COMPRESSION CONNECTOR

FIELD OF INVENTION

The present invention relates broadly to a compression connector, and in the example embodiment in particular to a fine pitch compression connector.

BACKGROUND

The conventionally designed terminal of a compression connector has single deflecting beam as shown in example terminals 100, 102, 103 in Figures 1 A-C. When the contact is loaded with force, the beam flexes and produces reacting force. The amount of reacting forces produced depends on the geometry and material of the terminal.

Terminal design becomes difficult with a fine pitch connector as the fine pitch limits the available width of formed terminal and therefore, the resulting compression force. The optimum required compression force is either difficult to attain or has to be achieved with higher cost, for example using more expensive material or complicated component designs.

In addition, terminal design must take into consideration other related components and processes to ensure the terminal can be manufactured. A good terminal design may not work if the matching housing cannot be produced.

SUMMARY

In accordance with a first aspect of the present invention there is provided a compression connector comprising a housing; and at least one terminal element disposed in the housing; wherein each terminal element comprises at least first and second cantilever segments, each cantilever segment interacting with the housing such that a load is distributed between the two segments when the terminal element is compressed.

A contact segment of the terminal element may be disposed between the first and second cantilever segments.

The terminal element may be shaped such that the first and second cantilever segments define a gap therebetween.

The first and second cantilever segments may be disposed in separate cavities formed in the housing.

Respective support elements for the first and second cantilever segments may each comprise a wall of the respective cavities.

The terminal element may further comprise a link portion disposed between the first and second cantilever segments in a manner such that the link portion is substantially parallel to a compression force direction of the terminal element.

The first cantilever segment may be substantially U-shaped.

The contact segment may be substantially U-shaped.

The terminal element may further comprise a solder tail segment.

The connector may comprise a plurality of terminal elements.

The plurality of terminals may be arranged side by side in the housing.

The first and second cantilever segments of the respective terminal elements may be disposed in respective individual cavities formed in the housing.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will be better understood and readily apparent to one of ordinary skill in the art from the following written description, by way of example only, and in conjunction with the drawings, in which:

Figures 1 A) - C) are illustrations of typical examples of a known compression connector with single deflecting beam.

Figures 2 A) and B) are schematic drawings in side-view and a perspective view respectively of a terminal in an example embodiment.

Figure 3 is a cross-sectional drawing of a housing for the terminal in an example embodiment.

Figures 4 A) and B) are cross-sectional drawings of a compression connector before and after load is applied, respectively, in an example embodiment.

Figure 5 is a sectional drawing of a plurality of terminals arranged side by side in the housing in an example embodiment.

DETAILED DESCRIPTION

Figure 2A shows the design of the terminal 200 for a compression connector in an example embodiment. The terminal 200 comprises two cantilever segments, in the form of first beam segment 202 and a second beam segment 204. The design of the terminal 200 involves bending beam segment 204 backward (against a contact wiping direction) while maintaining a gap 206 between beam segment 202 and beam segment 204. By having this gap 206, ease of manufacture of the terminal 200 is provided as the forming of the terminal 200 can be done without the cantilever segment, i.e. beam segment 204 in the example embodiment, being interfering with the forming tool.

The terminal 200 further comprises a link portion in the form of third beam segment 208 and a contact bend portion 210 which are disposed between beam segment 202 and beam segment 204. The beam segment 208 is held in a manner such that it is substantially parallel to a compression force direction applied to the contact bend 210. The terminal 200 also has a solder tail 212.

The terminal 200 comprises retention barbs 214 which are disposed between first beam segment 202 and solder tail 212. Figure 2B shows a terminal 200 with retention barbs 214 spaced out at a regular distance in an example embodiment. The terminal 200 is made from a conductive material in the example embodiment, e.g. beryllium copper or phosphor bronze, and/or gold plated material. Other conductive materials may be used for manufacturing the terminal in different embodiments.

Figure 3 shows a cross-sectional view of a moulded insulating housing 300 for the terminal 200 in an example embodiment. The housing 300 are made of generic engineering plastics, e.g. Polyphenylene Sulfide (PPS) and Liquid Crystal Polymer (LCP) in the example mebodiment. Other non-conductive materials may be used for manufacturing the housing in different embodiments.

In Figure 3, two different cavities 302 and 304 are seen, in which beam segment 204 and beam segment 202 are received respectively (compare with Figure 2). There is

a slot/recess 306 in the side walls of cavity 304, and the retention barbs 214 are being pushed to fit into the respective slots 306. After being fitted into the slots 306, the retention barbs 214 press against the walls of the slots 306 to secure the terminal 200 within the housing 300.

