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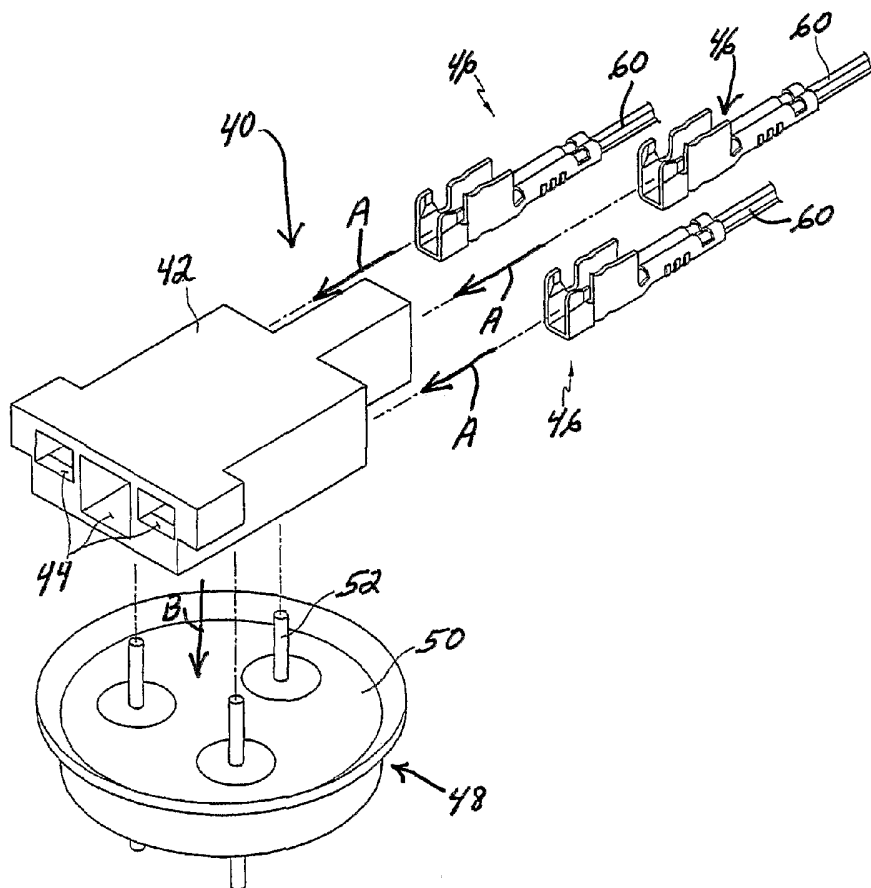
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[Continued on next page]

(54) Title: TERMINAL FOR ELECTRICAL CONNECTORS



(57) Abstract: An electrical terminal is provided for electrical connection to a terminal pin. The terminal includes a rear terminating end for connection to an appropriate electrical conductor. A contact section is disposed forwardly of the terminating end for connection to the terminal pin. The contact section includes a base plate having a through hole for receiving the terminal pin therethrough. A pair of contact portions project from the base plate at opposite sides of the through hole for engaging the terminal pin. The contact portions have concave, semi-cylindrical opposing contact surfaces on the insides thereof extending in a direction away from the base plate for gripping the terminal pin. The contact surfaces also taper inwardly toward each other in the direction away from the base plate to increase the gripping forces.



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GW, ML, MR, NE, SN, TD, TG).

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

TERMINAL FOR ELECTRICAL CONNECTORS

Field of the Invention:

This invention generally relates to the art of electrical connectors and, particularly, to an electrical terminal for connection to a terminal pin.

Background of the Invention:

Electrical connectors are used in conjunction with motors, compressors, transformers, relays and the like. Such connectors include one or more terminals which are terminated to conductors or electrical wires. For instance, the terminal may include a terminating end or wire holder crimped onto an electrical wire by an appropriate crimping tool. A contact portion of the connector is inserted into a dielectric or insulating housing to form the connector which, in turn, is mated with a complementary mating connector which may have a terminal pin inserted into the housing and into the contact portion of the terminal.

FIGS. 1 and 2 show a prior art electrical connector, generally designated 10, for mating with a complementary mating connector, generally designated 12. The mating connector includes a housing 14 having a plurality of terminal pins 16.

Connector 10 includes a dielectric or insulating housing 18 having a plurality of terminal-receiving passages 20. A plurality of terminals, generally designated 22, are inserted into the passages in the direction of arrows [A].

