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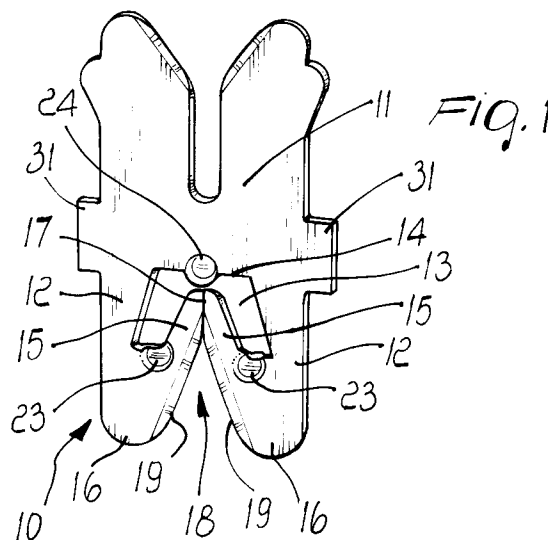
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I-20123 Milano (IT)(54) **Connector for electric connections.**

(57) Connector (10) for electrical connections of the type including a laminar body (11) made of conducting material with at least two substantially rigid oppositely arranged wings (12) which form a slot (13) in which two elastic tabs (15) converge towards the bottom (14), each tab (15) blending with a corresponding one of the wings (12) so as to form an elbow-shaped portion (16), an electrical conductor (20), made of copper or enamelled copper alloy, being insertable between the elastic tabs (15) up to their free ends, parts (19) of the borders of the tabs (15) being sharp, the connector (10) being characterized in that the tabs (15) are pre-loaded, so as to push towards each other, by raised portions (23, 24), which are formed so as to affect the inner border of each one of the elbow-shaped blending portions (16), and by a deformation of the wings (12), which has the purpose of moving their ends mutually closer.

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The present invention relates to a connector for electric connections.

Particular connectors are usually used in electrical connections and wirings; these connectors are obtained from a laminar element wherein the electric contact elements are capable of adequately punching through the insulating sheath, if any, of the conductor and of entering it to provide contact.

One kind of these connectors comprises a laminar body made of a conducting metallic material with at least two oppositely arranged substantially rigid wings which form, between them, a slot in which two elastic electrical contact tabs converge towards the bottom; each tab blends with one of the wings, forming an elbow.

A conductor can be inserted and locked between said elastic tabs, forming an electric contact.

Some regions of the borders of the tabs are sharp, so that during the insertion of the conductor between them the insulating sheath thereof is cut and so that said tabs can penetrate in the conductor and provide contact with the conducting part.

The laminar element from which the connector is obtained is blanked by means of punches which must of course have a certain thickness in order to provide an effective cutting action.

For this reason, the two tabs are mutually spaced during initial blanking and are then moved mutually closer so as to move into mutual contact their ends which must accommodate the conductor, giving them an elastic pre-loading.

This is currently achieved by providing a notch for each tab in the region where said tabs blend with the outer wings and by then forming a raised portion which overlaps the notch.

However, the notches have the important drawback that they weaken the structure exactly in a region where the stresses induced by the presence of the conductor once installed tend to discharge.

While this on one hand makes it impossible for the conductor to disengage from said tabs and enter the slot, on the other hand it hinders the movements to which the tabs are subjected both during the forming of the connector, particularly with the pre-loading by forming the notch and the raised portion, and during use, when they are moved mutually apart by the insertion of the conductor.

A principal aim of the present invention is to provide a connector for electrical connections of the type described above which eliminates the drawbacks described above in the known art.

A consequent primary object is to provide a connector that provides improved contact and electrical connection with respect to those currently commercially available.

Another important object is to provide a connector which is suitable for electrical conductors having a wide range of diameters.

Another important object is to provide a connector whose manufacture does not entail particular technical difficulties, with particular reference to the operations for blanking with punches.

Another important object is to provide a connector that can be manufactured without particular difficulties with conventional equipment and facilities.

Another important object is to provide a connector that can be manufactured with dies that are more reliable than current ones.

