

SPECIFICATIONSYSTEM FOR TERMINATING THE SHIELD OF A HIGH SPEED CABLEField of the Invention

5 This invention generally relates to the art of electrical connectors and, particularly, to a system for terminating the metallic shield of a high speed cable, such as the metallic braid of the cable.

Background of the Invention

10 A typical high speed cable includes a center conductor or core surrounded by a tube-like inner dielectric. A shield is disposed outside the inner dielectric for shielding and/or grounding the cable. The shield typically is a tubular metallic braid. However, one or more longitudinal conductive wires have also been used
15 and are commonly called "drain wires." An insulating jacket surrounds the composite cable outside the shield.

Various types of connectors are used to terminate high speed cables. The connectors typically have contacts which are terminated to the center conductor or core of the
20 cable. The connectors also have one form or another of a terminating member for terminating the metallic shield of the high speed cable, usually for grounding purposes. A typical system in such connectors terminates the metallic shield to the terminating member by soldering. Other
25 systems use crimping procedures to crimp at least a portion of the terminating member securely to the metallic braid for commoning purposes.

30 With the ever-increasing miniaturization of the electronics in various industries, such as in the computer and telecommunications industries, along with the accompanying miniaturization of electrical connectors, considerable problems have been encountered in terminating miniature high speed cables, particularly in terminating

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the metallic shield of the cable. For instance, the outside diameter of a small coaxial cable may be on the order of 0.090 inch. The outside diameter of the inner dielectric surrounding the conductor/core may be on the order of 0.051 inch, and the diameter of the center conductor/core may be on the order 0.012 inch. Coaxial cables having even smaller dimensional parameters have been used.

The problems in terminating such very small coaxial cables often revolve around terminating the metallic shield of the cable. For instance, if soldering methods are used, applying heat (necessary for soldering) in direct proximity to the metallic shield can cause heat damage to the underlying inner dielectric and, in fact, substantially disintegrate or degrade the inner dielectric. If conventional crimp-type terminations are used, typical crimping forces often will crush or deform the inner dielectric surrounding the center conductor/core of the cable.

The above problems are further complicated when the metallic shield of the high speed cable is not terminated to a cylindrical terminating member, but the shield is terminated to a flat terminating member or contact. For instance, it is known to terminate the tubular metallic shield or braid of a coaxial cable to a flat ground circuit pad on a printed circuit board. This is accomplished most often by simply gathering the tubular metallic braid of the coaxial cable into a twisted strand or "pigtail" which, in turn, is soldered to the flat ground pad on the circuit board.

Another example of terminating the metallic shield or braid of a coaxial cable to a flat ground member is shown in U.S. Patent No. 5,304,069, dated April 19, 1994 and assigned to the assignee of the present invention. In that patent, the metallic braids of a plurality of coaxial cables are terminated to a ground plate of a high speed

signal transmission terminal module. The conductors/cores of the coaxial cables are terminated to signal terminals of the module.

5 In terminating the tubular metallic shields or
braids of high speed cables to flat ground contact pads as
in a printed circuit board, or to a planar ground plate as
in the above-referenced U.S. patent, or to any other flat
or non-tubular terminating member, various design
10 considerations should be considered as has been found with
the present invention. It should be understood that there
is a transition zone created where the center
conductor/core of the high speed cable goes from a
"controlled environment" wherein the conductor/core is
15 completely surrounded by the tubular metallic shield or
braid, to an "uncontrolled environment" where the braid is
spread away from the conductor/core for termination to the
non-tubular terminating member. It is desirable that this
transition zone be held to as small an area as possible and
as short a length (i.e., longitudinally of the cable) as
20 possible. Preferably, the metallic shield or braid should
be terminated over an area (or at least at two points)
approximately 180° apart in relation to the center
conductor/core of the cable. Preferably, the flat
terminating member should overlap or at least extend to the
25 point where the metallic shield or braid is separated from
its tubular configuration surrounding the conductor/core of
the cable. Still further, it is desirable that the
metallic shield or braid of any given high speed cable be
terminated on the same side of the flat terminating member
30 as the center conductor/core of the cable.

The present invention is directed to solving the
above-identified problems and satisfying as many of the
above-identified design parameters as possible in an
improved system for terminating the metallic shield of a
35 high speed cable to a terminating member, such as a ground
plate.

Summary of the Invention

An object, therefore, of the invention is to provide a new and improved system or terminal for terminating the metallic shields of a plurality of high speed cables.

