This invention relates to the splicing of electrical cables or wires by means of a compression sleeve or tube; and more particularly, to a method and means for applying a compression splice to join electrical conductors without any bolting or undue curvature.

In the past, it has become customary to splice two ends of cables or wires together by means of a malleable metal sleeve or tube. A bare wire is inserted into each end of the sleeve, and the sleeve is then compressed onto the wires by a series of crimps or indentations made along the length of the sleeve, locking the wires therein. The forces the crimps to destroy the splice by separating the wires from the sleeve. Any known as pull-out strength, is a direct function, inter alia, of the number and type of crimps made on the coextensive length of sleeve and wire. Generally, to achieve sufficient pull-out strength it is necessary to make a number of crimping along the length of the conductor.

In the prior art, it is customary to apply these compression sleeves by means of hydraulically or manually operated tools. When a hydraulic tool is used, the dies generally travel toward each other on a straight axis, their faces maintaining a parallel relationship. Manually operated dies, however, are usually mounted on a pincer type tool, wherein the dies travel on an arcuate path, usually about a pivot to which the jaws and handles of the tool are joined. If more than one pivot is utilized, the path of the dies may become a compound arc. As these dies approach each other, their faces are not parallel. A pincer type tool is illustrated by Rogoff, in United States Patent 2,635,494.

Due to this nonparallel closing of the dies in a pincer type tool, a bowing or curving of the splice will occur if the plurality of crimps are all made from the same side of the splice by means of a pincer type tool.

This bowed condition is undesirable as it shortens the effective length of the splice, increases the effective volume of space occupied by the wire, and reduces the wire to increased stress at the junction of the wire and the end of the sleeve.

The customary expedient to avoid this bowed condition when using a pincer type tool, is to make the crimps alternately from diametrically opposite sides of the splice. Although this technique avoids the bowed condition, it is sometimes quite inconvenient, especially when the crimping operation is being conducted above the ground and/or at some distance from the operator.

An object of this invention is to provide a method of crimping a splice with arcuately traveling dies which permits the crimps to be made from the same side of the sleeve and yet avoids any resultant bowing of the splice.

Another object of this invention is to provide a tool adapted to crimp a splice from one side of the sleeve and yet avoid any resultant bowing of the splice.

A feature of this invention is a method and means for flowing equal volumes of metal on both sides of the medianting line of the connector sleeve when making a crimp with arcuately moving jaws.

These and other objects and features of this invention will become more apparent by reference to the following description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a top plan view of a completed splice, using the tool and method of this invention,

FIG. 2 is a plan view of a pincer type crimping tool embodying this invention; and

FIG. 3 is an elevation taken along line 3-3 of FIG. 2.

Referring to FIG. 1, reference character 1 designates a malleable metal sleeve which is crimped onto wires 2 and 3 by a series of crimps or indentations, as at 4. As previously mentioned, the pull-out strength of the splice is a direct function, inter alia, of the number and type of crimps made on the coextensive length of sleeve and wire.

The splice shown in FIG. 1 will assume a bowed or curved shape if the crimps are made by the prior art pincer type tool and dies from one side only.

It was realized, that due to the arcuate paths followed by the rectangularly faced dies in the prior art tools that when compressing the sleeves the pivotally proximate portions of the dies closed towards each other more rapidly than the pivotally remote portions of the dies. This resulted in the proximate side of the sleeve being compressed more rapidly than the remote side, and a larger volume of metal being flowed on the proximate side than on the remote side. This unequal flow of metal on the sides is assumed to cause the undesirable bowing.

In accordance with the principles of this invention the area of the remote portions of the dies is increased and the area of the proximate portions is decreased so as to make the volumes of metal displaced by the dies during crimping to be equal above and below the center line of the jaw portion of the tool. When equal volumes of metal are thus displaced in the crimping operation, the splices maintain their straightness and develop little or no curvature.

In a specific tool embodiment, illustrated in FIG. 2, reference character 5 indicates generally a pincer type tool having jaws 6 and 7 attached to a compound pivot 8, 9 and 10. Dies 11 and 12 are mounted on jaws 6 and 7, respectively. The remote portions of dies 11 and 12 above the centerline travel 1.7 times the distance to full closure traveled by the proximate portions. Therefore, the area of the face of the proximate portion was made approximately 1.7 times the area of the remote portion, so that as the dies traveled from their first contact with no pressure applied to sleeve position to a full closure position, the die face portions would sweep out substantially equal volumes. A trapezoidal shaped face, as illustrated in FIG. 3, having an area above the median substantially 1.7 times that below the median, has been found to achieve the desired result. Obviously, other die face configurations might be utilized. While the ratio of 1.71 has been found to be preferable, the ratio may vary from the preferred ratio while producing a substantial improvement over the prior art devices.

The invention has thus been described, but it is desired to be understood that it is not confined to the particular forms or uses shown and described, the same being merely illustrative, and that the invention may be carried out in other ways without departing from the spirit of the invention and, therefore, the right is hereby claimed to employ all equivalent instrumentality coming within the scope of the appendant claims, and by means of which objects of the invention are attained and new results accomplished, as it is obvious that the particular embodiments herein shown are only some of those which can be employed to obtain these objects and accomplish these results.

I claim:

1. A pressure applying tool for forming a splice between a malleable metal sleeve and a therein inserted wire by crimping said sleeve to said wire comprising: a pair of opposable jaws having a common pivot; a sleeve contacting face on each of said jaws; each said surface being medially divided into a portion proximate to
said pivot and a portion remote to said pivot; each of said proximate and remote surface portions having an area such that when said jaws are moved from their initial sleeve contacting position to their fully closed position said areas are rotated about said pivot to sweep out substantially equal volumes.

2. A tool according to claim 1, wherein said sleeve contacting surfaces are so shaped that each said remote portion is of greater area than each proximate portion.

3. In a tool having pivoted, pressure applying, opposable jaws for forming a splice between a malleable metal sleeve and a therein inserted wire by crimping said sleeve to said wire: a sleeve contacting area on each of said jaws; said area being medially divided into a portion proximate to the pivot and a portion remote to the pivot; said portions being so constructed and arranged that said remote and proximate areas sweep out substantially equal volumes when the jaws move from their initial sleeve contacting position to their fully closed position; and wherein said sleeve contacting areas are so shaped that the said remote portion is of greater area than the proximate portion; and further, wherein said remote and proximate areas are substantially in the ratio of 1.7 to 1.

4. A tool according to claim 2, wherein said sleeve contacting surfaces are of trapezoidal shape.

5. A method of forming a splice between a malleable metal cylindrical sleeve and a therein inserted wire by crimping said sleeve to said wire, said sleeve being considered to be divided into two halves by a first plane passing diametrically therethrough, consisting of the steps of (1) applying a pair of opposed forces, at a given angular velocity about a given pivoted point, said pivotal point being located externally to said sleeve and in a second plane passing diametrically through said sleeve and perpendicular to said first plane, to a first quantity of area on the surface of said sleeve-half proximal to said pivotal point, so that in a given time said first quantity of area sweeps out a first volume of sleeve; and (2) concurrently applying a second pair of opposed forces, at said given angular velocity about said given pivotal point to a second quantity of area on the surface of said sleeve-half remote to said pivotal point, so that in said given time said second quantity of area sweeps out a second volume of sleeve, said first and second swept out volumes of sleeve being equal.

References Cited in the file of this patent

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