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Description

[0001] The present invention relates to an electric terminal crimping method and the assembly obtained by this method.

[0002] It is known how to create an electric assembly between an electric wire, particularly a multistranded wire, and a metal terminal element by a crimping operation for which wings cut out of the metal terminal element are bent around the stripped electric wire by means of a crimping tool of the stamp-anvil type. This technique is applied to terminals made from a metal blank that has been cut and bent.

[0003] US patent 5,561,267, for example, discloses a terminal to be crimped comprising wings of different size allowing covering one crimping wing onto another and a crimping method with a specifically designed stamp-anvil tool.

[0004] The crimped terminals encounter problems of reliability in low current and low voltage applications and more particularly, microcracks appear over time. It has been shown that crimping can lose its efficiency due to an elastic spring back phenomenon of the crimping wings which causes a reduction of the terminal pressure between the wings and the strands of crimped wire and can lead to terminal resistance increase or instabilities, or even losses of electrical contact and continuity.


[0006] More particularly, the present invention relates to a method according to claim 1.

[0007] As it will be understood upon reading the description that follows of particular embodiments of the invention, "initial part" and "subsequent part" of the crimping section are not necessary different parts, in particular the subsequent part may correspond to at least a portion of the initial part.

[0008] According to some embodiments, one might also use the features of one or more of the dependent method claims.

[0009] The invention also relates to an assembly according to claim 9.

[0010] According to some embodiments, one might use the features of one or more of the dependent assembly claims.

[0011] Other characteristics and advantages will be better understood upon reading the description that follows of particular embodiments of the invention given by way of non-limiting examples and in reference to the figures, which show

In Figure 1: a crimping tool according to one aspect of the invention;
In Figure 2: an electric terminal element and a wire to be crimped;

In Figures 3a and 3b: a crimped terminal;
In Figure 4: a schematic sectional view of a crimping of an electric wire;
In Figures 5a and 5b: two versions of the second crimping step;
In Figure 6: a schematic representation of the first crimping step;
In Figure 7a: a perspective view of a metal sheet blank for forming the terminal element according to another embodiment of the invention;
In Figure 7b: a planar partial view of Figure 7a;
In Figure 8a: a perspective view of a portion of the terminal of the another embodiment at an initial step of a crimping method;
In Figure 8b: a sectional planar view along line B-B of Figure 8a;
In Figure 8c: a sectional planar view along line C-C of Figure 8a;
In Figure 8d: a lateral view taken along line D-D of Figure 8a;
In Figures 9a and 9d: views corresponding to Figures 8a and 8d at the end of an initial crimping step;
In Figures 9b and 9c: sectional perspective views along line B-B and C-C, respectively, of Figure 8a, at the end of the initial crimping step;
In Figures 10a to 10d: views corresponding to Figures 9a to 9d at the end of a subsequent crimping step;
In Figure 11a: a partial top view of a blank for another embodiment of the invention;
In Figure 11b: a view corresponding to Figure 11a for another embodiment of the invention;
In Figure 11c: a view corresponding to Figure 11a for another embodiment of the invention;
In Figure 11d: a view corresponding to Figure 11a for another embodiment of the invention;
In Figure 12a: a schematic perspective partial view of an assembly obtained by applying a crimping method on the blank of Figure 11c or 11d; and
In Figure 12b: a view similar to Figure 12a of another embodiment of an assembly obtained from the blank of Figure 11c or 11d.

[0012] According to the example of application shown in Figure 2, a crimping process is conducted on electric terminals with an open barrel. Such terminals comprise:
- a front part A, notably for coupling to a typical complementary terminal, and
- a crimping section 30, in an intermediate part, provided with an open barrel 3 with wings 4, 5 for crimping on a stripped part 12 of an electric wire 2, the crimping section 30 being designed to be crimped onto the wire to create an electric contact between wire 2 and terminal element 1.

[0013] According to the example, terminal element 1 has a terminal section 31 forming a force-absorbing or
stress-release zone provided with wings 10, 11 designed to be closed on the insulating sheath 13 of the wire 2.

Front part A of the terminal element can be of any type and can possibly even be made of a second crimping section in order to create a splice, for example.

Such terminal elements are made by cutting and folding a metal strip of small thickness of the order of 0.2 mm to several millimetres thick.

Due to the need for these terminals to have a good rigidity and, in the case of terminals with contact spring blades, a good elasticity, the material used is not very ductile and is subject to elastic spring back effect during folding or shaping operations.

It has been shown that this elastic spring back effect exists at the level of wings 4, 5 for crimping and even if the variations in dimensions are only of the order of several microns, this elastic spring back effect can cause intermittent loss of contact between the strands and the terminal element, particularly in low-current and low-voltage applications such as self-diagnostic procedures for elements mounted on automobiles.

Moreover, the wire, generally copper-based, has a small elastic spring back capacity which is notably smaller than that of alloys such as a copper-beryllium alloy often employed for terminal elements.

The invention intends to modify the mechanical crimping behaviour in order to utilize the physical phenomenon of elastic spring back in a favourable sense over a particular terminal zone.

