THE JOINT EXAMINATION BOARD

PAPER P6 – INFRINGEMENT AND VALIDITY

Tuesday 4th November 2008

10.00 a.m. – 2.00 p.m.

Please read the following instructions carefully. ***Time Allowed – 4 HOURS***

1. You should respond to the instructions given at the end of the Client's letter.

2. Please note the following:

   a. Enter the Paper Number (P6) and your Examination number in the appropriate boxes at the top of each sheet of paper;
   b. The scripts are photocopied for marking purposes. Please write with a **dark inked pen** on one side of the paper only and within the printed margins. Do not use highlighters in your answer;
   c. Do not state your name anywhere in the answer;
   d. Write clearly, as examiners cannot award marks to scripts that cannot be read;
   e. **Marks are awarded for the reasoning displayed and the points selected for discussion rather than the conclusions reached.**

3. Under the Examination Regulations **you may be disqualified from the examination and have other disciplinary measures taken against you if**:

   a. you are found with unauthorised printed matter or other unauthorised material in the examination room;
   b. your mobile phone is found to be switched on;
   c. you copy the work of another candidate, use an electronic aid, or communicate with another candidate or with anyone outside the examination;
   d. you continue to write after being told to stop writing by the invigilator(s). **NO WRITING OF ANY KIND IS PERMITTED AFTER THE TIME ALLOTTED TO THIS PAPER HAS EXPIRED.**

4. **At the end of the examination assemble your answer sheets in page number order and put them in the WHITE envelope provided**. Ensure that the answer sheets placed in the envelope are not stapled or joined together in any way. Any answer script taken out of the examination room will not be marked.

Document checklist:

Client's letter		(1 page)
Document A:	GB Patent No. 2 121 212B	(6 pages)
Document B:	US Patent No. 7 000 000	(4 pages)
Document C:	US Patent No. 4 500 000	(4 pages)
Document D:	US Patent No. 4 600 000	(6 pages)

This paper consists of 22 pages in total, including this page.

A new client writes to you as follows.

"Dear Sirs,
My company makes electrical terminals and connectors for use in electronic equipment, as well as in products such as motor vehicles and domestic appliances. We own UK patent no. 2121212 [Document A], which relates to one of our best selling connector designs.
We have recently received a letter from a US competitor, Black Hat Electronics, Inc., stating that they intend to begin selling in the UK devices for connecting electrical wires to circuit boards, exactly as illustrated in their US patent no. 7000000 [Document B]. They state that their devices are structurally different from those shown in our patent, and therefore they believe that their devices do not infringe our patent. They are also of the view that our patent is invalid in the light of two of their earlier patents, US 4500000 [Document C] and US 4600000 [Document D].
Therefore, 'for commercial certainty', they want us 'to confirm in writing that the devices shown in US patent no. 7000000 would not infringe any valid claim of UK patent no. 2121212 if imported into, and sold in, the UK'.
We are concerned about potential lost profits from such imports, as Black Hat's printed circuit board connectors would certainly compete with similar products that we sell in the UK. Through economies of scale they could probably offer their terminals at a much lower price than ours. Please advise us as to our position and how we should respond to Black Hat.

Yours faithfully,
A. Sparks

Director
Newbie Electricals Limited"

Your background checks establish that:

- GB2121212 is in force
- Your client has no other relevant patents
- Black Hat Electronics Inc. does not have any UK or European patents or patent applications.

Prepare a memorandum including a detailed analysis of validity and infringement and other advice, in preparation for a meeting with Mr. Sparks, in answer to his letter.

DOCUMENT A

(12) UK Patent (19) GB (11) 2121212 (13) B

(45) Date of publication: 03.09.2000

(54) Title of the invention: Insulation Piercing Terminal

(51) INT CL: *H01R 4/24*

(21) Application No: 9806363.8

(22) Date of Filing: 24.02.1998

(43) Date A Publication: 26.08.1999

(56) Documents Cited:
None

(58) Field of Search:
As for published application 2121212 A *viz:*
INT CL **H01R**

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GB2121212

DOCUMENT A

INSULATION PIERCING TERMINAL

BACKGROUND OF THE INVENTION

The need has arisen for an inexpensively produced insulation piercing terminal for fitment to insulated conductors.

Insulation piercing terminals include a slot which receives the conductor. They must achieve a minimum level of rigidity, necessary to enable the terminal to effectively pierce through the insulative sleeve of the inserted conductor. After the insulation has been pierced, the contact between the terminal and the conductor is optimally of a resilient nature in order to preserve the electrical and mechanical integrity of the connection. The terminal must be easily produced for economic reasons, and must require a minimal amount of insertion force to facilitate the connection to a conductor.

