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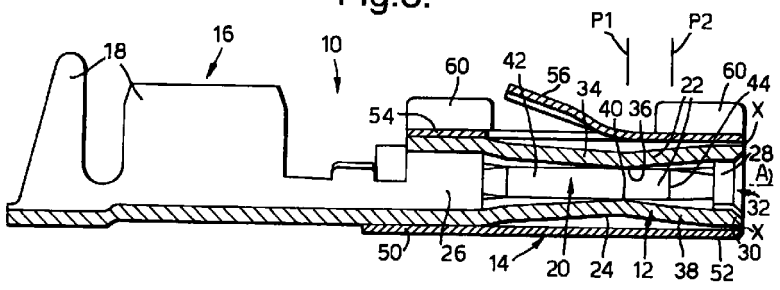
(54) Electrical female terminal

(57) An electrical female terminal (10), for mating with an electrical terminal pin, comprising a socket member (12) and a sleeve (14) substantially surrounding the socket member; wherein the socket member is substantially tubular with a longitudinal axis (A) and comprises first and second pairs of spring arms (22,24) which extend in the longitudinal direction to define walls of a bore (20) for receiving the terminal pin; an annular member (26) at one end of the bore connected with the spring arms; a first arcuate member (28) at the other end of the bore connected to the first pair of spring arms; and a second arcuate member (30) at the other end of bore connected to the second pair of spring arms; the first and second arcuate members defining an opening (32) which is substantially circular through which the terminal pin can pass; first spring arms (34,38) of the first and second pairs of spring arms being bent inwardly to define opposed contact edges (36,40); second spring arms (42,46) of the first and second pair of spring arms being bent inwardly to define opposed contact edges (44,48); the contact edges of the first spring arms lying in a first plane (P1) substantially perpendicular to the longitudinal axis; the contact edges of the second spring arms lying in a second plane (P2) substantially perpendicular to the longitudinal axis and axially spaced from the first plane; and wherein the sleeve engages the annular member at one end (50) and has a predetermined minimum clearance (X) with the arcuate members at the other end (52). Reduces the force required to insert the terminal pin.

Fig.3.



EP 0 986 140 A2

Description

Technical Field

[0001] The present invention relates to an electrical female terminal for mating with an electrical terminal pin.

Background of the Invention

[0002] EP-A-0390865 describes an electrical female terminal which comprises a socket member integral with a crimp portion, and a sleeve which surrounds the socket member. The socket member is tubular and has a longitudinally extending bore having a rectangular cross-section, with a rectangular opening at the end remote from the crimp portion, for receiving an electrical pin. The bore is defined by four longitudinally extending spring arms, which are bent to provide contact edges adjacent the opening. The contact edges of the four spring arms are aligned in the same plane. Adjacent pairs of spring arms are joined at the opening. This known female terminal generates a high engagement force between the female terminal and the electrical pin during insertion of the pin.

Summary of the Invention

[0003] It is an object of the present invention to overcome the above mentioned disadvantage.

[0004] An electrical female terminal in accordance with the present invention, for mating with an electrical terminal pin, comprises a socket member and a sleeve substantially surrounding the socket member; wherein the socket member is substantially tubular with a longitudinal axis and comprises first and second pairs of spring arms which extend in the longitudinal direction to define walls of a bore for receiving the terminal pin; an annular member at one end of the bore connected with the spring arms; a first arcuate member at the other end of the bore connected to the first pair of spring arms; and a second arcuate member at the other end of bore connected to the second pair of spring arms; the first and second arcuate members defining an opening which is substantially circular through which the terminal pin can pass; a first spring arm of the first pair of spring arms being bent inwardly to define a contact edge; a first spring arm of the second pair of spring arms being bent inwardly to define a contact edge opposed the contact edge of the first spring arm of the first pair of spring arms; a second spring arm of the first pair of spring arms being bent inwardly to define a contact edge; a second spring arm of the second pair of spring arms being bent inwardly to define a contact edge opposed the contact edge of the second spring arm of the first pair of spring arms; the contact edges of the first spring arms lying in a first plane substantially perpendicular to the longitudinal axis; the contact edges of the second spring arms lying in a second plane substantially perpendicular to the longitudinal axis and axially spaced from the first plane; and wherein the sleeve engages the annular member at one end and has a predetermined minimum clearance with the arcuate members at the other end.

