

PATENT SPECIFICATION

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(54) CABLE CONNECTOR

(71) We, E. I. DU PONT DE NEMOURS AND COMPANY, a corporation organized and existing under the laws of the State of Delaware, located at Wilmington, State of Delaware, United States of America, 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 crimpable electrical connector for a flat conductor cable.

An electrical connector for a flat conductor cable including a base and a platform spaced from but overlying the base is described in USP 3,880,488. The platform has a pair of lances so that on crimping the connecting portion to a flat flexible cable, each lance pierces the insulation and engages a flat conductor in the cable. In this connector, the lances pierce an insulating sheath and a flat conductor encased in the sheath transverse to the plane of the cable supported on the base. Since the lances pierce the insulating sheath and conductor transverse to the plane of the cable, the insulating sheath is not stripped from the conductor and the lances contacting the conductor are not wiped along the surface of the conductor.

Another connecting device for a flat conductor cable is described in USP 3,395,381. In this device, a U-shaped channel includes a web having a pair of lances struck inwardly from a plane of the web. A segment of the web between the lances is coined to prevent the lances from moving back into the plane of the web when the U-shaped walls of the device are crimped and curled to pinch the conductor in engagement with the lances. Although this type of connection provides for stripping the insulation and wiping the lance along a surface of a flat conductor, it provides a pressure contact only at the points of intersection of the edges of the lances and the curled ends of the U-shaped walls.

According to the present invention there

is provided a crimpable electrical connector for a flat conductor cable, having first and second portions facing each other for the reception of a flat conductor cable therebetween, the first portion having a pair of spaced apertures therein, and the second portion having a pair of insulation-rupturing lances extending therefrom in alignment with the apertures so as to extend therethrough upon crimping of the connector, the first portion further comprising a pair of inclined insulation-rupturing lances extending therefrom between the apertures and projecting towards the second portion.

Preferably the first portion includes a first layer and a second layer, the first layer having said apertures therein and said lances extending therefrom and the second layer including an electrical contact extending therefrom, and a window in said second layer opening onto the apertures in the first layer.

An exemplary embodiment of the invention will now be described with reference to the accompanying drawings, wherein:—

Figure 1 is a perspective view of an embodiment of a connector according to the invention.

Figure 2 is a side view of the connector of Figure 1 including an insulating housing and tooling for crimping a flat conductor cable in the connector.

Figure 3 is a fragmentary side view in section similar to Figure 2, but with most of the housing omitted.

Figure 4 is a side view in section similar to Figure 3 illustrating the connector crimped to a flat conductor cable.

A flat conductor connector 10 according to the invention includes a double thickness base 12. A first layer 14 of the base 12 includes a pair of spaced apertures 16. A pair of upwardly projecting lances 18 are inclined at an obtuse angle with a segment of layer 12 between apertures 16. Each lance 18 has a width substantially equal to the width of each aperture 16. A

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second layer 20 of base 12 includes a window 22 opening onto the spaced apertures 16 in layer 14. A mating electrical contact, e.g. a male pin 24 as illustrated in Figure 1 or a female contact as illustrated in phantom in Figure 2, extends from layer 20 of base 12.

An arm 26 is hingedly connected to layer 14 of base 12 by a V-shaped hinge 28. A lance 30 is provided on the free end of arm 26 and a lance 32 is struck from a central portion of arm 26. Each lance 30, 32 is arcuately curved inwardly and includes a coined, work-hardened truncated sharp end 34. End 34 of each lance 30, 32 is in alignment with one of the apertures 16 in layer 14 of base 12.

An insulating housing 40 comprises a mating end 42 and a cable receiving end 44. The mating end 42 includes a cavity 46 for receiving a male or female contact and a base 48 for receiving each connector 10. A cover 52 is hingedly connected to the housing 40 and includes a latch arm 54 at each side of the housing 40. A window 50 is provided in the base 48 of housing 40 for each connector 10.

The fitting of the connector may be readily understood with reference to the drawings and the description below. A plurality of connectors 10 (one illustrated) are mounted in a housing 40. The housing 40 is mounted on lower tooling 60. The lower tooling 60 includes a dished anvil 62 which extends through window 50 in housing 40 and window 22 in layer 20 of base 12 of the connector 10. A flat conductor cable having an insulated sheath I and a plurality of flat conductors C (one illustrated) encased in the sheath I is inserted between the arm 26 and base 12 of the connector 10. Upper tooling 66 is moved downward to operatively engage arm 26, and the arm 26 is moved downward parallel to the base 12 of connector 10. Lances 30, 32 engage the insulated sheath I of the cable against lances 18 projecting upwardly from layer 14 of base 12. Sharp ends 34 of lances 30, 32 pierce the insulation I on one surface of the cable, the conductor C, and the insulation I on the other surface of the conductor C. Ends 34 of lances 30, 32 extend through the aligned apertures 16 and the window 22 in the base 12 and engage the dished anvil 62 of the lower tooling 60. Lances 18 rupture the insulation I on the lower surface of the cable. As the arm 26 engages the opposite surface of the cable, the lances 18 are spread and wiped along the surface of the conductor C. Lances 30, 32 are curled inwardly by anvil 62 and clench the conductor establishing a primary

pressure, electrical contact between each lance 18 and the conductor C of the cable. The inner surface of each lance 30, 32 piercing the conductor C establishes a secondary pressure electrical contact between each lance 30, 32 and the conductor C. The substantially equal width of lances 18 and 30, 32 provide for a pressure contact along the transverse width of the lances. The upper tooling 66 is withdrawn and the hinged cover 52 is closed and the latch arm 54 at each side of the housing 40 snaps over the base 48 of the housing 40. The connectors 10 in the housing provide for connecting the mating end of the housing and contacts mounted therein with a plurality of mating electrical connectors.