SUMMARY OF THE INVENTION

The subject electrical terminal is as defined in the claims. A preferred embodiment of the invention is described in detail below and illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a preferred embodiment of the subject terminal;

FIG. 2 is a cross sectional view of the terminal taken along line 2--2 of FIG. 1;

FIG. 2A is a cross sectional view taken along line 2A--2A of FIG. 1, showing a connected wire in the terminal;

FIG. 2B is a scrap cross-section taken adjacent to one pair of the insulation piercing jaws showing their contact with the wire; and

FIG. 3 is a perspective view of the terminal and the connected wire.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. 1, the terminal 10 comprises a rearward insulation gripping portion 12, an intermediate conductor engaging portion 14, and a forward portion 16 illustratively shown to be a pin engageable in a receptacle (not shown) to form complementary parts of a two-part electrical coupling. Other contact configurations such as a female socket member could be used, within the scope of the invention. The insulation gripping portion 12 includes a pair of arms 18, 20 which are opposite to and offset with respect to each other, and which are bent to grip the insulation of a wire to which the terminal 10 is fitted (see Fig. 3), using a suitable tool. This serves to protect the electrical connection area, outlined by intermediate portion 14, from mechanical manipulations of the wire which could disturb the electrical and mechanical integrity of the connection.

The intermediate conductor engaging portion 14 comprises a pair of spaced apart, parallel side members 24, 26 extending upwardly from a terminal floor 28, as shown in FIGS. 1 and 2. The floor 28 and side members 24, 26 define a wire receiving channel 30. Each side member carries forward 32, 34 and rearward 36, 38 jaws respectively. Each jaw is formed at substantially a right angle to its respective side member, to project inwardly into the wire receiving channel 30 toward an opposite jaw.

As shown in FIGS. 1 and 2, each of the jaws presents an exposed edge 40 to the wire receiving channel 30, with corresponding and opposite exposed edges defining a funnel shaped upper entry portion 42 leading to a lower insulation piercing slot 44, with each of the slots 44 having a substantially constant width toward the terminal floor 28. The intermediate conductor engaging portion 14 is further provided with indents 46, 48 formed in respective side members 24, 26 along lower longitudinal bends 50, 52 respectively. The indents 46, 48 extend inwardly into the wire receiving channel 30 and serve to increase the rigidity of their respective side members and prevent buckling and bending type deformation.

Referring now to FIGS. 2, 2A and 2B, the conductor engaging portion 14 of the terminal 10 is intended for connection to a wire 66 comprising a conductor 70 and an outer

insulative covering 68. The conductor 70 of wire 66 is representatively shown to be a plurality of discrete strands, but may alternatively be a solid core. Comparing FIGS. 2 and 2A, the normal spacing between side members 24, 26 is slightly greater than the outer diameter of the wire insulation 68, and the width of the insulation piercing slot 44 is slightly less than the diameter of the conductor 70.

As specifically shown in FIGS. 2A, 2B and 3, the insertion of a length of the wire 66 into the wire receiving channel 30 using a suitable pressing tool (not shown) causes the length to be guided through the funnel shaped entry portions 42 and into the lower piercing slots 44 (only one of the slots 44 being shown in FIGS. 2A and 2B). As the wire 66 is forced into the lower piercing slots 44, the edge portions 40 of the jaws, which define the slots, pierce the insulative sleeve 68 of the wire 66 to electrically and mechanically engage inner conductor 70.

It should be noted that the forced entry of the wire 66 into the slots 44 causes a force to be distributed outwardly along the jaws 32, 34, 36, 38, and these outward forces tend to deflect the side members 24, 26 outward. The rigidity of the side members 24, 26 enhanced in the above-mentioned manner by indents 46, 48, exerts a direct counter influence through the normally projecting jaws and upon the wire 66. The relative sharpness of the edge portions 40 facilitates easy penetration of a potentially tough insulative sleeve 68, and thereby minimises the magnitude of insertion force required.

The resilient side members 24, 26 tend to exert a residual, spring-like force to resiliently pinch the conductor. The in-turned, opposing jaws 32, 34 and 36, 38 respectively project from the side members 24, 26 towards each other to simply and directly transfer this resilient force to the wire conductor 70. This ensures that integrity of the connection will be maintained e.g. where temperature variations tend to adversely affect contact integrity.