[0005] The spacing of the planes of the contact edges reduces the force required to insert the terminal pin.

Brief Description of the Drawings

[0006] The present invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a perspective view of a first embodiment of electrical female terminal in accordance with the present invention;
Figure 2 is an end view of the female terminal of Figure 1;
Figure 3 is a cross-sectional view on the line III-III of Figure 2;
Figure 4 is a top view of the female terminal of Figure 1;
Figure 5 is a side view of the female terminal of Figure 1; and
Figure 6 is a perspective view of a second embodiment of electrical female terminal in accordance with the present invention.

Description of the Preferred Embodiment

[0007] Referring to Figures 1 to 5, the first embodiment of electrical female terminal 10 comprises a socket member 12 and a sleeve 14 which substantially surrounds the socket member. The socket member 12 is stamped and folded from sheet metal and is integrally connected with a crimp portion 16. The crimp portion 16 comprises a number of arms 18 which can be bent over, in use, to mechanically and electrically connect with an electrical conductor (not shown) in the usual manner.

[0008] The socket member 12 is substantially tubular and has a bore 20 with a longitudinal axis A. The walls of the bore 20 are defined by first and second pairs of spring arms 22,24, respectively, which extend in the longitudinal direction. At the end of the socket member 12 adjacent the crimp portion 16, the spring arms 22,24 are integrally connected by an annular member 26. At the end of the socket member 12 remote from the crimp portion 16, the first pair of spring arms 22 are integrally connected by a first arcuate member 28, and the second pair of spring arms 24 are integrally connected by a second arcuate member 30. The first and second arcuate members 28,30 define an opening 32 to the bore 20 which is substantially circular in shape and centred on the axis A.

[0009] The first spring arm 34 of the first pair 22 is bent inwardly towards the axis A to define a contact

edge 36 which extends substantially perpendicular to the axis. The first spring arm 38 of the second pair 24 is bent inwardly towards the axis A to define a contact edge 40 which extends substantially perpendicular to the axis. The second spring arm 42 of the first pair 22 is bent inwardly towards the axis A to define a contact edge 44 which extends substantially perpendicular to the axis. The second spring arm 46 of the second pair 24 is bent inwardly towards the axis A to define a contact edge 48 which extends substantially perpendicular to the axis. The first spring arms 34,38 are substantially opposed one another on either side of the axis A. The contact edges 36,40 of the first spring arms 34,38 are aligned in a first plane P1 which extends substantially perpendicular to the axis A. The second spring arms 42,46 are substantially opposed one another on either side of the axis A. The contact edges 44,48 of the second spring arms 42,46 are aligned in a second plane P2 which extends substantially perpendicular to the axis A. The first and second planes P1,P2 are spaced apart along the axis A, with the second plane being positioned nearer the opening 32 to the bore 20.

[0010] Each spring arm 34,38,42,46 is substantially rectangular in cross-section on either side of its respective contact edge 36,40,44,48, but becomes arcuate (relative to axis A) at the transition to the annular member 26 and to the respective arcuate member 28,30. The bore 20 therefore has a substantially rectangular cross-section for the majority of its axial length with a substantially circular cross-section at either end. The contact edges 36,40,44,48 are substantially straight (as shown in Figure 2).

[0011] The sleeve 14 is separately formed from the socket member 12 and is substantially square in cross-section. The sleeve 14 is stamped and folded from sheet metal, and then slid into position around the socket member 12. At one end 50 of the sleeve 14, the sleeve engages the outer surface of the annular member 26 of the socket member 12. At the other end 52 of the sleeve 14, in the relaxed state of the terminal 10 as shown, a predetermined minimum clearance X is provided between the sleeve and the first and second arcuate members 28,30. One of the walls 54 of the sleeve 14 has an integrally formed, outwardly directed, resilient latch tongue 56 formed therein. The latch tongue 56 is preferably substantially U-shaped in cross-section. The latch tongue 56 is used to retain the female terminal 10 when positioned in a terminal housing (not shown). Another of the walls 58 of the sleeve 14 is formed with a projecting tab or tabs 60 for ensuring correct alignment of the female terminal 10 when positioned in the terminal housing.