To this aim, a method of crimping a crimping section of an electric terminal element 1 on an electric wire 2 according to the invention comprises a first crimping step for crimping the crimping section 30 on the stripped part 12 of the wire by folding wings 4, 5 on the wire 2 by means of a crimping tool comprising a stamping element 6 and an anvil 7 (See Fig.1). For this first step, the beginning of which is described in Figure 6, a stamping element 6, made up of three parts 6a, 6b, 6c according to the example, is applied advantageously with its three parts over the whole length of the wires 4 and 5 and the anvil is applied under the barrel 3, wings 4 and 5 being continuous wings, i.e. single sections.

The crimping section is obtained as a function of the dimensions of the terminal and of the wire by classical crimping, a minimal amount of compression being obtained so as to close the wings onto and into the wire. This first crimping step is carried out over a major part of the surface of wings 4, 5 or even the whole length of these wings by stamping element 6 over a major part or even the whole length of barrel 3 with the anvil 7. The residual void obtained within the strands under the wings 4, 5 after completion of the first crimping step is of the order of about 5-10%.

The method comprises a second step or crimping operation, this operation being conducted in a localized zone of the wings. This step is advantageously conducted in such a way that a greater amount of compression is obtained under the crimping tool than the amount of compression exerted during the first crimping step. This second step is shown schematically in Figures 4 and 5b representing a first embodiment for which only parts 6a, 6c of the stamping element 6 are applied on ends 4a, 4c, 5a, 5c of the wings (See Fig.3a), the central part 6b being advantageously slightly maintained in a set-back position in such a way that the pressure of part 6b on the wings becomes zero or about zero. In a second embodiment shown on Figure 5a, only the stamping part element 6b is pressed on parts 4b and 5b of the wings, stamping parts 6a and 6c being advantageously slightly maintained in a set back position.

Advantageously, in both embodiments, the second crimping step is carried out over a part of the wing surface that has undergone the first crimping step.

These two embodiments of the second crimping lead to two variants for the terminal, one in which longitudinal end zones 4a, 4c, 5a, 5c of the wings as shown in Figure 3a are more compressed; in the other variant, the second crimping is carried out over central zones 4b, 5b of these wings as shown in Figure 3b.

According to the example of Figure 3a, the crimped terminal has three successive zones for squeezing the wings onto the wire, two of the three zones having been subjected to the second crimping step so that subsequently the wire exerts some force on the wings at the level of the third zone.

According to the example of Figure 3b, the crimped terminal has three successive zones for squeezing the wings onto the wire, one of the three zones having been subjected to the second crimping step so that subsequently the wire exerts some force on the wings at the level of the other two zones.

The double crimping reverses the elastic spring back to make it play a positive role, i.e., to create a contact pressure between the barrel (i.e. the barrel wings) and the wire strands. According to the method, and as described in Figure 4, at the end of the second crimping operation, for the embodiment of Figure 3a, some portion of strand material is displaced from zones 20a and 20c to zone 20b, whereby the wire strands locally expand in zone 20b between the two tool parts 6a and 6c creating the positive effect of second crimping step. Consequently, while for the wing end zones under tools 6a and 6c, the elastic spring back of the wings remains greater than that of the wire strands, in intermediate zone 20b, the wire strands press and deform the wing by expanding effect. The strands under the intermediate zone 20b expand during the second crimping operation. The expanding strands deform the intermediate zone 20b away from its rest position obtained after the first crimping operation.

The elasticity of the wings thus has a positive effect in the intermediate part 20b since it tends to compress the wire, which involves a mechanical contact pressure, and therefore a better and more reliable electrical conduction, even under mechanical or thermal stress.

The crimping tool shown in Figure 1 and designed for the method according to the invention, com-
prises a common anvil 7 and separable stamping element parts 6a, 6b, 6c. Such a tool can function in an automatic press traditionally used by means of a separate control for the stamping element parts 6a, 6b.

[0030] It is possible, of course, to conduct the crimping operations on two separate stations, a first station having a first stamping element that conducts the first crimping operation and a second station having a stamping element designed to conduct the second crimping operation onto a particular terminal zone. It remains that the embodiment in which stamping element 6 is divided into mobile stamping element parts that can be activated separately allows conserving a perfect alignment of the terminal element with the stamping element parts and successively conducting the two operations on the same press.

[0031] The purpose of the common anvil is that barrel 3 is deformed during the first crimping step and keeps its form during the second crimping step. The barrel thus keeps a good mechanical rigidity and a good resistance to mechanical stress in cases of traction on the wire.

[0032] Such a method is applicable to terminals to be crimped with an open barrel for cut-out and folded electric terminals, but also to closed-barrel terminals such as cut-out and rolled terminals made from a metal sheet.