Claims:

1. An electrical terminal for insulation piercing connection of an electrical wire formed by a conductor covered with insulation, said terminal comprising:
a rearward wire engaging portion comprising a base and first and second side members connected to edges of said base by respective bends,
said side members extending side by side and defining a wire receiving channel,
each of said side members having at least one insulation piercing jaw directed toward a corresponding insulation piercing jaw of the other of said side members, each of said insulation piercing jaws having an edge portion;
said edge portion of said one insulation piercing jaw being spaced from said edge portion of said corresponding insulation piercing jaw a distance slightly less than the diameter of said conductor,
and said edge portions piercing through said insulation of said wire to establish electrical and mechanical engagement therewith as a portion of said wire is moved laterally of its axis into said wire receiving channel.

2. A terminal as set forth in claim 1, wherein each said insulation piercing jaw comprises an end portion bent perpendicular to said respective side member.

3. A terminal as set forth in claim 2, wherein each said end portion has a material thickness equal to the thickness of said respective side member.

4. A terminal as set fourth in any preceding claim, comprising at least one indent formed in each side member though the bend and into the adjacent base portion to increase the rigidity of the wire engaging portion.

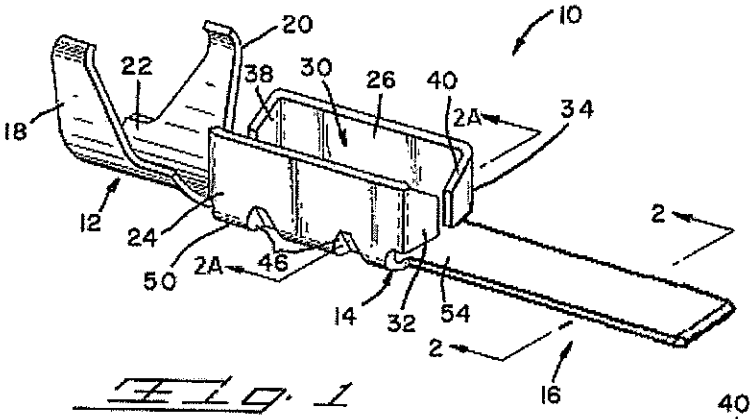

Fig. 1

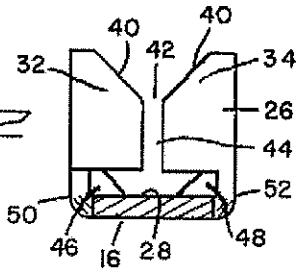

Fig. 2

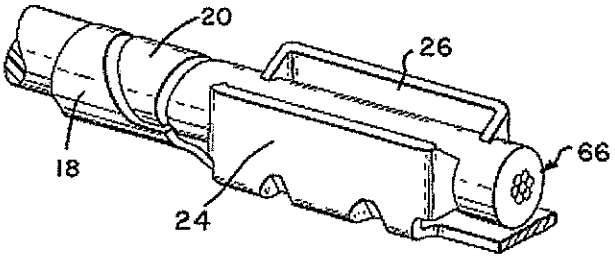

Fig. 3

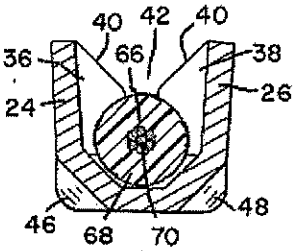

Fig. 2A

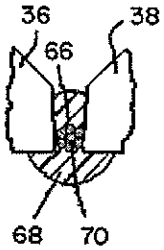

Fig. 2B

United States Patent [19]

Clinker

[11] **7,000,000**

[45] **Aug. 17, 2004**

[54] TERMINAL AND TERMINAL BLOCK

[75] Inventor: James T. Clinker, Southboro, Mass.

[73] Assignee: Black Hat Electronics, Inc., Watertown, Mass.

[21] Appl. No.: **193,652**

[22] Filed: Oct. 3, 2001

[51] **Int. Cl.**[3] **H01R 13/38**

[52] **U.S. Cl.** ..... **339/99 R**

[58] **Field of Search** ..... 339/97 R, 97 P, 98, 339/99 R

[56] **References Cited**

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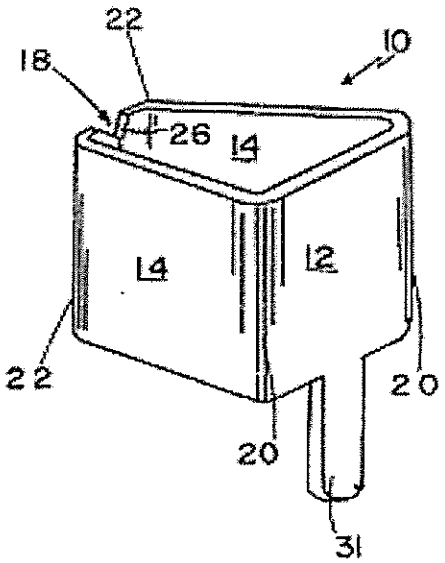
Primary Examiner—Joseph H. McGlynn

