JOINTING CLIPS FOR INSULATED ELECTRIC WIRES

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ABSTRACT

Channel-type wire-piercing jointing clips are inserted with a close fit in an extruded channel of resilient insulating material whose flanges are doubled-back inwardly in U-formation at their free edges so that the metal clips can be inserted by being pressed into the insulating channel from its open side until the doubled-back edge portions of the insulating snap into position over the free edges of the channel-type metal clip, which they then retain against lifting out while being themselves retained against separation of the insulating wall portions after crimping.

5 Claims, 3 Drawing Figures
JOINTING CLIPS FOR INSULATED ELECTRIC WIRES

This application is a streamlined continuation of my co-pending application Ser. No. 27,514 filed Apr. 13, 1970, now abandoned, which itself was a continuation-in-part of my application Ser. No. 732,602, filed May 28, 1968, now Pat. No. 3,517,804.

The present invention relates to the jointing of electric wires and has for an object to provide improved channel-type insulated jointing clips each adapted to form, when applied to a pair of adjacent placed ends of electric wires, an electrically conductive joint between the conductors of the wires, in which all conductive surfaces are protected by insulating material, and it is more particularly, though not exclusively, applicable to jointing clips which are formed with insulation-piercing sharp-edged portions which, when the clip is crimped with the insulated wires placed into it, will establish electrical connection between the conductive cores of the wires without requiring the wires to be stripped of insulation. In order to achieve effective insulation of all conductive surfaces of the completed joints, all external surfaces of the clip must be covered by an insulating layer, which should overlap the two ends of the channel-type metal clip, and which must remain in position relative to the surfaces of the clip during the insertion of the clip and wires into a crimping tool while at the same time it is desirable from a manufacturing point of view that it should be as simple as possible to bring the metal clip into the requisite permanent relationship to the insulating material.

With this object in view a broad aspect of the invention consists in an insulated jointing clip comprising a channel-type metal jointing clip accommodated in a channel of flexible insulating material which projects over the two ends, and which closely embraces the web and flanges of the metal jointing clip, the free ends of the flanges of the insulating channel being bent-over towards each other so as to retain the metal jointing strip against removal from the insulating channel in a direction at right angles to the plane of the web of said channel.

A further development of this invention has for an additional object to provide improved protection against the risk of separation of the insulating material constituting the walls of the insulating channel from the surface of the wall portions of the metal clip after completion of the crimping.

Thus according to a further aspect of the invention the insulation consists of a channel of flexible insulated material of the channel whose flanges have their free edges bent-over inwardly of the channel in U-formations, the dimensions of the channel being such as to tightly embrace the metal clip, with the U-edges of the insulating channel wrapped round the edges of the channel-profile metal clip so as to prevent the latter from being lifted out of the insulating channel, the amount by which the U-shaped edges extend into the channel being sufficiently small to allow the metal clip to be inserted into the insulating channel by being forced into it from the open side of the channel profile, at right angles to the web portion of the insulated channel, until the U-shaped edge portions of the insulated channel snap over the edges of the channel-type metal clip.

Conveniently the insulating channel may be formed as an extruded strip, into which individual channel-type metal clips are the inserted at appropriate intervals to allow, after separation of this assembled structure into individual jointing clips, the material of the insulating channel to project over both ends of each metal jointing clip. The flanges of the extruded channel are preferably sub-divided by transverse slots before the channel is severed between adjacent metal clips, so that adjacent jointing clips at this stage are only interconnected by a flexible portion of the web of the insulating channel. This will permit the assembled structure to be wound in spool form, for example into a magazine. Each metal clip is preferably held against longitudinal displacement in the insulating channel by a staggering operation. It will be readily appreciated that while, in order to prevent the metal clip from being lifted out of the insulating channel, it would be sufficient to provide the flanges of the insulating channel at their free edges with inwardly projecting secondary flanges, there would still be a risk that, when the wires to be jointed have been inserted and the flanges folded over by a crimping operation, the resilience of the insulating channel might cause the flanges of the insulating channel to move back towards their original position, thereby becoming separated from the surface of the metal clip, which might thus be exposed to accidental contact. This risk is avoided by the present invention because the free edges of the insulating channel are doubled back in U-shape towards the interior of the channel. This construction causes the re-entrant portion of the U to be clamped inside the metal clip by the crimping operation, and thus prevents the flanges of the insulating channel from rising off the surface of the flanges of the metal clip after the crimping.

