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(54) METHOD AND APPARATUS FOR TWIST CONNECTING WIRES

VERFAHREN UND VORRICHTUNG ZUR DRALLVERBINDUNG VON DRÄHTEN

PROCEDE ET APPAREIL DE CONNEXION TORSADEE DE FILS

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Description

This invention relates to the joining together of two elongated ductile elements (hereinafter called wires) by means of a spiral twist connection between the wires.

The invention is concerned with a novel method of achieving the twist tie and apparatus in the form of a connector for performing the method.

The invention has particular relevance to joining the conductive cores of insulated electrical cables, which are to be considered as falling within the group of elements to be called "wires".

With the twist joining of wires (including the conductors of electrical cables) it is possible manually to twist together the ends of two or more wires to form a dead end connection or an inline connection. However, manual twisting frequently results in a poor connection because of the difficulty in applying sufficient pressure manually to make the joint firm. Frequently the connection provided is in the form of one wire twisted around the other which is a poor form of joint. In the ideal joint each wire is in the form of a spiral which interlocks with a spiral formed in the other wire(s) to give a conjoining of the wires as interlocked spirals.

Frequently tools are used to ensure the twisted connection is secure, for example pliers are commonly used by both electrical tradesmen and handymen to grip the ends of the conductors in order to make a twist joint. The torque applied by the twisting of the pliers has to be countered and this frequently requires the wires adjacent the portions being twisted also to be held with pliers. Such an operation requires the necessary two tools to be at hand and for wire insulation strippers to be at hand, if the wires are insulation clad. With such an operation the person making the twist joint has to handle several items at the one time. The task can be achieved but there is considerable tool use and manual dexterity required and a tight joint does not always result. Another drawback with the use of hand tools of the above type for forming the joint is that severe metal deformation can be caused in the wires by excessive twisting or they can be damaged by the use of excess pressure.

EP-A-0,203,253 is an example of a specialist tool adapted to form a twist connection between two or more wires, the tool having cavity means internally shaped to jam the wires against the internal surface of the cavity and thus to deform the wires into the desired twisted shape.

US-A-1,657,933, however, is regarded as the closest prior art in that it discloses a connector to form a twist connection between first and second ductile wires, wherein said connector comprises: first and second members each having cavity means accessible from first ends of the respective members to receive and position wires to be joined in side by side relationship, the cavity means of at least one member including torque applying shoulder means and torque reaction shoulder means adjacent the first end of the associated member being inner surfaces of each cavity means against which the wires become jammed during relative rotation of said members.

In relation to US-A-1,657,933 and from one aspect, the present invention is characterised in that the cavity means of said at least one member further includes brake means acting against relative longitudinal movement of the wires by forced engagement with the wires during relative rotation of said members.

US-A-1,657,933 also discloses a method of forming a twist connection between two ductile wires, said method comprising the steps of:

providing a connector comprised of two members wherein each member has wire receiving cavity means to receive wires to be joined in side by side relationship, torque applying shoulder means and torque reaction shoulder means in each cavity means; and

contra-rotating said members with wires positioned in said cavity means to cause said wires sequentially to be forced into contact with said torque reaction shoulder means by said torque applying shoulder means, to cross and engage each with the other, and to twist each about the other to form a twist connection of interlocking spirals.

From another aspect, the present invention is characterised in relation to US-A-1,657,933 in that at least one member has brake means associated with its cavity means and in that the wires are braked against relative longitudinal movement during said contra-rotation by forced engagement with said brake means.

In conceptual terms, therefore, the method of the invention comprises positioning wires to be joined in side by side relationship in two members and then applying a twisting torque to the wires by means of relative rotational motion of the members and at the same time applying a brake against relative longitudinal movement of the wires.

The present invention provides a simple method and apparatus for achieving a uniformly twisted joint between wires. The multi-part connector of the invention in one of its possible forms can be used to strip the insulation from the wires (conductors) of an electrical cable prior to joining the wires. After joining the wires the connector, in one of its forms, can seal and insulate the connection.

Several presently preferred forms of connector to carry out the method of the invention will now be described with reference to the accompanying drawings in which:

Fig. 1 is a sectional elevation of an embodiment of the invention for the formation of a dead end connection between wires;

Fig. 2 is an end view of one of the members of the connector of Fig. 1, featuring an alternative bayonet coupling means;

Fig. 3 is an elevation of one member of the connector variation of Fig. 1, showing details of the bayonet lugs and corresponding mating face of the coupling means;

Fig. 4 is a sectional elevation showing an early stage of the formation of a dead end twist connection between wires using the connector variation of Fig. 1;

Fig. 5 is a view similar to Fig. 4, showing the dead end connection complete and the members coupled together;

Fig. 6 is a sectioned elevation of conjoined members coupled together in face-to-face abutment to produce inline connections between wires, this view showing interengaged teeth means on opposed front faces of the members to permit relative rotation in one direction only; and

Fig. 7 is an enlarged fragmentary view of a coupling between the connector members of Fig. 6 to permit relative rotational movement therebetween.

Fig. 8 is an isometric view of a preferred member of the connector of this invention.

An embodiment of the invention suitable for dead end connections between two wires is illustrated in Figs. 1 to 5.

Referring to Fig. 2, a blind central chamber 103 is connected by discrete radial slots 104 to two discrete radially offset blind ended chambers 105. The gap of the slots 104 is narrower than the diameter of the wire to be housed therein. Provision of a conical enlargement 106 at the open end of each chamber 105, correspondingly produces a convergent entrance 107 leading into the open end of each said slot 104 which results in the formation of profiled shoulder means (SM) between the points 108-109-110 in relation to each chamber 105.