Each terminal 22 includes a terminating end, generally designated 24; a leading end, generally designated 26; and a contact section, generally designated 28, between the ends. Terminating end 24 of prior art terminal 22 includes a rearward section 24a having a pair of crimp arms 24b for crimping onto the outer insulation of a conductor or electrical wire 30. A forward section 24c has a pair of crimp arms 24d for crimping onto the conductive core of the electrical wire. A plurality of ribs 24e of the forward section ensures a positive gripping contact with the conductive core.

A bottom plate 32 of terminal 22 extends from leading end 26 through contact section 28. Generally, the contact section is U-shaped with a pair of side walls 34 upstanding from bottom

plate 32, with wall sections 34a being on opposite sides of a pin-receiving hole 36 which extends through bottom plate 32.

After terminals 22 are inserted in the direction of arrows "A" into terminal-receiving passages 20 of housing 10, the assembled connector is mated with mating connector 12 in the direction of arrow "B". Terminal pins 16 of the mating connector move through the bottom of housing 18 and into holes 36 in terminals 22, whereupon side wall sections 34a of the terminals contact opposite sides of the terminal pins.

Prior art terminals 22 have a number of problems or disadvantages, one of which is that the terminals are difficult to insert into terminal-receiving passages 20 of connector housing 18. Another considerable problem is that side wall sections 34a of the terminals do not provide a stable electrical connection with terminal pins 16 of the mating connector. The present invention is directed to solving these various problems.

Summary of the Invention:

An object, therefore, of the invention is to provide a new and improved electrical terminal for electrical connection to a terminal pin.

In the exemplary embodiment of the invention, the terminal includes a rear terminating end for connection to an appropriate electrical conductor. A contact section is disposed forwardly of the terminating end for connection to the terminal pin. The contact section includes a base plate having a through hole for receiving the terminal pin therethrough. A pair of contact portions project from the base plate at opposite sides of the through hole for engaging the terminal pin. The contact portions have concave, semi-cylindrical opposing contact surfaces on the insides thereof extending in a direction away from the base plate for gripping the terminal pin. The contact surfaces also taper inwardly toward each other in the direction away from the base plate to increase the gripping forces.

According to one aspect of the invention, the terminal is stamped and formed of conductive sheet metal material. The contact portions comprise side wall plates of the contact section.

According to another aspect of the invention, at least a portion of the base plate increases in width rearwardly toward the terminating end of the terminal to facilitate inserting the terminal into an appropriate terminal-receiving passage in a connector housing.

According to a further aspect of the invention, the terminal includes a front leading end for insertion into the terminal-receiving passage in the connector housing. The base plate extends into the front leading end, and the base plate then increases in width rearwardly toward the terminating end to facilitate the insertion of the terminal into the terminal-receiving passage of the connector housing.

Other objects, features and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings.

Brief Description of the Drawings:

The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with its objects and the advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify like elements in the figures and in which:

FIG. 1 is an exploded perspective view of an electrical connector incorporating terminals according to the prior art, in conjunction with a mating connector, and as described in the Background, above;

FIG. 2 is an enlarged top plan view of one of the prior art terminals in FIG. 1;

FIG. 3 is a view similar to that of FIG. 1, but incorporating terminals according to the invention;

FIG. 4 is an enlarged perspective view of one of the terminals shown in FIG. 3;

FIG. 5 is a vertical section taken generally along line 5-5 in FIG. 4; and

FIG. 6 is a top plan view of one of the terminals according to the invention.

Detailed Description of the Preferred Embodiment:

Referring to the drawings in greater detail, and first to FIG. 3, an electrical connector, generally designated 40, includes a dielectric or insulating housing 42 having a plurality of terminal-receiving passages 44 for receiving a plurality of electrical terminals, generally designated 46, according to the invention. The terminals are inserted into passages 44 in the direction of arrows "A". Connector 40 is mateable with a complementary mating connector 48 in the direction of arrow "B". Mating connector 48 includes a housing 50 which mounts a

plurality of upstanding terminal pins 52. Terminals 46 preferably are stamped and formed of conductive sheet metal material.

Referring to FIGS. 4-6 in conjunction with FIG. 3, each electrical terminal 46 includes a rear terminating end 54, a front or leading end 56 and a contact section, generally designated 58, between the ends. Each terminal 46 is terminated to an appropriate conductor or electrical wire 60 as seen in FIG. 3.

