

PATENT SPECIFICATION

(11)

1 484 761

1 484 761

- (21) Application No. 2862/75 (22) Filed 22 Jan. 1975
 (31) Convention Application No. 7 402 028 (32) Filed 14 Feb. 1974 in
 (33) Netherlands (NL)
 (44) Complete Specification published 8 Sept. 1977
 (51) INT. CL.² H01R 13/02
 (52) Index at acceptance
 H2E 3A12 3A13 3A2 3B1 3B6 3C2A 3C2C
 (72) Inventor LUCAS SOES



(54) IMPROVEMENTS IN AND RELATING TO ELECTRICAL CONNECTORS

(71) We, AMP INCORPORATED, a corporation organised and existing under the laws of the State of New Jersey, of Eisenhower Boulevard, Harrisburg, Pennsylvania, 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 electrical connector assemblies and especially to electrical connector assemblies for use in the electronics industry.

According to the present invention, an electrical connector assembly comprises a forked female contact having a pair of spaced cantilever contact springs extending from a yoke portion with inwardly directed lobes at their free ends receiving a complementary male contact, the male contact including a forward yoke portion with a pair of rearwardly directed, spaced cantilever contact springs diverging rearwardly from the yoke portion towards their free ends, the male contact entering the female contact by outward flexure of the contact springs of the female contact and inward flexure of the contact springs of the male contact, the shape of the contact springs of the male contact being such that they extend rearwardly from the male yoke portion in divergent manner to an outer position and then extend inwardly in convergent manner to be engaged by the lobes of the contact springs of the female contact.

An embodiment of the invention will now be described, by way of example, reference being made to the Figures of the accompanying diagrammatic drawings in which:—

Figure 1 is a perspective view of two electrical connectors which when mated form an electrical connector assembly;

Figure 2 is a side elevation partly in cross-section of the electrical connectors of Figure 1;

Figures 3 and 4 are views similar to Figure 2 but showing the electrical connectors in varying degrees of mating engagement; and

Figure 5 is an enlarged view of a detail of Figure 4.

As shown, an electrical connector assembly includes at least one male electrical contact 1 mounted in a housing 2 and engaging at least one mating female electrical contact 3 mounted in a housing 4.

The male contact 1 which is blanked and formed from sheet metal comprises a forward yoke portion 6 with first and second substantially identical cantilever contact springs 5 diverging rearwardly from the yoke portion 6 towards their free ends. Extending in the same sense from the yoke portion 6 as the contact springs 5 and between the contact springs 5 is a post 7. The yoke portion 6 consists of two limbs 8, each limb 8 connecting a contact spring 5 to the post 7. Each contact spring 5 includes a first part 10 immediately adjacent its associated limb 8 of the yoke portion 6. The first part 10 is angled with respect to the limb 8 and has an outside side surface 11 which diverges with respect to the outside side surface of its opposite part 10 to a position 12 of maximum divergence. A second part 13 of each contact spring 5 has an outside side surface 29 which is generally parallel in the undeformed state of the male contact 1 with the direction of mating of the contacts 1, 3. The second part 13 includes an abutment adjacent the free ends of the contact spring 5 and extending inwardly of the male contact 11 which abutment defines a stop surface 14.

The housing 2 comprises a generally rectangular block of insulating material having upper and lower surfaces 20, 21, as

shown in Figure 1. Alternate slots 22 and abutments 23 are formed on the surfaces 20, 21 and extend from a mating front surface 24 to an opposite rear surface 25.

Through holes 26 are also provided between the surfaces 24, 25, each hole 26 being in alignment with a pair of slots 22.

On assembly of a male contact 1 in a housing 2, the post 7 extends through a hole 26 with a tight fit so that the yoke portion 6 engages the mating forward surface 24 of the housing 2. The contact springs 5 are each received in one of a pair of slots 22. As shown in Figure 2, there is clearance between the base of each slot 22 and its respective contact spring 5.

The female contact 3 which is stamped and formed from sheet metal comprises first and second substantially identical cantilever contact springs 35 extending from a yoke portion 36. Extending from the yoke portion 36 in a sense opposite to that of the contact springs 35 is a post 37. The yoke portion 36 has two limbs 38, each limb 38 connecting a contact spring 35 to a post 37. Each contact spring 35 is relatively wide adjacent its associated limb 38 and tapers to a relatively thin free end 40. At its free end 40, each contact spring 35 has an inwardly directed lobe 41 which defines a contact surface 42. In the undeformed state of the female contact 3 the contact springs 35 are generally parallel with the direction of mating of the contacts 1, 3.