In a twist operation (see Figs. 1, 4 and 5) the holding portions 111-112 of the wires 113-114 are held in spaced relationship in chambers 115 in the member 102 and the respective joining portions 116-117 of said wires reside in the chambers 105 of the member 101. Resistance of the wires to deformation when the members 101 and 102 are contra rotated, bring said joining portions into contact with the profiled shoulder means (SM) 108-109-110 which guide the joining portions into the convergent entrances 107 and thereafter, into engagement with the restrictive slots 104 thereby to generate a frictional braking effect thereupon. In combination with the continuing relative rotation between the members 101 and 102, the said braking effect causes the joining portions 116-117 to overlap and contact at intermediate portions 118-119 of said joining portions, in commencement of a twist connection between the said joining portions, which in response to further relative rotation between the said members, culminates in the formation of a tightly conjoined spiral dead end joint between said joining portions 116-117 of the wires 113-114 (see Fig. 5).

Reference in this description to the term "brake" or "braking" is intended to mean a movement inhibiting force which can be overcome, to brake the wires being connected against relative longitudinal movement during the formation of the joint.

After completing the joint, it is housed in the blind central chamber 103 in the member 101 and the members 101 and 102 are united in face to face contact by means of headed lugs 120 common to both members. The heads of said lugs may be profiled to suit co-operative engagement with corresponding surfaces upon each member, in either a snap connection or by a cammed bayonet connection. With reference to Figs. 1 to 5 the headed lugs illustrated are intended to perform the bayonet type connection referred to, whereby a tight engagement of the raised lands 125 is accomplished by passing the headed lugs 120 of the respective members 101 and 102 through respective apertures 123 in opposing said members in order to bring the said lands of opposed members 101 and 102 into radially misaligned face to face contact, then contra rotating said members (30 degrees as illustrated), simultaneously to align the lands whilst forcing them into tight engagement by virtue of the reaction between correspondingly profiled camming surfaces, being respectively the inner edges 121 of the elevated head portions 122 of the headed lugs 120, and the rearwardly facing outwardly disposed surfaces 124 in the apertures 123.

Alternatively, the members may be provided with collars 5 and releasably coupled together with a sleeve 9 (as described below with reference to Figs. 6 and 7) prior to commencement of the twist connection, whereby the joining portions 116 and 117 of the wires 113 and 114 to be joined, are dragged through the restricted radial slots 104 from the chambers 105 as contra rotation of the members 101 and 102 begins, thereafter to progressively transfer into the central chamber 103 and said joining portions 116 and 117 spirally conjoin towards the blind bottom of said central chamber 103 during the continued contra rotation of the members 101 and 102; and whereby the interference fit of said joining portions in the slots 104 imposes a frictional grip upon each said joining portion as they drag through said slots, thereby to maintain the required braking effect to both wires to ensure a tightly twisted spiral joint.

Figures 6 and 7 show a connector having a similar arrangement of chambers that can be used to produce inline connections between wires. The connector illustrated therein comprises two identical members 1 and

2 each having a body 3 which is wider than it is thick and at one end of the body 3 there is a head 4 of circular cross-section having a collar 5 also of circular cross-section at the forward end thereof. The collar 5 has an annular front end face 6 with a conical face 7 extending outwardly and rearwardly from the end face 6 and terminating in an engagement shoulder 8, which is preferably angled rearwardly as shown.

The two members 1 and 2 are coupled by a sleeve 9 which is generally annular in shape with inwardly directed circular ribs 10 inward of outwardly expanding conical contact faces 11. The internal diameter of the ribs 10 is less than the external diameter of the engagement shoulder 8 and thus there is an interference engagement between the inner faces 12 of the ribs 10 and the shoulders 8 which is facilitated by the engaging action of the faces 7 and 11 as the members 1 and 2 are pushed together with the sleeve 9 therebetween. As will be understood another form of connection would be to mount the sleeve 9 on one member 1 or 2 and then insert the collar of the other member into the sleeve. In an alternative arrangement the collar would be integral with one of the members 1 or 2 and would be profiled internally as just described to snap engage over the shoulder 8 of the other member.

The sleeve 9 may also be resiliently deflectable to permit engagement with the collars 5. The construction of the components from a suitably elastic plastics material is envisaged so as to provide for the required ability to deflect resiliently and achieve a snap connection. The foregoing is the preferred form of engagement between the collars and the sleeve as it forms a seal to prevent the ingress of moisture or corrosive agents which could affect the joint. The seal is formed by virtue of the residual forces within the expanded sleeve causing it to bear on the collar 5, Figs. 6 and 7, to form a high pressure low contact area along a narrow line of contact and thus to provide a good seal. A better understanding of the interaction of the components forming the snap connection can be obtained from the enlarged fragmentary view of Fig. 7.

However an alternate arrangement may be used, for example forwardly of the collar 5 may be made up of a plurality of fingers to facilitate the snap connection, or the sleeve ends may be longitudinally slit to provide fingers, thereby to facilitate the snap connection.

The foregoing construction permits the relative rotation of the members 1 and 2 as is required in one manner of performing the method of the invention. However, the relative rotation of the members 1 and 2 whilst interconnected is not essential for the performance of the method of the invention, as will hereinafter be described, and accordingly the collars and sleeve can be other than circular in shape.

In the embodiment of the invention illustrated in Figures 6 and 7, the members 1 and 2 are relatively rotatable and the faces 6 are optionally provided with teeth to position the members in a relative rotational position. These teeth are of ratchet type allowing only one direction of relative rotational movement of one member relative to the other. The reason is to prevent the unwinding of a wire joint after its formation.

Internally the members 1 and 2 are substantially identical and include an axial chamber means configured to have a central chamber 14 therethrough from the end face 6 to the rear end face 16 and at least one side chamber 15. The side chamber 15 may extend through the rear face 16 or may be blind, but is open to the front end of the members 1 and 2. As illustrated in Fig. 6, the side chamber 15 is blind at the rear end 17 and is circular in cross section, but other shapes are also possible.

The side chamber 15 is interconnected with the chamber 14 by a slot the gap of which is less than the diameter of the wire to be joined with the wire in the chamber 14.

The front end of the side chamber 15 is best seen in Figure 8. In the head 4, a counterbore 18 may be provided as shown in Figure 8.

In a twist operation, the two members 1 and 2 face each other. Each wire has a holding portion that lies within the chamber 14 of a respective member 1 and 2 and a joining portion that is inserted into a side chamber 15 of the other respective member 1 and 2.