Terminating end 54 of each terminal 46 includes a forward pair of crimp arms 54a having edges 54b and a rearward pair of crimp arms 54c having edges 54d. The respective electrical wire 60 may have its outer insulating cladding stripped to expose a distal end of its interior conductive core. In that event, forward crimp arms 54a are crimped onto the core, with edges 54b of the arms positively or rigidly engaging the core. Transverse cavities 54e are stamped and formed into the terminal to form ridges therebetween to further facilitate clamping onto the conductive core. Rearward crimp arms 54c are crimped onto the outer insulating cladding of the electrical wire, with edges 54d of the crimp arms piercing the cladding to engage the conductive core of the wire. If the cladding is not stripped to expose the conductive core, both pairs of crimp arms 54a and 54c pierce the cladding to engage the core.

Contact section 58 of each terminal 46 is generally U-shaped and includes a base plate 62 and a pair of upstanding side wall plates 64. The base plate has a through hole 66 for receiving a respective one of the terminal pins 52 (Fig. 3). It can be seen in FIGS. 4 and 6 that the base plate extends forwardly through leading end 56 of the terminal. As best seen in FIG. 6, contact portions 64a of side wall plates 64 are disposed on diametrically opposite sides of through hole 66 for receiving the terminal pin therebetween.

According to one aspect of the invention, contact portions 64a have concave, semi-cylindrical opposing contact surfaces 70 as best seen in FIG. 6. These concave surfaces on the insides of the contact portions extend in a direction away from base plate 62 for gripping one of the terminal pins 52 with a stable engagement.

Another aspect of the invention is best shown in FIG. 5. It can be seen that contact surfaces 70 on the insides of contact portions 64a taper inwardly toward each other in a direction away from base plate 62. This increases the gripping forces of the concave contact portions onto the respective terminal pin. The contact portions preferably will engage the terminal pin through the entire length or height of the contact portions.

Finally, FIG. 6 shows another feature of the invention wherein base plate 62 increases in width rearwardly toward terminating end 54 of the terminal. This facilitates inserting the terminal into its respective terminal-receiving passage 44 in housing 42 and to precisely locate the terminal therewithin.

5 It will be understood that the invention may be embodied in other specific forms without departing from the spirit or central characteristics thereof. The present examples and embodiments, therefore, are to be considered in all respects as illustrative and not restrictive, and the invention is not to be limited to the details given herein.

CLAIMS:

What is claimed is:

1. An electrical terminal for electrical connection to a terminal pin, comprising:
a rear terminating end for connection to an appropriate electrical conductor; and
a contact section forwardly of the terminating end for connection to the terminal pin and
including
5 a base plate having a through hole for receiving the terminal pin therethrough,
a pair of contact portions projecting from the base plate at opposite sides of the through
hole for engaging the terminal pin,
the contact portions having concave semi-cylindrical opposing contact surfaces on the
insides thereof extending in a direction away from the base plate for gripping the terminal pin,
10 and
the contact surfaces tapering inwardly toward each other in said direction away from the
base plate to increase the gripping forces.
2. The electrical terminal of claim 1 wherein said terminal is stamped and formed of
conductive sheet metal material.
3. The electrical terminal of claim 1 wherein said contact portions comprise side
wall plates of the contact section.
4. The electrical terminal of claim 1 wherein at least a portion of said base plate
increases in width rearwardly toward said terminating end to facilitate inserting the terminal into
an appropriate terminal-receiving passage in a connector housing.
5. The electrical terminal of claim 1, including a front leading end for insertion into
an appropriate terminal-receiving passage in a connector housing.

6. The electrical terminal of claim 5 wherein said base plate extends into the front leading end and the base plate then increases in width rearwardly toward said terminating end to facilitate inserting the terminal into the terminal-receiving passage in the connector housing.

7. An elongated electrical terminal stamped and formed of conductive sheet metal material for electrical connection to a terminal pin, the elongated terminal defining a longitudinal axis, comprising:

a rear terminating end for connection to an appropriate electrical conductor;

5 a front leading end for insertion into an appropriate terminal-receiving passage in a connector housing; and

a generally U-shaped contact section between said ends for connection to the terminal pin and including

10 a base plate running axially of the longitudinal terminal and having a through hole for receiving the terminal pin therethrough,

a pair of side wall plates upstanding from the base plate at opposite sides of the through hole for engaging the terminal pin,

the contact portions having concave opposing contact surfaces on the insides thereof and extending generally perpendicular to said axis for gripping the terminal pin, and

15 the contact surfaces tapering inwardly toward each other in a direction away from the base plate to increase the gripping forces.