[57] **ABSTRACT**

A terminal and terminal block for connecting an insulated wire to electrical circuitry, without stripping and preparing the wire

10 Claims, 2 Drawing Figures



US7000000

DOCUMENT B

TERMINAL AND TERMINAL BLOCK

This invention relates to a terminal and terminal block adapted to retain an insulated wire, enabling it to be connected to electrical circuitry such as, for example a circuit board, without stripping and preparing the wire. The terminal block of the invention has a base, in which the terminal is provided, and a top. In a first terminal block position, the base and top allow a wire to be inserted into the block and laid over the terminal. The top is movable toward the base to reach a second terminal block position in which base and top are locked together. The motion of the top relative to the base forces the wire into a slit provided in the terminal. Edges of the slit slice the insulation to make electrical contact with the wire.

Preferred embodiments of the invention are described below with reference to the drawings, in which:

FIG. 1 is a perspective view of a terminal embodying the invention, the terminal block being omitted, and

FIG. 2 is a perspective view of a modified terminal embodying the invention.

As shown in Figures 1 and 2, terminal 10, 10a is made of springy, electrically conductive sheet metal. It has a generally flat trunk 12, from opposite sides of which a pair of opposing spring arms 14 extends. Opposed, insulation-slicing, wire-contacting edges 16 are provided at the ends of the arms 14 opposite to the trunk 12. Edges 16 are spaced from one another to define a wire-receiving slit 18 which is narrower than the diameter of any wire for which the terminal is designed.

The portion of spring arm 14 extending between trunk 12 and edge 16 has a rounded trunk corner 20 adjacent trunk 12, and a rounded edge corner 22 adjacent edge 16. A

straight connecting portion between these corners forms an included angle of less than about 90 degrees with the trunk 12; and forms an included angle of greater than about 90 degrees with the plane of opposed edges 16.

Each edge 16 provides a beveled corner 26 at one end for receiving and slicing the surrounding insulation of the wire. The portion of spring arm 14 between edge corner 22 and edge 16 is of reduced thickness, so as to more readily penetrate the wire insulation. Terminal 10 further provides an electrical contact or tail 31 extending from trunk 12.

In the variant shown in Figure 2, the upper edge 87 of the terminal spring arms 14 and trunk 12 can be bent outwardly in a forming operation. Similarly the lower edges 90 of the spring arms can be folded outwardly, to increase the overall stiffness of the resulting terminal 10a, compared to the terminal 10 of Figure 1. The increased stiffness results in higher gripping forces exerted by the slit edges 16 on the wire 11 conductor.

In both illustrated embodiments, the top and base of the terminal block (not shown) are movable towards one another to force the wire obliquely into the slit 18. When the wire is fully inserted into the terminal, a major portion always extends over the trunk 12 (to the right as shown in Figure 2); whereas a short end part of the wire extends through the slit 18 out of the terminal in the opposite direction.

[Claims omitted]

