

SPECIFICATIONELECTRIC CONNECTOR5 Background Of The Invention

 The present invention relates to a stacked
electrical connector and more particularly to a stacked,
shielded I/O connector having improved means for aligning
10 the solder tail portions of the connector.

 There has been an increasing demand for multi-
pole electric connectors having an increased number of
terminals as the input and output lines of electronic
devices, such as computers, especially as the popularity
15 and affordability of computers increases. To meet such a
demand, often one or more interface connectors are laid or
stacked on each other and bound together with a metal
strap, and encapsulated, as is shown in Japanese Patent
Application Laid-Open No. 6-29061.

20 This connector assembly is made from an increased
number of parts (i.e. the number of parts of a single
connector multiplied by the number of connectors laid on
each other). The assembling of this type of connector not
only requires extra parts, such as joint pieces. Because
25 of the increased number of parts in such a connector, but
is also tedious and the cost of assembly increases
accordingly.

 A need therefore exists for a simplified, stacked
I/O connector assembly with a reduced number of parts.

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Summary Of The Invention

 In view of this, one object of the present
invention is to provide a multi-pole electric connector
which can be assembled using the least possible number of
35 parts to facilitate the assembly of the connector parts.

To attain this object, an electrical connector according to the present invention comprises: a casing having a plurality of connector components on its front for mating to opposing connector components of a counter-connector, the housing having a plurality of conductive terminals press-fitted therein with their contact portions arranged in each connector component, and a shell covering the front of the housing having a corresponding number of shielding enclosures each closely surrounding each of said connector components.

The number of the connector components can be determined to meet occasional demands. Usually the housing has two connector components arranged at upper and lower levels. This arrangement is advantageous to the reducing of the bottom size of the connector assembly to a minimum.

Each terminal of the connector may have an L-shape with a contact portion on one end and a solder tail portion on the other end. The solder tail portions extend down on the rear side of the housing when the terminals are press-fitted along the rear side of the housing into place within the appropriate connector component.

The shell may have pegs on its bottom for fastening the electric connector to a printed circuit board.

The electrical connector assembly may further comprise latch members and the shell may have slots on the opposite sides of each connector component, and the housing may have slots aligned with the slots of the shell, thereby fastening the latch members to the housings when the latch members are inserted in and caught by the slots of the housing.

These and other objects, features and advantages of the present invention will be clearly understood through a consideration of the following detailed description.

Brief Description Of The Drawings

In the course of the following description of the detailed description, reference will be made to the attached drawings wherein like reference numerals identify like parts and wherein:

FIG. 1 is a sectional view of a multi-pole electric connector constructed in accordance with the present invention taken along lines A-A of FIG. 2;

FIG. 2 is a frontal view of the multi-pole electric connector of FIG. 1;

FIG. 3 is a plan view of the multi-pole electric connector of FIG. 2 taken along lines 3-3 thereof;

FIG. 4 is a side view of the multi-pole electric connector of FIG. 1;

FIG. 5 is a front view of the shell utilized in the multi-pole electric connector of FIG. 1;

FIG. 6 is a bottom view of the shell of FIG. 5 taken along lines 6-6 thereof;

FIG. 7 is a side view of the shell of FIG. 5 taken along lines 7-7 thereof;

FIG. 8 is a plan view of a lower terminal guide plate of the multi-pole electric connector; and

FIG. 9 is an enlarged view showing how a latch piece is fastened to the housing.

Description Of The Preferred Embodiment

Referring now to FIGS. 1 to 4, a stacked two-layer perpendicular, or right angle, connector assembly is illustrated generally as 1 and is seen to comprise a housing 2 molded from a suitable dielectric resin and a metal shell 3 covering the front portion 4 of the housing 2. The housing 2 has upper and lower fitting protrusions, or connector components, shown as receptacle connectors 5 on its front for mating with corresponding opposing male, or plug connectors of a counter-connector assembly (not shown). The housing 2 illustrated further has two vertical walls 60 that extend rearwardly from the front portion 4 thereof. As explained below, these walls 60 provide support for a terminal solder tail portion alignment means as well as define a channel which partially encloses the solder tail portions of the terminals 7. The housing 2 may further include lateral walls 63 that also extend rearwardly along the sidewalls 60 at an angle thereto in order to provide a sufficient amount of stiffness to the entire housing 2.

