

[54] **WIRING CONNECTOR**

[76] Inventor: **Jacques Grillet**, 4 Place Bir Hakeim, Grenoble, France

[22] Filed: **Aug. 3, 1972**

[21] Appl. No.: **277,660**

[30] **Foreign Application Priority Data**

Aug. 30, 1971 France..... 7132054

[52] **U.S. Cl.**..... **339/244 UC**, 24/115 R, 174/71 R, 174/84 R, 174/94 R, 248/68 R, 287/111, 339/275 R

[51] **Int. Cl.**..... **H01r 7/06**

[58] **Field of Search** 339/241, 242, 244, 252, 339/275; 24/115 R, 115 G; 174/71 R, 84 R, 84 S, 94 R, 94 S; 248/65, 68 R; 287/111

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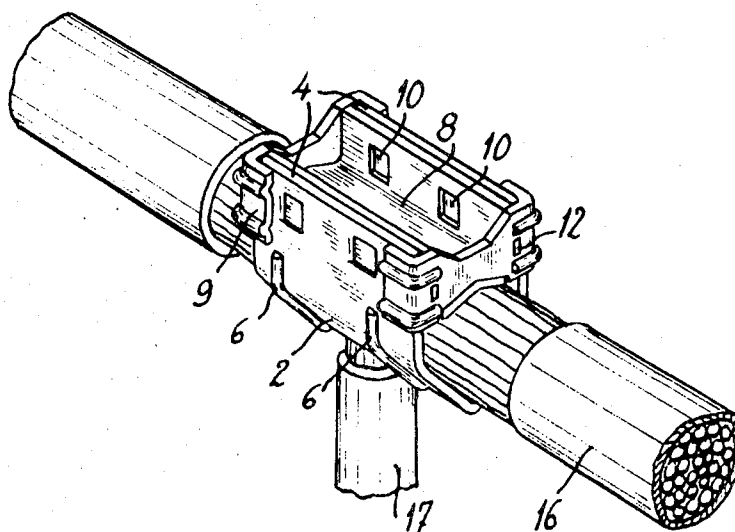
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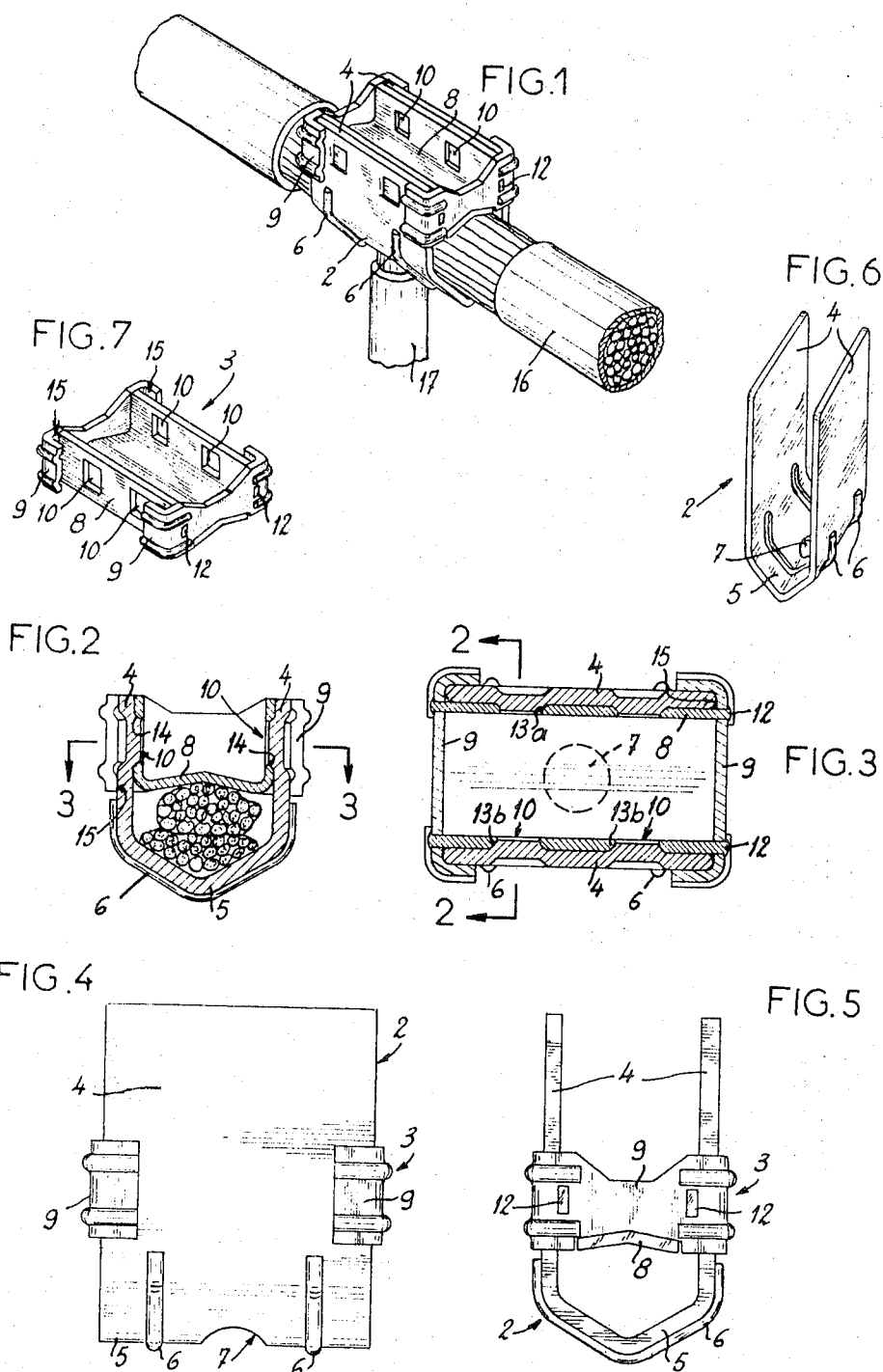
Primary Examiner—Joseph H. McGlynn
Attorney, Agent, or Firm—Karl F. Ross; Herbert Dubno