In the exemplary embodiment of the invention, a terminal is disclosed for terminating the shields of a plurality of high speed cables each having an outer jacket and an inner metallic shield with a portion of the outer jacket removed to expose a portion of the metallic shield. The terminal includes a conductive ground plate portion. A gripping arm projects from the ground plate portion for embracing the plurality of high speed cables in direct engagement with the exposed portions of the metallic shields thereof. A solder connection is disposed between the gripping arm and the metallic shields.

As disclosed herein, the ground plate is generally planar, and the gripping arm projects inwardly from an edge of the ground plate. Preferably, a pair of the gripping arms project from opposite sides of the ground plate, with the gripping arms projecting inwardly from opposite edges of the ground plate. In the preferred embodiment, each gripping arm is contoured to cooperate with the ground plate to define discrete chambers for respectively receiving the plurality of high speed cables. Specifically, each gripping arm is undulated to define generally semi-cylindrical portions for respectively embracing the plurality of high speed cables.

In one embodiment of the invention, each gripping arm includes an opening for receiving the solder connection therethrough. In the preferred embodiment, the opening is a circumferentially extending slot. The slot is on the order of 0.040 inch wide. In another embodiment, the solder connection is disposed on the inside of the gripping arms by solder material having been deposited thereat and

subsequently reflowed. Preferably, the solder material is deposited as an inlay on the inside of the gripping arms.

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

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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:

FIGURE 1 is a perspective view of an electrical connector of a type in which the invention is applicable;

FIGURE 2 is a fragmented vertical section taken generally along line 2-2 of Figure 1;

FIGURE 3 is a plan view of a stamped metal blank from which the terminal or ground plate is formed;

FIGURE 4 is a perspective view of the ground plate with the gripping arms formed to receive the coaxial cables;

FIGURE 5 is a perspective view of the formed ground plate with a pair of coaxial cables positioned therein, and with the cables prepared by removing portions of the outer jackets to expose the metallic shields;

FIGURE 6 is a view similar to that of Figure 5, but showing four coaxial cables positioned in the ground plate;

FIGURE 7 is a perspective view of the terminal module mountable in the connector of Figures 1 and 2; and

FIGURE 8 is a view similar to that of Figure 7, but showing an alternative embodiment of the invention wherein the solder material is inlayed on the inside of the gripping arms.

Detailed Description of the Preferred Embodiments

Referring to the drawings in greater detail, and first to Figures 1 and 2, the invention is embodied in a shielded electrical connector, generally designated 10, which is a hybrid electrical connector for terminating both the conductors of slower data transmission lines and the conductors of high speed or high frequency transmission lines. In particular, electrical connector 10 includes a dielectric housing 12 (Fig. 2) mounting a plurality of data transmission terminals 14 (Fig. 1). A conductive shield, generally designated 16, substantially surrounds dielectric housing 12 and has a shroud portion 18 projecting forwardly about the mating ends of data transmission terminals 14. A two-piece backshell (not shown) substantially in conformance with that shown in U.S. Patent No. 5,358,428, dated October 25, 1994, projects rearwardly of housing 12 and shield 16. An overmolded boot 20 includes an integral cable strain-relief 22 that is in engagement with a composite electrical cable 24 which includes both the data transmission lines and the high speed or high frequency transmission lines. A pair of thumb screws 26 project through the overmolded boot and include externally threaded forward distal ends 26a for securing the connector to a complementary mating connector, panel or other structure.

As seen best in Figure 2, a high speed signal transmission terminal module, generally designated 30, is inserted into a passage 31 in dielectric housing 12 from the rear thereof. The terminal module includes a pair of identical terminal blocks 30a and 30b which clamp a ground plate, generally designated 32, therebetween. Each terminal block includes a post 34 and a recess. The post from each terminal block extends from each terminal block through a hole or slot 44 (Fig. 3) in the ground plate and into a recess in the other terminal block to secure terminal blocks 30a and 30b to ground plate 32 as a subassembly. Once this subassembly is inserted into

passage 31 in housing 12 as shown in Figure 2, the terminal blocks are effective to clamp the ground plate therebetween. The terminal module is held within the dielectric housing by ramped latches 36 on each terminal block.

