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PATENT

SHIELDED VERTICALLY ALIGNED ELECTRICAL CONNECTOR COMPONENTS

1

FIELD OF INVENTION:

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The present invention relates to an improvement in electrical connector components. More particularly, the present invention relates to a shielded electrical connector for terminating a multiconductor cable having vertically aligned connector components.

BACKGROUND OF THE INVENTION:

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In transmitting data signals, electrical connectors are commonly used to terminate signal carrying multiconductor electrical cables which interconnect the various components of the data system. Many data systems require the components to be supported in an electrically closed loop. A closed-loop system provides for continuity of signal in a multicomponent system when certain of the components are not interconnected.

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In order to achieve such a closed loop when the components are frequently connected and disconnected, the connectors connecting such components use automatic shunting mechanisms so that a closed-loop connection is maintained even when the connector is in a non-connected condition. The use of such shunting connectors in a closed-loop data system is shown in numerous patents including: Re. 32,760, 4,449,778, 4,501,459, 4,508,415, 4,582,376, 4,602,833, 4,619,494, 4,641,906, 4,653,825, 4,671,599, 4,682,836, 4,711,507, 4,711,511, 4,731,032, 4,744,769, 4,859,201, 4,883,433, 4,884,981, 4,891,022, 5,030,114, 5,030,121, 5,035,647, 5,052,940, 5,074,803, 5,088,934, 5,104,337, 5,112,243, 5,122,076 and 5,169,346.

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While the connectors shown in the above-identified patents provide adequately for the connection of components in a data system, the increasing use of smaller components in such systems requires the use of smaller connectors.



1 However, despite the reduction in size, these connectors
still must provide closed loop connections.

 Additionally, these connectors are designed to carry
signals at increasingly higher data rates. At such higher
5 data rates, cross-talk interference between components of
the connector also increases. Thus, these connectors must
include adequate shielding so as to reduce cross-talk
interference between connector components.

 It is, therefore, desirable to provide a data connector
10 of reduced size, which provides adequate shunting to
maintain closed-loop connections and which provides adequate
shielding.

SUMMARY OF THE INVENTION:

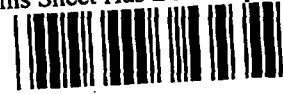
 It is an object of the present invention to provide an
15 improved electrical data connector.

 It is a further object of the present invention to
provide data connector components of reduced size which
provide for adequate shunting.

 It is a still further object of the present invention
20 to provide a data connector having vertically aligned
components.

 It is still another object of the present invention to
provide improved shielding in a data connector having
vertically aligned components so as to reduce cross-talk
25 interference between contacts of the connector.

 In the efficient attainment of these and other objects,
the present invention provides an electrical connector
including an insulative housing having a mating end for
engagement with a mating connector device and a terminating
30 end. Plural electrical contacts are supported in the
housing. The contacts are arranged in vertically spaced
horizontally extending upper and lower rows. Each contact
of one row being paired in vertically stacked relationship
with a contact of the lower row. Shunting means is included
35 for operatively electrically shunting the contacts of each
of the vertically stacked pairs. Conductive shielding is



1 supported within the insulative housing. The shielding
includes portions extending between at least two of the
contacts in each of the upper and lower rows and between the
shunting means associated therewith.

5 As more particularly described by way of the preferred
embodiment herein, the connector includes the upper row of
contacts having a downwardly depending shunt member
extending for engagement with portions of the lower
10 contacts. The conductive shielding extends between two of
the contacts in each row and also between the downwardly
depending shunt member.

BRIEF DESCRIPTION OF THE DRAWINGS:

Figure 1 shows a shielded multiconductor electrical
cable used in combination with the present invention.

15 Figure 2 is a perspective showing of the electrical
connector component assembly of the present invention.

Figures 3 and 4 are rear-plan and side-elevational
showings, respectively, of the electrical connector
component assembly of Figure 2.

20 Figures 5 and 6 are top and side fragmented showings,
respectively, of an electrical contact used in the
electrical connector component assembly shown in Figure 2.

Figure 7 is an exploded perspective view of a further
embodiment of the electrical connector component assembly of
25 the present invention.