[0033] It should be noted that according to the invention in which the stamping element is divided into mobile stamping element parts that can be activated separately, the first crimping step can be executed by means of only the stamping element part 6b (for a final result, after the second crimping operation, of the type shown on Figure 3a) or by means of only parts 6a and 6c of this stamping element (for a final result, after the second crimping operation, of the type shown in Figure 3b), this means that parts 6a and 6c, and respectively, part 6b, remain(s) in a high position during this first crimping step without coming to be hard pressed onto wings 4 and 5 of the barrel positioned on the anvil. During the first crimping step, the wings 4 and 5 nevertheless will undergo a more-or-less marked folding/crimping operation over all or a very significant part of their length beyond the sole zone(s) of the wing(s) onto which part 6b, or respectively, parts 6a/6c of the stamping element come to be applied during the second crimping step. In such a case, the first crimping step is applied on the central zone of the wings, or on the end zones of the wings, respectively. The second crimping step which follows the first step is thus conducted by means of parts 6a, 6c, or, respectively, part 6b, according to the invention, the stamping element part 6b, or, respectively, parts 6a and 6c of this stamping part, remaining in an end-of-course position in the first step to keep the barrel in the form resulting from the first step. Thus, the first crimping step crimps at least one first zone of each wing 4 and 5, called the localized region of the crimping section, complementary to said at least one first zone.

[0034] Figure 7a shows in perspective a part of a metal sheet strip 8 which comprises a plurality (only one being shown on Figure 7) of blanks 9 which are to be formed into the terminal element 1. The blank 9 comprises a terminal portion 14 to be formed into a terminal section to crimp the insulation sheet of an electric wire. The blank 9 further comprises a crimping portion 15 to be formed into the crimping section, for crimping onto the stripped part of the electrical wire. The blank further comprises a mating portion 16 for forming a front part for coupling to a complementary terminal.

[0035] Figure 8a shows a crimping section 30 obtained from the blank of Figure 7a, according to another embodiment of the invention, placed on the anvil 7. The crimping portion is shown on Figure 7b before being formed as the crimping section 30. The crimping section 30 comprises the barrel 3 receiving the stripped part 12 of the wire which comprises a plurality of parallel extending strands 17. The barrel 3 comprises, on its internal face 3a, a plurality of transverse recesses 18 designed for easing the deformation of the terminal element upon crimping. Wings 4 and 5 extend from the barrel 3 symmetrically with respect to the wire longitudinal axis X.

[0036] In this embodiment, the central zone 4b, 5b of the wings is longer than the surrounding end zones 4a, 4c, 5a, 5c. This length is measured for example, from a connection end of the wings, at which the wings are connected to the barrel 3, and which is exemplified on Fig. 8a by dotted line 19, to the opposite free end of the wing portion. The dotted line 19 is a straight line running parallel to the longitudinal axis X, and the length is measured in a plane transverse to that axis. The exact location of the connection end of the wings does not itself need being precisely defined. It is sufficient that the location of the connection end be the same for all the wings, so as to define a common reference for measuring the length of the wings.

[0037] Further, in this embodiment as shown on Figs. 7b, 8a and 8d, slots 21 are performed between neighbouring wing portions 4a and 4b, 4b and 4c, 5a and 5b, 5b and 5c. These slots are performed so that, in the slot portion formed between two adjacent wing portions, the length between the connection end and the free end is lower than the length of the neighbouring wing portions. The slots 21 are for example performed by a cut-out in the wings during the forming step.

[0038] Figure 8b shows a sectional planar view taken along line B-B of Figure 8a of one of the wing end portions 4a, 5a. Figure 8c shows a similar view taken along line C-C of Figure 8a at the level of portions 4b, 5b.

[0039] Figure 8d is a lateral view taken along line D-D of Figure 8a showing the three stamping elements 6a, 6b, 6c before applying the crimping method. As can be seen in particular on Figure 8d, at that time, the stamping elements 6a and 6c have a stamping surface. At least one 6b of the stamping elements has a stamping surface
that is not at the same level as the stamping surfaces of the other stamping elements 6a and 6c, relatively to the stamping movement direction. For instance, the stamping elements 6a and 6c have a stamping surface located forward of the stamping elements 6b by about 0.5 mm.

As can be seen in particular on Fig. 9d, an initial crimping step is performed for moving simultaneously and by a same displacement, the stamping elements 6a, 6b, 6c downward. During this initial step, as can be seen on Figures 9a to 9c, the free ends of the wings penetrate in between the strands 17 of the stripped part 12 of the wire. At the end of this initial crimping step, the stamping elements 6a and 6c, in the position in which they are stopped are still located forward with respect to the intermediate stamping part 6b, for example by 0.5 mm.

At this stage, due to the spring back effect, the parts 4a, 4c, 5a and 5c of the wings will spring back from their position at the end of the initial crimping step, due to the natural elasticity of their material, to a rest position. This spring back effect, which might be only of few microns, and could therefore not be represented, may release the contact between the wings and the strands at the end portions 4a, 4c, 5a, and 5c.