[0012] In use, an electrical male terminal pin (not shown) is inserted into the bore 20 of the female terminal 10 through the opening 32, and engages the spring arms 34,38,42,46. During insertion of the terminal pin, the pin initially engages the contact edges 44,48 of the second spring arms 42,46, and then on further insertion engages the contact edges 36,40 of the first spring arms 34,38. Because of the shape of the opening 32 and the cross-sectional shape of the bore 20, the female terminal 10 is suitable for mating with a terminal pin having a square or a round cross-sectional shape. The axial spacing of the planes P1 and P2 of the contact edges 36,40 and 44,48 reduces the force required to insert the terminal pin when compared to similar female terminals having contact edges lying in the same plane. The sleeve 14 restricts the radial outward movement of the spring arms 34,38,42,46 during insertion of the terminal pin. The cross-sectional shape of the bore 20, and the arrangement of the spring arms 34,38,42,46, substantially prevents an increase in insertion force when the terminal pin is not aligned on the axis A during mating.

[0013] The second embodiment of electrical female terminal 100 shown in Figure 6 comprises a socket member 112 with an integral crimp portion 116 which are substantially the same as the socket member 12 and crimp portion 16 of the first embodiment of female terminal 10 described above. In the second embodiment, the sleeve 114 is substantially round in cross-section and substantially surrounds the socket member 112 with a minimum clearance at the open end 132 of the socket member.

Claims

1. An electrical female terminal (10), for mating with an electrical terminal pin, comprising a socket member (12) and a sleeve (14) substantially surrounding the socket member; wherein the socket member is substantially tubular with a longitudinal axis (A) and comprises first and second pairs of spring arms (22,24) which extend in the longitudinal direction to define walls of a bore (20) for receiving the terminal pin; an annular member (26) at one end of the bore connected with the spring arms; a first arcuate member (28) at the other end of the bore connected to the first pair of spring arms; and a second arcuate member (30) at the other end of bore connected to the second pair of spring arms; the first and second arcuate members defining an opening (32) which is substantially circular through which the terminal pin can pass; a first spring arm (34) of the first pair of spring arms being bent inwardly to define a contact edge (36); a first spring arm (38) of the second pair of spring arms being bent inwardly to define a contact edge (40) opposed the contact edge of the first spring arm of the first pair of spring arms; a second spring arm (42) of the first pair of spring arms being bent inwardly to define a contact edge (44); a second spring arm (46) of the second pair of spring arms being bent inwardly to define a contact edge (48) opposed the contact edge of the second spring arm of the first pair of spring arms; the contact edges of

the first spring arms lying in a first plane (P1) substantially perpendicular to the longitudinal axis; the contact edges of the second spring arms lying in a second plane (P2) substantially perpendicular to the longitudinal axis and axially spaced from the first plane; and wherein the sleeve engages the annular member at one end (50) and has a predetermined minimum clearance (X) with the arcuate members at the other end (52).

2. An electrical female terminal as claimed in Claim 1, wherein the contact edges (36,40,44,48) extend substantially perpendicular to the longitudinal axis (A).

3. An electrical female terminal as claimed in Claim 1 or Claim 2, wherein the contact edges (36,40,44,48) are substantially straight.

4. An electrical female terminal as claimed in anyone of Claims 1 to 3, wherein the spring arms (34,38,42,46) are shaped such that the bore (20) has a substantially circular cross-section at either end and a substantially rectangular cross-section between the ends.

5. An electrical female terminal as claimed in any one of Claims 1 to 4, wherein the sleeve (14) is substantially square in cross-section.

6. An electrical female terminal as claimed in Claim 5, wherein one of the walls (54) of the sleeve (14) has an integrally formed, outwardly extending, resilient latch tongue (56).

7. An electrical female terminal as claimed in Claim 5 or Claim 6, wherein one of the walls (58) of the sleeve (14) has a projecting tab (60).