8. The elongated electrical terminal of claim 7 wherein said base plate extends into the front leading end and the base plate then increases in width rearwardly toward said terminating end to facilitate inserting the terminal into the terminal-receiving passage in the connector housing.

9. The elongated electrical terminal of claim 7, in combination with a connector housing having a terminal-receiving passage for receiving said terminal and mating with a complementary mating connector generally perpendicular to said axis.

10. An electrical terminal for electrical connection to a terminal pin, comprising:
a rear terminating end for connection to an appropriate electrical conductor; and
a contact section forwardly of the terminating end for connection to the terminal pin and
including
- 5 a base plate having a through hole for receiving the terminal pin therethrough,
a pair of contact portions projecting from the base plate at opposite sides of the through
hole for engaging the terminal pin, and
the contact portions having concave semi-cylindrical opposing contact surfaces on the
insides thereof for gripping the terminal pin.
11. The electrical terminal of claim 10 wherein said terminal is stamped and formed
of conductive sheet metal material.
12. The electrical terminal of claim 10 wherein said contact portions comprise side
wall plates of the contact section.
13. The electrical terminal of claim 10 wherein at least a portion of said base plate
increases in width rearwardly toward said terminating end to facilitate inserting the terminal into
an appropriate terminal-receiving passage in a connector housing.
14. The electrical terminal of claim 10, including a front leading end for insertion into
an appropriate terminal-receiving passage in a connector housing.
15. The electrical terminal of claim 14 wherein said base plate extends into the front
leading end and the base plate then increases in width rearwardly toward said terminating end to
facilitate inserting the terminal into the terminal-receiving passage in the connector housing.

AMENDED CLAIMS

received by the International Bureau on 13 December 2004 (13.12.04): original claims 1-15 have been replaced by amended claims 1-12.

1. An electrical terminal (46) for electrical connection to a terminal pin(52), comprising:
 - a rear terminating end (54) for connection to an appropriate electrical conductor (60); and
 - a contact section (58) forwardly of the terminating end for connection to the terminal pin and including
 - a base plate (62) having a through hole (66) for receiving the terminal pin there through,
 - a pair of upstanding side wall plates (64), each plate having a contact portion (64a) disposed on opposite sides of the through hole for engaging the terminal pin, the contact portions having concave semi-cylindrical opposing contact surfaces (70) on the insides thereof extending in a direction away from the base plate for gripping the terminal pin, and
 - the contact surfaces (70) tapering inwardly toward each other in said direction away from the base plate to increase the gripping forces.
2. The electrical terminal of claim 1 wherein said terminal (46) is stamped and formed of conductive sheet metal material.
3. The electrical terminal of claim 1 wherein said contact portions comprise side wall plates (64,64a) of the contact section (58).
4. The electrical terminal of claim 1 wherein at least a portion of said baseplate (62) increases in width rearwardly toward said terminating end (54) to facilitate inserting the terminal into an appropriate terminal-receiving passage (44) in a connector housing (42).
5. The electrical terminal of claim 1, including a front leading end (56) for insertion into an appropriate terminal-receiving passage (44) in a connector housing (42).
6. The electrical terminal of claim 5 wherein said base plate (62) extends

into the front leading end (56) and the base plate then increases in width rearwardly toward said terminating end (54) to facilitate inserting the terminal into the terminal-receiving passage (44) in the connector housing (42).

7. An elongated electrical terminal (46) stamped and formed of conductive sheet metal material for electrical connection to a terminal pin (52), the elongated terminal defining a longitudinal axis, comprising:

a rear terminating end (54) for connection to an appropriate electrical conductor (60);

a front leading end (56) for insertion into an appropriate terminal-receiving passage (44) in a connector housing (42); and

a generally U-shaped contact section (58) between said ends for connection to the terminal pin and including

a base plate (62) running axially of the longitudinal terminal and having a through hole (66) for receiving the terminal pin there through,

a pair of side wall plates (64) upstanding from the base plate at opposite sides of the through hole for engaging the terminal pin,

the contact portions (64a) having concave opposing contact surfaces (70) on the insides thereof and extending generally perpendicular to said axis for gripping the terminal pin, and

the contact surfaces (70) tapering inwardly toward each other in a direction away from the base plate to increase the gripping forces.