Initial contra-rotational movement of the members 1 and 2 will cause first contact parts of the wires lying forward of the chambers 14 and 15 to contact. It is at this stage that an overlapping engagement of the wires in the chamber 14 needs to be promoted. This is achieved by the combined effects of the contra-rotation and the shoulder means (SM) previously described applying torque to the wires and forcing the wires against torque reaction shoulder means in the wire receiving chambers. Without the shoulder means (SM) the wires in the side chambers 15 would tend to withdraw longitudinally from the side chambers 15 in response to initial relative rotation between the members 1 and 2 resulting in substantially no angular disposition of wires in chambers 14 and 15 one relative to the other, which is an essential relationship for a spiral twist to be achieved. The overlapping within the chamber 14 is essential (in this embodiment of the invention) to promote the frictional drag brake effect referred to above across the shoulder means (SM). Experimentation has shown that unless a braking effect is present during the twisting operation a twist of acceptable tightness and spiral form will not occur.

Other forms of end to end connection could also be provided as might be preferred for particular configurations of the members 1 and 2/101 and 102.

Other features of the members 1 and 2 which facilitate the use of the connector include an insulation stripper for insulated electrical wires. The stripper comprises an end extension 36 of the members 1 and 2 preferably coupled thereto by a frangible zone 37. The extension has a slot 38 therealong and a tapered entry 39 to the

slot. The edges of the slot 38 and entry 39 are angled to provide a cutting edge 40. The slot 38 ideally is slightly greater in width than the diameter of the conductor of the wire and the tapered entry 39 has a maximum width greater than the diameter of the insulation.

The procedure is to place the wire with the required length to be stripped above the extension 36 and then force the insulated wire into and through the tapered entry 39 into the slot 38 preferably with a part or full rotation to cause the cutting edge to sever the insulation. Then by holding the wire and pulling the member 1 away from the wire the severed insulation is stripped from the conductor leaving it bared for insertion into its channel in the member 1. If desired the wire can be inserted into the slots of the extensions of two oppositely opposed relatively inverted members 1 and 2 and then by pulling the members apart the stripping is effected. Either form of stripping can be adopted.

Subsequently the extensions 36 can be broken off, if desired.

As a further feature of the invention it is desirable to seal the chamber 14 around the wire passing therethrough.

For example, an inwardly and forwardly projecting annular sealing flap can be used to embrace a wire passing through the chamber 14, the forward angle of the flap facilitating the passage of the wire through the chamber 14.

An alternative rear opening seal arrangement is illustrated in Fig. 6. This arrangement is preferred when material inflexibility of the moulded member prevents the proper functioning of the flap type seal and when a modified embodiment, utilising a wire to wire overlap, as opposed to a wire to insulation overlap in the chambers 14, is used for electrical wires. The alternative seal relies upon a gradual tapered entry into the through opening in the rear end of the member wherein the minimum diameter of the entry is less than the insulation diameter of the wire. The insulation is pushed into the tapered entry as far as it will go when mounting the wire in the member. Thereafter the formation of the spiral joint draws upon this portion of the wire, dragging the insulated shrouding tightly into the tapered entry thus forming a watertight seal.

The members are desirably of a deformable nature as there is a phase in the creation of the twist tie between the wires where they are forced one over the other in overlapping relationship within the chamber 14 by the shoulder means (SM), requiring deformation of the member.

For electrical conductors the members can be formed from material which can be moulded and which has appropriate heat and electrical insulation properties. The material should also be sufficiently hard to allow the cutting edges of the slot and entry thereto, 38-39, to sever the insulation around a conductor. A typical material would be glass filled PET, such as DuPont "Rynite" (trade mark) grade PR530 and FR515.

It will be clear from the several embodiments described that these connectors can have more than one channel associated with the chamber 14 in order to join more than two wires in one connection. Other variations can be adopted without departing from the inventive concept and method as hereinbefore defined.

Claims

1. A connector to form a twist connection between first and second ductile wires (113, 114), wherein said connector comprises: first and second members (1, 2, 101, 102) each having chamber means accessible from first ends of the respective members (1, 2, 101, 102) to receive and position wires (113, 114) to be joined in side by side relationship, the chamber means (14, 15, 103, 104, 105) of at least one member (1, 2, 101) including torque applying shoulder means (SM, 108, 109, 110) and torque reaction shoulder means (SM, 108, 109, 110) adjacent the first end of the associated member (1, 2, 101, 102) being inner surfaces of each chamber means (14, 15, 103, 104, 105) against which the wires (113, 114) become jammed during relative rotation of said members (1, 2, 101, 102); characterised in that the chamber means (14, 15, 103, 104, 105) of said at least one member (1, 2, 101) further includes brake means acting against relative longitudinal movement of the wires (113, 114) by forced engagement with the wires during relative rotation of said members (1, 2, 101, 102).

2. A connector as defined in claim 1, wherein the chamber means comprises a central chamber (14, 103) capable of housing both of said wires (113, 114) when twisted together and first and second side chambers (15, 105) connected to the central chamber (14, 103) by slot means (104) the gap of which is less than the diameter of either of said wires (113, 114), the side chambers (15, 105) being of a cross section such that the two wires (113, 114) cannot occupy a side chamber (15, 105) simultaneously.

3. A connector as defined in claim 2 including chamfers (106) around entry ends of said side chambers (15, 105) adjacent the first end of said at least one member (1, 2, 101) to provide an enlarged entry end for said side chambers (5, 105) and further provide within said slot means (104) intersection lines between said chamfers (106) and said slot means (104), said intersection lines providing said torque applying shoulder means (SM, 108, 109, 110).

4. A connector as defined in any preceding claim, wherein the members (1, 2, 101, 102) are deformable.

5. A connector as defined in any preceding claim and including releasable coupling means (5, 9, 120, 123) whereby conjoined members (1, 2, 101, 102) are coupled together with their first ends in face-to-face abutment.