8. An electrical female terminal as claimed in any one of Claims 1 to 4, wherein the sleeve (114) is substantially round in cross-section.

Fig.1.

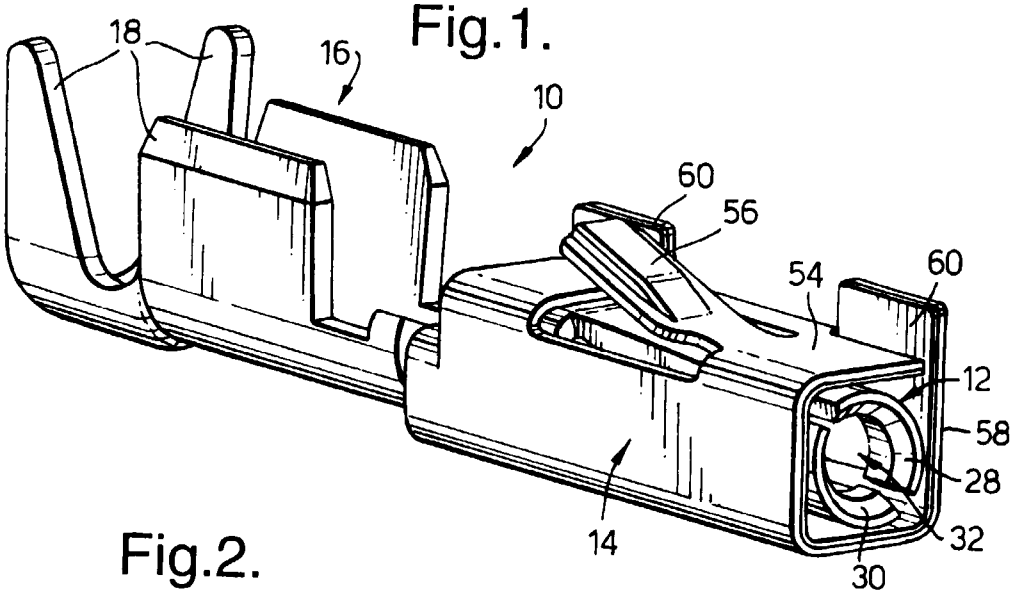


Fig.2.

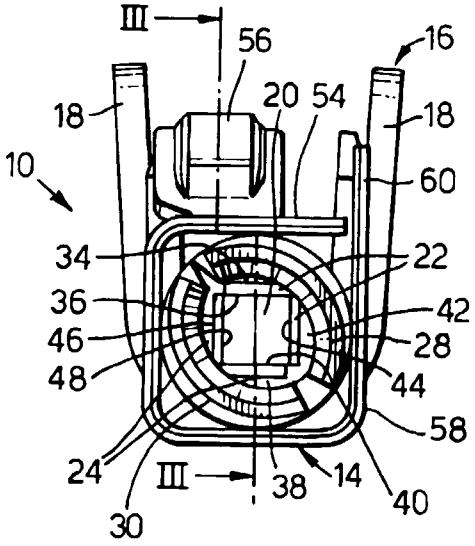


Fig.3.