A plurality of electrically conductive terminals 7 are press-fit into the connector portions 5 from the rear side of the housing 2. Their contact portions 8 are laterally arranged and held within each connector portion 5. A metal shell 3 is fastened to the housing 2, as described in greater detail below.

As seen from FIGS. 5-7, the shell 3 has two enclosures 11 formed on the upper and lower sides of a central, rectangular opening 10 of a metal plate 9 that is coextensive with the front 4 of the housing 2 when applied thereto. These enclosures 11 are aligned with the housing 2 and closely surround the connector portions 5 of the housing 2 when applied to the housing 2 so that they, in effect, serve as a shield for the receptacle connectors 5. The shielding shell 3 has an upper engagement strip 15 which engages the upper edge of the metal plate 9,

extending rearward at right angle relative to the front 4
of the housing 2. It further has two lower engagement
extensions 17 that engage the lower edge of the metal plate
9, by extending rearwardly at an acute angle somewhat less
5 than the right angle relative to the front in the offset
manner illustrated in FIG. 4. Each lower engagement
extension 17 ends with a depending peg or engagement arm
18.

The metal plate 9 further has two engagement tabs
10 19 extending rearwardly from the centers of its opposite
sides at right angles relative to the front 4 of the
housing. Each tab 19 has an opening 20 formed therein
which engages by a protrusion 21 formed on either side of
the housing 2.

15 As seen in FIG. 1, each terminal 7 of the
connector 1 has an L-shape with a contact portion 8
disposed on one end thereof and a solder tail portion 22
disposed on its other end. The solder tail portions 22
extend down along the rear side of the housing 2 and extend
20 below the bottom 16 of the housing 2 when the terminals 7
are press-fitted from the rear side of the housing 2 and
therefore, the solder tail portions 22 may be considered as
angularly diverging from the contact portions 8 and their
respective connector portions 5.

25 To assure that the soldering tails 22 of all
terminals 7 are arranged in their correctly aligned
positions and, in an important aspect of the present
invention, the connector housing 2 is provided with upper
and lower terminal guide plates 23 and 24 that accommodate
30 the multiple rows of terminal solder tail portions, four
such rows of solder tail portions being shown in FIG. 1 as
entering the upper guide plate 23 and eight such rows being
shown as entering the lower guide plate 24.

Specifically, the upper guide plate 23 contains
35 a plurality of insertion holes 50 that receive and hold
upper portions of the solder tail portions 22 of the

terminals 7 that are inserted in the upper receptacle connector 5 which the lower guide plate 24 has a plurality of insertion holes 51 that receive and hold the solder tail portions 22 of the terminals 7 inserted in both the upper and lower portions receptacle connectors 5 so that the solder tail portions 22 of all the terminals 7 are put in correct alignment with opposing holes on a printed circuit board 70. The solder tail portions 22 of the terminals 7 are maintained in alignment by the insertion openings 50, 51 which are arranged in multiple rows of openings and in which adjacent rows are staggered with respect to each other. Because the number of connector contacts are the same for each connector portion 5, the lower guide plate 24 contains twice as many insertion openings 50 as the upper guide plate 23.

FIG. 8 shows the lower guide plate 24 as having insertion holes 51 staggered at regular intervals. The upper guide plate 23 has a similar pattern of insertion holes 50 for holding the solder tail portion of terminals, which are inserted in the upper receptacle connector 5. Both of the alignment or guide plates 23, 24, because of their vertical separation, cooperate to keep the solder tail portions of the terminals 7 separate which also serves to prevent potential shorting when the solder tail portions are at small pitches (i.e. the spacing between adjoining and adjacent solder tail portions). The present invention is therefore beneficial in the production of high circuit density stacked I/O connector. In order to facilitate insertion of the solder tail portions driving assembly of the connector 1, the guide plates 23, 24 may include ramped entryways 65 disposed around their respective insertion holes 50, 51.