This aim, these objects and others which will become apparent hereinafter are achieved by a connector for electrical connections of the type which comprises a laminar body made of conducting material with at least two substantially rigid oppositely arranged wings which form a slot in which two elastic tabs converge towards the bottom, each tab blending with a corresponding one of said wings so as to form an elbow-shaped portion, an insulated electrical conductor being insertable between said elastic tabs up to their free ends, parts of the borders of said tabs being sharp, said connector being characterized in that said tabs are pre-loaded, so as to push towards each other, by raised portions, which are formed so as to affect the inner border of each one of said elbow-shaped blending portions, and by a deformation of said wings, which has the purpose of moving their ends mutually closer.

Advantageously, the bottom of said slot in which said tabs extend has a portion which extends closer to the ends of said tabs and is formed, after blanking, by a raised portion which is formed on said body, forming a supporting border for said conductor when it is inserted between said tabs.

Further characteristics and advantages of the invention will become apparent from the detailed description of an embodiment thereof, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is a perspective view of the connector according to the invention;

figure 2 is a front view of the connector of figure 1, with a conductor arranged between its contact elements;

figure 3 is an enlarged-scale perspective detail view of a tab included in the connector;

figures 4 to 10 schematically illustrate in sequence the steps of the process for manufacturing the connector.

With reference to the above figures, a connector for electrical connections is generally designated by the reference numeral 10 and comprises a laminar body 11 made of a conducting material,

such as copper or copper alloy, with two oppositely arranged wings 12; each wing is wide enough to be substantially rigid, and said wings form, between them, a slot 13 in which two elastic tabs 15 converge towards the bottom 14; each tab blends, by means of an elbow-shaped portion 16, with a corresponding wing 12.

Said tabs 15 touch each other at a flat tip region 17 thereof and together they delimit a space 18 which tapers from the region of the elbow-shaped portions 16 towards the region of mutual contact.

Each border of the tabs 15 that delimits the space 18 has a double blade 19 obtained by chamfering, by plastic deformation, the material at the edges.

An insulated electric conductor 20 (enamelled copper wire) can be inserted between the elastic tabs 15 until it accommodates between the flat regions 17; its coating is conveniently subjected, in substantially opposite positions, to a double incision by the double blade 19, which makes the tabs 15 penetrate the insulating layer 21 to reliably and broadly rest against the core 22 with the flat regions 17 so as to provide electrical contact.

In the regions where the blades 19 blend with the flat regions 17 and widen (figure 3) an axial sliding action also occurs, after the incision, moving the insulating layer 21 in the same direction and consequently achieving better penetration therein.

Conveniently, said tabs 15 are formed by blanking the metal plate from which the connector 10 is obtained with a punch that forms said tabs so that they have flat regions 17 at a certain distance from one another and so that their ends are spaced from the bottom 14 of the slot 13.

This occurs because of the need to produce punches having a certain thickness.

In the final configuration, the two elastic tabs 15 are pre-loaded so as to push towards each other by corresponding raised portions 23, which are formed so as to affect the inner border of each elbow-shaped blending portion 16, and by a deformation of said wings 12, as will become apparent hereinafter, which are moved so that their ends become mutually closer, assuming a parallel arrangement, from an initial state after blanking in which they diverge.

In order to move the bottom 14 of the slot 13 towards the ends of the tabs 15 without preventing their elastic movements and without allowing a conductor 20 to disengage from contact by entering the slot 13, a raised portion 24 is formed on the body 11 so as to affect the border of the slot 13 in order to move a portion thereof towards the tabs 15.

The raised portion 24 can be adjusted according to the type of material and/or its thickness

without having to act on the blanking punches.

As regards the process for the mass-production of connectors 10, shown in figures 4 to 9, in a first step (figure 4) holes 26 for stepwise advancement are punched by blanking on a continuously fed sheet metal strip 25.

In a second step (figure 5), blanking is performed by means of punches 27 so as to form the border of said elastic tabs 15 which forms the part 18 for the insertion of the conductor 20.

Adequate space is left between the flat regions 17 due to the need to form the punch with a certain thickness.

A further step (figure 6) forms the double blades 19 on the elastic tabs 15 by compression, for example by means of suitable punches 28.

A subsequent step (figure 7) performs blanking, by means of a punch 29, so as to form the border of said slot 13 and the remaining parts of the tabs 15.