Then, a subsequent crimping step is applied, as illustrated on Figures 10a-10d. In this example, the central portion 6b alone is submitted to a continuous forward movement, so as to further crimp the corresponding wing portions 4b and 5b to the strands. The compression of the strands 17 in zone 20b during the subsequent crimping step will cause a displacement of strand material to the two neighbouring zones 20a and 20c. This displacement will cause an expansion of the strands in zones 20a and 20c. In turn, this expansion will elastically deform, in zones 20a and 20c, the wing portions 4a, 4c, 5a, 5c away from their rest position. Thus, in this deformed state, the spring back effect in zones 20a and 20c tends to bring the wing portions 4a, 4c, 5a and 5c back to their rest position, thereby tendency to compress the strands 17 in this zone. Electrical connectivity is thereby improved by way of the positive spring back effect in these zones. With the longest wing portions 4b, 5b being compressed during the subsequent step, the residual void measured in zone 20b has shown to be well below 1%, even below 0.1%, and has often been observed in the range 0.05-0.01%. The residual void in zones 20a and 20c remains at about 5%-10%. The subsequent crimping step is performed, for example, so that the stamping elements 6a and 6c still lie forward of the central stamping element 6b at the end of the subsequent crimping step, for example by 0.03 mm. In such an embodiment, the height e₂ in zones 20a and 20c is lower than the height e₁ in zone 20b such as in the embodiment of Figure 3a.

In another embodiment, the subsequent crimping step is performed until the central stamping element 6b lies level with, or forward of, the end stamping elements 6a and 6c. In this latter case, the height e₁ in the end zones 20a and 20c will be greater than the height e₂ in the central zone 20b such as in the embodiment of Figure 3b.

Since the wing portions with a greater length are submitted to the subsequent crimping step, more metal penetrates between the strands under the stamping element during the subsequent crimping step, which results in an improved compactness (measured as a lower residual void) in zone 20b at the end of the subsequent crimping step. This improved compactness will produce an improved deformation of the strands in the neighbouring zones, 20a and 20c, and thereby in an improved positive spring back effect.

As shown on Figure 8a, in this embodiment, slots 21 are used between neighbouring wing portions, so that independent wing portions correspond to independently activated stamping elements. In this way, a stamping element, when activated, has a limited influence on the wing portions other than the wing portion directly below it. In this way, the stamping force applied to each stamping element can be better controlled, is more uniform, and the process reproducibility is improved. Such slots 21 could be used for any barrel geometry, whatever the lengths of the wing portions are (for example in an embodiment having all its wing portions 4a-5c of identical length). In other embodiments, it is possible not to use any slots in between the wing portions, in particular when the wing portions are of different length.

Another embodiment differing from the previous one by the crimping portion 15 of its blank is shown on Figure 11a. At the slot portion 21, the lateral edge 22 of the central wing portions 4b, 5b, is angled by an angle σ₁ with respect to the transverse axis Y orthogonal to the longitudinal axis X. The central wing portions 4b, 5b are thus bevelled so that their widths measured along the longitudinal axis X at their free end is lower than their width at their connection end. This bevel is performed, for example, both for the central wing portion 4b and the central wing portion 5b, and for both their lateral edges 22. The blank partly shown on Figure 11a could be formed and crimped onto an electric wire by any of the above embodiments, such as for example, by the method described above in relation to Figures 8a to 10d.

Figure 11b shows a blank 9 of a terminal element according to another embodiment. When compared to the embodiment shown on Fig. 7b, it should be noted that it is now the lateral edge 23 of the wing end portions 4a, 4c, 5a, 5c which neighbours the lateral edge 22 of the central wing portion 4b, 5b, respectively, which is angled relative to the transverse direction Y by an angle σ₂. Further, the lateral edge 23 of an end wing portion and the neighbour lateral edge 22 of a central wing portion are connected by a partly circular portion 24 so as to further minimize the stresses encountered there during the crimping process. The terminal element as obtained from the blank of Figure 11b could be submitted to any of the above-described crimping methods, for example such as the one described in reference to Figure 8a to
It is understood that the design of the slots 21 could be further modified by the person skilled in the art, still remaining within the scope of the invention.

Although the invention has, up to now, been exemplified by embodiments having wings 4 and 5 with three wing portions each, it is understood that the invention is not limited to these exemplary embodiments. The number of wing portions and the location of the longer wing portion could be made to vary within the scope of the invention.

As exemplified in Figure 11c, according to another embodiment, the crimping portion 15 is made of only two wing portions 4a, 4b, 5a, 5b on each side. The geometry of the terminal element of this embodiment is, for example, similar to the one of Figure 7b, from which the wing portions 4c, 5c have been removed.

Such a terminal element could be crimped onto the stripped part of an electric wire according to any of the above described embodiments, adapted to the geometry of Figure 11c. For example, one uses a crimping tool having only two crimping elements 6a and 6b, and the method as described in relation Figures 8a to 10d is applied. The resulting assembly is for example partially shown on Figure 12b (on which the terminal section is not shown).

In a variant embodiment, the subsequent crimping step could be performed down to a height lower than the height resulting from of the initial crimping step (i.e. the first crimping operation), to provide with an assembly partially shown on Figure 12a.

According to another embodiment, the blank of which is partially shown on Figure 11d, it is the other short wing portions 4a, 5a of the fifth embodiment which are removed. Above described crimping methods can also be applied to this embodiment.

It is to be understood that the transition portion between adjacent wing portions of the embodiments of Figures 11c and 11d could have any suitable shape, such as the shapes shown on Figures 7b, 11a or 11b, for example.