Each terminal block 30a and 30b is overmolded about at least one high speed signal terminal 38. The contact ends of a pair of the terminals 38, along with the forward end of ground plate 32, are shown projecting forwardly of the connector in Figure 1, within the surrounding shroud portion 18 of shield 16. The rear ends 38a of terminals 38 (Fig. 7) are terminated to the center conductor/cores 60 of a plurality of coaxial cables, generally designated 40 in Figure 2. The invention is particularly directed to the manner of termination of the metallic shields of the coaxial cables to ground plate 32, as described below.

More particularly, Figure 3 shows a blank, generally designated "B," stamped from conductive sheet metal material and from which ground plate 32 is formed. Blank "B" is generally T-shaped and includes a leg or stem portion 42 which will form a blade portion for ground plate 32. The blade portion includes aperture 44 through which posts 34 (Fig. 2) of terminal blocks 30a and 30b extend. A wing or arm 46 projects outwardly at one end of leg 42 generally at each opposite edge thereof. These wings will form the gripping arms of the ground plate, as will be seen hereinafter. Each wing or gripping arm has an elongated slot 48 to facilitate the solder termination described hereinafter.

When soldering cable shields 56 to ground plate 32, it is desirable to use a soldering iron having a relatively small tip. Although it is desirable to dimension the slot wide enough to facilitate adequate solder flow throughout the slot, it should be narrow enough to prevent the relatively small tip of the soldering iron

from contacting the braid or shield 56 of the cable, which could result in damage to the underlying inner dielectric 62. Each slot is on the order of approximately 0.040 inch wide, although it is believed that such slot could be within the range of 0.010 to 0.110 inch wide. Finally, barbs or teeth 49 are stamped at the opposite edges of blade portion 42 to facilitate holding the subassembly of the ground plate and terminal blocks 30a and 30b within the housing.

As will be seen hereinafter, once formed, ground plate 32 is provided with a positioning and gripping arm on each side of the ground plate for positioning and gripping a pair of coaxial cables. The arms are located at the extreme rear distal end of blade portion 42. With this structure, the ground plate can terminate from one to four coaxial cables depending on the specifications of the connector. In some computer applications, three cables may be used to carry the red, green and blue chroma signals for a monitor. A fourth cable might be used for flat screen monitors for carrying the pixel clock timing signals.

Figure 4 shows the stamped blank "B" of Figure 3 with wings 46 having been bent inwardly to form an upper positioning and gripping arm, generally designated 50a, and a lower positioning and gripping arm, generally designated 50b. Each gripping arm is contoured in an undulated configuration to define a pair of semi-cylindrical portions 52 which cooperate with blade portion 42 to define discrete chambers 54 for receiving a plurality of coaxial cables, as described hereinafter. It can be seen that, after forming, slots 48 in the arms extend in a circumferential direction about portions of each chamber 54. It also can be seen that each gripping arm extends entirely across blade portion 42, leaving only a very small gap 56 between the distal end of the arm and the blade portion. Therefore, the coaxial cables are substantially entirely surrounded by the gripping arms and the blade portions. With this

structure, the ground plate can terminate from one to four coaxial cables depending on the specifications of the connector.

Figure 5 shows the formed ground plate 32 of Figure 4 with a pair of coaxial cables 40 positioned within chambers 54 of upper gripping arm 50a. At this point, it should be understood that each coaxial cable 40 is of a conventional construction in that each cable includes a center conductor or core 60 surrounded by a tube-like inner dielectric 62. A metallic shield in the form of a tubular metallic braid 64 surrounds inner dielectric 62. An insulating jacket 66, as of plastic or the like, surrounds metallic braid 64 to form the overall composite coaxial cable 40.

Figure 5 also shows that center conductor/core 60 of each coaxial cable 40 has been stripped to expose a given length thereof which will be soldered to the inner end of one of the high speed signal transmission terminals 38 (Fig. 7). The outer insulating jacket 66 of each cable also has been cut-back to expose a given length of the respective metallic shield 64. Therefore, the exposed shields can be soldered to the gripping arms 50a or 50b of ground plate 32 as discussed below.