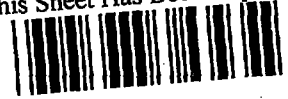
Figure 8 is a perspective showing of the outer housing
of the electrical connector component assembly of Figure 7.

Figure 9 is an exploded perspective view of the outer
housing of Figure 8.

30 Figure 10 shows electrical connector component assembly
of Figure 7 shown connected to a like connector in
hermaphroditic fashion.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT:

35 Referring to Figure 1, an electrical cable 10 of the
type used in accordance with the present invention is shown.



1 Electrical cable 10 is a multiconductor data transmission
cable including a plurality of insulated conductors 12
enclosed in an outer insulative jacket 14. A metallic
shield 16 is interposed between the conductors 12 and the
5 jacket 14. Shield 16, as is well-known in the art, is used
to provide electrical shielding for cable 10. In the
present illustrative embodiment, a braided shield 16 is
shown. However, shields of other construction, such as
metallic foil, may also be employed. Cable 10 is shown
10 prepared for termination with end portions of conductors 12
extending outwardly of jacket 14. A portion of shield 16 is
also shown extending from jacket 14.

Referring to Figures 2-4, the electrical connector
component assembly 20 of the present invention may be
15 described. Assembly 20 includes first and second
electrically insulative housings 22 and 24 arranged in a
vertically stacked relationship. Each housing 22 and 24
supports a pair of electrical contacts 26 and 28
respectively. Assembly 20 further includes a pair of
20 conductor support blocks 30 and 32 which are engagable with
housings 22 and 24, respectively, to support conductors 12
of electrical cable 10 in electrical engagement with
contacts 26 and 28, as will be further described
hereinbelow.

25 Electrical connector component assembly 20 may be
housed within an electrically shielded housing (not shown)
to permit electrical interconnection with a further
connection device. Connector component assembly 20 and its
associated shielded housing may be constructed to be of the
30 hermaphroditic variety so that it will permit
interconnection to an identically formed member. Connectors
of such construction are shown in several of the above-
identified U. S. patents, most notably, U. S. Patent No.
4,682,836.

35 Housing 24, which is the lower of the two housings
shown in the drawings, includes a bottom wall 34 and two
transversely spaced upstanding sidewalls 36 and 38. An



1 upstanding dividing wall 40 suitably electrically isolates
contacts 28. As shown in Figure 3, a transverse wall 42 of
height less than the sidewalls extends across a rear portion
of bottom wall 34.

5 Electrical contacts 28 are supported by housing 24.
Contacts 28 are formed of a suitably conductive stamped and
formed metallic material such as beryllium copper. Contacts
28 include a generally elongate base portion 28a, an
insulation displacement contact (IDC) portion 28b and a
10 reversely bent cantilevered spring portion 28c, which
extends back over base portion 28a. IDC portion 28b is of
conventional flat-blade configuration, having two spaced
relatively sharp tines 28d and 28e, defining therebetween a
conductor receiving slot 28f. IDC portion 28b is shown
15 extending in a direction opposite that of reversely bent
cantilevered spring portion 28c so that it may be accessible
adjacent bottom wall 34. A contact transition portion 28g
provides for the inversion of IDC portion 28b. Contacts 28
are fixedly secured in housing 24 with contact base portion
20 28a positioned along bottom wall 34. Appropriate housing
structure (not shown) inclusive of transverse wall 42 may be
employed to support IDC portion 28b in housing 24.

Cantilevered spring portion 28c is deflectable to move
toward and away from base portion 28a upon interconnection
25 of a further connecting device in a manner well-known in the
art. Upon interconnection, cantilevered spring portion 28c
will deflect downwardly toward base portion 28a, returning
to its original position shown in Figure 4 upon
disconnection.

30 Housing 22, shown as the upper housing in the drawings,
is of substantially similar construction to that of housing
24. Housing 22 includes a bottom wall 44 and two
transversely spaced upstanding sidewalls 46 and 48. An
upstanding dividing wall 50 electrically isolates contacts
35 26. A transverse wall 52 of height less than the sidewalls
extends upwardly from a rear portion of bottom wall 44.