6. A connector as defined in claim 5, including a coupling in the form of a releasable resiliently-engageable sleeve (9) for linking the members (1, 2) together.

7. A connector as defined in claim 5, including a coupling in the form of an extended collar (9) at the first end of the first member (1), the collar having a bore adapted to pass over and releasably resiliently engage with a co-operative annular flange (5) extending from the first end of the second member (2) thereby to link the members (1, 2) together.

8. A connector as defined in any of claims 5 to 7 wherein the coupling means (5, 9, 120, 123) permits the members (1, 2, 101, 102) to be relatively rotated whilst linked together.

9. A connector as defined in claim 8 wherein the first ends of the members (1, 2, 101, 102) are provided with and are interengaged by detent means when the members (1, 2, 101, 102) are linked together to thereby rotationally position the members (1, 2, 101, 102), said detent means being able to be forcibly over-ridden during relative rotation of said members (1, 2, 101, 102).

10. A connector as defined in claim 9 wherein said detent means can be over-ridden only in one rotational direction.

11. A connector as defined in any preceding claim wherein said members (101, 102) are provided at their first ends with fingers with latch lugs (120) and openings with co-operating ramped latch faces (123) so that insertion of said fingers in said openings followed by partial relative rotation of the members (101, 102) will cause engagement of said latch lugs (120) with said latch faces (123) in a camming action pulling said members (101, 102) into abutting relationship.

12. A connector as defined in claim 11 including sealing surfaces (125) surrounding the chamber means (14, 15, 103, 104, 105) access from the first end of both members (101, 102) which surfaces are forced into contact by said camming action.

13. A connector as defined in claim 12 wherein the sealing surface (125) on the first end of at least one of said members (101, 102) is a continuous raised land (125).

14. A connector as defined in any preceding claim and further including an insulation cutter extending from at least one of said members (1, 2, 101, 102) at an end opposite the first end thereof, said cutter comprising a pair of fingers (36) with a spacing (38) between the first finger portions adjacent said opposite end of said member (1, 2) which is substantially equal to but no less than the diameter of the wire to be mounted in the chamber means (14, 15, 104) of the member (1, 2) and a spacing (39) between further finger portions extending from said first finger portions to free ends of said fingers remote from said first finger portions which is divergent away from said first finger portions, cutting profiles on facing edges (40) of said fingers (36) whereby insulated wires (113, 114) forced between said fingers into the space between said first finger portions and rotated will have the insulation circumferentially severed.

15. A connector as defined in claim 14 wherein said insulation cutter is frangibly connected (37) to its associated member (1, 2).

16. A connector as defined in any preceding claim including a resilient seal to sealingly embrace a wire entering one of said chamber means (14, 15, 103, 104, 105).

17. A method of forming a twist connection between two ductile wires (113, 114), said method comprising the steps of:

providing a connector comprised of two members (1, 2, 101, 102) wherein each member (1, 2, 101, 102) has wire receiving chamber means (14, 15, 103, 104, 105) to receive wires (113, 114) to be joined in side by side relationship and torque applying shoulder means (SM, 108, 109, 110) and torque reaction shoulder means (SM, 108, 109, 110) in each chamber means (14, 15, 103, 104, 105); and

contra-rotating said members (1, 2, 101, 102) with wires (113, 114) positioned in said chamber means (14, 15, 103, 104, 105) to cause said wires (113, 114) sequentially to be forced into contact with said torque reaction shoulder means (SM, 108, 109, 110) by said torque applying shoulder means (SM, 108, 109, 110), to cross and engage each with the other, and to twist each about the other to form a twist connection of interlocking spirals;

characterised in that at least one member has brake means (104) associated with its chamber means (14, 15, 103, 104, 105) and in that the wires (113, 114) are braked against relative lon-

gitudinal movement during said contra-rotation by forced engagement with said brake means (104).

Patentansprüche

1. Ein Verbinder zur Bildung einer Drallverbindung zwischen ersten und zweiten biegsamen Drähten (113, 114), wobei der Verbinder umfaßt: erste und zweite Elemente (1, 2, 101, 102), jeweils mit einer Kammer, die von ersten Enden der entsprechenden Elemente (1, 2, 101, 102) zugänglich ist, um zu verbindende Drähte (113, 114) Seite an Seite aufzunehmen und zu positionieren, wobei die Kammer (14, 15, 103, 104, 105) von wenigstens einem Element (1, 2, 101) eine ein Moment anlegende Schulter (SM, 108, 109, 110) aufweist und eine auf das Moment reagierende Schulter (SM, 108, 109, 110) in Nachbarschaft zu dem ersten Ende des zugeordneten Elementes (1, 2, 101, 102) Innenflächen von jeder Kammer (14, 15, 103, 104, 05) sind, gegen welche die Drähte (113, 114) während der relativen Drehung der Elemente (1, 2, 101, 102) geklemmt werden; dadurch gekennzeichnet, daß die Kammer (14, 14, 103, 104, 105) von wenigstens einem Element (1, 2, 101) ferner Bremsmittel umfaßt, die gegen eine relative Längsbewegung der Drähte (113, 114) durch Zwangseingriff mit den Drähten während der Relativdrehung der Elemente (1, 2, 101, 102) wirken.

2. Ein Verbinder, wie in Anspruch 1 definiert, wobei die Kammer eine zentrale Kammer (14, 103) umfaßt, die beide Drähte (113, 114) aufnehmen kann, wenn sie zusammen verdrillt werden und erste und zweite Seitenkammern (15, 105), die mit der zentralen Kammer (14, 103) durch Schlitze (104) verbunden sind, deren Spalt kleiner als der Durchmesser von jedem der Drähte (113, 114) ist, wobei die Seitenkammern (15, 105) einen solchen Querschnitt aufweisen, daß die zwei Drähte (113, 114) nicht gleichzeitig eine Seitenkammer (15, 105) belegen können.