As stated, Figure 5 shows gripping arms 50a and 50b in position for receiving coaxial cables 40 prepared as described above. Figure 5 shows two coaxial cables 40 positioned within upper gripping arm 50a longitudinally so that metallic shields 64 of the cables are in registry with the gripping arm on the inside thereof. Each coaxial cable is positioned longitudinally within one of the chambers 54 defined by semi-cylindrical portions 52. The coaxial cables may be positioned within the gripping arm by a slight press-fit. Alternatively, the gripping arms may be initially formed to freely receive the coaxial cables longitudinally thereinto, whereas the arms initially function only to position the cables, and, thereafter, the

arms may be further formed to positively grip the coaxial cables and completely close gaps 56. In such embodiment, the free end of gripping arms 50a and 50b could include some type of latch (not shown) to engage or overlap a portion of ground plate 32 or the other gripping arm in order to completely encircle the coaxial cable. It should be understood that the gripping arms are not crimped onto the metallic shields as is typical in the crimping art. Rather, an amount of force is used to slightly form the gripping arms inwardly, so as only to grip and retain the coaxial cables prior to soldering. The gripping or crimping pressure should not be excessive so as to damage the underlying inner dielectric material 62 to any extent, which could affect the electrical performance thereof.

Ground plate 32 then is mechanically and electrically connected to metallic shields 64 of the coaxial cables by soldering the metallic shields to gripping arm 50a by applying solder through slot 48 in the gripping arm, as at "S" in Figure 5. As stated above, the slots are formed on the order of approximately 0.040 inch wide to prevent the application of concentrated heat directly to the metallic shield, which could cause heat damage to the underlying inner dielectric. The slot should be sufficiently narrow to at least prevent whatever soldering iron or tool is used from passing through the slot and into direct engagement with the metallic shield. Such engagement may result in damage to the underlying inner dielectric. In essence, the slots restrict the amount of soldering heat which is transmitted inwardly to the inner dielectric. On the other hand, the slots extend in a circumferential direction to provide a large circumferential area of access to the metallic shields in a circumferential direction.

Once the two coaxial cables 40 are soldered to the upper gripping arm 50a as shown in Figure 5, ground plate 32 is inverted as shown in Figure 6 and another pair

of coaxial cables are inserted into chambers 54 of the other gripping arm 50b and soldered thereto as described above in relation to Figure 5.

Once the subassembly of Figure 6 is fabricated, including the soldering procedures, this subassembly is assembled to terminal blocks 30a and 30b including high speed signal transmission terminals 38 to form terminal module 30 as shown in Figure 7 and described above in relation to Figure 2. Center conductors/cores 60 of the coaxial cables are then connected, as by soldering, welding or otherwise securing to the inner ends 38a of terminals 38, while terminal blocks 30a and 30b clamp blade portion 42 of ground plate 32 therebetween, as shown in Figure 2 and described above. The terminal module then is mounted within dielectric housing 12 as shown in Figure 2. If desired, terminal blocks 30a and 30b could be mounted to blade portion 42 of ground plate 32 prior to inserting cables 40 into gripping arms 50a and 50b. In other words, the ground plate would have the terminal blocks mounted thereon at the beginning of the termination process.

Figure 8 shows an alternative embodiment of the invention wherein slots 48 have been eliminated and solder material is deposited or inlaid on the inside of gripping arms 50a and 50b as indicated by dotted lines 70 and subsequently reflowed during the soldering process. Once the gripping arms are formed as shown in Figure 8, the inlaid solder material is not visible from the outside of the structure. During processing, after the coaxial cables are inserted into position within the gripping arms, and with the metallic braids in registry with the arms, the inlaid solder material is heated and reflowed to mechanically and electrically connect the gripping arms to the metallic shields of the coaxial cables.

In the alternative, it is believed that by using coaxial cables having inner dielectrics that can withstand

relatively high temperatures without deformation or degradation, it may be possible to eliminate slots 48 or inlays 70 in gripping arms 50a and 50b. In such case, solder would be applied along the leading or trailing (or both) edges of the gripping arms where they contact the metallic shields.

The concepts of the invention have been shown and described herein in conjunction with terminating the metallic shields of a plurality of coaxial cables to a terminating member in the form of a ground plate. However, it should be understood that the concepts of the invention are equally applicable for terminating the metallic shields to other types of terminating members, such as individual electrical terminals themselves.

