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SNAP-ON PIGTAIL CONNECTOR

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4 Claims. (Cl. 174—87)

The invention relates in general to a shielded pigtail connector of the type wherein the ends of electric conductors are grouped together to form a splice, the splice secured within the bore of a metal sleeve functioning as a connector and the preformed unit so formed replaceably contained within a shielding cap or other form of guard formed of an insulating material.

The present disclosure constitutes a development of the disclosure in the pending application of Martin D. Bergan, for "Two-Part Pigtail Wire Splice," Serial No. 441,211, filed July 6, 1954, featuring a similar form of two-part pigtail connector where the two parts of the insulating shield are screwed together.

An objection has been raised to this form of screw-on connection in that it takes time to assemble the two parts of the shield and care must be exercised to make sure that the screw parts smoothly engage before the required powerful turning torque is applied. Unless the screw parts are jammed tight there is an ever-present tendency for the parts to unscrew accidentally, especially under the vibration to which such pigtail connectors are often subjected while in use.

The primary object of the invention is to retain the advantages of the two-part pigtail connector disclosed in the above-identified Bergan application and at the same time provide a locking connection between the parts which can be effected quickly and which will tend to resist accidental separation of the two parts of the shield.

Broadly, this objective is attained, first, by forming the two parts of the shield of an insulating material, pre-molded to shape and which is elastic, particularly in the portions thereof which form the joint between the two parts, and, second, by locking the parts together by a form of snap-fastener of the type which will utilize the resiliency of the elastic material to resist accidental un-locking of the assembled parts while permitting a forceful separation of the parts when necessary, as, for instance, to permit an inspection of the pigtail housed therein.

Various other objects and advantages of the invention will be in part obvious from an inspection of the accompanying drawings and in part will be more fully set forth in the following particular description of one form of pigtail connector embodying the invention, and the invention also consists in certain new and novel features of construction and combination of parts hereinafter set forth and claimed.

In the accompanying drawings:

Fig. 1 is an exploded view in axial section through a preferred embodiment of the invention with the component parts of the shield separated, constituting an article of manufacture and free of the pigtail for which it is intended;

Fig. 2 is a view of the two parts shown in Fig. 1 assembled in interlocked relation with the metal sleeve crimped onto a pigtail; and

Fig. 3 is a showing somewhat enlarged from the showing in Fig. 2 of the interlocking of the two parts of the

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shield and showing how the present connector tends to avoid forming a tracking path with a grounding cable shown in ghost outline.

The pigtail connector forms an article of manufacture complete as shown in Fig. 1 and is formed of the two parts, a body portion or male element 10 and a closure cap 11 forming a coacting female element. The body portion 10 has an inner or intruding end 12 of reduced diameter with its cross section of material reducing from the end 12 towards its other end to form a wall 13 of a skirt 14 having a larger entrance opening 15.

Initially the body portion 10 and the cap 11 have about the same external diameter in their widest portions, as shown in Fig. 1.

A long sleeve 17 of ductile metal has one end 18 embedded in the plastic material forming the thickened end 13 of the body portion, thus forming a permanent interlock between the body portion and the crimpable sleeve 17. The cylindrical end portion 19 of the sleeve 17 which projects beyond the body portion is exposed, in the absence of the closure cap 11, to facilitate the crimping of the sleeve onto a pigtail therein, as shown in Fig. 2.

In the manufacture of the body portion the insulating material is molded about the anchoring end 18 so that the metal sleeve is secured in place plastically.

In the instant case the sleeve 17 is made of either commercial bronze or copper. The two parts 10 and 11 of the insulating shield are each made of a rubber-like material having at least a slight degree of radial flexibility at their adjacent end portions forming the illustrated snap-fastener type of interlock. In the instant case the two parts of the shield are each molded from a thermoplastic material.

The lower open end of the cap 11 terminates in a locking flange 20 which projects outwardly at an angle from the inner edge of a stop shoulder 21. The lower edge of the flange 20 is of bulbous form and provides a rounded edge 22 to facilitate its entrance into a locking groove 23 formed in the upper face 24 of the body portion. The flange at its root end is of less cross section than at its free edge and this forms a neck 25 of reduced cross section.

The elastic flange 20 as shown in Fig. 1 extends at an angle of about 30 degrees with the axis $a-b$ of the cap and underlaps the stop shoulder 21. In effect the flange 20 is hingedly connected to the balance of the cap at its upper or root end and is biased to return elastically to its molded form as shown in Fig. 1 when displaced inwardly as shown in Figs. 2 and 3 and when the displacing force is removed.

The locking groove 23 for receiving the flange 20 has a cross section similar in contour and dimensions to that of the flange 20. It is to be noted, however, that the locking groove 23 as shown in Fig. 1 is inclined towards the axis $a-b$ from the normally distended position of the flange 20, but with the open end of the groove formed on a smaller radius than the leading edge 22 of the flange so that when the cap is lowered axially from the position shown in Fig. 1 the locking flange must be forced axially into the groove with a radial deformation and tensioning of the flange and the outer wall of the groove 23, as hereinafter described.