According to other embodiments, the crimping portion comprises four or more wing portions on each side, at least one of which being longer than at least one of the others.

One of the basic concepts of the invention comprises a first conventional crimping in a first zone. First spring-back effect then occurs after this first crimping. Then, a second crimping is performed in a nearby second zone. The exerted pressure and deformation from this second crimping pushes some amount of the strand material from the second zone into the first zone. Therefore, in the first zone some “reversed” crimping occurs, i.e. the soft material (wire) pushes on the harder material (the terminal sheet-metal). Then, a second spring-back occurs or might occur, but in the reverse and favourable direction. The more elastic sheet metal pressing on the softer wire.
5. Method according to any preceding claim wherein it is provided a crimping tool comprising a common anvil (7) and separable stamping element parts (6a, 6b, 6c) juxtaposed along the longitudinal direction, wherein the electrical terminal (1) is provided with its initial part of the crimping section (30) facing at least one initial stamping element part (6a, 6c) and its subsequent part of the crimping section (30) facing at least one subsequent stamping part, wherein the initial crimping step comprises displacing the initial stamping element part (6a, 6c) toward the anvil down to an initial stamping position, wherein the subsequent crimping step comprises displacing the subsequent stamping element part toward the anvil down to a subsequent stamping position.

6. Method according to claim 5 wherein the subsequent stamping element part (6b) is provided further away from the anvil (7) than the initial stamping element part (6a, 6c), and wherein the initial crimping step comprises displacing both the initial stamping element part (6a, 6c) and the subsequent stamping element part (6b) toward the anvil (7) by the same displacement.

7. Method according to any preceding claim wherein at least one of said applying steps includes introducing the free end of the respective wing portions (4a, 5a, 4b, 5b, 4c, 5c) between the strands (17) in the neighbouring zones, and the expansion elastically deforms the neighbouring wing portions (4a, 5a, 4c, 5c) away from a rest position.

8. An assembly of a wire (2) and an electrical terminal (1) crimped on said wire (2), the assembly comprising:

   - a wire (2) extending along a longitudinal direction and having a stripped part (12) comprising a plurality of strands (17),
   - an electrical terminal (1) comprising a crimping section (30) which comprises a barrel (3) adapted to receive said stripped part (12) and a plurality of pairs of individual wing portions (4a, 5a, 4b, 5b, 4c, 5c) extending from the barrel (3), wherein slots (21) are performed between neighbouring wing portions (4a, 5a, 4b, 5b, 4c, 5c), each pair of wing portions (4a, 5a, 4b, 5b, 4c, 5c) comprising two wing portions (4a, 5a, 4b, 5b, 4c, 5c) facing each other, wherein each wing portion (4a, 5a, 4b, 5b, 4c, 5c) has a connection end connected to the barrel (3), and a free end opposed to the connection end, and has a length measured between the connection end and the free end, said stripped part (12) extending into said barrel (3) between the wing portions (4a, 5a, 4b, 5b, 4c, 5c) of each pair of wing portions (4a, 5a, 4b, 5b, 4c, 5c), wherein an initial part of the crimping section (30) is folded over the stripped part (12) of the wire (2), wherein a subsequent part of the crimping section (30) is folded over the stripped part (12) of the wire (2), wherein the length of the wing portions (4b, 5b) of one pair of wing portions (4b, 5b) is greater than that...
of the wing portions (4a, 5a, 4c, 5c) of an other pair of wing portions (4a, 5a, 4c, 5c), wherein the wing portions (4b, 5b) with a greater length are submitted to a subsequent crimping step causing a displacement of strand material to neighbouring zones, the displacement causing an expansion of the plurality of strands (17) in neighbouring zones, and the expansion elastically deforms a neighbouring wing portion (4a, 5a, 4c, 5c) away from a rest position.

9. Assembly according to claim 8 wherein the initial part of the crimping section (30) comprises at least said one pair of wing portions (4a, 5a, 4c, 5c), wherein the subsequent part of the crimping section (30) comprises at least said other pair of wing portions (4b, 5b), wherein the initial part of the crimping section (30) comprises at least a further pair of wing portions (4c, 5c), and wherein said other pair (4b, 5b) is located between said one pair (4a, 5a) and said further pair (4c, 5c) along the longitudinal direction of the wire.