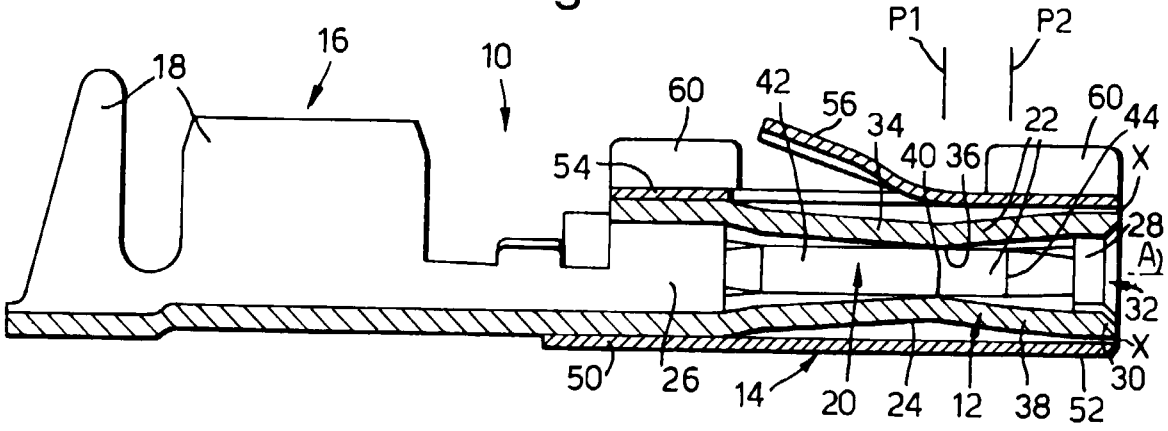


Fig.4.