Then (figure 8) the raised portions 23 and 24 are formed; said raised portions 23 provide a first pre-loading of the tabs 15, moving their ends mutually closer until the flat regions 17 meet.

Then (figure 9) punches 30 perform final blanking so as to complete the body 11 with the wings 12 in divaricated position.

It should be noted that the various bodies 11 formed in succession by means of the strip 25 are mutually connected by diaphragms 31 that can be appropriately cut for use.

The final step (figure 10) is the gauging of said body 11 so as to move the divaricated ends of said wings 12 mutually closer, in order to provide a second pre-loading of said tabs 15, which are pushed towards the bottom of the slot 13.

In practice it has been observed that the intended aim and objects of the present invention have been achieved.

The forming of the raised portions 23 at the inner border of each elbow-shaped portion 16 in fact produces a first pre-loading of the tabs 15 without weakening the structure as hitherto required in known embodiments.

Pre-loading is conveniently completed by moving mutually closer the ends of the wings 12 which are divaricated after the blanking operation.

The ends of the tabs 15 can move freely and elastically without interference with the bottom 14 of the slot 13 from which the raised portion 24 is formed; said raised portion cooperates with said tabs in retaining the conductor 20.

The border with a double blade and contact over a flat region furthermore help to improve both penetration in the insulating layer 21 and actual electrical contact.

This solution allows greater reliability of the connection, once installed, with respect to the solu-

tion in which the tab has blades along its entire length.

This is due to the fact that for an equal pressure applied to the contact region there is no danger of cutting the conductor (which is always possible in the case of tabs with a blade along their entire length), particularly if the component on which the connectors are mounted is subjected to vibrations during use.

Furthermore, the final flat part of the tabs allows the connection of thinner enamelled wires without the risk of cutting them.

The invention thus conceived is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept.

All the details may furthermore be replaced with other technically equivalent ones.

In practice, the materials employed, so long as they are compatible with the contingent use, as well as the dimensions, may be any according to the requirements.