The housing 4 has upper and lower walls 50, 51 (as shown in Figure 1) interconnected by an end wall 52 to define a generally U-channel section. The walls 50, 51, 52 each have a plurality of aligned slots 53, 54, 55 in which female contacts 3 are received. Extending through the end wall 52 is a hole 56.

On assembly of a female contact 3 in a housing 4, the post 37 extends through a hole 56 with a tight fit so that the contact springs 35 are received in slots 53, 55 and the yoke portion 36 is received in the slot 54.

On mating, the housing 2 together with the male contact 1 enters the housing 4 so that the contact surfaces 42 engage and move axially with respect to the outside side surfaces 11 of the first parts 10. The contact springs 5 flex inwardly and the contact springs 35 flex outwardly. At a maximum deflection, as shown in Figure 3, the contact surfaces 42 engage the positions 12 of maximum divergence. Further axial movement of the male contact 1 within the female contact 3 causes the contact surfaces 42 to engage the surfaces 29 as shown in Figure 4.

One advantage of the electrical connector assembly described above is that

the force exerted between a contact spring 5 and a contact spring 35 is transmitted by a contact surface 42 and an outside side surface 29. As can be seen from Figure 4, the force will have a component directed inwardly of the female contact 3 towards the yoke portion 36. This component resists withdrawal of the male contact from the female contact 3.

A further advantage is that a force greater than the normal contact force must be applied to disconnect the male contact 1 from the female contact 3 since the positions 12 are spaced apart farther than the outside side surface 29. This feature acts as a safeguard against any tendency of the contacts to disconnect due to vibration. The upper and lower surfaces 20, 21 of the housing 2 together with the stop surfaces 14 inhibit any likelihood of the contact arms 5 being overstressed.

A still further advantage of both the male and female contacts 1, 3 is that they each have contact springs 5, 35 which can flex about their junctions with their associated limbs 8, 38 whilst the limbs 8, 38 can flex about their junctions with their respective posts 7, 37. This adds to the flexibility of the electrical connector assembly.

WHAT WE CLAIM IS:

1. An electrical connector assembly comprising a forked female contact having a pair of spaced cantilever contact springs extending from a yoke portion with inwardly directed lobes at their free ends receiving complementary male contact, the male contact including a forward yoke portion with a pair of rearwardly directed, spaced cantilever contact springs diverging rearwardly from the yoke portion towards their free ends, the male contact entering the female contact by outward flexure of the contact springs of the female contact and inward flexure of the contact springs of the male contact, the shape of the contact springs of the male contact being such that they extend rearwardly from the male yoke portion in divergent manner to an outer position and then extend inwardly in convergent manner to be engaged by the lobes of the contact springs of the female contact.

2. An assembly as claimed in Claim 1, in which the contact springs of the male contact are substantially identical, each having a first part and a second part, the first part being immediately adjacent the forward yoke portion and including an outside side surface which diverges with respect to the outside side surface of the opposite first part on the opposite contact spring, the second part including an inwardly directed abutment adjacent the free

shown in Figure 1. Alternate slots 22 and abutments 23 are formed on the surfaces 20, 21 and extend from a mating front surface 24 to an opposite rear surface 25. Through holes 26 are also provided between the surfaces 24, 25, each hole 26 being in alignment with a pair of slots 22.

On assembly of a male contact 1 in a housing 2, the post 7 extends through a hole 26 with a tight fit so that the yoke portion 6 engages the mating forward surface 24 of the housing 2. The contact springs 5 are each received in one of a pair of slots 22. As shown in Figure 2, there is clearance between the base of each slot 22 and its respective contact spring 5.

The female contact 3 which is stamped and formed from sheet metal comprises first and second substantially identical cantilever contact springs 35 extending from a yoke portion 36. Extending from the yoke portion 36 in a sense opposite to that of the contact springs 35 is a post 37. The yoke portion 36 has two limbs 38, each limb 38 connecting a contact spring 35 to a post 37. Each contact spring 35 is relatively wide adjacent its associated limb 38 and tapers to a relatively thin free end 40. At its free end 40, each contact spring 35 has an inwardly directed lobe 41 which defines a contact surface 42. In the undeformed state of the female contact 3 the contact springs 35 are generally parallel with the direction of mating of the contacts 1, 3.

