

# PATENT SPECIFICATION (11)

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## (54) ELECTRICAL CONNECTOR

(71) We, AMP INCORPORATED, a corporation organised and existing under the laws of the State of New Jersey, United States of America, of Eisenhower Boulevard, Harrisburg, State of 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:—

This invention relates to an electrical component of the type which has a housing holding slotted plate contact members adapted to pierce the insulation of wires forced into slots in the contact members and effect electrical connection between the contact members and the wire cores. The invention also relates to a tear strip feature which is useful in such a component.

The present invention is an electrical component comprising a housing of electrically insulating material in which is secured a plurality of contact members each of which has at least one slotted plate portion, a housing cover which has means for securing the cover to the housing, a plurality of wire carriers respectively slidably mounted in through holes of the cover and movable relative to the cover from a retracted position to an inserted position, each wire carrier having at least one wire-receiving bore and a transverse groove intersecting the bore, the transverse groove being aligned respectively with a slotted plate portion such that on movement of the wire carrier to the inserted position a wire being carried is forced into the slot in the respective slotted plate portion where the wire insulation is sliced and the wire core is electrically connected to the respective slotted plate portion.

An embodiment of the present invention will now be described, by way of example, with reference to the drawings, in which:—

Figure 1 is an exploded rear perspective view of a duplex receptacle;

Figure 2 is a rear perspective view of the receptacle of Figure 1 showing the receptacle closed and connected to the wires of a cable;

Figure 3 is an enlarged fragmentary perspective view showing details of the receptacle;

Figure 4 is an enlarged partial side view of the receptacle;

Figure 5 is a fragmentary view similar to Figure 4 but showing also two wires which have been terminated by the receptacle;

Figure 6 is a fragmentary sectional view taken on line 6—6 of Figure 5;

Figure 7 is a fragmentary sectional view taken on line 7—7 of Figure 5; and

Figure 8 is a partial transverse vertical sectional view through the receptacle showing a further detail.

The duplex receptacle comprises a housing 10, contact members 12, 14, a ground contact member 16, and a back cover 18. The housing 10 includes a longitudinally extending central channel 20 which receives the ground contact member 16. On either side of the central channel there is a profiled recess 22, 24 each of which receives a contact member 12, 14, respectively, therein. The contact members 12, 14 and the recesses 22, 24 are substantially identical in configuration and therefore only the contact member 12 and the recess 22 will be described in detail. Two pairs of wire access openings 26, 28 lead to profiled end cavities 30, 32, respectively, of the recess 22. The cavities 30, 32 are interconnected by a narrow passage 34. A pair of spaced walls 36, 38 define therebetween a slot 40 opening into the passage 34. An additional ground wire opening 42 is formed in one side wall adjacent one end of the housing 10 to provide access for connection of a ground wire to the ground contact member 16. The housing 10 is further provided at each end with locking detents 44 and with locking detents 46 in the central channel 20.

Each contact member comprises two basic terminal units 48, 50 joined together by a removable tear strip portion 51 which includes a pull tab 52, and each comprising a socket portion 54 or 56 for engaging a pin of an electrical plug (not shown) and a portion 58 or 60 for terminating wires. Each wire termination portion 58 or 60 includes

two insulation piercing slots 62, 64 or 66, 68.

5 The ground contact member 16 includes a yoke frame 70 and a plate portion 72 extending normally with respect to the plane of the yoke frame 70 and including a ground wire receiving slot 74. A pair of ground sockets 76 and 78 are assembled with the yoke frame and adapted to receive ground pins of electrical plugs (not shown) inserted into the receptacle. The ends of the yoke include apertured mounting flanges 80, 82.

10 The back cover 18 is an integral member having identical wire carriers or stuffers 84, 86, 88, 90 and a ground wire stuffer 92. Since the wire carriers 84, 86, 88, 90 are identical and the ground wire carrying member is very similar, only wire carriers 84 will be described in detail. The wire carrier 84 is integrally attached to the cover 18 by resilient straps 94, 96 which permit the wire carrier 84 to be moved normally with respect to the back cover 18 in a slot 95 in the cover 18. The inherent resilience of the straps 94 and 96 maintains the wire carrier 84 in the retracted or 'out' position of Figures 1 and 4. The top surface of the cover 18 is formed with inclined surfaces 98 and 100 on opposite sides of the slot 95. The wire carrier 84 includes a pair of oppositely directed, inclined grooves 102, 104 which, when the wire carrier 84 is in the inserted or 'down' position, as shown in Figures 2 and 5, align approximately with the inclined surfaces 98, 100 respectively. The wire carrier 84 includes first and second blind bores 106, 108 and a transverse channel 110 (seen in Figures 6 and 7) intersecting both bores. The cover 18 further includes end locking lances 112 depending one from each corner for engaging respectively the detents 44 of the housing 10 and a pair of central locking lances 114, as shown in Figure 8, for engaging respectively the detents 46 of the housing 10.