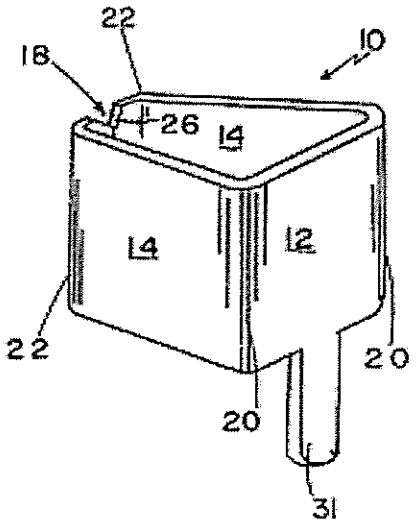


FIG 1

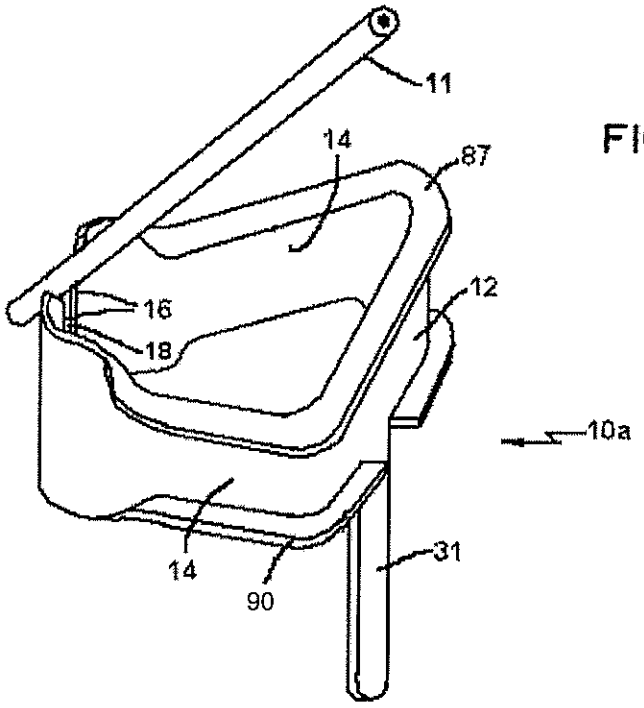


FIG 2

United States Patent [19]
Frazer

[11] 4,500,000
[45] Jun. 27, 1978

[54] ELECTRICAL TERMINAL

[75] Inventor: Frederick Q. Frazer, Bristolville, Ohio

[73] Assignee: Black Hat Electronics, Inc., Watertown, Mass.

[21] Appl. No.: 748,486

[22] Filed: Dec. 8, 1976

[51] Int. Cl.² H01R 11/20
[52] U.S. Cl. ..... 339/97 R
[58] Field of Search 339/97–99

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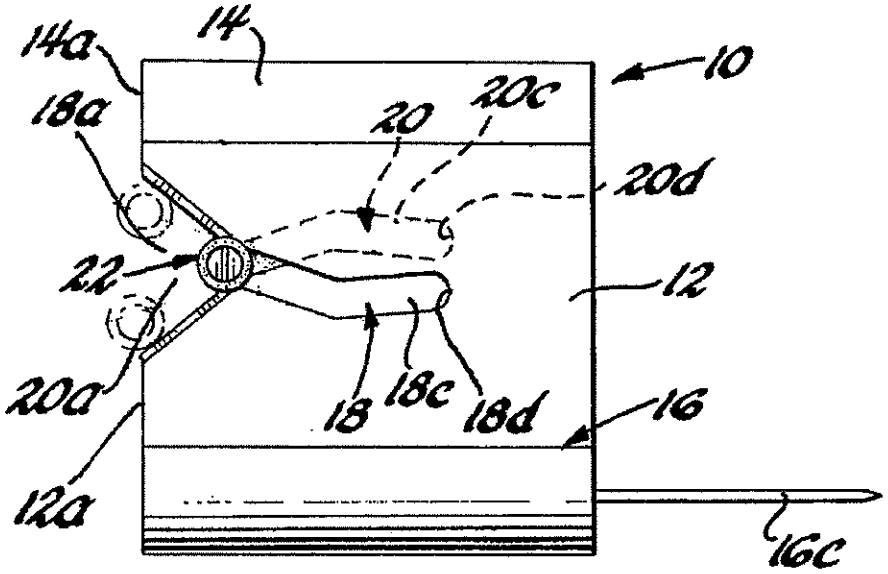
Primary Examiner—Joseph H. McGlynn
Attorney, Agent, or Firm—F. J. Fodale

[57] ABSTRACT

An electrical terminal has parallel front and back end plate portions containing respective V-shaped and inverted V-shaped slots. The end plate portions are relatively movable transversely of the slots to admit, make electrical contact with and retain an insulation covered wire.

10 Claims, 5 Drawing Figures



US4500000 **DOCUMENT C**

ELECTRICAL TERMINAL

This invention relates to electrical terminals which make electrical contact with an insulated electrical wire by displacing portions of the insulation for engaging the conductor core of the wire.

One such terminal uses a plate portion having a narrow slot into which an insulated electrical wire is pushed down such that the insulation is displaced and the conductor core is engaged by the terminal. A drawback of such a "fixed slot" terminal is that the slot is generally sized to accept a specific diameter conductor core thus requiring a different terminal for each size of insulated electrical wire. Another disadvantage is that these terminals disrupt the shape of wire cores containing multiple strands and therefore do not maintain firm electrical and mechanical contact with these multi-stranded cores.