3. Ein Verbinder, wie in Anspruch 2 definiert, umfassend Abschrägungen (106), um die Eintrittsenden der Seitenkammern (15, 105) in Nachbarschaft zu dem ersten Ende von dem wenigstens einen Element (1, 2, 101), um ein vergrößertes Eintrittsende für die Seitenkammern (5, 105) vorzugeben und ferner innerhalb der Schlitze (104) Schnittlinien zwischen den Abscbrägungen (106) und den Schlitzen (104) vorzugeben, wobei die Schnittlinien die das Moment anlegende Schulter (SM, 108, 109, 110) vorgeben.

4. Ein Verbinder, wie in irgendeinem vorhergehenden Anspruch definiert, wobei die Elemente (1, 2, 101, 102) deformierbar sind.

5. Ein Verbinder, wie in irgendeinem vorhergehenden Anspruch definiert und eine freigebbare Kupplungseinrichtung (5, 9, 120, 123) umfassend, wobei verkettete Elemente (1, 2, 101, 102) mit ihren ersten Enden Fläche an Fläche anliegend, miteinander gekoppelt sind.

6. Ein Verbinder, wie in Anspruch 5 definiert, umfassend eine Kupplung in der Form einer freigebbaren nachgiebig eingreifenden Hülse (9) für die Verbindung der Elemente (1, 2) miteinander.

7. Ein Verbinder, wie in Anspruch 5 definiert, umfassend eine Kupplung in der Form eines erweiterten Kragens (9) an dem ersten Ende des ersten Elementes (1), wobei der Kragen eine Bohrung besitzt, die einen zusammenwirkenden Ringflansch übergreift und mit diesem nachgiebig in Eingriff gelangen kann, der sich von dem ersten Ende des zweiten Elementes (2) erstreckt, um hierdurch die Elemente (1, 2) miteinander zu verbinden.

8. Ein Verbinder, wie in irgendeinem der Ansprüche 5 bis 7 definiert, wobei die Kupplungseinrichtung (5, 9, 120, 123) den Elementen (1, 2, 101, 102) eine relative Drehung erlaubt, während sie miteinander verbunden sind.

9. Ein Verbinder, wie in Anspruch 8 definiert, wobei die ersten Enden der Elemente (1, 2, 101, 102) mit Anschlageinrichtungen versehen und mit diesen in Eingriff gelangen, wenn die Elemente (1, 2, 101, 102) miteinander verbunden sind, um hierdurch in Drehrichtung die Elemente (1, 2, 101, 102) zu positionieren, wobei die Anschlageinrichtung in der Lage ist, zwangsläufig während der Relativdrehung der Elemente (1, 2, 101, 102) übersteuert zu werden.

10. Ein Verbinder, wie in Anspruch 9 definiert, wobei die Anschlageinrichtung nur in einer Drehrichtung übersteuert werden kann.

11. Ein Verbinder, wie in irgendeinem vorhergehenden Anspruch definiert, wobei die Elemente (101. 102) an ihren ersten Enden mit Fingern mit Verriegelungsansätzen (120) und Öffnungen mit zusammenwirkenden geneigten Verriegelungsflächen (123) versehen sind, so daß der Einsatz der Finger in die Öffnungen, gefolgt von einer teilweisen relativen Drehung der Elemente (101. 102), den Eingriff der Verriegelungseinsätze (120) mit den Verriegelungsflächen (123) in einer kämmenden Wirkung hervorruft, wodurch die Elemente (101, 102) in eine aneinander anliegende Beziehung gezogen wer-

den.

12. Ein Verbinder, wie in Anspruch 11 definiert, umfassend Abdichtflächen (125), die den Zugang der Kammer (14, 15, 103, 104, 105) von dem ersten Ende beider Elemente (101, 102) umgeben, welche Flächen durch die kämmende Wirkung in Kontakt gezwungen werden.

13. Ein Verbinder, wie in Anspruch 12 definiert, wobei die Abdichtfläche (125) an dem ersten Ende von wenigstens einem der Elemente (101, 102) ein kontinuierlich ansteigender Steg (125) ist.

14. Ein Verbinder. wie in irgendeinem vorhergehenden Anspruch definiert und ferner umfassend einen Isolationsschneider, der sich von wenigstens einem der Elemente (1, 2, 101, 102) an einem Ende gegenüber dem ersten Ende desselben erstreckt, wobei der Schneider ein Paar von Fingern (36) umfaßt, mit einem Abstand (38) zwischen den ersten Fingerteilen in Nachbarschaft zu dem gegenüberliegenden Ende des Elementes (1, 2), der im wesentlichen gleich, aber nicht geringer als der Durchmesser des in der Kammer (14, 15, 104) des Elementes (1, 2) zu montierenden Drahtes ist, und mit einem Abstand (39) zwischen den weiteren Fingerteilen, die sich von den ersten Fingerteilen zu freien Enden der Finger entfernt von den ersten Fingerteilen erstrecken, der von den ersten Fingerteilen hinweg auseinanderläuft zum Schneiden von Profilen an gegenüberliegenden Kanten (40) der Finger (36), wobei isolierte Drähte (113, 114), die zwischen den Fingern in den Raum zwischen den ersten Fingerteilen gezwungen und gedreht werden, am Umfang der Isolierung abgetrennt werden.

15. Ein Verbinder, wie in Anspruch 14 definiert, wobei der Isolationsschneider brechbar mit seinem zugeordneten Element (1, 2) verbunden (37) ist.

16. Ein Verbinder, wie in irgendeinem vorhergehenden Anspruch definiert, umfassend eine nachgiebige Abdichtung, um abdichtend einen Draht zu umgeben, der in eine der Kammern (14, 15, 103, 104, 105) eintritt.