As seen from FIGS. 2, 3 and 4, the connector assembly 1 further includes latch members 26 that extend forwardly from the front 4 of the connector 1 to engage with similar latch members of the counter connector. Each

latch member 26 comprises a bifurcated arm 29 with an associated engagement hook 30. As seen from FIG. 5, the shielding shell 3 has latch slots 53 on the opposite sides of each fitting protrusion 11, and the housing 2 has slots 54 formed therein and aligned with the latch slots 53 of the shell 3. As shown in FIG. 9, each latch piece 26 can be fastened to the housing 2 when its bifurcated arms 29 are inserted in and caught by the associated slot 54 of the housing 2.

In assembling the parts together to form a multi-pole electric connector assembly 1, contact portions 8 of one set of terminals 7 are press-fitted into the holes of the housing 2 at the lower receptacle connector 5, and the contact portions 8 of another set of terminals 7 are press-fitted into the holes of the housing 2 at the upper receptacle connector 5. The tails 22 of the lower set of terminals are then bent 90° to the contact portions 8. Then the tails 22 of the upper set of terminals are similarly bent. Next, the upper guide plate 23 is slid onto the tails of the upper set and attached to the housing 2 to hold the solder tail portions 22 of the terminals 7, and then the lower guide plate 24 is slid onto all of the tails and attached to the housing 2 to hold the solder portions tail 22 of all of the terminals 7. The attachment of the guide plates 23, 24 is accomplished by an interference fit or the like. As shown in the preferred embodiment, especially in FIG. 1, the guide plates 23, 24 engage the housing walls 60 at recesses 61 formed therein.

The shielding shell 3 is then applied to the front 4 of the housing 2, and is fastened thereto with latch means. Specifically, the shield portions 11 that enclose the upper and lower receptacle connectors 5 of the housing 2, and its engagement tabs 19 are caught by the protrusions 21 formed on the opposite sides of the housing 2. Finally, the bifurcated arms 29 of the latch pieces 26 are inserted in the latch slots 53 of the shell 3 and the associated slots 54 of the housing 2.

Although the invention has been illustrated and described with respect to exemplary embodiment thereof, it should be understood by those skilled in the art that the foregoing and various other changes, omissions and additions may be made therein and thereto, without departing from the spirit and scope of the present invention. Therefore, the present invention should not be understood as limited to the specific embodiment set out above but to include all possible embodiments which can be embodied within a scope encompassed and equivalents thereof with respect to the feature set out in the appended claims.

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CLAIMS

1. A stacked I/O connector (1), comprising: a dielectric connector housing (2), the connector housing (2) having at least first and second connector portions (5) disposed one on top of each other in a stacked fashion, each of the connector portions (5) including a plurality of contact-receiving openings; a plurality of electrically conductive terminals (7), each of the terminals (7) having a contact portion (8) disposed at one end thereof and a solder tail portion (22) spaced apart from the contact portion (8) and angularly divergent therefrom, said terminals (7) being separated into distinct first and second sets of terminals (7), the contact portions (8) of said first set of terminals (7) being associated with said first connector portion (5) and the contact portions (8) of said second set of terminals (7) being associated with said second connector portion (5), said solder tail portions (22) of said first set of terminals (7) having a length longer than said solder tail portions (22) of said second set of terminals (7); and, means for maintaining said solder tail portions of said first and second terminal sets in a predetermined alignment, the solder tail portion alignment means including first and second guides (23, 24) disposed within said connector housing (2) in spaced-apart fashion, the first guide (23) capturing said terminal first set solder tail portions (22) at a first location within said connector housing (2) proximate to said first connector portion (5) and the second guide (24) capturing said terminal first and second set solder tail portions (22) at a second location within said connector housing (2) proximate to said second connector portion (5).



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2. The stacked I/O connector (1) as defined in claim 1, wherein said first guide (23) includes a first guide plate having a plurality of solder tail portion-receiving openings (51) formed therein and said second
5 guide (24) includes a second guide plate having a plurality of solder tail portion-receiving openings (50) formed therein.

3. The stacked I/O connector (1) as defined in
10 claim 2, wherein said first and second guide plate solder tail-receiving openings (50,51) are arranged in rows.

4. The stacked I/O connector (1) as defined in
15 claim 3, wherein said rows are staggered with respect to each other respectively within said first and second guide plates.

5. The stacked I/O connector (1) as defined in claim 2, wherein said first and second guide plate solder
20 tail portion-receiving openings (50,51) include ramped entryways (65) surrounding said openings to guide said solder tail portions (22) during insertion thereof.