Patentansprüche

1. Verfahren zum Crimpen eines elektrischen Anschlusses (1) an eine Leitung (2), das aufweist:

- Vorsehen einer Anordnung, die aufweist:
  . eine Leitung (2), die sich entlang einer Längsrichtung erstreckt und einen abisolierten Teil (12) hat, der eine Vielzahl von Adern (17) aufweist,
  . einen elektrischen Anschluss (1), der einen Crimpenabschnitt (30) aufweist, der eine Hüse (3) aufweist, die ausgebildet ist zum Aufnehmen des abisierten Teils (12), und eine Vielzahl von Paaren von einzelnen Flügelteilen (4a, 5a, 4b, 5b, 4c, 5c), die sich von der Hüse (3) erstrecken, wobei Schlitze (21) zwischen benachbarten Flügelteilen (4a, 5a, 4b, 5b, 4c, 5c) vorgesehen sind, wobei jedes Paar von Flügelteilen (4a, 5a, 4b, 5b, 4c, 5c) zwei einander zugewandte Flügelteile (4a, 5a, 4b, 5b, 4c, 5c) aufweist, wobei jeder Flügelteil (4a, 5a, 4b, 5b, 4c, 5c) ein Verbindungsende hat, das mit der Hüse (3) verbunden ist, und ein freies Ende gegenüber dem Verbindungsende, und eine Länge zwischen dem Verbindungsende und dem freien Ende hat, gemessen bei dem Schritt des Vorsehens der Anordnung, wobei sich der abisolierte Teil (12) in die Hüse (3) zwischen den Flügelteilen (4a, 5a, 4b, 5b, 4c, 5c) jedes Paares von Flügelteilen (4a, 5a, 4b, 5b, 4c, 5c) erstreckt.

- Anwenden eines anfänglichen Crimpenschnitts durch Falten eines Anfangsteils des Crimpenabschnitts (30), der zumindest ein Paar von Flügelteilen (4a, 5a, 4b, 5b, 4c, 5c) aufweist, über den abisolierten Teil (12) der Leitung (2),
- Anwenden eines nachfolgenden Crimpenschnitts durch Falten eines nachfolgenden Teils des Crimpenabschnitts (30), der zumindest ein anderes Paar von Flügelteilen (4a, 5a, 4b, 5b, 4c, 5c) aufweist, über den abisolierten Teil (12) der Leitung (2), um die Adern (17) unter den nachfolgenden Teil zu komprimieren.

2. Verfahren gemäß Anspruch 1, wobei vor oder während des nachfolgenden Crimpenschnitts der Anfangsteil des Crimpenabschnitts (30) zumindest teilweise freigegeben wird, so dass er aufgrund seiner natürlichen Elastizität zurück in eine Ruheposition springt.

3. Verfahren gemäß Anspruch 1 oder 2, wobei der Anfangsteil des Crimpenabschnitts (30) zumindest das eine Paar von Flügelteilen (4a, 5a) aufweist, und wobei der nachfolgende Teil des Crimpenabschnitts (30) zumindest das andere Paar von Flügelteilen (4b, 5b) mit einer größeren Länge aufweist.

4. Verfahren gemäß Anspruch 3, wobei der Anfangsteil des Crimpenabschnitts (30) zumindest ein weiteres Paar von Flügelteilen (4c, 5c) aufweist und sich das andere mit einer größeren Länge (4b, 5b) zwischen dem einen Paar (4a, 5a) und dem weiteren Paar (4c, 5c) entlang der Längsrichtung der Leitung befindet.

5. Verfahren gemäß einem vorhergehenden Anspruch, wobei ein Crimpenwerkzeug vorgesehen ist, das einen gemeinsamen Amboss (7) und trennbare Prägeelementteile (6a, 6b, 6c) aufweist, die entlang der Längsrichtung nebeneinander angeordnet sind, wobei der elektrische Anschluss (1) mit seinem Anfangsteil des Crimpenabschnitts (30) zumindest einem Anfangspraegerenteile (6a, 6c) zugewandt und seinem nachfolgenden Teil des Crimpenabschnitts (30) zumindest einem nachfolgenden Prägeteil zugewandt vorgesehen ist,
Eine Anordnung aus einer Leitung (2) und einem
Verfahren gemäß einem vorhergehenden An-
Verfahren gemäß Anspruch 5, wobei der nachfol-
gende Teil des Crimpenabschnitts (30) über den abisolierten Teil (12) der Leitung (2) gefaltet wird, wobei die Länge der Flügelteile (4b, 5b) von einem Paar von Flügelteilen (4b, 5b) größer ist als diejenige der Flügelteile (4a, 5a, 4c, 5c) eines anderen Paares von Flügelteilen (4a, 5a, 4c, 5c), wobei die Flügelteile (4b, 5b) mit einer größeren Länge einem nachfolgenden Crimpenabschnitt unterzogen werden, was ein Versetzen von Adern-Material zu benachbarten Zonen verursacht, wobei das Versetzen eine Ausweitung der Vielzahl von Adern (17) in benachbarte Zonen verursacht, und die Ausweitung einen benachbarten Flügelteil (4a, 5a, 4c, 5c) wegfaltet.

6. Verfahren gemäß Anspruch 5, wobei der nachfol-
gende Prägeelementteil (6b) weiter weg von dem
Amboss (7) als der Anfangs-Prägeelementteil (6a, 6c) gesehen ist, und wobei der anfängliche Crimpenabschnitt ein Versetzen sowohl des Anfangsteils des Crimpenabschnitts (30) als auch des nachfolgenden Prägeelementteils (6b) in Richtung des Ambosses (7) durch dieselbe Versetzung aufweist.