17. Ein Verfahren zur Bildung einer Drallverbindung zwischen zwei biegsamen Drähten (113, 114), wobei das Verfahren die Schritte umfaßt:

Vorgabe eines Verbinders, der zwei Elemente (1, 2, 101, 102) umfaßt, wobei jedes Element (1, 2, 101, 102) eine Drahtaufnahmekanmer (14, 15, 103, 104, 105) umfaßt zur Aufnahme von Drähten (113, 114), die in einer Beziehung Seite an Seite zu verbinden sind und eine ein Moment anlegende Schulter (SM, 108, 109, 110) und eine auf das Moment reagierende Schulter (SM, 108, 109, 110) in jeder Kammer (14, 15, 103, 104, 105); und

entgegengesetzte Drehung dieser Elemente (1, 2, 101, 102) mit in der Kammer (14, 15, 103, 104, 105) positionierten Drähten (113, 114), um die Drähte (113, 114) der Reihe nach in Kontakt mit der auf das Moment reagierenden Schulter (SM, 108, 109, 110) durch die das Moment anlegende Schulter (SM, 108, 109, 110) zu zwingen, um sich einander zu kreuzen und mit einander in Eingriff zu gelangen und jeden um den anderen zu verdrillen, um eine Drallverbindung von verriegelten Spiralen zu bilden;

dadurch gekennzeichnet, daß wenigstens ein Element eine seiner Kammer (14, 15, 103, 104, 105) zugeordnete Bremseinrichtung (104) besitzt und daß die Drähte (113, 114) gegen eine relative Längsbewegung während der entgegengesetzten Drehung gebremst werden durch Zwangseingriff mit der Bremseinrichtung (104).

Revendications

1. Connecteur destiné à former une connexion torsadée entre des premier et second fils ductiles (113, 114), dans lequel ledit connecteur comprend : des premier et second éléments (1, 2, 101, 102) comportant chacun des moyens formant chambre accessibles à partir des premières extrémités des éléments (1, 2, 101, 102) respectifs pour recevoir et positionner des fils (113, 114) à raccorder dans une relation côte à côte, les moyens formant chambre (14, 15, 103, 104, 105) d'au moins un élément (1, 2, 101) comprenant des moyens formant épaulement d'application de couple (SM, 108, 109, 110) et des moyens formant épaulement de réaction au couple (SM, 108, 109, 110) contigus à la première extrémité de l'élément associé (1, 2, 101, 102) constituant les surfaces intérieures de chacun des moyens formant chambre (14, 15, 103, 104, 105) contre lesquelles les fils (113, 114) sont bloqués pendant la rotation relative desdits éléments (1, 2, 101, 102), caractérisé en ce que les moyens formant chambre (14, 15, 103, 104, 105) dudit au moins un élément (1, 2, 101) comprennent, de plus, des moyens formant frein agissant contre le mouvement longitudinal relatif des fils (113, 114) par une mise en prise forcée avec les fils pendant la rotation relative desdits éléments (1, 2, 101, 102).

2. Connecteur selon la revendication 1, dans lequel les moyens formant chambre comprennent une chambre centrale (14, 103) capable de loger lesdits

deux fils (113, 114) lorsqu'ils sont torsadés l'un avec l'autre et des première et seconde chambres latérales (15, 105) reliées à la chambre centrale (14, 103) par des moyens formant fente (104) dont l'écartement est inférieur au diamètre de l'un ou l'autre desdits fils (113, 114), les chambres latérales (15, 105) étant d'une section telle que les deux fils (113, 114) ne puissent pas occuper une chambre latérale (15, 105) en même temps.

3. Connecteur selon la revendication 2, comprenant des chanfreins (106) autour des extrémités d'entrée desdites chambres latérales (15, 105) contiguës à la première extrémité dudit au moins un élément (1, 2, 101) pour fournir une extrémité d'entrée élargie pour lesdites chambres latérales (5, 105) et pour fournir, de plus, dans lesdits moyens formant fente (104), des lignes d'intersection entre lesdits chanfreins (106) et lesdits moyens formant fente (104), lesdites lignes d'intersection fournissant lesdits moyens formant épaulement d'application de couple (SM, 108, 109, 110).

4. Connecteur selon l'une quelconque des revendications précédentes, dans lequel les éléments (1, 2, 101, 102) sont déformables.

5. Connecteur selon l'une quelconque des revendications précédentes et comprenant des moyens d'accouplement amovibles (5, 9, 120, 123), de telle manière que les éléments unis (1, 2, 101, 102) soient accouplés l'un avec l'autre avec leurs premières extrémités en butée face à face.

6. Connecteur selon la revendication 5, comprenant un accouplement sous la forme d'une gaine (9) amovible, susceptible d'être mise en prise de manière élastique, pour relier les éléments (1, 2) l'un à l'autre.

7. Connecteur selon la revendication 5, comprenant un accouplement sous la forme d'une collerette élargie (9) à la première extrémité du premier élément (1), la collerette comportant un perçage adapté pour passer pardessus et se mettre en prise de manière amovible et élastique avec une bride annulaire (5) coopérative, s'étendant à partir de la première extrémité du second élément (2) pour, de ce fait, relier les éléments (1, 2) l'un à l'autre.

8. Connecteur selon l'une quelconque des revendications 5 à 7, dans lequel les moyens de couplage (5, 9, 120, 123) permettent la mise en rotation relative des éléments (1, 2, 101, 102) tandis qu'ils sont reliés l'un à l'autre.

9. Connecteur selon la revendication 8, dans lequel les premières extrémités des éléments (1, 2, 101, 102) sont pourvues de moyens de détente et sont mises en prise mutuellement par ceux-ci lorsque les éléments (1, 2, 101, 102) sont reliés l'un à l'autre pour, de ce fait, positionner les éléments (1, 2, 101, 102) de manière rotative, lesdits moyens de détente pouvant être dépassés de force pendant la rotation relative desdits éléments (1, 2, 101, 102).

10. Connecteur selon la revendication 9, dans lequel lesdits moyens de détente ne peuvent être dépassés que dans un sens de rotation.

11. Connecteur selon l'une quelconque des revendications précédentes, dans lequel lesdits éléments (101, 102) sont pourvus, à leurs premières extrémités, de doigts avec des ergots de verrouillage (120) et d'ouvertures avec des faces de verrouillage en forme de rampe concourante (123), de sorte que l'insertion desdits doigts dans lesdites ouvertures, suivie de la rotation relative partielle des éléments (101, 102) entraîneront la mise en prise desdits ergots de verrouillage (120) avec lesdites faces de verrouillage (123) dans une action de came retenant lesdits éléments (101, 102) dans une relation de butée.