45 The receptacle is assembled as follows: the contact members 12 and 14 are inserted into the respective recesses 22 and 24, the ground contact member 16 is inserted into the central channel 20 and back cover 18 is assembled with the housing by bringing the central 114 and end 112 locking lances into engagement with the corresponding locking detents 46 and 44, respectively.

50 A wire is terminated by the receptacle as follows. With the wire carrier 84 in the retracted or 'out' position as shown in Figure 4, an unstripped wire 116 may be inserted along a wire access opening 28 and into a blind bore 106 or 108. When the wire has been pushed to the end of the bore, the wire carrier 84 is pushed inwardly relative to the cover 18 against the resilience of the straps 94 and 96 to force the wire 116 into the insulation piercing slot 66 or 68 of the contact member 12. It is noted with

particular reference to Figure 6 that the wire termination portion 60 of the contact member 12, which portion 60 contains the insulation piercing slots 66 and 68, is received in the transverse channel 110 of the wire carrier 84. In the fully inserted or 'in' position of the wire carrier 84 as shown in Figures 2, 5 and 6 the sides of the insulation piercing slot 68 have sliced through the insulation of the wire 116 and bite into the conductive core, as best seen in Figure 7, to establish good electrical and mechanical connection between the wire 116 and the contact member 12.

Figure 2 shows current carrying wires 116 and 118 of a cable 120 terminating in the receptacle after insertion into wire carriers 84 and 90 and a ground wire 122 of the cable terminated in the receptacle after insertion into the wire carrier 92. This is a typical application of the present invention but it should be noted that, instead of a cable, separate wires passing through a conduit or any similar arrangement could equally well be terminated. It should also be noted that, although the embodiment described is capable of terminating up to eight wires, the receptacle could be adapted to handle any desired number of wires. Furthermore, although the embodiment described is a receptacle, the present invention could just as well be embodied in, e.g. a switch, a bus bar or a splice.

After a wire carrier has been pushed in to terminate a wire, the wire carrier remains in the inserted position because of the tight mechanical connection between the terminated wire and the slot of the contact member. However, it is possible to retract the wire carrier in order to exchange the wire. This is accomplished by inserting the tip of a screwdriver or similar instrument into one of the grooves 102 and 104 of the wire carrier and prising the wire carrier in a direction out of the slot 95 in the cover 18 using leverage from the adjacent inclined surface 98 or 100.

Each contact member 12 or 14 can be completely separated into its two basic terminal units 48 and 50 should it be desired to have each of the two outlet sockets of the receptacle electrically separate. In order to do this the removable tear strip portion 51 adjacent the pull tab 52 best shown in Figures 1, 3 and 4 must be removed. The tab 52 is struck from the contact member 12 or 14 for only a short length. It is unnecessary to provide scores, bends or indentations on the adjacent part of the contact member to simplify removal of the adjacent part for the following reason. The adjacent part is constrained in the passage 34 against the ends of the spaced walls 36 and 38 of the housing 10. When a pair of pliers (not shown) is inserted into the slot 40 and the

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tab 52 gripped and pulled the walls 36 and 38 act as shear surfaces aligned with the edges of the tab 52 thus causing the tear strip portion 51 to be torn completely through. It has been found that a very low force in the range of 15 to 25 pounds for conventional 0.020 inch-stock of a suitable metal such as phosphor bronze or brass alloy is necessary to effect this separation.

WHAT WE CLAIM IS:—

1. An electrical component comprising a housing of electrically insulating material in which is secured a plurality of contact members each of which has at least one slotted plate portion, a housing cover which has means for securing the cover to the housing, a plurality of wire carriers respectively slidably mounted in through holes of the cover and movable relative to the cover from a retracted position to an inserted position, each wire carrier having at least one wire-receiving bore and a transverse groove intersecting the bore, the transverse groove being aligned respectively with a slotted plate portion such that on movement of the wire carrier to the inserted position a wire being carried is forced into the slot in the respective slotted plate portion where the wire insulation is sliced and the wire core is electrically connected to the respective slotted plate portion.

2. An electrical component as claimed in claim 1, in which the wire carriers are integrally connected respectively to the cover by means of flexible straps.

3. An electrical component as claimed in claim 2, in which the straps resiliently bias the wire carriers to a retracted position.

4. An electrical component as claimed in claim 1, 2 or 3, in which each wire carrier has at least one lateral groove accessible from the outer surface of the cover when the wire carrier is in its inserted position.

5. An electrical component as claimed in any preceding claim, in which the bore in each wire carrier is a blind bore.

6. An electrical component as claimed in any preceding claim, in which the contact members comprise at least two basic terminal units integrally joined together by a tear strip portion including a pull tab, and the housing includes a slot giving access to the pull tab and defining a pair of shear surfaces for the tear strip portion.

7. An electrical component as claimed in any preceding claim, in the form of a duplex receptacle.

8. An electrical component substantially as described with reference to the drawings.

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