7. Verfahren gemäß einem vorhergehenden An-
Verfahren, wobei zumindest einer der Anwendungs-
schritte ein Einführen des freien Endes der jewei-

8. Eine Anordnung aus einer Leitung (2) und einem
elektrischen Anschluss (1), der an die Leitung (2)
gecrimpt ist, wobei die Anordnung aufweist:

. eine Leitung (2), die sich entlang einer Längs-
richtung erstreckt und einen abisolierten Teil
(12) hat, der eine Vielzahl von Adern (17) auf-
weist,

. einen elektrischen Anschluss (1), der einen
Crimpenabschnitt (30) aufweist, der eine Hülse
(3) aufweist, die ausgebildet ist zum Aufnehmen
des abisolierten Teils (12), und eine Vielzahl von
Paaren von einzelnen Flügelteilen (4a, 5a, 4b, 5b, 4c, 5c), die sich von der Hülse (3) erstrecken, wobei Schlitzte (21) zwischen benachbarten Flügelteilen (4a, 5a, 4b, 5b, 4c, 5c) vorgesehen sind, wobei jedes Paar von Flügelteilen (4a, 5a, 4b, 5b, 4c, 5c) zwei einander zugewandte Flügelteile (4a, 5a, 4b, 5b, 4c, 5c) aufweist, wobei jedes Paar von Flügelteilen (4a, 5a, 4b, 5b, 4c, 5c) ein Verbindungsende hat, das mit der Hülse (3) verbunden ist, und ein freies Ende gegenüber dem Verbindungsende, und eine Länge hat, die zwischen dem Verbindungsende und dem freien Ende gemessen wird.

wobei sich der abisolierte Teil (12) in die Hülse (3) zwischen den Flügelteilen (4a, 5a, 4b, 5b, 4c, 5c) jedes Paares von Flügelteilen (4a, 5a, 4b, 5b, 4c, 5c) erstreckt, wobei ein Anfangsteil des Crimpenabschnitts (30) über den abisolierten Teil (12) der Leitung (2) gefaltet wird, wobei ein nachfolgender Teil des Crimpenabschnitts (30) über den abisolierten Teil (12) der Leitung (2) gefaltet wird.

Revendications

1. Procédé pour sertir une borne électrique (1) sur un fil (2), comprenant :

- la fourniture d’un assemblage comprenant :
- un fil (2) s’étendant le long d’une direction lon-
gitudinale et ayant une partie dénudée (12) com-
prénant une pluralité de brins (17),
- une borne électrique (1) comprenant une sec-
tion de sertissage (30) qui comprend un cylindre
(3) adapté à recevoir ladite partie dénudée (12)
et une pluralité de paires de ports en ailettes
individuelles (4a, 5a, 4b, 5b, 4c, 5c) s’étendant
depuis le cylindre (3), dans lequel des fentes
(21) sont ménagées entre des ports en ailet-
tes voisines (4a, 5a, 4b, 5b, 4c, 5c), chaque paire
de ports en ailettes (4a, 5a, 4b, 5b, 4c, 5c) comprenant deux ports en ailettes (4a, 5a, 4b, 5b, 4c, 5c) ayant une extrémité de connexion connectée au cylindre (3), et une extrémité libre opposée à l’extrémité de connexion, et ayant une longueur, mesurée lors de l’étape de fourniture de l’as-
semblage, entre l’extrémité de connexion électri-
tique et l’extrémité libre,

ladite partie dénudée (12) s’étendant jusque dans ledit cylindre (3) entre les ports en ailet-
tes (4a, 5a, 4b, 5b, 4c, 5c) de chaque paire de ports en ailettes (4a, 5a, 4b, 5b, 4c, 5c).
- appliquer une étape de sertissage initiale, en repliant une partie initiale de la section de sertissage (30), comprenant au moins une paire de portions en ailettes (4a, 5a, 4b, 5b, 4c, 5c), par-dessus la partie dénudée (12) du fil (2),

- appliquer une étape de sertissage successive, en repliant une partie successive de la section de sertissage (30), comprenant au moins une autre paire de portions en ailettes (4a, 5a, 4b, 5b, 4c, 5c), par-dessus la partie dénudée (12) du fil (2), de manière à comprimer les brins (17) sous la partie successive,

dans lequel la longueur des portions en ailettes (4b, 5b) d'une paire de portions en ailettes (4b, 5b) est plus grande que celle des portions en ailettes (4a, 5a, 4c, 5c) d'une autre paire de portions en ailettes (4a, 5a, 4c, 5c), dans lequel les portions en ailettes (4b, 5b) avec une plus grande longueur sont soumises à l'étape de sertissage successive en provoquant un déplacement du matériau des brins vers des zones voisines, le déplacement provoquant l'expansion des brins (17) dans les zones voisines, et l'expansion déformant élastiquement les portions en ailettes voisines (4a, 5a, 4c, 5c) en éloignement d'une position de repos.

2. Procédé selon la revendication 1, dans lequel avant ou pendant l'étape de sertissage successive, la partie initiale de la section de sertissage (30) est au moins partiellement relâchée de sorte qu'elle retourne par effet ressort à une position de repos en raison de son élasticité naturelle.

3. Procédé selon la revendication 1 ou 2, dans lequel la partie initiale de la section de sertissage (30) comprend au moins ladite paire de portions en ailettes (4a, 5a), et dans lequel la partie successive de la section de sertissage (30) comprend au moins ladite autre paire de portions en ailettes avec une plus grande longueur (4b, 5b).