6. The stacked I/O connector (1) as defined in
25 claim 2, wherein said plurality of second guide plate solder tail portion-receiving openings (50) is double that of said first guide plate.

7. The stacked I/O connector (1) as defined in
30 claim 1, further including a metal shielding shell (3) engaging said housing and partially enclosing said connector portions (5) thereof.

8. The stacked I/O connector (1) as defined in
35 claim 1, wherein said connector portions (5) include receptacle connectors.



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5 9. The stacked I/O connector (1) as defined in claim 2, wherein said connector housing (2) includes two walls (60) extending away from said connector portions, the two walls (60) defining a housing channel that partially encloses said first and second terminal set solder tail portions (22).

10 10. The stacked I/O connector (1) as defined in claim 9, wherein said first and second guides (23,24) are held between said housing walls (60) in an orientation generally perpendicular to said connector housing walls (60).

15 11. The stacked I/O connector (1) as defined in claim 1, further including a metal shell portion (3) affixed to said connector housing (2), the shell including a pair of shield portions (11) that surround said connector portions to provide a metallic shield therefor, the shell portion (3) further including means (15,17,19) for engaging said connector housing (2) and at least one slot (53), the slot (53) receiving an engagement tab (26) therein and extending from said shell portion (3), the engagement tab (26) adapted to engage a corresponding engagement tab of an opposing connector.

25 12. The stacked I/O connector (1) as defined in claim 11, wherein said engagement tab (26) has an elongated body portion and said connector housing includes a recess (54) aligned with said shell portion slot (53), the connector housing recess (54) receiving said engagement tab body portion therein.

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13. A electrical connector assembly (1) comprising: at least two connector members (5) disposed therein in vertically spaced-apart fashion for attachment to cables of an opposite connector gender, at least two
5 metal shields (11) surrounding the connector members (5) in an electrically shielding relationship, at least two sets of electrically conductive terminals (7) respectively associated with said connector members (5), one of said two terminal sets including contact portions (8) disposed
10 within one of said connector members (5) and another of said two terminal sets (7) including contact portions (8) disposed with another of said connector members (5), said one terminal set (7) including elongated first solder tails (22) spaced apart from said one connector member (5) and
15 angularly divergent therefrom and said another terminal set (7) including elongated second solder tails (22) spaced apart from said another connector member (5) and angularly divergent therefrom, a connector housing (2) having at least two walls (60) extending away from said two connector
20 members (5) and cooperatively defining a channel partially enclosing said first and second solder tails (22), and first and second guide members (23,24) which cooperatively guide and align said first and second solder tails (22) in their respective angularly divergent paths along their
25 extent out of said connector housing (2), the first guide member (23) including a plurality of openings (51) formed therein and disposed thereon in a series of rows, said first guide member openings (51) receiving individual first solder tails (22) therein and further extending completely
30 around said first solder tails (22) so as to capture said first solder tails (22) therein and restrain said first solder tails (22) from any appreciable lateral movement, the second guide member (24) including a plurality of openings (50) formed therein and disposed thereon in a
35 series of rows, said second guide member openings (50) receiving individual first and second solder tails (22)



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therethrough and further completely extending around said first and second solder tails (22) so as to capture said first and second solder tails (22) therein and further restrain said first and second solder tails (22) from any appreciable lateral movement.

14. The connector assembly (1) of claim 13, wherein said first and second guide member openings (50,51) are aligned with each other.

15. The connector assembly (1) of claim 13, wherein said first and second guide members (23,24) are disposed in said connector housing generally perpendicularly to said first and second solder tails (22).

16. The connector assembly (1) of claim 13, wherein said first guide member (23) is disposed within said connector housing channel proximate to said one connector member (5) and said second guide member (24) is disposed within said connector housing channel proximate to said another connector member (5).

17. The connector assembly (1) of claim 13, further including means (26) flanking said connector members (5) for engaging said cables.

18. The connector assembly (1) of claim 16, wherein said connector housing channel includes ledges which engage said first and second guide members (23,24).

19. The connector assembly (1) of claim 13, wherein the plurality of second guide plate openings (50) is double the plurality of first guide plate openings (51).

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20. The connector assembly (1) of claim 13, wherein said first guide member first solder tail openings (51) are offset from said second guide member second solder tail openings (50).



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