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:

1. A termination assembly comprising:
a pair of cables (40) each of which cables having
an inner conductor (60), an inner dielectric (62)
5 surrounding at least a portion of said inner conductor, a
metallic shield (64) surrounding at least a portion of said
inner dielectric and an outer insulating jacket (66)
surrounding at least a portion of said metallic shield, a
portion of said outer jacket being removed to expose an
10 exposed portion (64) of said metallic shield;
a terminal (32) to which said metallic shields
are to be terminated, said terminal being at least
partially disposed in a dielectric housing (12) of an
electrical connector (10) and having a termination portion
15 (42); and
a gripping arm (50a) projecting from said
termination portion and configured to grip at least a
portion of said exposed portion of said metallic shield of
each of said cables without deformation of said inner
20 dielectric, said gripping arm having a slot (48) used in
bonding said exposed portions of said metallic shields to
said gripping arm.
2. The termination assembly of claim 1 wherein
25 said termination portion (42) includes a generally planar
base (42) and wherein said slot (48) in said gripping arm
(50a) extends across a substantial portion of said gripping
arm.



3. The termination assembly of claim 1 wherein said termination portion (42) includes a generally planar base (42) having opposed lateral edges and wherein said gripping arm extends from one of said lateral edges of said base toward the other opposite lateral edge of said base such that said gripping arm extends arcuately about said exposed portions (64) of said metallic shields (64) to thereby grip said exposed portions of said metallic shields.

4. The termination assembly of claim 3 wherein said gripping arm (50a) is contoured (52) and cooperates with said base to generally form a pair of receiving areas (54) for receiving said exposed portions (64) of said metallic shields (64), each of said receiving areas being dimensioned such that said gripping arm maintains said cable (40) relative to said base (42) by gripping said exposed portion of said metallic shield disposed therein without deformation of said inner dielectric.

5. The termination assembly of claim 4 wherein said gripping arm (50a) is undulated (52) to define generally semi-cylindrical receiving areas (54) for respectively embracing said exposed portions (64) of said metallic shields (64) of said cables (40).

6. The termination assembly of claim 2 wherein said exposed portions (64) of said metallic shields (64) are bonded to said gripping arm (50a) by soldering (5) said exposed portions (64) to said gripping arm by using said slot (48) in said gripping arm.

7. The termination assembly of claim 1 including at least one additional cable (40) terminated to said termination portion (42), said additional cable including an additional inner conductor (60), an additional



inner dielectric (62) surrounding at least a portion of
said additional inner conductor, an additional metallic
shield (64) surrounding at least a portion of said
additional inner dielectric and an additional outer
5 insulating jacket (66) surrounding at least a portion of
said additional metallic shield, a portion of said
additional outer jacket being removed to expose an
additional exposed portion (64) of said additional metallic
shield and said termination assembly further including an
10 additional gripping arm (50b) projecting from said
termination portion, said additional gripping arm being
configured to be disposed about said additional exposed
portion of said additional metallic shield of said
additional cable and configured to grip a portion of said
15 additional metallic shield of said additional cable without
deformation of said additional inner dielectric of said
additional cable, said additional gripping arm having an
additional slot (48) used in bonding said additional
exposed portion of said additional metallic shield to said
20 termination portion.

8. The termination assembly of claim 7 wherein
said gripping arm (50a) is spaced longitudinally on said
termination portion (42) from said additional gripping arm
25 (50b).

9. The termination assembly of claim 8 wherein
said termination portion (42) includes a generally planar
base (42) and wherein said slot (48) extends along a
30 substantial portion of said gripping arm (50a) and wherein
said additional slot (40) extends along a substantial
portion of said additional gripping arm (50b).



10. The termination assembly of claim 9 wherein said exposed portions (64) of said metallic shields (64) are bonded to said gripping arm (50a) by using said slot (48) to solder (S) said exposed portions to said gripping arm and wherein said additional exposed portion (64) of said additional metallic shield (64) is bonded to said additional gripping arm (50b) by using said additional slot (48) to solder (S) said additional exposed portion to said additional gripping arm.

11. The termination assembly of claim 8 wherein said termination portion (42) has opposed edges and opposite sides and wherein said additional gripping arm (50b) extends from an opposite side of said termination portion from the side from which said gripping arm (50a) extends and from an edge of said termination portion opposite to the edge of said termination portion from which said gripping arm extends.

12. An electrical connector (10) for termination to a pair of cables (40) each of which includes an inner conductor (60), an inner dielectric (62) surrounding at least a portion of said inner conductor, a metallic shield (64) surrounding at least a portion of said inner dielectric and an outer insulating jacket (66) surrounding at least a portion of said metallic shield, a portion of said outer jacket being removed to expose an exposed portion (64) of said metallic shield, said electrical connector comprising:

a dielectric housing (12) having a mating face, a termination face and a plurality of terminal receiving passages between said mating face and said termination face;

a plurality of terminals (38) extending through at least some of said terminal receiving passages;

a ground member (32) disposed at least partially



within said housing relative to said terminals, said ground member including a termination portion (42) for terminating said metallic shield of said cables to said ground member, said termination portion including a gripping arm (50a) projecting from said termination portion and configured to grip at least a portion of said exposed portions of said metallic shield of each of said cables without deformation of said inner dielectric, said gripping arm having a slot (48) used in bonding said exposed portions of said metallic shields to said termination portion.