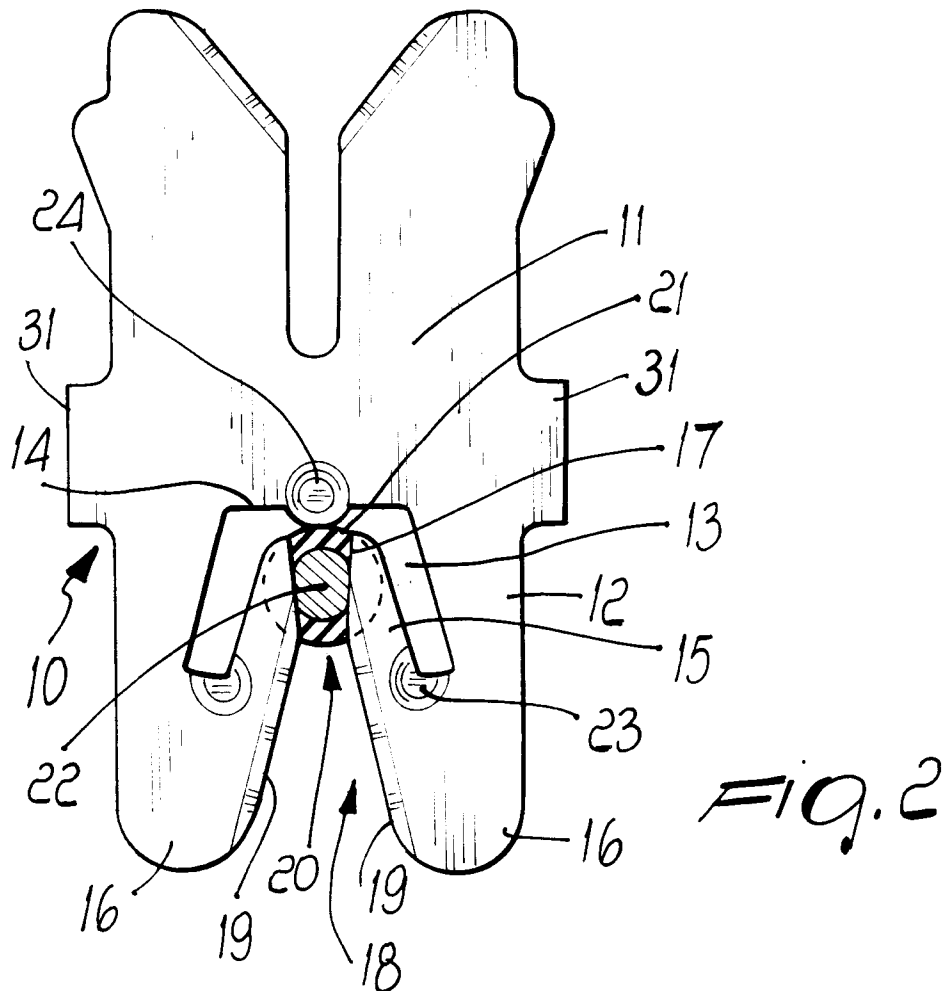
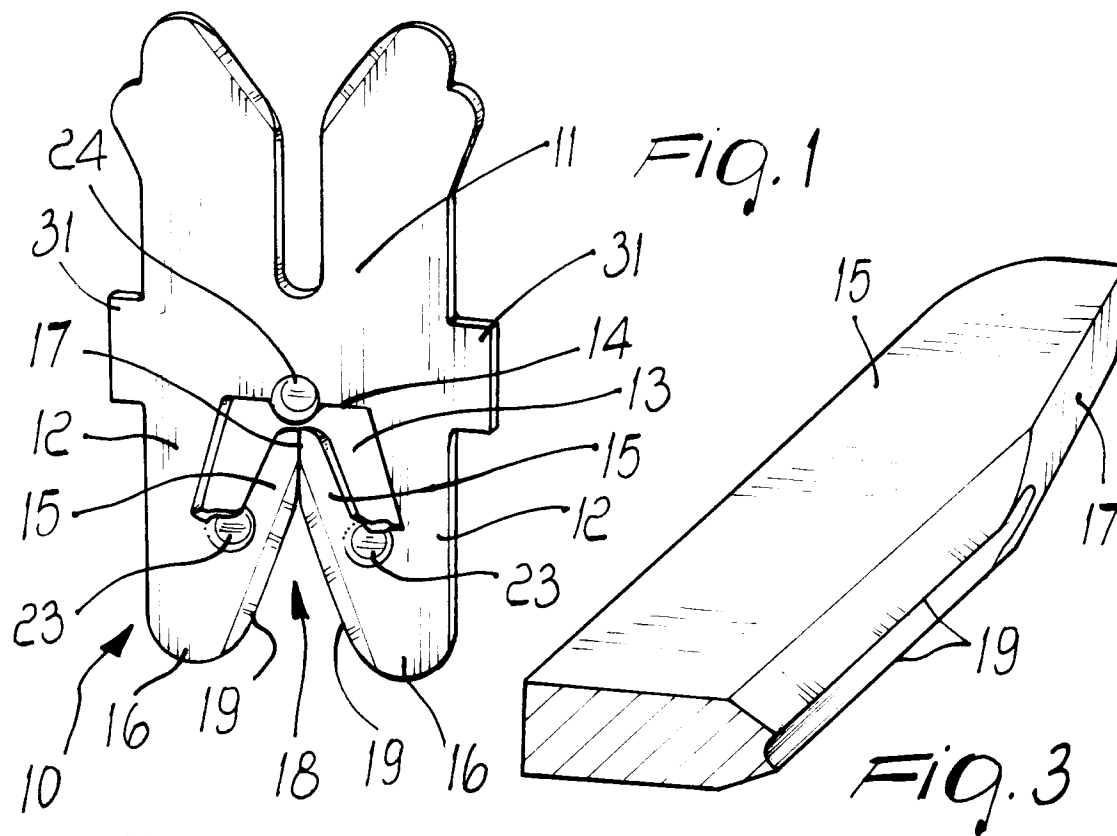
Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. Connector (10) for electrical connections of the type which comprises a laminar body (11) made of conducting material with at least two substantially rigid oppositely arranged wings (12) which form a slot (13) in which two elastic tabs (15) converge towards the bottom (14), each tab (15) blending with a corresponding one of said wings (12) so as to form an elbow-shaped portion (16), an insulated electrical conductor (20) being insertable between said elastic tabs (15) up to their free ends, parts (19) of the borders of said tabs (15) being sharp so as to form blades, said connector (10) being characterized in that said tabs (15) are pre-loaded, so as to push towards each other, by raised portions (23, 24), which are formed so as to affect the inner border of each one of said elbow-shaped blending portions (16), and by a deformation of said wings (12), which has the purpose of moving their ends mutually closer.
2. Connector according to claim 1, characterized in that the bottom (14) of said slot (13) has a region which lies closer to the ends of said tabs and is formed by a raised portion (24)

