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(54) ELECTRICAL CONNECTING METHOD

(71) We, PRESSAC LIMITED, a British Company of Acton Grove, Long Eaton, Nottingham, NG10 1FW, formerly of Leopold Street, Long Eaton, Nottingham, NG10 4QL, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a method of establishing electrical contact between an electrically insulated conductive strip and a socket member having an electrical contact element therein.

The primary object of the invention is to improve the degree of electrical contact between the insulated strip and the socket contact element.

According to the present invention we provide a method of establishing electrical contact between an elongate electrically insulated conductive strip of uniform cross-section along its width and a socket member having an electrical contact element therein, the method comprising (1) the application of a crimping tool to pierce the insulated conductive strip at two points spaced apart with the ends of a crimpable strip of flexible resilient, electrically conductive material to make a first electrical connection with the insulated strip and to fold over the passed through ends of the crimpable strip into a region of the insulated strip between the said two piercing points and again to pierce the insulation of the insulated conductive strip to effect a second electrical connection with the insulated strip, and (2) the insertion of the resultant crimped joint into the said socket member whereby at least two electrical connecting points are established between the crimped strip and the said contact element in the socket member. Expediently the crimped strip takes the form of a "B"-shape with the doubly curved part of the "B"-shape constructed so as to form two electrical connecting points with the said contact element, e.g. a cantilever spring

contact. Opposite ends of the crimpable strip before crimping may be provided with teeth extending in the plane of the strip; in such an event parallel serrations projecting perpendicularly to the plane of the strip and joining the teeth at the ends of the strip may be provided.

This invention is especially applicable to the establishment of electrical contact between an electrically insulated conductive strip of flat flexible cable and a connector of the kind illustrated in Figure 7 (hereinafter described) but is not limited thereto.

By way of example, preferred embodiments of the invention will now be described with reference to the diagrammatic drawings accompanying the Provisional Specification (other than Fig. 5) wherein:

Figure 1 is a sectional elevation of a crimpable electrically conducting strip which has been applied by a crimping tool to a conductive strip of a flexible printed wiring circuit element;

Figure 2 shows part of the flexible printed wiring circuit element;

Figure 3a is a plan view of the crimpable strip before crimping;

Figure 3b is a section along line X—X of Figure 3a;

Figure 4 is a sectional elevation of part of the flexible printed wiring circuit element to which has been applied a crimped strip as shown in Figure 1 and a housing provided with an electrical connector into which the crimped joint is introduced;

Figure 5 is a sketch showing a conventional arrangement;

Figure 6 is an arrangement illustrative of the invention for comparison with Figure 5, and Figure 7 is a sectional view similar to Figure 6.

A crimpable strip 4 of flexible, resilient, electrically conducting material is shown in its flattened position in Figures 3a and 3b. Figure 3a shows teeth 8 to facilitate piercing and Figure 3b shows longitudinal serrations 9 to give multi-point contact at positions 6 as well as at 2 (Figure 1).

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A flexible printed wiring circuit element 10 is shown at Figure 2, this consisting of electrically conductive copper strips 5 arranged parallel to another and separated from one another by insulation 3.

Figure 1 shows a crimpable strip 4 which has been applied with a crimping tool (not shown) to a copper strip 5 of the circuit element 10 as shown. The strip 4 pierces the copper strip 5 and makes electrical connection with the edges 1 of the strip 5. The ends of the crimped strip 4 pierce the insulation 3 making a second point of electrical connection at 2. In the crimped state the strip 4 takes the form of a "B"-shape. 7 indicates by hatching that the region may be dished as shown by the full curved line or linear as shown by the dotted line, the linear form also being shown in Figure 6 and 7.

Figure 4 shows the crimped joint denoted by arrow 13 inserted into a conventional printing circuit edge connection socket consisting of a housing 11 with a cantilever spring contact 12.

With the embodiments described and illustrated it will be understood that it is not necessary to remove the insulation 3 (insulation removal often being awkward and inconvenient) which covers the conductive strips 5 in order to terminate the strip 5 onto a conventional printing circuit edge connector.

Figure 5 is not illustrative of the invention but represents conventional practice, a single connecting point 14 being established between a conventional copper strip 5 and a conventional cantilever spring contact 12 of a conventional printed circuit connector socket. By way of comparison a corresponding embodiment illustrative of the invention is shown in Figure 6. A crimped strip 4a comparable to that shown in Figure 1 serves to connect a conventional copper strip 5 with a conventional cantilever spring contact 12. By virtue of the B-shape of the strip 4a two connecting points 14¹ are established. This illustrates that with the use of the crimped joint as specifically described (13) it is possible to increase the number of possible points of electrical connection between members 5 and 12 and thereby improve the current carrying capacity of the crimped joint.

Figure 7 is similar to Figure 6 but the latter is on a larger scale. Channels 15 serve to cool the connecting points 14¹ if they should become overheated. It will be appreciated that the increase in the amount of air around the contacting faces of members 4a and 12 means that more of any heat generated at the contacting faces will be

removed by convection or air circulation.