12. Connecteur selon la revendication 11, comprenant des surfaces d'étanchéité (125) entourant l'accès aux moyens formant chambre (14, 15, 103, 104, 105) depuis la première extrémité des deux éléments (101, 102), lesquelles surfaces sont mises en contact de force par ladite action de came.

13. Connecteur selon la revendication 12, dans lequel la surface d'étanchéité (125) sur la première extrémité d'au moins un desdits éléments (101, 102) est une surface surélevée continue (125).

14. Connecteur selon l'une quelconque des revendications précédentes et comprenant, de plus, un outil de découpe d'isolant s'étendant depuis au moins un desdits éléments (1, 2, 101, 102) à uns extrémité opposée à la première extrémité de celui-ci, ledit outil de découpe comprenant deux doigts (36) avec un espacement (38) entre les premières parties de doigt contiguës à ladite extrémité opposée dudit élément (1, 2) qui est sensiblement égal, mais pas inférieur, au diamètre du fil à monter dans les moyens formant chambre (14, 15, 104) de l'élément (1, 2) et un espacement (39) entre les autres parties de doigt s'étendant depuis lesdites premières parties de doigt jusqu'aux extrémités libres desdits doigts éloignées desdites premières parties de doigt qui diverge desdites premières parties de doigt, des profils de découpe sur les bords (40) se faisant face desdits doigts (36) de telle manière que l'isolant des fils isolés (113, 114) forcés entre lesdits doigts dans l'espacement entre lesdites premières

parties de doigt et tournés sera détaché de manière circonférentielle.

15. Connecteur selon la revendication 14, dans lequel ledit outil de découpe d'isolant est connecté de manière frangible (37) à son élément associé (1, 2).

16. Connecteur selon l'une quelconque des revendications précédentes, comprenant un joint d'étanchéité élastique pour enfermer, de manière étanche, un fil entrant dans un desdits moyens formant chambre (14, 15, 103, 104, 105).

17. Procédé pour former une connexion torsadée entre deux fils ductiles (113, 114), ledit procédé comprenant les étapes consistant à :

prévoir un connecteur comprenant deux éléments (1, 2, 101, 102), dans lequel chaque élément (1, 2, 101, 102) comporte des moyens formant chambre de réception de fil (14, 15, 103, 104, 105) destinés à recevoir des fils (113, 114) à raccorder dans une relation côte à côte et des moyens formant épaulement d'application de couple (SM, 108, 109, 110) et des moyens formant épaulement de réaction au couple (SM, 108, 109, 110) dans chacun des moyens formant chambre (14, 15, 103, 104, 105) ; et
faire tourner en sens contraire lesdits éléments (1, 2, 101, 102) avec les fils (113, 114) positionnés dans lesdits moyens formant chambre (14, 15, 103, 104, 105) pour entraîner la mise en contact forcée desdits fils (113, 114), de manière séquentielle, avec lesdits moyens formant épaulement de réaction au couple (SM, 108, 109, 110) par lesdits moyens formant épaulement d'application de couple (SM, 106, 109, 110), pour les amener à se croiser et à se mettre en prise l'un avec l'autre et à s'enrouler l'un autour de l'autre pour former une connexion torsadée de spirales imbriquées ;
caractérisé en ce qu'au moins un élément comporte des moyens formant frein (104) associés à ses moyens formant chambre (14, 15, 103, 104, 105) et en ce que le mouvement longitudinal relatif des fils (113, 114) est freiné pendant ladite rotation en sens contraire par la mise en prise forcée avec lesdits moyens formant frein (104).