Figure 4A shows an assembled compression connector 400 in an example embodiment, before a load is applied on the contact bend 402 of the terminal 404. The terminal 404 is disposed in the housing 406. As no load is applied to the terminal 404, beam segments 412 and 414 are in a quiescent state, i.e. the terminal 404 is not deformed.

Figure 4B shows the compression connector 400 in the example embodiment after a load is applied on the contact bend 402 of the terminal 404. Load is applied on the contact bend 402 by pressing the PCB 410 vertically onto the contact bend 402. The load is kept substantially constant by securing the PCB 410 to the compression connector 400 with screws, latches or other fastening means. When the load is applied, both of the beam segments 412 and 414 will interact with the housing 406 by pressing against the housing 406 to produce a reaction force in the example embodiment. The load is thus distributed between beam segment 412 and beam segment 414, which each act as cantilevers around respective support points 415, 413 on the housing 406.

The terminal 404 in the example embodiment is capable of producing higher compression force and also of prevented the terminal 404 from being overly stressed and permanently deformed compared with relying on a single deflecting beam. A feature of the compression connector 400 is that the beam segments 412 and 414 interact as cantilever segments with the housing 406 by pressing against it when load is being applied to the contact bend 402. The terminal 404 and the housing 406 complement each other to provide a feasible and cost effective manufacturing solution for e.g. a fine pitch connector, in the example embodiment.

Figure 5 shows a perspective view, partly in cut-away section, of a plurality of terminals 502 arranged side by side in a housing 504, in an example embodiment. In this embodiment, two rows of cavities e.g. 506, 508, are formed in, and extend through the housing 504. Two beam segments e.g. 512 and 514, received in respective cavities e.g. 506, 508, of each terminal interact as cantilever

segments with the housing 504 by pressing against the housing when load is being applied to the terminal.

In this embodiment, link portions in the form of e.g. beam segments 510 of each terminal e.g. 502 disposed between the two beam segments e.g. 512, 514, are slightly inclined, but a substantially parallel orientation of the beam segments e.g. 510 with respect to a compression force on the terminals 502 is maintained (compare with Figures 4 A) and B)).

It will be appreciated by a person skilled in the art that numerous variations and/or modifications may be made to the present invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects to be illustrative and not restrictive.

For example, it will be appreciated that the present invention is not limited to the shapes of the terminals and/or the housings as shown in the example embodiments. Rather, other shapes can be used in different embodiments, including differently shaped cantilever segments, and/or contact segments, and/or link portions, and/or solder tail segments, and/or cavities.

Furthermore, it will be appreciated that different numbers of terminals may be per housing may be implemented in different embodiments.

CLAIMS

1. A compression connector comprising:

a housing; and

at least one terminal element disposed in the housing;

wherein each terminal element comprises at least first and second cantilever segments, each cantilever segment interacting with the housing such that a load is distributed between the two segments when the terminal element is compressed.

2. The connector as claimed in claim 1, wherein a contact segment of the terminal element is disposed between the first and second cantilever segments.

3. The connector as claimed in claims 1 or 2, wherein the terminal element is shaped such that the first and second cantilever segments define a gap therebetween.

4. The connector as claimed in claims 1 or 3, wherein the first and second cantilever segments are disposed in separate cavities formed in the housing.

5. The connector as claimed in claims 3 or 4, wherein respective support elements for the first and second cantilever segments each comprise a wall of the respective cavities.

6. The connector as claimed in any one of claims 1 to 5, wherein the terminal element further comprises a link portion disposed between the first and second cantilever segments in a manner such that the link portion is substantially parallel to a compression force direction of the terminal element.

7. The connector as claimed in any one of claims 1 to 6, wherein the first cantilever segment is substantially U-shaped.

8. The connector as claimed in claim 2, wherein the contact segment is substantially U-shaped.

9. The connector as claimed in any one of claims 1 to 8, wherein the terminal element further comprises a solder tail segment.

10. The connector as claimed in any one of claims 1 to 9, comprising a plurality of terminal elements.

11. The connector as claimed in claim 10, wherein the plurality of terminals are arranged side by side in the housing.

12. The connector as claimed in claims 10 or 11, wherein the first and second cantilever segments of the respective terminal elements are disposed in respective individual cavities formed in the housing.

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