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1 Contacts 26 are of construction similar to that of
 contacts 28 described above. Contacts 26 include an
 elongate base portion 26a, an insulation displacing contact
 (IDC) portion 26b and a reversely bent cantilevered spring
5 portion 26c. IDC portion 26b is also of generally flat
 blade configuration, having sharp tines 26d and 26e defining
 therebetween a conductor receiving slot 26f. IDC portion
 26b extends upwardly from base 26a in the direction of
 cantilevered spring portion 26c, which is of opposite
10 construction to that of contact 28. Thus, the IDC portions
 26b, 28b of contacts 26 and 28 are accessible from opposite
 directions.

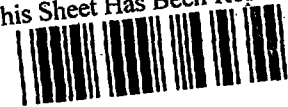
 As shown in Figures 5 and 6, each contact 26 further
 includes a depending shunt portion 26g. Shunt portion 26g
15 is struck from a central extent of the planar base portion
 26a and is bent downwardly out of the plane of base portion
 26a to extend at an angle of approximately 90° with respect
 thereto.

 Referring again to Figures 2-4, contacts 26 are fixedly
20 secured in housing 22 with each contact 26 being supported
 on bottom wall 44. Transverse wall 52 is appropriately
 constructed to support IDC portions 26b of contacts 26.
 Further, bottom wall 44 includes a pair of openings (not
 shown) which permit shunt portions 26g of contacts 26 to
25 extend therethrough.

 As shown particularly in Figure 4, shunt portion 26g of
 each contact 26 extends downwardly toward contact 28, which
 is vertically aligned therewith, such that a distal extent
 26h electrically engages cantilevered spring portion 28c.
30 In this condition, contact 26 is electrically shunted to
 contact 28.

 As above described, cantilevered spring portion 28c of
 contact 28 is deflectable toward and away from base portion
 28a. Upon interconnection of another connecting device,
35 cantilevered spring portion 28c of contact 28 will deflect
 downwardly from the position shown in Figure 4 so that
 cantilevered spring portion 28c is out of engagement with

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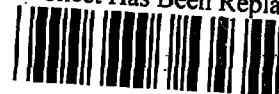


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1 depending shunt portion 26g of contact 26. Upon
disconnection, cantilevered spring portion 28c will return
to its original position, as shown in Figure 4, reconnecting
with depending shunt portion 26g of contact 26.

5 To facilitate the termination of cable 10 to connector
component assembly 20, conductor support blocks 30 and 32
are employed. Support blocks 30 and 32 are of substantially
similar construction. Referring to support block 30 as an
example, block 30 is formed of suitably insulative molded
10 plastic and includes a pair of spaced conductor receiving
bores 60 and 62, which accommodate two conductors 12 of
cable 10. A pair of IDC receiving slots 64 and 66 are
positioned adjacent conductor receiving bores 60 and 62 and
are in communication therewith. In order to terminate cable
15 10, two of the conductors 12 are inserted into bores 60 and
62 of block 30. The block 30 is then inserted into housing
22 such that IDC portions 26b are accommodated in IDC
receiving slots 64 and 66. Appropriate mating structure on
sidewalls 46 and 48 and on conductor support block 30
20 facilitates insertion of support block 30 into housing 22.
As shown in Figure 2, sidewalls 46 and 48 include vertical
slots 46a and 48a which accommodate extending tongues 30a
and 30b of block 30. However, other mating structure may
also be employed. Also, a latch or detent such as shown as
25 31 on block 30 may be employed to provide for a snap fit of
block 30 in housing 22. Support block 30, including
conductors 12 supported therein, may be manually inserted or
inserted under application of an appropriate tool such that
conductors 12 are electrically terminated with IDC portions
30 26b in a manner well-known in the connector art. Conductor
support block 30 may be formed of a clear molded plastic so
that the proper termination of conductors 12 to IDC portions
26b may be observed.

35 Conductor support block 32, being substantially similar
to that of conductor support block 30, operates in the same
manner to terminate the other two conductors 12 of cable 10
to contacts 28 supported in housing 24. In fact, it is



1 contemplated that conductor support block 32 may be
identical to conductor support block 30 so that a single
construction may be used in both instances.