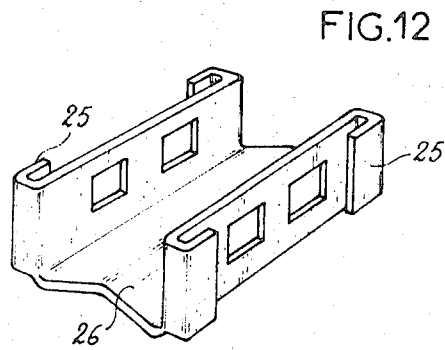
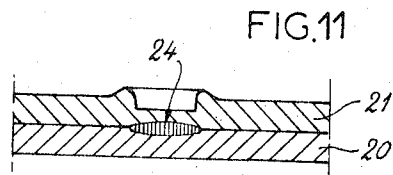
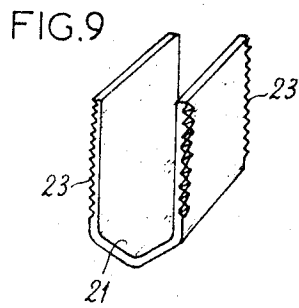
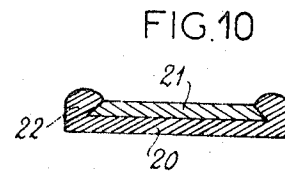
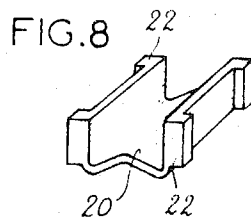
[57] **ABSTRACT**

A wire connecting device for various electrical appliances comprises essentially a U-shaped strap and a shallower U-shaped clamping member adapted to fit into the strap so as to clamp the wires between the bottoms of these elements. Windows are formed in the side walls of said clamping member for retaining by setting the adjacent wings of the strap. End distance-pieces may complete if desired the clamping member to which they are secured to caulking. The strap wings have a length sufficient to project somewhat above the top edges of the clamping member so that they can be pulled while the clamping member is pressed against the wires, whereafter the excess metal of said wings is cut off by using the top edges of the clamping members as counter-blades.

10 Claims, 12 Drawing Figures







WIRING CONNECTOR

1. FIELD OF THE INVENTION

The present invention relates to wiring connecting devices in general and has specific reference to a wire connector and to a method of mounting same.

2. BACKGROUND OF THE INVENTION

As a rule, wire connecting devices may be classified in two main groups namely the so-called "mechanical clamping" connectors and the so-called "setting" ones.

The connectors of the first group comprise all the screw clamping and tightening devices; therefore, they are adapted to be disassembled and re-assembled, permit a relatively wide range of tightening degrees, and can be fitted without resorting to complicated tools or means, since in most instances a spanner or a screw-driver is sufficient. However, they are objectionable on account of their relatively high cost, their over-all dimensions, and their lack of controllable pressure.