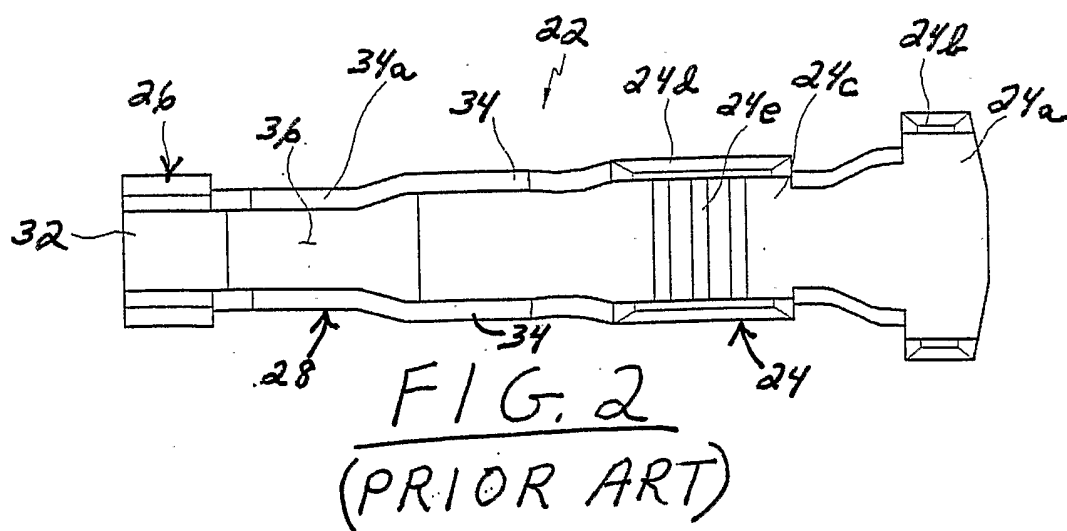
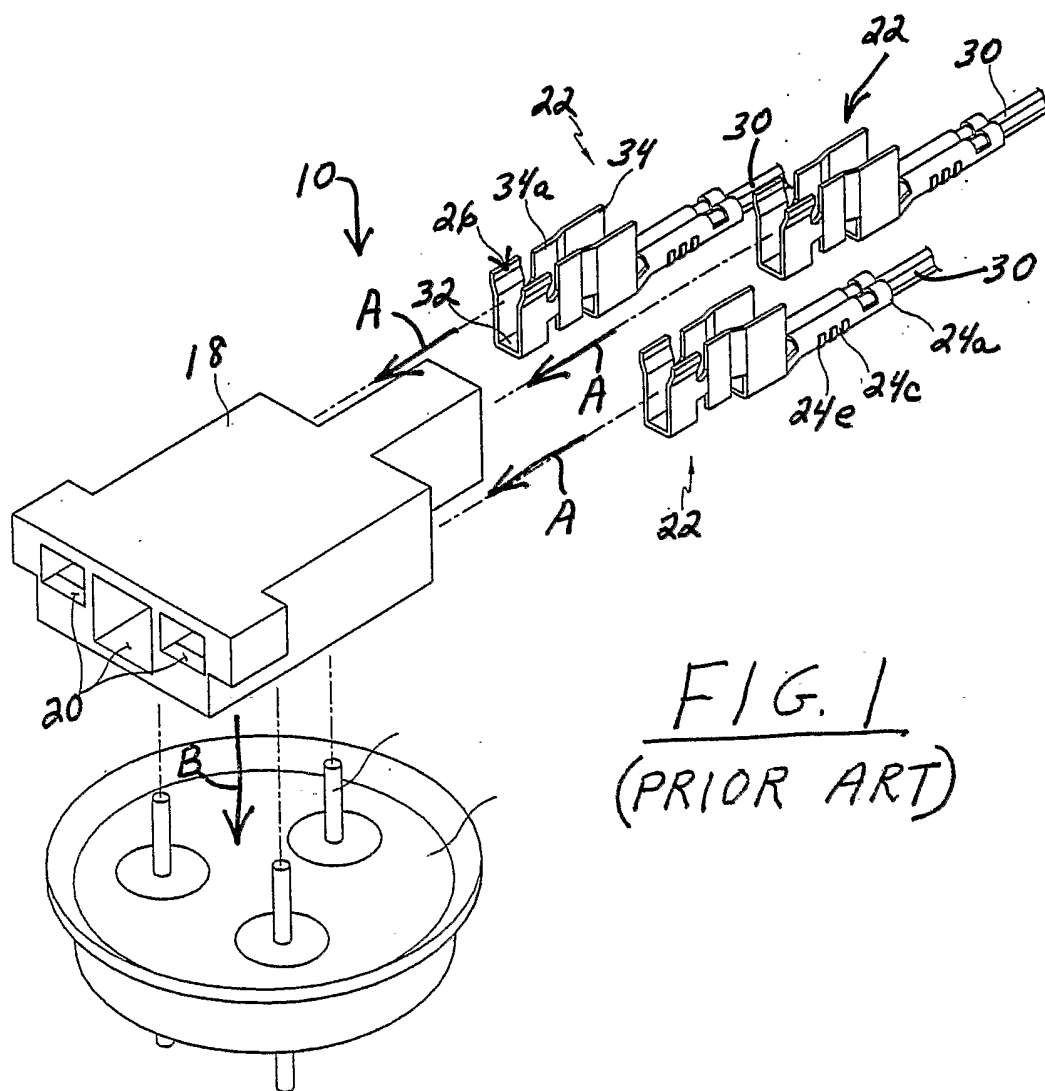
8. The elongated electrical terminal of claim 7 wherein said base plate (62) extends into the front leading end (56) and the base plate then increases in width rearwardly toward said terminating end (54) to facilitate inserting the terminal into the terminal receiving passage (44) in the connector housing (42).