4. Procédé selon la revendication 3, dans lequel la partie initiale de la section de sertissage (30) comprend au moins une autre paire de portions en ailettes (4c, 5c) et ladite autre paire avec une plus grande longueur (4b, 5b) est située entre ladite paire (4a, 5a) et ladite autre paire (4c, 5c) le long de la direction longitudinale du fil.

5. Procédé selon l'une quelconque des revendications précédentes, dans lequel il est prévu un outil de sertissage comprenant une enclume commune (7) et des parties d'éléments de matriçage séparables (6a, 6b, 6c) juxtaposées le long de la direction longitudinale, dans lequel la borne électrique (1) est prévue avec sa partie initiale de la section de sertissage (30) en face d'au moins une partie initiale de l'élément de matriçage (6a, 6c), et sa partie successive de la section de sertissage (30) en face d'au moins une partie de matriçage successive, dans lequel l'étape de sertissage initiale comprend de déplacer la partie initiale de l'élément de matriçage (6a, 6c) vers l'enclume jusqu'à une position de matriçage initiale, dans lequel l'étape de sertissage successive comprend de déplacer la partie successive de l'élément de matriçage vers l'enclume jusqu'à une position de matriçage successive.

6. Procédé selon la revendication 5, dans lequel la partie successive de l'élément de matriçage (6b) est prévue plus éloignée de l'enclume (7) que la partie initiale de l'élément de matriçage (6a, 6c), et dans lequel l'étape de sertissage initiale comprend de déplacer à la fois la partie initiale de l'élément de matriçage (6a, 6c) et la partie successive de l'élément de matriçage (6b) vers l'enclume (7) par le même déplacement.

7. Procédé selon l'une quelconque des revendications précédentes, dans lequel l'une au moins desdites étapes d'application inclut d'introduire l'extrémité libre des portions en ailettes respectives (4a, 5a, 4b, 5b, 4c, 5c) entre les brins.

8. Assemblage composé d'un fil (2) et d'une borne électrique (1) sertie sur ledit fil (2), l'assemblage comprenant :

- un fil (2) s'étendant le long d'une direction longitudinale et ayant une partie dénudée (12) comprenant une pluralité de brins (17),
- une borne électrique (1) comprenant une section de sertissage (30) qui comprend un cylindre (3) adapté à recevoir ladite partie dénudée (12) et une pluralité de paires de portions en ailettes individuelles (4a, 5a, 4b, 5b, 4c, 5c) s'étendant depuis le cylindre (3), dans lequel des fentes (21) sont ménagées entre des portions en ailettes voisines (4a, 5a, 4b, 5b, 4c, 5c), chaque paire de portions en ailettes (4a, 5a, 4b, 5b, 4c, 5c) comprenant deux portions en ailettes (4a, 5a, 4b, 5b, 4c, 5c) qui se font mutuellement face, dans lequel chaque portion en ailette (4a, 5a, 4b, 5b, 4c, 5c) comporte une extrémité de connexion connectée au cylindre (3) et une extrémité libre opposée à l'extrémité de connexion, et a une longueur mesurée entre l'extrémité de connexion et l'extrémité libre, ladite partie dénudée (12) s'étendant jusque dans ledit cylindre (3) entre les portions en ailettes (4a, 5a, 4b, 5b, 4c, 5c) de chaque paire de portions en ailettes (4a, 5a, 4b, 5b, 4c, 5c), dans lequel une partie initiale de la section de sertissage (30) est repliée par-dessus la partie dénudée.
(12) du fil (2), dans lequel une partie successive de la section de sertissage (30) est repliée par-dessus la partie dénudée (12) du fil (2), dans lequel la longueur des portions en ailettes (4b, 5b) d’une paire de portions en ailettes (4b, 5b) est plus grande que celle des portions en ailettes (4a, 5a, 4c, 5c) d’une autre paire de portions en ailettes (4a, 5a, 4c, 5c), dans lequel les portions en ailettes (4b, 5b) avec une plus grande longueur sont soumises à une étape de sertissage successive en provoquant un déplacement du matériau des brins vers des zones voisines, le déplacement provoquant une expansion de la pluralité de brins (17) dans des zones voisines, et l’expansion déformant élastiquement une portion en ailette voisine (4a, 5a, 4c, 5c) en éloignement d’une position de repos.

9. Assemblage selon la revendication 8, dans lequel la partie initiale de la section de sertissage (30) comprend au moins ladite paire de portions en ailettes (4a, 5a, 4c, 5c), dans lequel la partie successive de la section de sertissage (30) comprend au moins ladite autre paire de portions en ailettes (4b, 5b), dans lequel la partie initiale de la section de sertissage (30) comprend au moins une autre paire de portions en ailettes (4c, 5c), et dans lequel ladite autre paire (4b, 5b) est située entre ladite paire (4a, 5a) et ladite autre paire (4c, 5c) le long de la direction longitudinale du fil.
REFERENCES CITED IN THE DESCRIPTION

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