The connectors of the second group are based on the principle of plastic deformation (by using a punch and die tool), and comprise generally a metal sheath or casing enclosing the wire or wires to be connected. Therefore, they cannot be disassembled. In comparison with the devices of the first group, they are relatively inexpensive to manufacture, but like these last-named devices the pressure exerted on the wire or wires is hardly controllable, and in contrast to the mechanical clamping connectors their range of clamping forces is relatively narrow, and special tools capable of exerting a considerable pressure must be used for obtaining the necessary deformation of the metal casing.

Under these conditions, there is no satisfactory solution in the form of a device having concomitantly relatively low cost, facility of use, wide range of clamping forces and a controllable pressure force.

3. SUMMARY OF THE INVENTION

It is the essential object of this invention to fill this gap by providing a wiring device comprising in combination a strap-shaped metal strip and a U-shaped but shallower clamping member of harder metal adapted to be slidably fitted into the strap and secured thereto through any suitable means; this clamping member has two parallel sides engageable by the wings of said strap of which the upper portions are cut flush with the U-shaped member, with the upper edges of this member acting in the manner of counter-blades.

Various means may be used for assembling the strap and the shallower U-shaped member in their operative position. Thus, according to one embodiment, each wing of said strap may comprise at least one window permitting the setting or crimping thereof in relation to the clamping member.

In this case the U-shaped clamping member may advantageously consist of a small U-shaped pressed sheet-metal part of which each side has formed therein a pair of windows and is cut at either end to provide a tenon permitting the mounting of a pair of distance-pieces (spacers for stiffening the U-shaped member, the spacers having end portions bent at right angles to form in conjunction with the sides of said member slideways in which the wings of the strap are adapted first to be slidably fitted and then locked against movement. To facilitate the relative setting of the strap and U-shaped

member, the lateral windows of said element are formed with bevelled edges facilitating the extrusion of the strap metal, and their horizontal edges comprise a counter-taper such that when the strap and its associated member are assembled by setting they cannot be disassembled.

As already mentioned hereinabove, the setting step constitutes however but one of the various possible methods of assembling the strap and the U-shaped element. In fact, this assembly may also be formed by hammering the bent ends of the two sides of the clamping member into notches formed to this end in the ends of the two wings of said strap, or alternatively by resorting to the method already known per se of molecular compression cold welding. In this case, the strap and the member have the same thickness and nature, for example aluminum alloy or copper alloy.

It may also be pointed out that the clamping member may have a shape other than that mentioned in the foregoing. Thus, it may consist simply of a U-shaped member having its two ends bent to constitute recesses for receiving the two wings of the strap. Obviously, an element thus obtained is not as rigid as the one described hereinabove; however, due to its inherent and relative elasticity, it has advantageous in certain types of wiring connections.

In all cases the strap comprises, of course, as already known per se, at least one window formed in its bottom to permit the passage of a conducting wire or cable perpendicular to those extending longitudinally through the device (T-connector).

4. DESCRIPTION OF THE DRAWING

A clearer understanding of this invention will be had if reference is made to the attached drawing illustrating diagrammatically a few typical forms of embodiment of the wiring connector according to this invention. In the drawing:

FIG. 1 is a perspective view of a first embodiment of a connector in the position obtaining for connecting two perpendicular cables or wires;

FIGS. 2 and 3 are sections taken along the lines 2—2 and 3—3 of FIGS. 3 and 2, respectively;

FIGS. 4 and 5 are a front-elevation view and a side-elevation view, respectively, of the connector before use;

FIGS. 6 and 7 are perspective views showing the strap and the clamping member, respectively;

FIGS. 8 and 9 are perspective views showing the clamping member and the strap of the connector, respectively, when these two elements are assembled by hammering or caulking.

FIG. 10 is a horizontal section taken along one wing of said strap and said member after the crimping or setting operation;

FIG. 11 is a detail view showing on a larger scale one portion of the wings of said strap and said clamping member, in case these parts are assembled by cold welding, for example by molecular compression; and

FIG. 12 is a perspective view showing a modified embodiment of the clamping member.

5. SPECIFIC DESCRIPTION

The connector illustrated in FIGS. 1 to 7 of the drawing comprises essentially two main elements, i.e., a strap 2 and a clamping member or bridge piece 3.

The strap 2 has a generally U-shaped configuration and comprises side wings 4 and a concave bottom 5; the wings 4 are relatively long, and the bottom 5 is stiffened by a pair of ribs 6 and has a central hole 7.

The clamping member or bridge piece 3 comprises three elements, i.e., a main element 8 and a pair of distance-pieces 9. The main element 8 is of substantially U-shaped configuration and comprises a convex bottom and two upstanding sidewalls.