Thus a channel of resilient insulating material whose flanges are doubled-back inwardly at their free edges at a spacing sufficient to accommodate the edges of a channel-type metal jointing clip, constitutes another aspect of the invention, while a further aspect is constituted by a channel-type metal jointing clip accommodated in a length of such channel of insulating material with the edge of each flange of the metal clip embraced by the doubled-back edge of the corresponding edge of each flange of the metal clip thereby becoming divided into separate lengths by transverse slots between adjacent metal clips.

In order to allow the channel-type metal clips to be inserted in the proposed manner into the insulating channel, it has been found in practice sufficient for the distance between the inner surface of the outer wall of the insulating channel at the doubled-back portion of that wall to be approximately equal to the wall thickness of the insulating channel, with the doubled-back portion of the wall projecting towards the channel bottom from the inner surface of its U-bend by an
amount equal to, or slightly smaller than, the wall thickness, for example four-fifths of the wall thickness, of the insulating channel. In a practical embodiment, in which the internal width of the insulating channel was approximately 0.2 inch, and its overall height about 0.135 inch, and in which the channel was made of extruded so-called "rigid polyvinylchloride" with a wall thickness of about 0.014 inch, satisfactory results were achieved with a secondary flange which was doubled back at a spacing of 0.012 inch to 0.015 inch from the inner surface of the channel side wall to project towards the channel bottom by an amount of 0.01 inch to 0.012 inch, the bottom edges of the channel being rounded with a radius of 0.012 inch, and the bottom of the insulating channel being concave in a transverse section with a radius of 0.2 inch.

In the accompanying drawing

FIG. 1 is a cross-section of one form of the insulating channel, constructed according to the invention.

FIG. 2 is a perspective view, similar to FIG. 1 of the parent patent, showing a single insulated channel-type joining clip according to the present invention, with part of the clip shown broken away, and

FIG. 3 is a sectional side elevation of a continuous flexible strip assembly according to the present invention, suitable for sub-division into individual insulated joining clips.

Referring now first to FIG. 1 the profile of the insulating channel 75 is generally U-shaped, with the bottom 75a slightly concave from the outer side and the side walls 75b leaning somewhat towards each other. Their free edges have inwardly projecting secondary flanges 65c, and the inner edges 75d of the latter are doubled back towards the channel bottom 75a.

It should be understood that construction of the metal clips and their arrangement in the channel is substantially as illustrated in FIG. 1 of the main patent, except that the bottom of the metal clip is preferably concave similarly to the bottom of the insulating channel; such profile of the bottom of metal joining clips corresponds to a proposal of the British Post Office. It is believed that the concave profile of the bottom of the insulating channel assists in giving to the channel profile sufficient resilience for the doubled-back edges to snap into position upon the insertion of a metal clip, more particularly when the bottom of the metal clip is also concave in profile.

Referring now to FIG. 2, the illustrated strip comprises a clip constituted by a thin-walled channel 1 of suitably deformable metal, for example phosphor bronze or half-hard brass, having a bottom or web portion 1a and two side walls or flanges 1b. The length of the clip substantially corresponds to that length of each wire which is to be employed to form the joint. The web 1a of the channel is sub-divided in its width by two triangular tabs spaced along its longitudinal plane of symmetry and provided with a number of mutually staggered sharp-edged excrescences. Only one of the tabs is shown; the second one is arranged at the opposite side of a transverse plane of symmetry indicated by a chain-dotted line 3. When using the clip to join two insulated wires, the two wires to be joined are respectively placed unstriped into the channels at the two sides of the tabs 2, and a suitable tool is then applied to fold-over the two channel side walls 1b towards the center of the channel and to press them down on to the wires so as to hold each wire firmly in position. That application operation will at the same time force the excrescences of the channel bottom through the insulation of the wires into intimate contact with the metal core of each wire.

When the above-described metal clip has been formed and suitably plated, it is covered on its outer side with suitably flexible insulating material by inserting the metal clip into an extruded length or section of channel 75, made of rigid polyvinylchloride or other suitable insulating material, having a similar combination of resilience and malleability, whose flanges 75b are doubled-back inwardly of the channel in U-formation as shown at 75c. These doubled-back portions are arranged to co-operate with the free edges of the side walls or flanges 1b of the metal clip to retain the latter inside the insulating channel 75, and the height of the flanges or side walls 1b of the metal channel 1 is so chosen that the outer surfaces 75c of the doubled-back portions 74d of the insulating channel 75 will approximately meet when the application operation has been completed. The insulated clip 1 is inserted into an insulating-channel length 75 which is somewhat longer than the metal clip, the insertion being preferably effected by movement at right angles to the web or bottom 75a, and in order to ensure proper longitudinal positioning of the metal clip with the two end portions of the insulating channel section projecting beyond both ends of the metal clip as shown at 75f, the bottom portions 1a of each metal clip and of each channel length or section are further provided with aligned central perforations 6 and 6a respectively. After its application to the metal clip, the insulating channel length 75 is retained in its longitudinal position relative to the metal clip by depressing or staggering portions 75g of the channel bottom 75a to project into apertures 2a which are formed in the bottom 1a of the metal clip 1 by the deflection of the tabs 2.