5 As above-mentioned, connector component assembly 20 is
supported within a shielded housing for interconnection
purposes. The shield of that housing would be appropriately
electrically connected to shield 16 of cable 10 which
extends from jacket 14. Therefore, in order to maintain
shielded isolation as between contacts 26 and 28, the
10 present invention contemplates interposing a metallic shield
between housing 22 and housing 24. This metallic shield
would be electrically continuous with the shield of the
outer housing, which is in turn connected to the shield 16
of cable 10.

15 Referring to Figure 7, a preferred embodiment of the
present invention is shown. For simplicity of explanation,
like reference numerals are used to denote like components.

Electrical connector component assembly 120 includes
first and second electrically insulative housings 122 and
20 124 arranged in vertically stacked relationship. Each
housing 122 and 124 supports four electrical contacts 126
and 128, respectively. Assembly 120 further includes a pair
of conductive support blocks 130 and 132 which are engagable
with housings 122 and 124, respectively, to support
25 conductors 12 of electrical cable 10 (Fig. 1) in electrical
engagement with contacts 126 and 128 in a manner similar to
that described hereinabove.

Electrical connector component assembly 120 further
includes an outer electrically shielded outer housing 131
30 formed of side by side matable housing members 125 and 129
which support the remainder of the components of connector
component assembly 120.

Housings 122 and 124 support contact shields 138 and
139, respectively. Housing 122, which is substantially
35 similar to housing 124, includes a bottom wall 122a and
transversely spaced upstanding side walls 122b and 122c. A
central upstanding dividing wall 122d separates the contacts



1 126 supported therein into two side by side pairs. A
central slot 122e extends through upstanding dividing wall
122d for accommodation of shield 138 as will be described in
further detail hereinbelow.

5 Contacts 126 are substantially similar to contacts 26
described above and include a depending shunt portion 126g
extending from planar base portion 126a. Contacts 128 are
substantially similar to contacts 28 described above and
include a cantilevered spring portion 128c which is designed
10 for engagement with shunt portion 126g in a manner shown and
described with respect to Figures 5 and 6 above. While
contacts 126 and 128 are shown as being stamped and formed
metallic members with cantilevered portions 126c and 128c
being reversely bent back over central base portions 126a
and 128a, other contact configurations may also be employed.

15 One such particular configuration where the contacts
are stamped such that the cantilevered spring portions are
struck from the central base portion and bent out of the
plane thereof are shown and described in our co-
pending European application filed 13 July 1994 and claiming
a priority date of 14 July 1993 from US Serial No. 08/092049
entitled Shielded Compact Data Connector.

Each of housings 122 and 124 are constructed to
accommodate shields 138 and 139, respectively therein.
Shield 138, which is substantially similar to shield 139, is
a metallic member formed of stamped material having a bottom
planar surface 162, which is constructed to be in
conformance with bottom wall 122a of housing 122, and a pair
of upstanding transversely spaced side extensions 164 and
166. A planar central extension 168 extends upwardly from
bottom planar surface 162 between side extensions 164 and
166. Side extensions 164 and 166 are constructed to be
received along side walls 122b and 122c, respectively, and
central extension 168 is designed to be received within
central slot 122e of upstanding dividing wall 122d.

Each of side extensions 164 and 166 and central
extension 168 is of sufficient height and length to span the



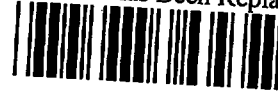
1 length of contacts 126 supported therein including depending
shunt member 126g so as to provide cross-talk shielding for
the contacts supported on either side of upstanding dividing
wall 122a. Thus, contact shield 138 in combination with
5 contact shield 139 of lower housing 124 assures that
adequate cross-talk shielding is provided between contacts
126 and 128 supported within connector component assembly
120. While a stamped and formed shield is shown in Figure
7, it is contemplated that contact shields 138 and 139 may
10 be integrally formed into a one-piece member formed of die
cast metal.

Referring additionally to Figures 8 and 9, outer housing
members 125 and 129 are shown being matable members forming
overall outer housing 131. Outer housing members 125 and
15 129 have generally similar configurations.