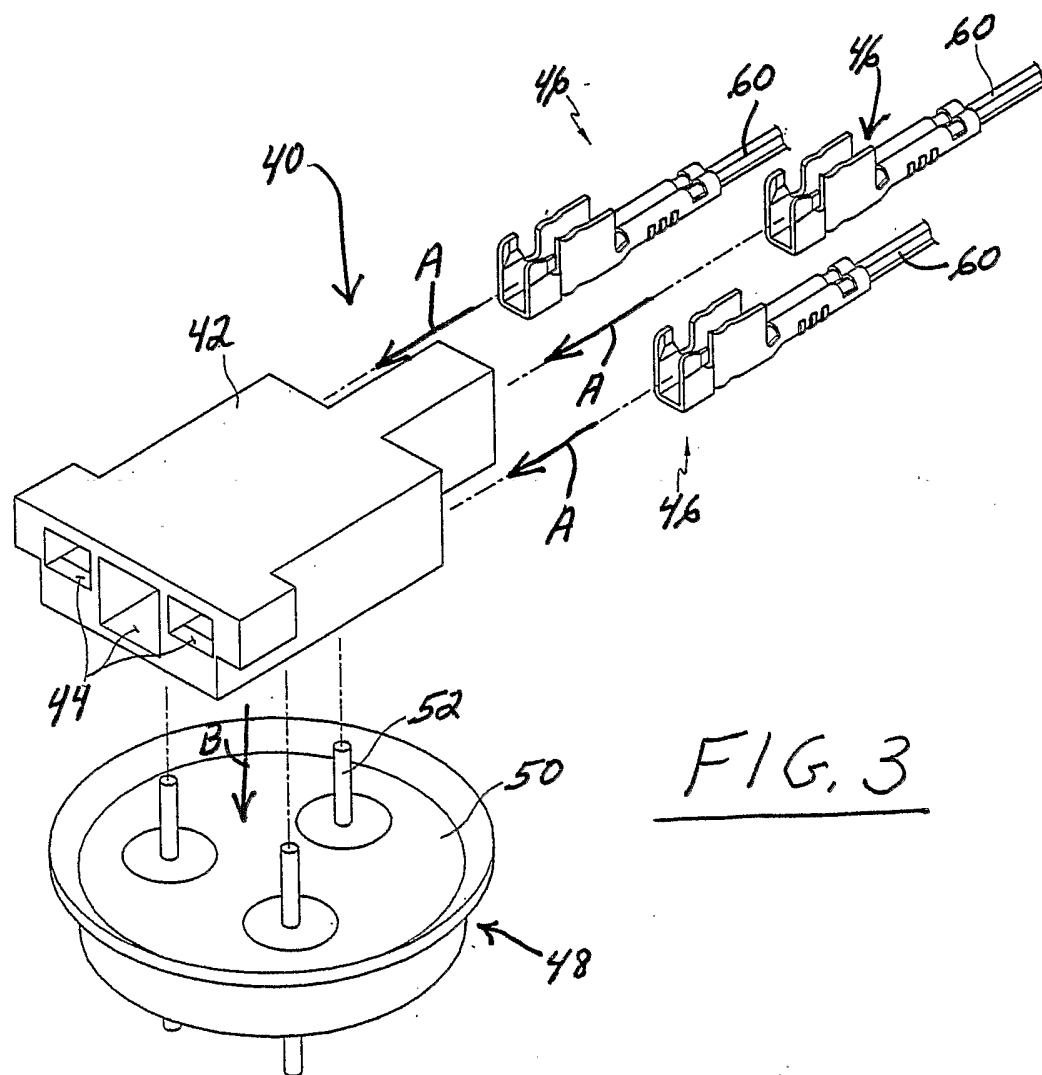
9. The elongated electrical terminal of claim 7, in combination with a connector housing (42) having a terminal-receiving passage (44) for receiving said terminal (46) and mating with a complementary mating connector (48) generally perpendicular to said axis.