FIG. 3 shows a flexible strip 80 according to the invention comprising a plurality of sections each constituting an insulated joining clip, the insulating channel sections 75 of the clips being integrally joined by their web portions 75a while their side walls or flanges 75b are separated from each other by razor cuts 51 extending from the free edges of the flanges to end just short of the web portion 75a, and each channel section 75 is, prior to the insertion of the metal clips 1, provided with a locating aperture 6a: Each section 75 is then loaded with a metal clip 1, which is introduced from the open side of the channel with the hole 6 of the clip aligned with the hole 6a of the associated channel section, so that the two ends of the clip are evenly spaced from the incisions 51 that terminate the individual sections of the insulating channel. When thus positioned in an insulating channel section, the metal clip 1 is secured against longitudinal displacement by applying to the outer side of the web portion 75a of the insulating channel a staggering tool to force portions of its material into one of the apertures 2a of the web portion 1a of the metal clip. A strip 50 is thus obtained of individual clips which are joined only by the flat back or web portion of the insulating channel. The strip 50 is therefore readily flexible towards its back so that it can be loaded in spiral form into a small-diameter cassette. I claim:
1. An insulated channel-type jointing clip for electric conductor wires, which comprises: a channel-type metal jointing clip having channel walls respectively constituting a web and two substantially plane flanges extending from the web, and a channel of resiliently flexible insulating material whose flanges have their free longitudinal edges doubled-back inwardly of the channel in U-formation substantially throughout their length, the dimensions of the insulating channel being such as to tightly embrace the metal clip, with the doubled-back longitudinal edges of the insulating channel wrapped round the longitudinal edges of the flanges of the channel-type metal clip so as to prevent the metal clip from being lifted out of the insulating channel and as to ensure insulating protection of said longitudinal edges of the metal clip when the flanges of the clip have been folded inwardly to clasp such conductor wires, the insulating channel extending between two ends each projecting beyond the corresponding end of the metal clip without embraceing the ends of the channel walls of the metal clip, the amount by which the doubled-back edges of the insulating channel extend towards the web of the channel being sufficiently small to permit the assembly of the insulating jointing clip to be effected by forcing the metal clip into the insulating channel from the open side of the channel profile, at right angles to the web of the insulating channel and then allowing the doubled-back edge portions of the insulating channel to snap over the longitudinal edges of the channel-type metal clip.

2. An insulated jointing clip as claimed in claim 1, wherein the web of the channel of resilient insulating material is substantially flat, the two flanges projecting from the two edges of the web in at least approximately parallel planes, and being doubled-back in such manner as to form a pair of secondary flanges projecting towards each other from the outer longitudinal edges only of the two flanges respectively, and to further form a pair of lips extending from the mutually facing edges of the two secondary flanges towards the web of the channel for a distance which is less than the distance between each lip and the flange to which it is connected, both said secondary flanges and said lips being substantially co-extensive in the longitudinal direction of the channel.

3. An insulating jointing clip as claimed in claim 2, wherein the distance between the inner surfaces of each flange of the insulating channel and the lip extending from the associated secondary flange is approximately equal to the wall thickness of the insulating channel, with the said lip projecting towards the web of the channel from the inner surface of its U-bend by an amount approximately equal to four fifths of the wall thickness of the insulating channel.

4. A strip of insulated jointing clips, each as claimed in claim 1 comprising a channel of resilient insulating material whose flanges are doubled-back inwardly at their outer edges, said channel containing, in longitudinally spaced positions, metal jointing clips each retained in said channel of insulating material by the doubled-back longitudinal edges of the flanges of the insulating channel against longitudinal displacement, two of the three walls of the insulating channel being divided into separate lengths by tranversed slots between adjacent metal clips.

5. A jointing clip as claimed in claim 1, wherein the metal clip is provided with recesses, and parts of the walls of the insulating channel are deformed for interlocking engagement with such recesses to prevent longitudinal displacement of the metal clip in the insulating channel.

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