The housing 4 has upper and lower walls 50, 51 (as shown in Figure 1) interconnected by an end wall 52 to define a generally U-channel section. The walls 50, 51, 52 each have a plurality of aligned slots 53, 54, 55 in which female contacts 3 are received. Extending through the end wall 52 is a hole 56.

On assembly of a female contact 3 in a housing 4, the post 37 extends through a hole 56 with a tight fit so that the contact springs 35 are received in slots 53, 55 and the yoke portion 36 is received in the slot 54.

On mating, the housing 2 together with the male contact 1 enters the housing 4 so that the contact surfaces 42 engage and move axially with respect to the outside side surfaces 11 of the first parts 10. The contact springs 5 flex inwardly and the contact springs 35 flex outwardly. At a maximum deflection, as shown in Figure 3, the contact surfaces 42 engage the positions 12 of maximum divergence. Further axial movement of the male contact 1 within the female contact 3 causes the contact surfaces 42 to engage the surfaces 29 as shown in Figure 4.

One advantage of the electrical connector assembly described above is that

the force exerted between a contact spring 5 and a contact spring 35 is transmitted by a contact surface 42 and an outside side surface 29. As can be seen from Figure 4, the force will have a component directed 70 inwardly of the female contact 3 towards the yoke portion 36. This component resists withdrawal of the male contact 1 from the female contact 3.

A further advantage is that a force 75 greater than the normal contact force must be applied to disconnect the male contact 1 from the female contact 3 since the positions 12 are spaced apart farther than the outside side surface 29. This feature acts 80 as a safeguard against any tendency of the contacts to disconnect due to vibration. The upper and lower surfaces 20, 21 of the housing 2 together with the stop surfaces 14 inhibit any likelihood of the contact 85 arms 5 being overstressed.

A still further advantage of both the male and female contacts 1, 3 is that they each have contact springs 5, 35 which can flex about their junctions with their associated limbs 8, 38 whilst the limbs 8, 38 can flex about their junctions with their respective posts 7, 37. This adds to the flexibility of the electrical connector assembly. 95

WHAT WE CLAIM IS:

1. An electrical connector assembly comprising a forked female contact having a pair of spaced cantilever contact springs 100 extending from a yoke portion with inwardly directed lobes at their free ends receiving complementary male contact, the male contact including a forward yoke portion with a pair of rearwardly directed, 105 spaced cantilever contact springs diverging rearwardly from the yoke portion towards their free ends, the male contact entering the female contact by outward flexure of the contact springs of the female contact 110 and inward flexure of the contact springs of the male contact, the shape of the contact springs of the male contact being such that they extend rearwardly from the male yoke portion in divergent manner to an 115 outer position and then extend inwardly in convergent manner to be engaged by the lobes of the contact springs of the female contact.

2. An assembly as claimed in Claim 1, 120 in which the contact springs of the male contact are substantially identical, each having a first part and a second part, the first part being immediately adjacent the forward yoke portion and including an out- 125 side side surface which diverges with respect to the outside side surface of the opposite first part on the opposite contact spring, the second part including an inwardly directed abutment adjacent the free 130





(12)

end of the contact spring which abutment defines a stop surface.

3. An assembly as claimed in Claim 1 or 2, in which a post extends from the forward yoke portion of the male contact between the contact springs, the forward yoke portion consisting of two limbs, each limb connecting a contact spring to the post.

10 4. An assembly as claimed in Claim 3, in which each contact spring of the male contact flexes about its junction with the limb of the forward yoke portion and the limb of the forward yoke portion also flexes about its junction with the post.

15 5. An assembly as claimed in Claim 3 or 4, in which a plurality of female con-

tacts are mounted in a first insulating housing and a plurality of male contacts are mounted in a second insulating housing, the post of each male contact passing through a hole in the second insulating housing the contact springs of the male contacts extending from the forward yoke portion into slots on opposite surfaces of the second insulating housing.

6. An electrical connector assembly constructed and arranged substantially as herein described, with reference to and as illustrated in the Figures of the accompanying drawings.

For the Applicants:

R. G. STUART-PRINCE
Chartered Patent Agent