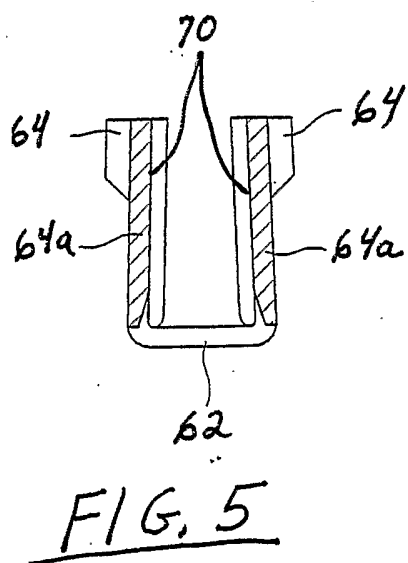
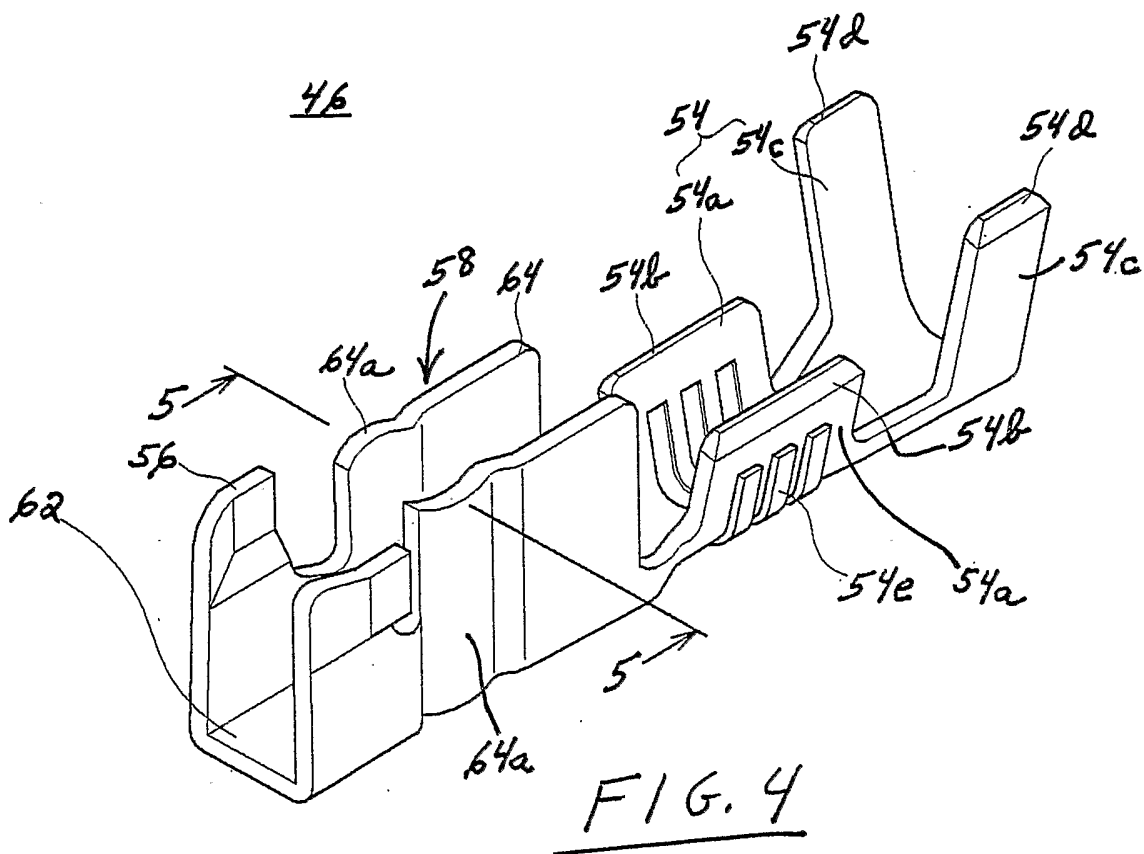
10. An electrical terminal (46) for electrical connection to a terminal pin (52), comprising:
- a rear terminating end (54) for connection to an appropriate electrical conductor (60); and
 - a contact section (58) forwardly of the terminating end for connection to the terminal pin and including
 - a base plate (62) having a through hole (66) for receiving the terminal pin there through, a portion of said base plate increasing in width rearwardly toward said terminating end (54) to facilitate inserting the terminal into an appropriate terminal-receiving passage (44) in a connector housing (42)
 - a pair of contact portions (64a) projecting from the base plate at opposite sides of the through hole for engaging the terminal pin, and
 - the contact portions (64a) having concave semi-cylindrical opposing contact surfaces(70) on the insides thereof for gripping the terminal pin.