The following is a detailed description of a preferred embodiment of the invention as illustrated in the accompanying sheet of drawings in which:

FIG. 1 is a side view of an insulation displacement terminal in accordance with this invention,

FIG. 2 is a front view of the terminal shown in FIG. 1 taken substantially along the line 2--2 of FIG. 1 and looking in the direction of the arrows,

FIG. 3 is a front view of the terminal similar to FIG. 2 showing the terminal operatively engaging an insulated electrical wire,

FIG. 4 is a section taken substantially along the line 4--4 of FIG. 3 and looking in the direction of the arrows,

FIG. 5 is a perspective view of the terminal shown in FIGS. 1 and 2 with a portion broken away to illustrate otherwise hidden detail.

Referring now to FIG. 5, the terminal 10 comprises a unitary sheet metal body formed from a strip shape which is bent into a double layered L-shaped body. More specifically the terminal 10 comprises a pair of end plates 12 and 14 positioned side-by-side in a closely spaced parallel relationship. Bottom edges of the end plates 12 and 14 are interconnected by a spring portion 16 which is of hairpin shaped section and disposed generally perpendicular and to one side of the end plates 12 and 14. The bottom leg 16a of the spring portion 16 is connected to the back end plate 14 and the top leg 16b is connected to the front end plate 12. The spring portion 16 is shown in its free unstressed state in FIGS. 1 and 2. This arrangement of the spring portion 16 permits but resists upward vertical movement of the front end plate 12 with respect to the back end plate 14 from the position shown in FIGS. 1 and 2. The front end plate 12 moves generally parallel to the back end plate 14 over the range of movement of interest, because of the length and orientation of the spring portion 16. From the bottom leg 16a an electrical contact 16c is provided as a coplanar extension, which serves as a connection to a complementary electrical connector (not shown). A central portion of leg 16a is cut out and bent downwardly at an angle to serve as a lock tab 16d for locking the terminal 10 in a connector body cavity (also not shown).

Initially, the insulated electrical wire 22 is placed in aligned V-shaped mouths 18a and 20a of slots 18 and 20, provided respectively in the front and back end plates 12 and 14. The edges defining the mouths 18a, 20a are preferably thinned and sharpened, so that they can pierce the insulation as the wire is pressed further into the slots 18, 20.

The slots 18 and 20 from the mouths 18a, 20a are of shallow V- and inverted V-shape respectively. As the wire is pushed into these it contacts the top edge of slot 18 and the bottom edge of slot 20 and urges the legs 16a, 16b apart. Then as the wire passes the apex of the V's, the springiness serves to move the legs 16a, 16b back towards each other and urge the wire towards the closed ends 18d, 20d of the slots. In this way the wire is retained in position and in firm electrical contact with the terminal.

[Claims omitted]