Referring to outer housing member 129, it includes
three angularly disposed back walls. Central back wall 140
is flanked by lateral walls 142 and 144 which are disposed
at generally 45° angles therefrom. Each of walls 140, 142
20 and 144 includes a semi-circular frangible housing portion
146. Frangible housing portion 146 may be manually removed
creating a semi-circular aperture for passage of electrical
cable 10 therethrough. As shown in Figure 8, when connector
housing member 125 is secured to connector housing member
25 129, both semi-circular frangible members 146 and 148 form
a full circular member which facilitates such cable passage.
Thus, cable 10 may be inserted into outer connector housing
131 in either straight through fashion or at 45° angles
therefrom.

30 Outer connector housing 131 when assembled is designed
for hermaphroditic mating in a manner shown in Figure 10.
In that regard, connector housing member 125 includes a
deflectable connector latch 150 which comprises a
cantilevered arm 152, a manually actuatable surface 154 and
35 a locking member 156. Locking member 156 includes ramped
engagement wall 158 and a locking wall 159 which extends
downwardly from ramped engagement wall 158.

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1 Outer housing member 129 includes a latch retention
member 160 which is supported on a wall 161 opposite wall
151 which supports latch 150. Latch retention member 160
includes a ramped wall 162 and a recess 164 beginning at the
5 upper edge of ramped wall 162.

 As shown in Figure 10, outer connector housing 131 is
designed for hermaphroditic interconnection with like
connector 131'. As can be seen, latch 150 of outer
connector housing 131 is designed for matable locking
10 interconnection with latch engagement member 160' of outer
connector housing 131'. Upon connecting outer housing 131
to outer housing 131', ramped wall 158 of locking member 156
engages ramped wall 162 of latch engagement member 160'.
This action causes the deflection of cantilevered arm 152,
15 permitting such interaction. Upon reaching the end of
respective ramp walls, latch member 156 is forced into
recess 164' by the spring bias of cantilevered arm 152 thus
locking latch 150 to latch retention member 160'. A similar
interaction occurs on the other side of outer connector
20 housings 131 and 131' with respect to latch 150' and latch
retention member 160 (not shown).

 In order to release outer connector housing 131 from
outer connector housing 131', manually actuatable surface
154 may be actuated by the installer to move against the
25 bias of cantilevered arm 152 to release latch 150 from
recess 164'. This will cause engagement of ramped walls 158
and 162' thereby disconnecting housing 131 from housing
131'. While manually actuatable surface 154 is shown to be
a curved recessed member, it is also contemplated that a
30 bump or protrusion with gripping elements may be employed to
facilitate easy manual engagement of the latch by the
fingers of the installer.

 Various changes to the foregoing described and shown
structures would now be evident to those skilled in the art.
35 Accordingly, the particularly disclosed scope of the
invention is set forth in the following claims.

CLAIMS

- 1 1. An electrical connector comprising:
 an insulative housing having a mating end for
 engagement with a mating electrical connection device and a
 termination end;
5 plural electrical contacts supported within said
 housing, said contacts being arranged in vertically spaced
 horizontally extending upper and lower rows, each contact of
 one row being paired in vertically stacked relationship with
 a contact of said other row;
10 shunting means for operatively electrically
 shunting said contact of each said vertically stacked pair;
 a conductive shield supported within said
 insulative housing, said shield including a shield portion
 extending between at least two of said contacts in each of
15 said upper and lower rows and said shunting means.
- 1 2. An electrical connector of claim 1 wherein said
 shunting means includes each of the contacts of one of said
 upper rows including a depending shunt portion, each said
 shunt portion for engagement with one of said contacts of
5 said lower row.
- 1 3. An electrical connector of claim 1 or claim 2
2 wherein said conductive shield includes a pair of shield members.
- 1 4. An electrical connector of claim 3 wherein said
 conductive shield members include lateral shield portions
3 extending on each side of each of said upper and lower rows.
- 1 5. An electrical connector of claim 4 wherein said
 conductive shield members each include a shield portion
 extending between at least two of said contacts of said
4 upper and lower rows.

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- 1 6. An electrical connector of claim 4 wherein said
 conductive shield portion of at least one shield member
 extends between said shunt portions of said at least two
4 contacts.

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