These side walls are characterised in that they comprise each a pair of windows 10 and at either end a small tenon 12. The windows 10 have bevelled vertical edges 13a and 13b, respectively, and counter-taper horizontal edges 14.

The pair of distance-pieces 9 associated with the main element 8 to constitute the clamping member 3 are longer than the width of this member so as to project laterally therefrom and provide, between the sides of the main element 8 and the curved ends of these distance-pieces 9, slideways 15 permitting the fitting of this clamping member 3 by slidably engaging the strap wings 4. As clearly apparent from the drawings, the main element 8 is assembled to the distance-pieces 9 to constitute the complete clamping member 3 by simply engaging the end tenons 12 of said main element 8 into corresponding orifices punched or otherwise formed in said distance-pieces 9. This connector may be used at will for interconnecting a plurality of wires or cables disposed in parallel relationship in the trough formed by the strap 2, or alternatively for electrically connecting one or more cables disposed in said trough with another cable extending at right angles thereto. Actually, this last-mentioned wiring connection is illustrated in FIG. 1 wherein the reference numeral 16 designates the main cable, 17 being the branch cable passing through the central hole 7 formed in the bottom of said strap 2.

This connector is used as follows: the two elements, i.e., strap 2 and clamping member 3, are separated from each other; then the strap 2 is fitted to the end of the branch cable 17, and the assembly thus obtained receives the main cable 16. Under these conditions, the clamping member 3 is fitted into and upon the strap 2 and caused to slide along the vertical wings 4 of this strap until the upper edges of these wings project above the edges of the clamping member sufficiently to permit of seizing said upper edges with a pair of pliers so that a predetermined tractive force can be applied thereto; with the clamping member held on a suitable support, this traction exerted on the strap wings causes the cables 16 and 17 to be tightened or clamped under a predetermined pressure between the clamping member 3 and the bottom of strap 2.

The last step is a definitive interlocking of these two members so as to hold the strap and its wings in a state of mechanical stress as required for ensuring a proper electric contact by pressure; this result is obtained by setting the wings 4 of said strap 2 on the sides of clamping member 3. During this setting step and by virtue thereof the metal portions of said wings 4 which register with the windows 10 of clamping member 3 is pressed through these windows; the partial extrusion of the metal through these windows is facilitated by the bevelled edges 13a, 13b of windows 10 of clamping member 3. The advantageous consequences of this setting step are clearly illustrated in FIGS. 2 and 3 wherein the metal of wings 4 is shown as having been pressed

through the windows 10 of element 3, and the resulting assembling action is irreversible due to the counter-taper 14 provided on the horizontal edges of the windows 10.

Thus, the connector is definitively locked in the clamping position on the two cables 16 and 17, and the now useless or excess portions of the strap wings 4 which project beyond the top of the clamping member 3 are cut off flush to the upper edges of the main element 8 of clamping member 3. These edges are rectilinear and therefore their rigidity is sufficient to enable them to act as counterblades for facilitating the cutting off of the useless portions of said strap wings 4.

Of course, various tool means may be used for performing the three steps, namely clamping, setting and cutting, but it is advantageous to use a single and same tool for performing these three steps successively.

In FIGS. 8, 9 and 10 of the drawings, the reference numerals 20 and 21 designate the two main component elements of the connector of this invention according to a modified and simplified form of embodiment thereof. Element 20 is the clamping member and element 21 the strap. The two side walls of clamping member 20 have their ends 22 bent at right angles and the edges of the wings of strap 21 are serrated or notched as shown at 23. The clamping member 20 and strap 21 are assembled by simply caulking or hammering the bent ends 22 of member 20 into the serrations or notches 23 of strap 21, as illustrated in FIG. 10.

However, any other suitable means may be provided for assembling the strap 21 and clamping member 20; thus, as shown in FIG. 11, these two members may be assembled by cold welding or molecular compression welding as illustrated at 24. To apply this method, however, certain requirements must be met, namely that the wings of members 20 and 21 have the same thickness and same nature, such as aluminum alloy or copper alloy, so as to be extremely malleable.

Whatever the mode of assembling these clamping member 20 and strap 21, the clamping member may differ considerably from the arrangement described hereinabove, notably by dispensing with the use of the distance-pieces contemplated hereinabove in the first embodiment for stiffening this clamping member. FIG. 12 illustrates this member without any distance-piece. The ends 25 of the two side walls of clamping member 26 are bent twice at right angles to constitute slideways adapted to receive the edges of the strap; in the device illustrated in FIG. 12 windows are formed in these side walls to permit a convenient assembling, by setting, of the clamping member and strap; however, it will readily occur to those conversant with the art that any methods described in the foregoing.

