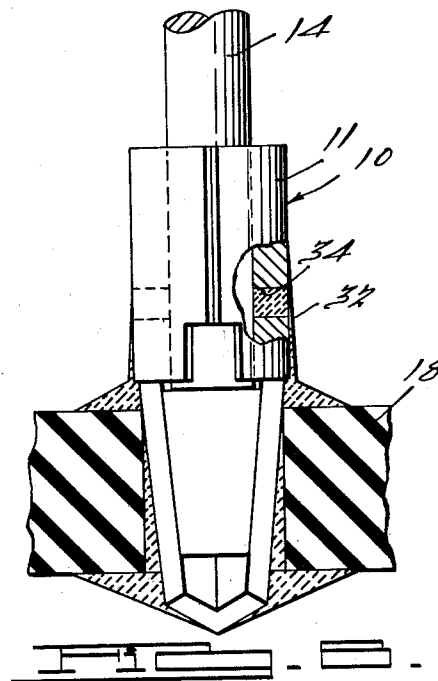
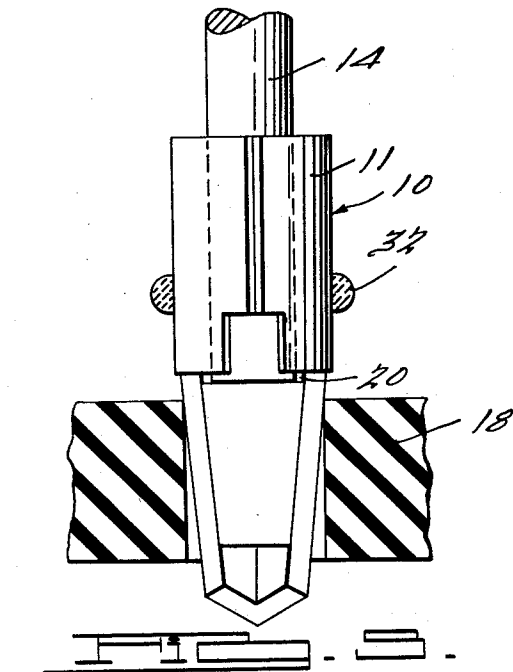
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ELECTRICAL CONNECTION AND TERMINAL FOR MAKING THE SAME

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6 Claims. (Cl. 174—68.5)

This invention relates to electrical connections and terminals for making the same and has particular reference to an electrical connection between a wire and a printed circuit board and to a terminal for making such a connection.

A principal object of the invention is to provide an efficient, simple and inexpensive electrical connection between a wire and a printed circuit board as well as a new and improved terminal for making such a connection.

Other and further objects of the invention will be apparent from the following description and claims and may be understood by reference to the accompanying drawings, of which there are two sheets, which by way of illustration show preferred embodiments of the invention and what I now consider to be the best mode of applying the principles thereof. Other embodiments of the invention may be used without departing from the scope of the present invention as set forth in the appended claims.

In the drawings:

FIGURE 1 is a perspective view of a terminal embodying the invention crimped onto a wire preparatory to inserting the terminal in a socket of a printed circuit board;

FIGURE 2 is a sectional view of the terminal as shown in FIGURE 1 inserted in a socket of a printed circuit board;

FIGURE 3 is a sectional view taken along the line 3—3 of FIGURE 2 and showing the terminal soldered in a circuit board;

FIGURE 4 is a cross sectional view taken along the line 4—4 of FIGURE 3;

FIGURE 5 is a view similar to FIGURE 2 showing a modified form of the invention;

FIGURE 6 is a view illustrating the terminal of FIGURE 5 after being soldered in the socket of a terminal board;

FIGURE 7 is a plan view of the terminal per se of FIGURES 1 to 4;

FIGURE 8 is a side elevational view of FIGURE 7;

FIGURE 9 is a front elevational view of the terminal illustrated in FIGURE 7.

As illustrated in FIGURES 1, 7, 8 and 9, a sheet metal terminal embodying the invention includes a U-shaped ferrule portion 10 and an integral tapering channel shaped portion 12 projecting axially from the ferrule portion and adapted to receive the end of a wire 14 around which the ferrule portion 10 is crimped. The crimped ferrule is of substantially uniform cross section throughout its length. The channel shaped portion 12 is adapted to be disposed in and project through a socket or hole 16 in a printed circuit board 18.

The terminal is made from an integral piece of sheet metal such as hard brass which preferably is solder coated in accordance with the process disclosed in Berg application for United States letters patent Serial No. 761,995, filed September 19, 1958, for "Method of Solder Coating Strip Stock," now Patent No. 3,068,566. The ferrule portion 10 is made U-shaped and as shown in FIGURES 7, 8 and 9 includes ears 11 which define a channel for receiving the end of a wire such as 14. The ears 11 are wrapped around and crimped on the wire 14 as shown in FIGURE 1 so as to form a good mechanical connection therebetween. The ears 11 are preferably crimped on the wire so as to leave paths 20 for the flow of molten solder

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between the ears 11 and the wire 14, and the corners of the ears on one end thereof are notched so as to form a notch 22. When the ears 11 are crimped on the wire 14 the end 24 of the wire is flattened by a coining operation so that the end of the wire which projects beyond the ferrule 10 is substantially disposed within the channel portion 12. This coining operation exposes clean and unoxidized metal surface to facilitate solder joining the wire to the printed circuit board as explained more fully hereinafter.