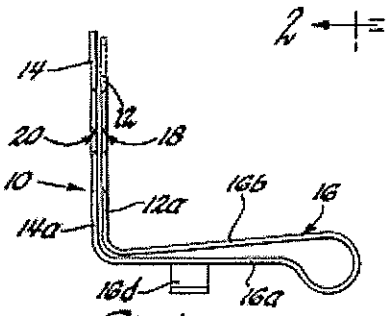


Fig. 1

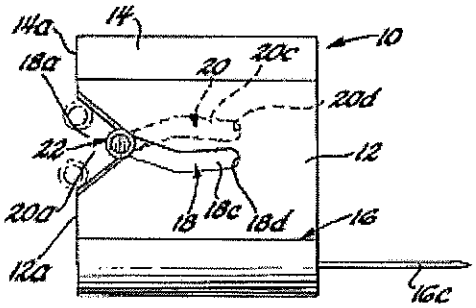


Fig. 2

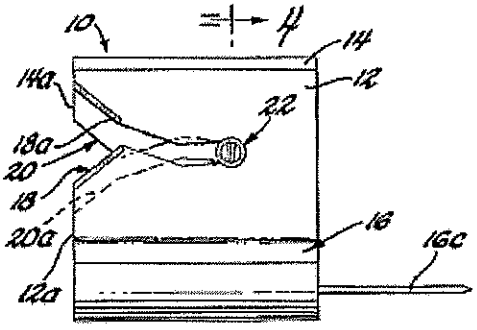


Fig. 3

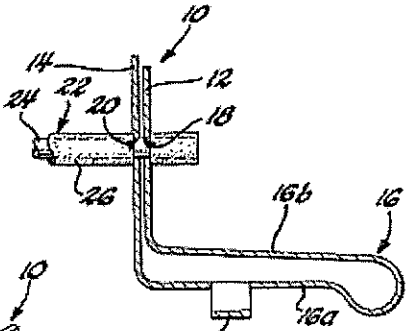


Fig. 4

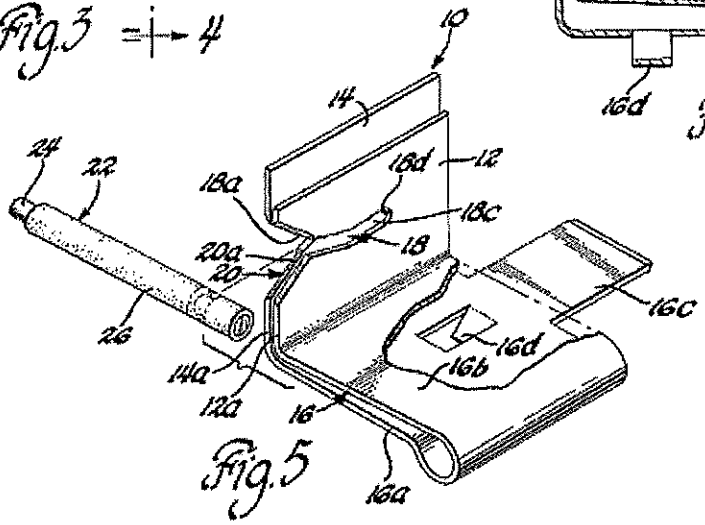


Fig. 5

United States Patent [19]

Frazer

[11] 4,600,000

[45] Sep. 8, 1981

[54] CONTACT FOR ELECTRIC CONNECTOR

[75] Inventor: Fred Q. Frazer, Bristolville, Ohio

[73] Assignee: Black Hat Electronics, Inc., Watertown, Mass.

[21] Appl. No.: 100,107

[22] Filed: Dec. 4, 1979

[51] Int. Cl.³ H01R 11/20; H01R 43/00

[52] U.S. Cl. ..... 339/97 R; 29/882

[58] Field of Search ..... 339/97 R, 258 R, 258 P, 339/95, 96, 97 P, 98, 99, 17 LC, 17 LM, 17 M, 17 L; 29/874, 882, 881

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4,118,103	10/1978	Leidy	339/98

Primary Examiner—John McQuade

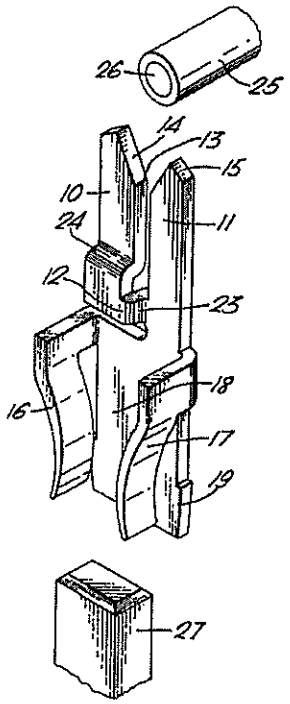
Assistant Examiner—John S. Brown

Attorney, Agent, or Firm—Kerkam, Stowell, Kondracki & Clarke

[57] ABSTRACT

A contact for an electric connector comprises a terminal element for connection to an electric conductor and a contact-making portion for connection to an electric circuit.

16 Claims, 3 Drawing Figures



US4600000

DOCUMENT D

CONTACT FOR ELECTRIC CONNECTOR

This invention relates to an insulation-displacement contact for an electric connector, and to a connector including such contacts.

Wires for electrical connections are usually covered with an insulating material which must be removed before a satisfactory connection can be made.

A number of connection systems have been developed using what are referred to as "insulation-displacement contacts". The most common method is to force an insulated wire into a metallic contact member having a slot the width of which is slightly less than that of the metallic wire core. The insulation is displaced either by a shearing (slicing or piercing) action or by a crushing action, or by a combination of the two. The displaced insulation is compressed by the contact member to a degree which ensures a gas-tight joint which is essential for a good long-lasting connection between corrosion-prone metal connecting parts. However, the compression of the core must not be excessive, otherwise the wire will be weakened to such an extent that it will be mechanically unacceptable.

This type of contact is often referred to as a "notch" contact, and may be of very simple form. The notch is necessarily narrow to suit the diameter of the conductor, and its width must be held to close tolerances. This may cause manufacturing problems, particularly in cases where the metal thickness is greater than the width of the notch since this may damage, or shorten the life of, the tool used to form the notch. In addition, the clamping force developed by the contact must not fall to an unacceptable level during the life of the contact.