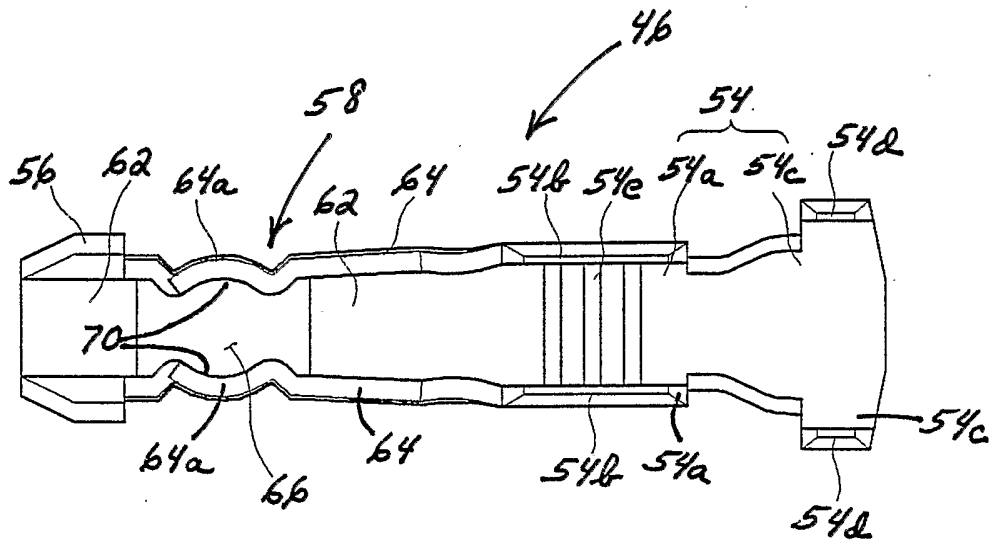
11. The electrical terminal of claim 10 wherein said terminal (46) is stamped and formed of conductive sheet metal material.

12. The electrical terminal of claim 10 wherein said contact portions (64a) comprise side wall plates (64) of the contact section (58).









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INTERNATIONAL SEARCH REPORT

International Application No

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01R13/115

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 438 244 A (MOLEX INC) 24 July 1991 (1991-07-24) column 5, line 39 - column 6, line 37; figure 1	1-15
A	FR 1 407 942 A (UNITED CARR INC) 28 June 1965 (1965-06-28) page 2 - page 3	1-15
A	EP 0 898 339 A (MOLEX INC) 24 February 1999 (1999-02-24) column 4, line 2 - column 5, line 16; figure 5	1-15

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

& document member of the same patent family

Date of the actual completion of the international search

26 October 2004

Date of mailing of the international search report

05/11/2004

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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