In any case, the connector according to this invention provides the desired advantage of:

- a reduced cost, notably on account of the use of metal strips which are both particularly simple and light in weight;
- a wide range of clamping pressures, since the wings 4 of strap 2 may be relatively long;
- reduced over-all dimensions corresponding substantially to those of the assembled cables or wires, for after cutting off the useless portions of wings 4 substantially no part of the connector projects from the cables or wires, and
- easily controllable and relatively moderate clamping pressures, since the necessary pressure is limited to

that required for ensuring a proper electric contact between two wires or cables; furthermore, in contrast to the conventional setting method it is not required to add thereto the pressure necessary for producing the plastic deformation of a metal casing.

What I claim is:

1. An electric wiring connector comprising:

a U-shaped strap and a U-shaped clamping member disposed in parallel relationship, said clamping member being shallower than and fitted into said strap, with the wires to be connected disposed therebetween, the bottom of said strap comprising reinforcing ribs and a central hole for receiving the end of a wire to be connected at right angles to the wire or wires disposed longitudinally in the device, said strap having a concave bottom and said clamping member a convex bottom for receiving the wires to be connected to be connected therein, Connector as set forth in claim 3, wherein the side walls of said clamping member have their edges cut to form small tenons, the device further comprising a pair of distance-pieces adapted to fit over the ends of said clamping member and formed with holes engageable by said tenons.

2. The connector defined in claim 1 wherein said distance-pieces are disposed across the ends of said side walls of said clamping member and comprise end portions bent at right angles to provide a slideway-forming gap between the inner faces of said bent portions and the outer faces of said side walls.

3. The connector defined in claim 2 wherein said strap has lateral wings and said clamping member with the distance-pieces assembled thereto is adapted to be fitted by sliding on the wings of said strap for clamping the wires therebetween.

4. The connector defined in claim 3 wherein the side walls of said clamping member comprise each at least one window for assembling said strap with said clamping member by setting a portion of the strap into the windows of the clamping member juxtaposed therewith.

5. The connector defined in claim 4 wherein said strap has its wings normally projecting somewhat above the top edges of said clamping member to permit the pulling of said wings while pressing said clamping member against the wires disposed therebetween, and subsequently cutting off the excess portions of said strap wings by using said top edges as counter-blades.

6. The connector defined in claim 5, wherein said windows have bevelled edges, with the horizontal edges in counter-taper relationship for preventing any undesired disassembling of said strap and clamping member.

7. An electric wiring connector comprising a U-shaped strap and a U-shaped clamping member dis-

posed in parallel relationship, said clamping member being shallower than, and fitted into, said strap, and adapted to be used for pressing the wires to be connected in the bottom of said strap, said bottom comprising reinforcing ribs and a central hole for receiving a branch wire extending at right angles to the wires clamped longitudinally in the main portion of the device, said strap having a concave bottom and said clamping member a convex bottom to accommodate the wires therein, wherein the vertical edges of the vertical side walls of said clamping member are bent at right angles and the corresponding edges of said strap are formed with serrations adapted in the assembled condition of said strap and clamping member to engage said vertical edges of said clamping member and to be retained therein by simply setting said vertical edges against said serrations.

8. Connector as set forth in claim 7, wherein the strap and clamping member assembly is reinforced by performing a cold welding, such as molecular compression welding, therebetween at suitable locations.

9. An electric wiring connector comprising a U-shaped strap and a U-shaped clamping member disposed in parallel relationship, said clamping member being shallower than, and fitted into, said strap, and adapted to be used for pressing the wires to be connected into the bottom of said strap, said bottom comprising reinforcing ribs and a central hole for receiving a branch wire extending at right angles to the wires clamped longitudinally in the main portion of the device, said strap having a concave bottom and said clamping member a convex bottom to accommodate the wires therein, wherein the vertical edges of the vertical side walls of said clamping member are bent twice at right angles in order to constitute slideways for receiving the corresponding edges of said strap formed with notches adapted in the assembled condition of said strap and clamping member to engage said vertical slideways of said clamping member and to be retained therein by simply setting said bent vertical edges of said clamping member against the vertical edges of said strap.

10. Method of assembling the elements of an electric connector comprising a U-shaped strap and a U-shaped clamping member disposed in parallel relationship, said clamping member being shallower than, and fitted into, said strap, with the wires to be connected disposed therebetween, which comprises the steps of pulling the upper edges of the side wings of said strap which project above the top edges of the side walls of said clamping member while exerting a suitable pressure against said clamping member, and cutting off the excess metal of said strap by using said top edges as counter-blades.

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