WHAT WE CLAIM IS:—

1. A crimpable electrical connector for a flat conductor cable, having first and second portions facing each other for the reception of a flat conductor cable therebetween, the first portion having a pair of spaced apertures therein, and the second portion having a pair of insulation-rupturing lances extending therefrom in alignment with the apertures so as to extend therethrough upon crimping of the connector, the first portion further comprising a pair of inclined insulation-rupturing lances extending therefrom between the apertures and projecting towards the second portion.

2. A connector according to claim 1, wherein said lances extending from the first portion each have a width substantially equal to the width of said apertures.

3. A connector according to claim 1 or 2, wherein each of said lances extending from the first portion extends from the part of the first portion between said apertures at an obtuse angle with that part.

4. A connector according to claim 1, 2 or 3 wherein the first portion includes a first layer and a second layer, the first layer having said apertures therein and said lances extending therefrom and the second layer including an electrical contact extending therefrom, and a window in said second layer opening onto the apertures in the first layer.

5. A connector according to claim 4, said contact being a male terminal.

6. A connector according to claim 4, said contact being a female socket.

7. A connector according to claim 4, 5 or 6 further comprising an insulating housing, said housing including a mating end receiving said contact and a cable-receiving end including a base having a window opening onto said window in said second layer and a cover engageable with



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second layer 20 of base 12 includes a window 22 opening onto the spaced apertures 16 in layer 14. A mating electrical contact, e.g. a male pin 24 as illustrated in Figure 1 or a female contact as illustrated in phantom in Figure 2, extends from layer 20 of base 12.

An arm 26 is hingedly connected to layer 14 of base 12 by a V-shaped hinge 28. A lance 30 is provided on the free end of arm 26 and a lance 32 is struck from a central portion of arm 26. Each lance 30, 32 is arcuately curved inwardly and includes a coined, work-hardened truncated sharp end 34. End 34 of each lance 30, 32 is in alignment with one of the apertures 16 in layer 14 of base 12.

An insulating housing 40 comprises a mating end 42 and a cable receiving end 44. The mating end 42 includes a cavity 46 for receiving a male or female contact and a base 48 for receiving each connector 10. A cover 52 is hingedly connected to the housing 40 and includes a latch arm 54 at each side of the housing 40. A window 50 is provided in the base 48 of housing 40 for each connector 10.

The fitting of the connector may be readily understood with reference to the drawings and the description below. A plurality of connectors 10 (one illustrated) are mounted in a housing 40. The housing 40 is mounted on lower tooling 60. The lower tooling 60 includes a dished anvil 62 which extends through window 50 in housing 40 and window 22 in layer 20 of base 12 of the connector 10. A flat conductor cable having an insulated sheath I and a plurality of flat conductors C (one illustrated) encased in the sheath I is inserted between the arm 26 and base 12 of the connector 10. Upper tooling 66 is moved downward to operatively engage arm 26, and the arm 26 is moved downward parallel to the base 12 of connector 10. Lances 30, 32 engage the insulated sheath I of the cable against lances 18 projecting upwardly from layer 14 of base 12. Sharp ends 34 of lances 30, 32 pierce the insulation I on one surface of the cable, the conductor C, and the insulation I on the other surface of the conductor C. Ends 34 of lances 30, 32 extend through the aligned apertures 16 and the window 22 in the base 12 and engage the dished anvil 62 of the lower tooling 60. Lances 18 rupture the insulation I on the lower surface of the cable. As the arm 26 engages the opposite surface of the cable, the lances 18 are spread and wiped along the surface of the conductor C. Lances 30, 32 are curled inwardly by anvil 62 and clench the conductor establishing a primary

pressure, electrical contact between each lance 18 and the conductor C of the cable. The inner surface of each lance 30, 32 piercing the conductor C establishes a secondary pressure electrical contact between each lance 30, 32 and the conductor C. The substantially equal width of lances 18 and 30, 32 provide for a pressure contact along the transverse width of the lances. The upper tooling 66 is withdrawn and the hinged cover 52 is closed and the latch arm 54 at each side of the housing 40 snaps over the base 48 of the housing 40. The connectors 10 in the housing provide for connecting the mating end of the housing and contacts mounted therein with a plurality of mating electrical connectors.

WHAT WE CLAIM IS:—

1. A crimpable electrical connector for a flat conductor cable, having first and second portions facing each other for the reception of a flat conductor cable therebetween, the first portion having a pair of spaced apertures therein, and the second portion having a pair of insulation-rupturing lances extending therefrom in alignment with the apertures so as to extend therethrough upon crimping of the connector, the first portion further comprising a pair of inclined insulation-rupturing lances extending therefrom between the apertures and projecting towards the second portion.

2. A connector according to claim 1, wherein said lances extending from the first portion each have a width substantially equal to the width of said apertures.

3. A connector according to claim 1 or 2, wherein each of said lances extending from the first portion extends from the part of the first portion between said apertures at an obtuse angle with that part.

4. A connector according to claim 1, 2 or 3 wherein the first portion includes a first layer and a second layer, the first layer having said apertures therein and said lances extending therefrom and the second layer including an electrical contact extending therefrom, and a window in said second layer opening onto the apertures in the first layer.

5. A connector according to claim 4, said contact being a male terminal.

6. A connector according to claim 4, said contact being a female socket.

7. A connector according to claim 4, 5 or 6 further comprising an insulating housing, said housing including a mating end receiving said contact and a cable-receiving end including a base having a window opening onto said window in said second layer and a cover engageable with



said base hingedly connected to said housing.

8. A crimpable electrical connector for a flat conductor cable, substantially as herein described with reference to the accompanying drawings.

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