provided on said body (11) so as to form a resting border for said conductor (20).

3. Connector according to one or more of the preceding claims, characterized in that each one of said blades (19) extends from the ends of the converging space that lies between said tabs (15) up to an end region with a flat surface (17) where contact with said conductor (20) is provided.
4. Connector according to claim 3, characterized in that the border of said tabs (15) has two blades (19) formed by compressing the corresponding edges.
5. Connector according to one or more of the preceding claims, characterized in that the regions (17) of said tabs (15) for contact with said conductor are flat.
6. Process for manufacturing a connector (10) as defined in one or more of the preceding claims, comprising the steps of:
 - blanking a continuously fed sheet metal strip (25) so as to form the borders (18) of the region for the insertion of said conductor (20), forming a space at the mutually closed portions;
 - chamfering said borders so as to form corresponding blades (19);
 - blanking said metal strip (25) so as to form a border of said slot (13) and complete said tabs (15);
 - punching said metal strip (25) so as to form said raised portions (23, 24) for pre-loading and for moving the bottom (14) of said slot (13) closer to said tabs (15);
 - blanking said metal strip (25) so as to complete said body (11) with said wings (12) in divaricated position;
 - gauging said body (11), moving the divaricated ends of said wings (12) mutually closer.
7. Process according to claim 6, characterized in that the chamfering of said borders so as to form corresponding blades (19) is performed by compressing the edges of said borders so as to form double blades for each border.
8. Connector for electrical connections, comprising one or more of the technical features described and/or illustrated in the accompanying drawings.