The upper face 24 of the body portion exteriorly of the intruding end 12 and of the groove 23 is flat and when the parts are assembled as shown in Figs. 2 and 3 forms with the shoulder 21 a tight joint 26. The part of the upper end of the body which outlines the groove 23 forms an outwardly distensible resilient band 27 shown somewhat exaggerated in Figs. 2 and 3.

In operation, with the cap displaced, the stripped-back ends A of a plurality of wires B are twisted into a bundle

C, the bundle inserted into the sleeve 17 and the sleeve crimped onto the bundle with indentations D, following conventional practices in this respect.

The cap is then squeezed and its flange forced axially progressively with an accompanying rotary wringing action onto the body from the position shown in Fig. 1 into the position shown in Figs. 2 and 3, until the flange 20 has been intruded into the groove 23 and finally slides into position.

As the flange 20 is forced into the groove 23 two things occur: The flange is bent or strained progressively inwardly at least in part and the outer wall portion 27 correspondingly dilated outwardly whereby plastic memory develops with a tendency to bind inwardly on the flange in a radial direction perpendicular to the axis $a-b$, as indicated by the long arrow in Fig. 3.

The flange swings about its neck 25 inwardly and assumes in the case illustrated an angle of about 27 degrees with the axis $a-b$ thus placing the flange 20 under elastic tension biased to return outwardly to its initial position. This creates a reaction between the flange and the resilient band 27 in the angled direction of the small arrow in Fig. 3 and tends in its axial force component to close the joint 26 firmly. This locks together the body portion and its cap and resists their accidental separation.

In the event it is desired to remove the cap for any reason, as to inspect the connection of the sleeve 17 with the wires B, a forceful separation, preferably by rocking the cap on the body portion across the joint 26, will effect a withdrawal of cap from the balance of the assembly and thus permit the parts to be released from tension and to return resiliently to their respective molded contours, as shown in Fig. 1.

In the illustrated disclosure the dilating of the outer wall portion 27 forms an external projection 28 which assists in keeping possible grounding conductors, such as is shown in ghost outline at E, away from the outer edge of the joint 26.

In connectors of the type disclosed there is always the possibility of tracking or otherwise grounding along a surface of an insulator through a conductor external to the device. In the instant case the path between such an external conductor E and the sleeve 17 is prolonged by virtue of the presence of the flange 20 so that the distance from the exposed point F at the outer perimeter of the joint 26 to the point G on the housed sleeve is much longer than it otherwise might be and in this way the possibility of forming a leakage path between the conductor E and the sleeve 17 is very much eliminated.

The portion of the intruding end 21 which lies between the groove 23 and the shell 19 is squeezed upwardly by the flange 20, thus increasing slightly the length of the possible tracking path F—G as shown in heavy lines in Fig. 3.

By means of a snap-lock fastener of the type herein disclosed it is possible to secure the cap onto the body portion quickly simply by forcing the cap into position axially and thus avoid the long rotation necessary with devices of the screw-on type. The disclosure particularly features a form of snap-on connection between the cap and body portion which by reason of the resiliency of the parts forming the joint will automatically seal the joint therebetween in all portions thereof. This tends also to defeat the infiltration of water or moisture at the joint.

I claim:

1. A pigtail connector comprising a molded body member of resilient plastic material having an opening extending axially therethrough and an annular recess concentric with said opening in one end face thereof, a cylindrical sleeve of malleable metal concentric with and radially inward of said recess, said sleeve being bonded at one end thereof in the recessed end of said body member and thereat connected with said opening and extending axially from said recessed end face, and a cap of resilient plastic material for housing the extending portion of said sleeve having an open end portion comprising an annular flange of cross-sectional contour substantially identical with that of said annular recess and dimensioned for forced insertion therein, said flange having radial dimensions greater than the corresponding radial dimensions of the entrance to said recess whereby upon insertion into said recess the wall defining said flange will be deformed radially inwardly and the wall defining said recess deformed radially outwardly to provide a yieldable locking engagement between said body member and said cap.

2. A pigtail connector according to claim 1, characterized in that the leading edge of said annular flange is of bulbous configuration in cross section, and the cross section of the base of said flange reduced with respect to the leading edge of said flange.

3. A pigtail connector as set forth in claim 2, characterized further in that the bulbous leading edge of said flange is located radially outward from the base thereof.

4. In a pigtail connector as set forth in claim 2, characterized in that a stop shoulder extending radially outwardly from the base of said flange is adapted to seat on the recessed end face of said body member upon forced insertion of said flange into said annular recess.

References Cited in the file of this patent

UNITED STATES PATENTS

1,706,249	Naum	Mar. 19, 1929
1,747,760	Duffy	Feb. 18, 1930
2,202,163	Mulford	May 28, 1940

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