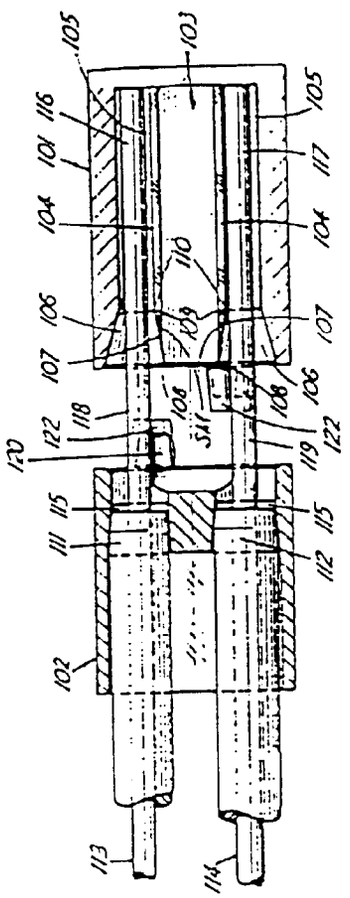

FIG. 1

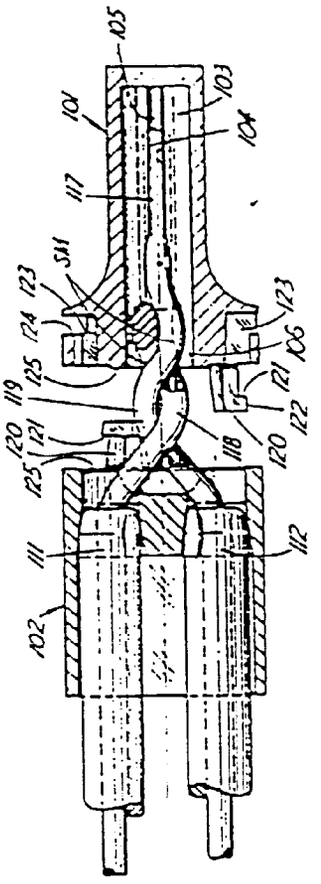

FIG. 4

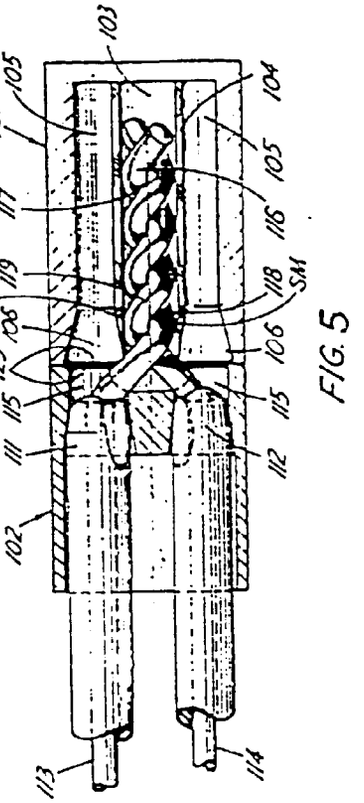

FIG. 5

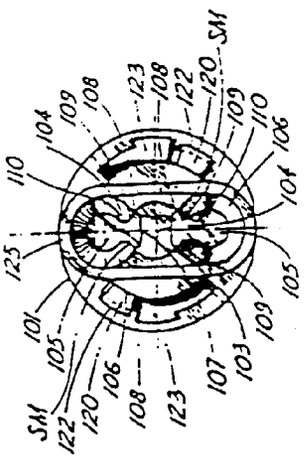

FIG. 2

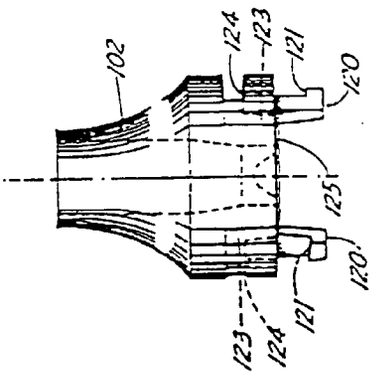

FIG. 3

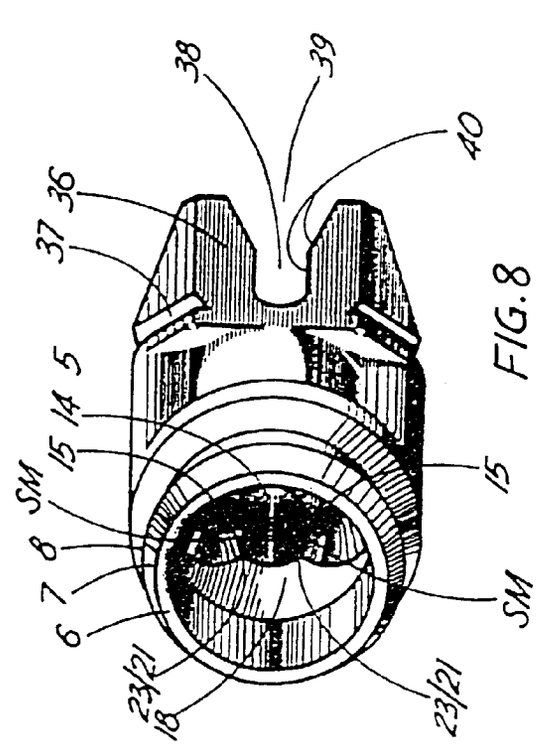

FIG. 8

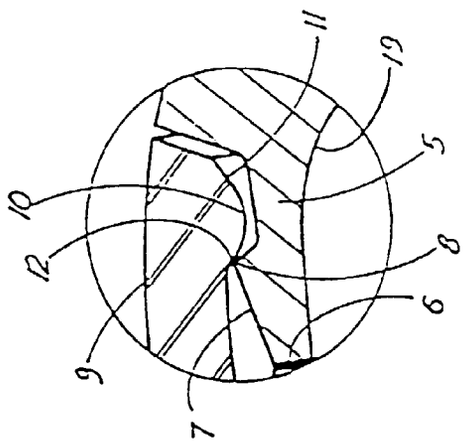

FIG. 7

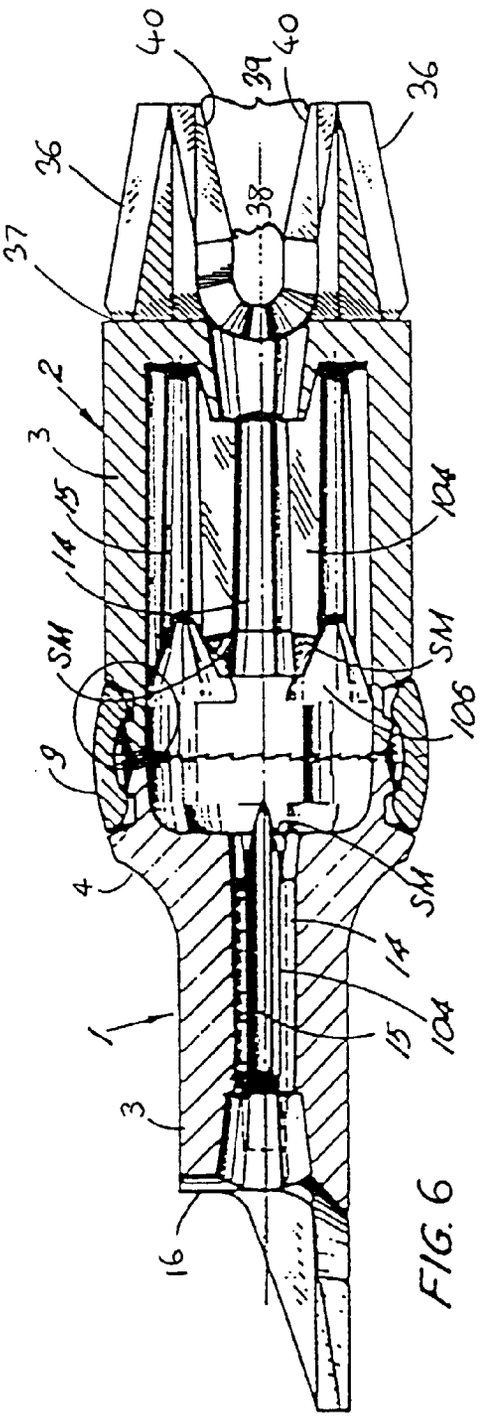

FIG. 6