It is an object of the invention to provide an insulation displacement contact for an electric connector which does not suffer from the above-mentioned disadvantages.

The invention will now be described with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of a stamped blank from which a contact is formed;
FIG. 2 is a similar view of a contact formed from the blank of FIG. 1, and
FIG. 3 is a front view of part of the contact of FIG. 2.

Referring now to FIG. 1, this shows a single blank or precursor, formed by stamping, from which a contact will be formed. The blank has two arms 10 and 11 joined at one base end by a link portion 12 and spaced apart to define a relatively wide notch 13. Arm 10 is slightly longer than arm 11. The free ends of arms 10 and 11 have steep slopes 14 on one side and shallower slopes 15 on the other side.

Below the base link portion 12 the blank branches out into three parallel portions. The outer two limbs 16 and 17 are located on either side of a central locating limb 18 which has an enlarged portion 19 formed on it. The entire blank may be carried on a conventional bandolier (carrier strip) 20 with pilot holes 21, and a weakened groove 22 eases detachment of the blank from the bandolier.

FIG. 2 shows a completed contact, detached from the bandolier and after a number of bending and other operations have been performed. The base link portion 12 has a double bend 23 formed in it so that the longer arm 10 is displaced out of the plane of the arm 11. A second double bend 24, formed at the lower end of arm 10, restores the upper end of this arm to the plane of arm 11. The two double bends reduce the width of the notch 13 to the value necessary to form the terminal element of the contact. This value is determined by the extent of the bends 23 and 24 and is therefore variable in manufacture. Both arms are now effectively of the same length. The steeper slopes 14 serve to guide a conductor with insulation 25, having a core 26, between the arms and into the notch 13, whilst the shallower slopes 15 serve to position an insulating cover in a complete connector.

The two lower limbs 16 and 17 are subjected to bending and forming operations which result in the formation of a leaf contact with which, for example, a pin 27 may engage. The central locating limb 18 and its enlarged portion 19 serve to position and retain the contact in an insulating cover (not shown).

FIG. 3 shows part of the contact of FIG. 2 with a conductor in position in the notch 13. As will be seen from FIG. 3 the act of pressing the conductor into the notch 13 cuts through the insulation 25 of the conductor, whilst the edges of the notch compress the core 26 to form a satisfactory electrical connection. The increased length of arm 10 relative to arm 11 results in the arm 10 having a lower stiffness, and hence this reduces the likelihood of failure of the connection.

[Claims omitted]

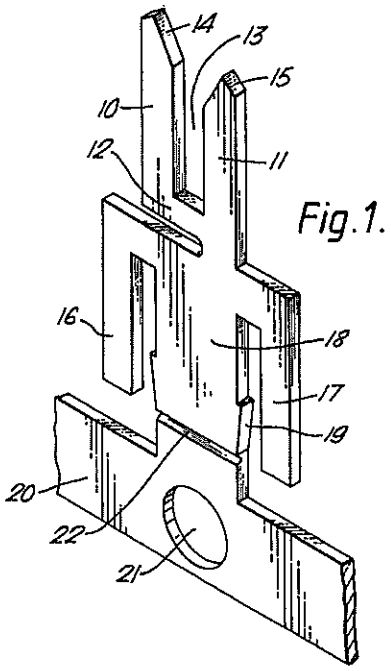


Fig. 1.

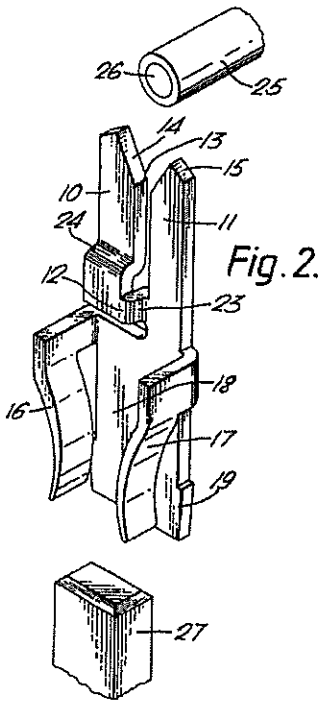


Fig. 2.

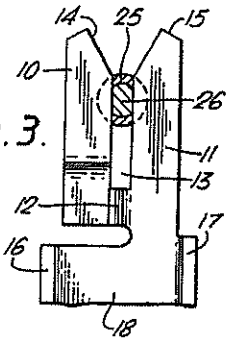


Fig. 3.