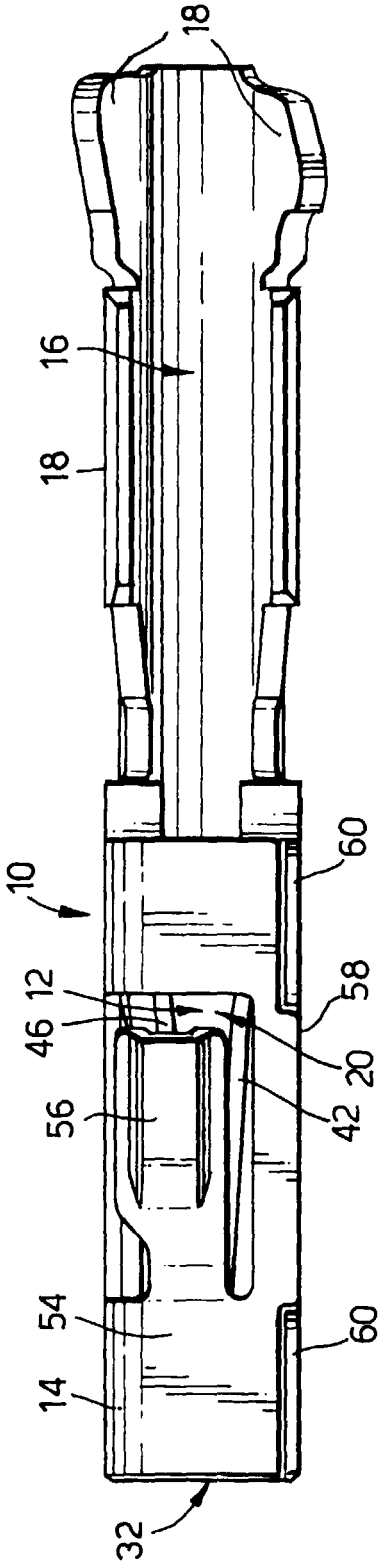

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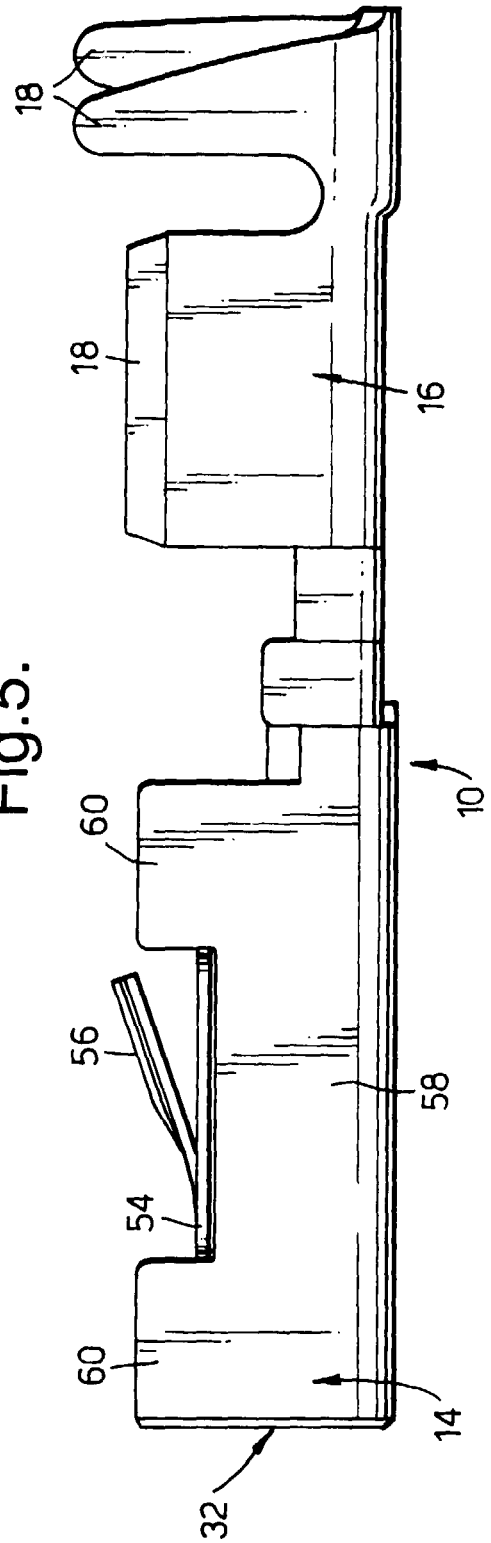
Fig.5.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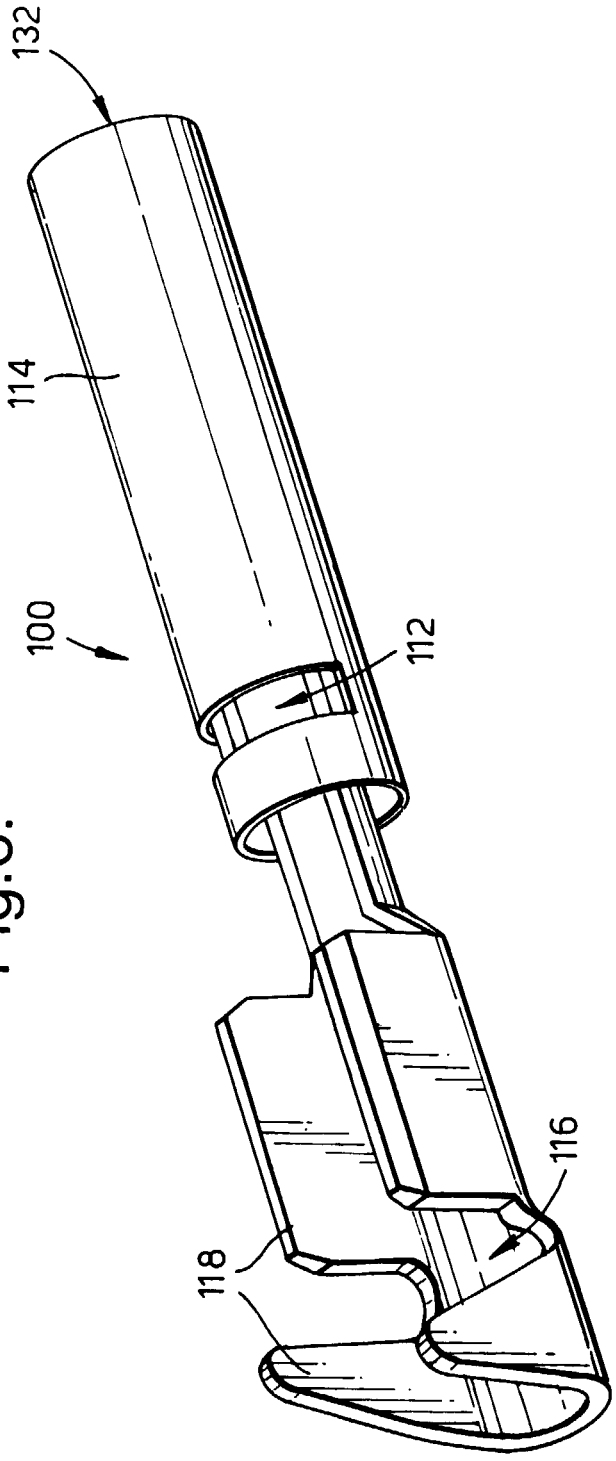

Fig.6.