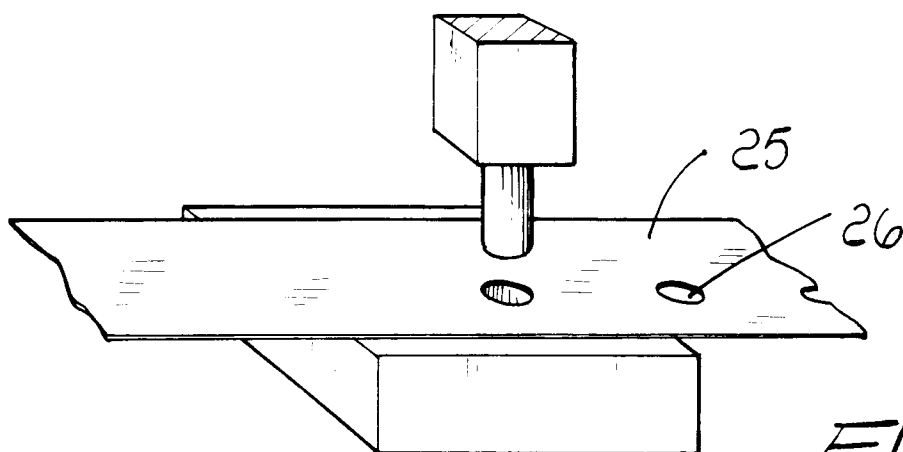


Fig. 4

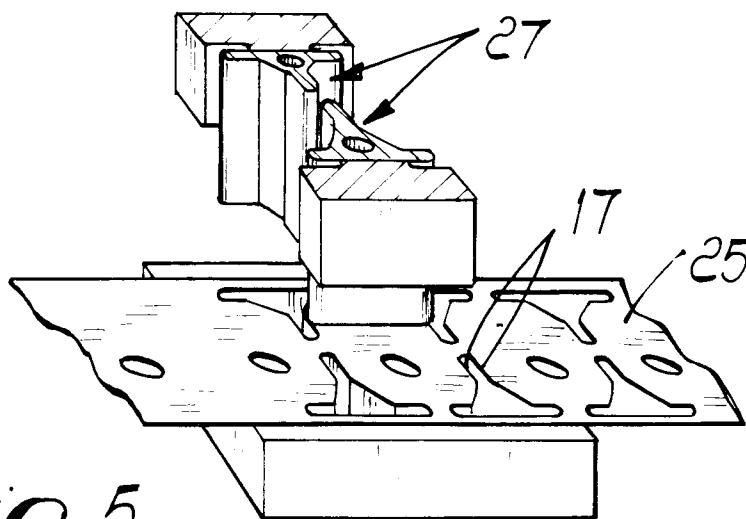


Fig. 5

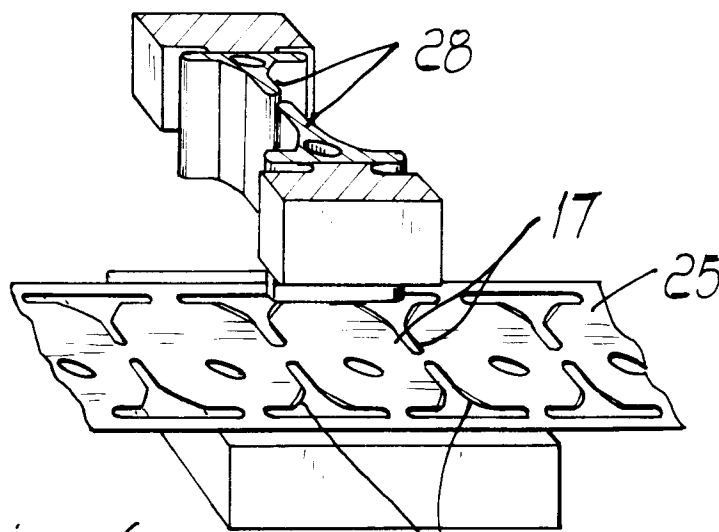
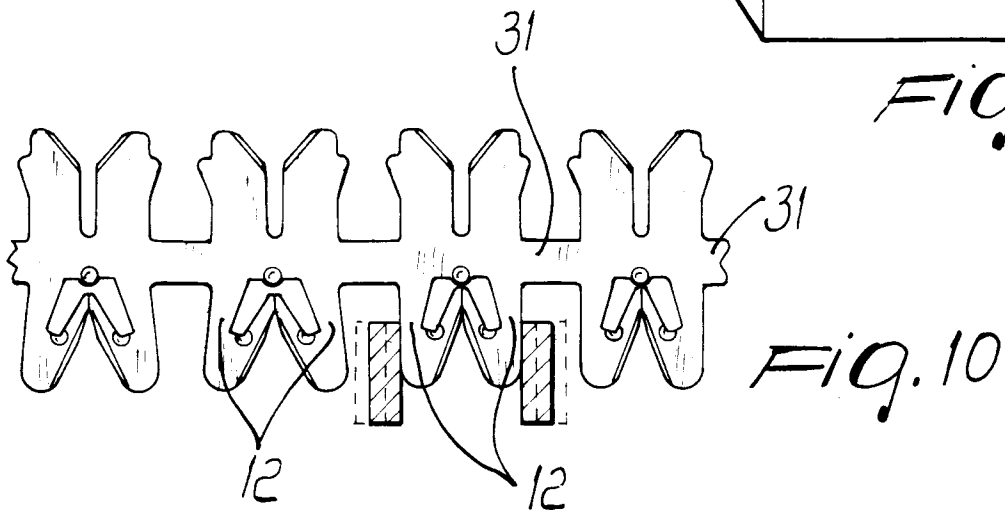
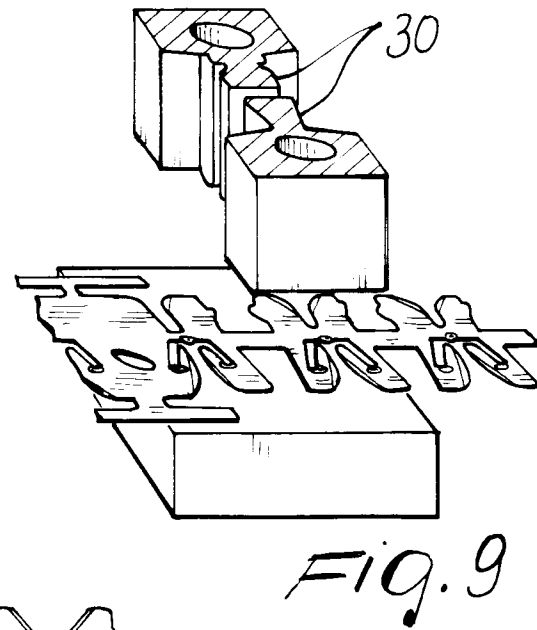
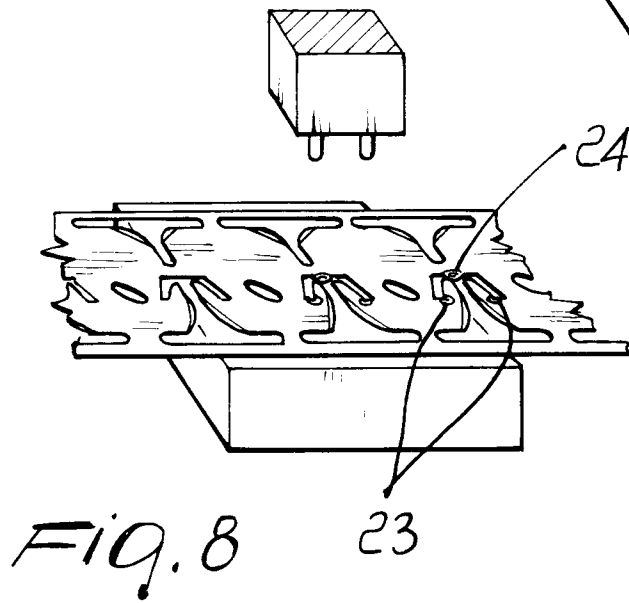
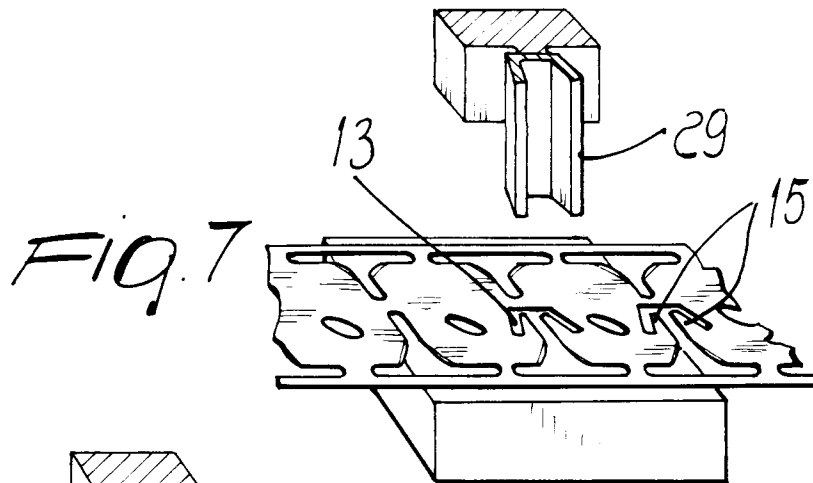


Fig. 6





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EUROPEAN SEARCH REPORT

Application Number
EP 94 11 4721

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X Y A	WO-A-88 05216 (AMTRONICS) * the whole document * ---	1 6 2-5,8	H01R43/16
Y A	US-A-4 638 559 (CHARLES MC GONIGAL) * claims; figures * ---	6 7	
A	DE-A-31 16 731 (KARL LUMBERG) * claims 1-5; figures 1-4 * ---	1-5	
A	GB-A-2 130 815 (H.&T. COMPONENTS) * the whole document * ---	1-5	
A	US-A-4 136 628 (CHARLES MC GONIGAL) * abstract; claims; figures * ---	6,7	
A	US-A-4 012 102 (THOMAS M. CHERNEY) * the whole document * ---	6,7	
A	FR-A-2 343 343 (NORTHERN TELECOM) -----		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6) H01R
Place of search THE HAGUE		Date of completion of the search 3 January 1995	Examiner Durand, F
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document			