The channel portion 12 tapers toward a point at the lead end thereof so as to facilitate insertion of the portion 12 in the hole 16. The cross sectional shape of the portion 12 with the end 24 of the wire coined therein is such as to form a plurality of solder flow channels between the portion 12 and the hole 16 as illustrated in FIGURE 4 so that when the board is solder dipped solder will flow upwardly through such channels and solder join the wire 14 to the terminal portions 10 and 12 and the terminal and wire 14 to the circuit board as illustrated in FIGURE 3. The notch 22 provides a vent to permit the escape of gases from the solder flow passages during the soldering operation. During such operation solder will also flow upwardly through the passages 20 so as to solder join the wire 14 to the ferrule portion 10.

In FIGURES 2 and 3 I have shown the hole 16 and the board 18 as provided with a metal lining or sleeve 30.

In the arrangement disclosed in FIGURES 5 and 6 no such lining or sleeve is illustrated and in such cases the terminal preferably has secured thereto, a strip or slug 32 of solder, portions of which are anchored in holes 34 in the ears 11. During the soldering operation above referred the strip 32 of solder will be melted under the influence of the heat of the soldering operation and flow inwardly through holes 34 to solder join the wire to the ferrule portion 10 and downwardly over the outside so as to make connection with the circuitry on the board 18. The solder which flows upwardly into the hole 16 during the soldering operation forms an electrical connection between the circuitry on the opposite sides of the board 18.

The construction herein disclosed includes the following features:

(1) A mechanical joint between the wire 14 and the terminal.

(2) A solder joint between the terminal and the printed circuit on the board.

(3) A solder joint directly between the wire 14 and the circuitry on the board 18.

(4) A solder connection between the ferrule portion 10 of the terminal and the wire 14.

(5) The shape of the portion 12 which projects through the hole 16 allows for good capillary flow of solder upwardly through the space between the portion 12 and the sides of the hole.

While I have illustrated and described preferred embodiments of my invention, it is understood that these are capable of modification, and I therefore do not wish to be limited to the precise details set forth but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. An electrical connection comprising a wire and a metal terminal secured thereto, said terminal including a ferrule portion wrapped around and crimped on said wire so as to leave solder flow paths between the inner surface of said ferrule portion and the wire embraced therein, and an integral tapering channel shaped portion open along one side projecting axially from said ferrule portion, the crimped ferrule portion being of substantially uniform cross section throughout its length, the end of said wire extending into said channel-shaped portion being

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flattened therein so that the end of the wire projecting beyond said ferrule portion is substantially disposed within said channel-shaped portion and with said channel-shaped portion forms a section substantially smaller than the crimped ferrule portion and which tapers toward a point remote from said ferrule portion, a circuit board having a hole therein, a metal sleeve in said hole forming a socket of smaller cross section than the crimped ferrule portion and of larger cross section than the point forming the end of the channel-shaped portion, said crimped ferrule portion of said terminal being disposed above said socket and said tapered channel-shaped portion being disposed in and projecting through said socket, solder in said paths uniting said wire with said ferrule and tapered channel-shaped portion, and solder uniting said wire and channel-shaped portion with said sleeve, said ferrule portion being notched adjacent the flattened end of said wire, said notched portion being disposed at the upper end of said socket.

2. An electrical connection comprising a wire and a terminal secured thereto, said terminal including a ferrule portion wrapped around and crimped on said wire, and an integral channel-shaped portion open along one side projecting from said ferrule portion, the end of said wire extending into said channel-shaped portion and being flattened therein so that the end of the wire projecting beyond said ferrule portion is substantially disposed within said channel-shaped portion and therewith forms a section substantially smaller than said crimped ferrule portion and which projects away from said ferrule portion, a circuit board having a hole therein forming a socket of smaller cross section than the crimped ferrule portion and of larger cross section than the free end of the channel-shaped portion, said crimped ferrule portion of said terminal being disposed above said socket and said channel-shaped portion being disposed in and projecting through said socket, and solder uniting said wire with said ferrule and channel-shaped portion and said wire and channel-shaped portion with said board.

3. An electrical connection according to claim 2 wherein the side wall of said socket is lined with a metal cylinder before solder joining the terminal to said board, and wherein said channel-shaped portion with the flattened end of the wire therein disposed in said socket is substantially triangular in cross section.

4. An electrical connection according to claim 2 wherein the end of said wire extending into said channel-shaped

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portion is flattened with respect to the portion embraced by said ferrule portion.

5. An electrical connection according to claim 2 wherein parts of the inner surface of said crimped ferrule portion are spaced from said wire so as to leave paths for the flow of solder between the inner surface of said crimped ferrule portion and said wire embraced therein.

6. An electrical connection comprising a wire and a metal terminal secured thereto, said terminal including a ferrule portion wrapped around and crimped on said wire so as to leave paths for the flow of molten solder between the inner surface of said ferrule portion and the wire embraced therein, and an integral tapering channel-shaped portion projecting axially from said ferrule portion, the end of said wire extending into said channel-shaped portion and forming therewith a section substantially smaller than the crimped ferrule portion which tapers toward a point remote from said ferrule portion, a circuit board having a hole therein, a metal sleeve in said hole forming a socket of smaller cross section than the crimped ferrule portion and of larger cross section than the channel-shaped portion, said crimped ferrule portion of said terminal being disposed above said socket and said tapered channel-shaped portion being disposed in and projecting through said socket, solder in said paths uniting said wire with said ferrule, and solder uniting said tapered channel-shaped portion and said wire and channel-shaped portion with said sleeve, said ferrule portion being notched at the upper end of said socket.

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