WHAT WE CLAIM IS:—

1. A method of establishing electrical contact between an elongate electrically insulated conductive strip of uniform cross-section along its width and a socket member having an electrical contact element therein, the method comprising (1) the application of a crimping tool to pierce the insulated conductive strip at two points spaced apart with the ends of a crimpable strip of flexible, resilient, electrically conductive material to make a first electrical connection with the insulated strip and to fold over the passed through ends of the crimpable strip into a region of the insulated strip between the two said piercing points and again to pierce the insulation on the insulated conductive strip to effect a second electrical connection with the insulated strip, and (2) the insertion of the resultant crimped joint into the said socket member whereby at least two electrical connecting points are established between the crimped strip and the said contact element in the socket member.

2. A method according to Claim 1, wherein the crimped strip takes the form of a B-shape with the doubly curved part of the "B"-shape constructed so as to form two electrical connecting points with the said contact element.

3. A method according to any preceding claim, wherein the said contact element is a cantilever spring contact.

4. A method according to any preceding claim, wherein opposite ends of the crimpable strip before crimping are provided with teeth extending in the plane of the crimpable strip.

5. A method according to Claim 5, wherein before crimping parallel serrations projecting perpendicularly to the plane of the crimpable strip and joining the teeth at the ends of the crimpable strip are provided.

6. A method for establishing electrical contact between an electrically insulated conductive strip and a socket member having an electrical contact element therein substantially as herein described with reference to Figures 1-4, 6 and 7 of the drawings filed with the Provisional Specification.

7. An electrical connection established by the method claimed in any preceding claim.

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A flexible printed wiring circuit element 10 is shown at Figure 2, this consisting of electrically conductive copper strips 5 arranged parallel to another and separated from one another by insulation 3.

Figure 1 shows a crimpable strip 4 which has been applied with a crimping tool (not shown) to a copper strip 5 of the circuit element 10 as shown. The strip 4 pierces the copper strip 5 and makes electrical connection with the edges 1 of the strip 5. The ends of the crimped strip 4 pierce the insulation 3 making a second point of electrical connection at 2. In the crimped state the strip 4 takes the form of a "B"-shape. 7 indicates by hatching that the region may be dished as shown by the full curved line or linear as shown by the dotted line, the linear form also being shown in Figure 6 and 7.

Figure 4 shows the crimped joint denoted by arrow 13 inserted into a conventional printing circuit edge connection socket consisting of a housing 11 with a cantilever spring contact 12.

With the embodiments described and illustrated it will be understood that it is not necessary to remove the insulation 3 (insulation removal often being awkward and inconvenient) which covers the conductive strips 5 in order to terminate the strip 5 onto a conventional printing circuit edge connector.

Figure 5 is not illustrative of the invention but represents conventional practice, a single connecting point 14 being established between a conventional copper strip 5 and a conventional cantilever spring contact 12 of a conventional printed circuit connector socket. By way of comparison a corresponding embodiment illustrative of the invention is shown in Figure 6. A crimped strip 4a comparable to that shown in Figure 1 serves to connect a conventional copper strip 5 with a conventional cantilever spring contact 12. By virtue of the B-shape of the strip 4a two connecting points 14¹ are established. This illustrates that with the use of the crimped joint as specifically described (13) it is possible to increase the number of possible points of electrical connection between members 5 and 12 and thereby improve the current carrying capacity of the crimped joint.

Figure 7 is similar to Figure 6 but the latter is on a larger scale. Channels 15 serve to cool the connecting points 14¹ if they should become overheated. It will be appreciated that the increase in the amount of air around the contacting faces of members 4a and 12 means that more of any heat generated at the contacting faces will be

removed by convection or air circulation.

WHAT WE CLAIM IS:—

1. A method of establishing electrical contact between an elongate electrically insulated conductive strip of uniform cross-section along its width and a socket member having an electrical contact element therein, the method comprising (1) the application of a crimping tool to pierce the insulated conductive strip at two points spaced apart with the ends of a crimpable strip of flexible, resilient, electrically conductive material to make a first electrical connection with the insulated strip and to fold over the passed through ends of the crimpable strip into a region of the insulated strip between the two said piercing points and again to pierce the insulation on the insulated conductive strip to effect a second electrical connection with the insulated strip, and (2) the insertion of the resultant crimped joint into the said socket member whereby at least two electrical connecting points are established between the crimped strip and the said contact element in the socket member.

2. A method according to Claim 1, wherein the crimped strip takes the form of a B-shape with the doubly curved part of the "B"-shape constructed so as to form two electrical connecting points with the said contact element.

3. A method according to any preceding claim, wherein the said contact element is a cantilever spring contact.

4. A method according to any preceding claim, wherein opposite ends of the crimpable strip before crimping are provided with teeth extending in the plane of the crimpable strip.

5. A method according to Claim 5, wherein before crimping parallel serrations projecting perpendicularly to the plane of the crimpable strip and joining the teeth at the ends of the crimpable strip are provided.

6. A method for establishing electrical contact between an electrically insulated conductive strip and a socket member having an electrical contact element therein substantially as herein described with reference to Figures 1—4, 6 and 7 of the drawings filed with the Provisional Specification.

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