13. The electrical connector (10) of claim 12 wherein said ground member (32) includes a generally planar base (42) and wherein said slot (48) in said gripping arm (50a) extends across a substantial portion of said gripping arm.

14. The electrical connector (10) of claim 12 wherein said ground member (32) includes a generally planar base (42) having opposed lateral edges and wherein said gripping arm (50a) extends from one of said lateral edges of said base toward the other opposite lateral edge of said base such that said gripping arm extends arcuately about said exposed portions (64) of said metallic shields (64) to thereby grip said exposed portions of said metallic shields.

15. The electrical connector (10) of claim 14 wherein said gripping arm (50a) is contoured (52) and cooperates with said base (42) to generally form a pair of receiving areas (54) for receiving said exposed portions (64) of said metallic shields (64), each of said receiving areas being dimensioned such that said gripping arm maintains said cable (40) relative to said base by gripping said exposed portion of said metallic shield disposed therein.



16. The electrical connector (10) of claim 15 wherein said gripping arm (50a) is undulated (52) to define generally semi-cylindrical receiving areas (54) for respectively embracing said exposed portions (64) of said metallic shields (64) of said cables (40).

17. The electrical connector (10) of claim 12 wherein said exposed portions (64) of said metallic shields (64) are bonded to said gripping arm (50a) by using said slot (48) to solder (S) said exposed portions to said gripping arm.

18. The electrical connector (10) of claim 12 including at least one additional cable (40) to be terminated to said termination portion, said additional cable including an additional inner conductor (60), an additional inner dielectric (62) surrounding at least a portion of said additional inner conductor, an additional metallic shield (64) surrounding at least a portion of said additional inner dielectric and an additional outer insulating jacket (66) surrounding at least a portion of said additional metallic shield, a portion of said additional outer jacket being removed to expose an additional exposed portion (64) of said additional metallic shield and said electrical connector further including an additional gripping arm (50b) projecting from said termination portion (42), said additional gripping arm being configured to be disposed about said additional exposed portion of said additional metallic shield of said additional cable and configured to grip at least a portion of said additional exposed portion of said additional metallic shield of said additional cable without deformation of said inner dielectric, said additional gripping arm having an additional slot (48) used in bonding said additional gripping arm to said additional exposed portion of said additional metallic shield.



19. The electrical connector (10) of claim 18 wherein said gripping arm (50a) is spaced longitudinally on said termination portion (42) from said additional gripping arm (50b).

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20. The electrical connector (10) of claim 18 wherein said exposed portions (64) of said metallic shields (64) are bonded to said gripping arm (50a) by using said slot (48) to solder (S) said exposed portions to said gripping arm and wherein said additional exposed portion (64) of said additional metallic shield (64) is bonded to said additional gripping arm (50a) by using said additional slot (48) to solder (S) said additional exposed portion to said additional gripping arm.

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21. The electrical connector (10) of claim 18 wherein said termination portion (42) has opposed edges and opposite sides and wherein said additional gripping arm (50b) extends from an opposite side of said termination portion from the side from which said gripping arm (50a) extends and from an edge of said termination portion opposite to the edge of said termination portion from which said gripping arm extends.

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22. A method of terminating a pair of cables (40) each of which cables having a inner conductor (60), an inner dielectric (62) surrounding at least a portion of said inner conductor, a metallic shield (64) surrounding at least a portion of said inner dielectric and an outer insulating jacket (66) surrounding at least a portion of said metallic shield to an electrical connector (10) having a dielectric housing (12) with a mating face, a termination face and a plurality of terminal receiving passages between said mating face and said termination face through which at least some passages extend a plurality of terminals (38) and having a ground member (32) at least partially disposed

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in said housing, said ground member including a mating portion (42) generally adjacent said mating face and a ground termination portion (42) generally adjacent said termination face, said method comprising the steps of:

5 providing each of said cables with a portion of said outer insulating jacket of said cable being removed from about said metallic shield so as to expose an exposed portion (64) of said metallic shield;

10 positioning said exposed portion of each of said metallic shields relative to said termination portion so that said exposed portion of said metallic shield of each of said cables is positioned on said termination portion;

15 forming a gripping arm (50a) extending from a lateral edge of said ground member into a generally arc-shaped configuration such that said gripping arm defines a pair of cable receiving areas (54) wherein said exposed portions of said metallic shields are disposed and said gripping arm grips said exposed portions of said metallic shields of said cables disposed within said cable receiving areas without deformation of said inner dielectrics; and

20 bonding each of said gripping arms to said exposed portion of said metallic shield disposed within said cable receiving area.

25 23. The method of claim 22 wherein said exposed portion (64) of said metallic shield (64) of each of said cables (40) has a longitudinal axis and each of said cables is positioned within a respective one of said cable receiving areas (54) by positioning said exposed portion
30 of said metallic shield at a location spaced from said respective cable receiving area and then moving said cable in a direction of its longitudinal axis and into said respective cable receiving area.

35 24. The method of claim 22 wherein a slot (48) is provided in said gripping arm (50a) and said exposed



portion (64) of said metallic shield (64) of each of said cables (40) is bonded to said ground termination portion (42) by using said slot to solder (S) said exposed portion to said gripping arm.

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25. The method of claim 22 further including terminating said inner conductor (60) of each of said cables (40) to one of said terminals (38) and forming said ground member (32) with said metallic shields (64) bonded thereto and said terminals with said inner conductors terminated thereto into a subassembly (30) for disposition in said housing (12).

26. The method of claim 22 wherein said ground member (32) includes a generally planar base (42) having opposed lateral edges and wherein said gripping arm (50a) extends from one of said lateral edges of said base toward the other opposite lateral edge of said base such that said gripping arm extends arcuately about said exposed portions (64) of said metallic shields (64) to thereby grip said exposed portions of said metallic shields.

27. The method of claim 26 wherein said gripping arm (50a) is contoured (52) and cooperates with said base (42) to generally form a pair of receiving areas (54) for receiving said exposed portions (64) of said metallic shields (64), each of said receiving areas being dimensioned such that said gripping arm maintains said cable relative to said base by gripping said exposed portion of said metallic shield disposed therein.

28. The method of claim 27 wherein said gripping arm (50a) is undulated (52) to define generally semi-cylindrical receiving areas (54) for respectively embracing said exposed portions (64) of said metallic shields (64) of said cables (40).



29. The method of claim 22 including at least one additional cable (40) to be terminated to said termination portion (42), said additional cable including an additional inner conductor (60), an additional inner dielectric (62) surrounding at least a portion of said additional inner conductor, an additional metallic shield (64) surrounding at least a portion of said additional inner dielectric and an additional outer insulating jacket (66) surrounding at least a portion of said additional metallic shield, a portion of said additional outer jacket being removed to expose an additional exposed portion (64) of said additional metallic shield and said method further including positioning said additional exposed portion of said additional metallic shield of said additional cable within one of a pair of receiving areas (54) formed by an additional gripping arm (50b) projecting from said termination portion, said additional gripping arm being configured to encircle a portion of said additional metallic shield of said additional cable; forming said additional gripping arm to grip said additional exposed portion of said additional metallic shield without deforming said additional inner dielectric and bonding said additional gripping arm to said additional exposed portion of said additional metallic shield.

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30. The method of claim 29 wherein said gripping arm (50a) is spaced longitudinally on said termination portion (42) from said additional gripping arm (50b).

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31. The method of claim 29 wherein said termination portion (42) includes a generally planar base (42), wherein said gripping arm (50a) includes a slot (48) extending along a substantial portion of said gripping arm, said slot being used to bond said exposed portions (64) of said metallic shields (64) to said gripping arm and wherein said additional gripping arm (50b) includes an additional

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slot (48) extending along a substantial portion of said additional gripping arm, said additional slot being used to bond said additional exposed portion (64) of said additional metallic shield (64) to said additional gripping arm.

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32. The method of claim 29 wherein said termination portion (42) has opposed lateral edges and opposite sides and wherein said additional gripping arm (50b) extends from one of said opposite sides of said termination portion and said gripping arm (50a) extends from said other of said opposite sides and said additional gripping arm extends from said edge of said termination portion opposite to the edge of said termination portion from which said gripping arm extends.

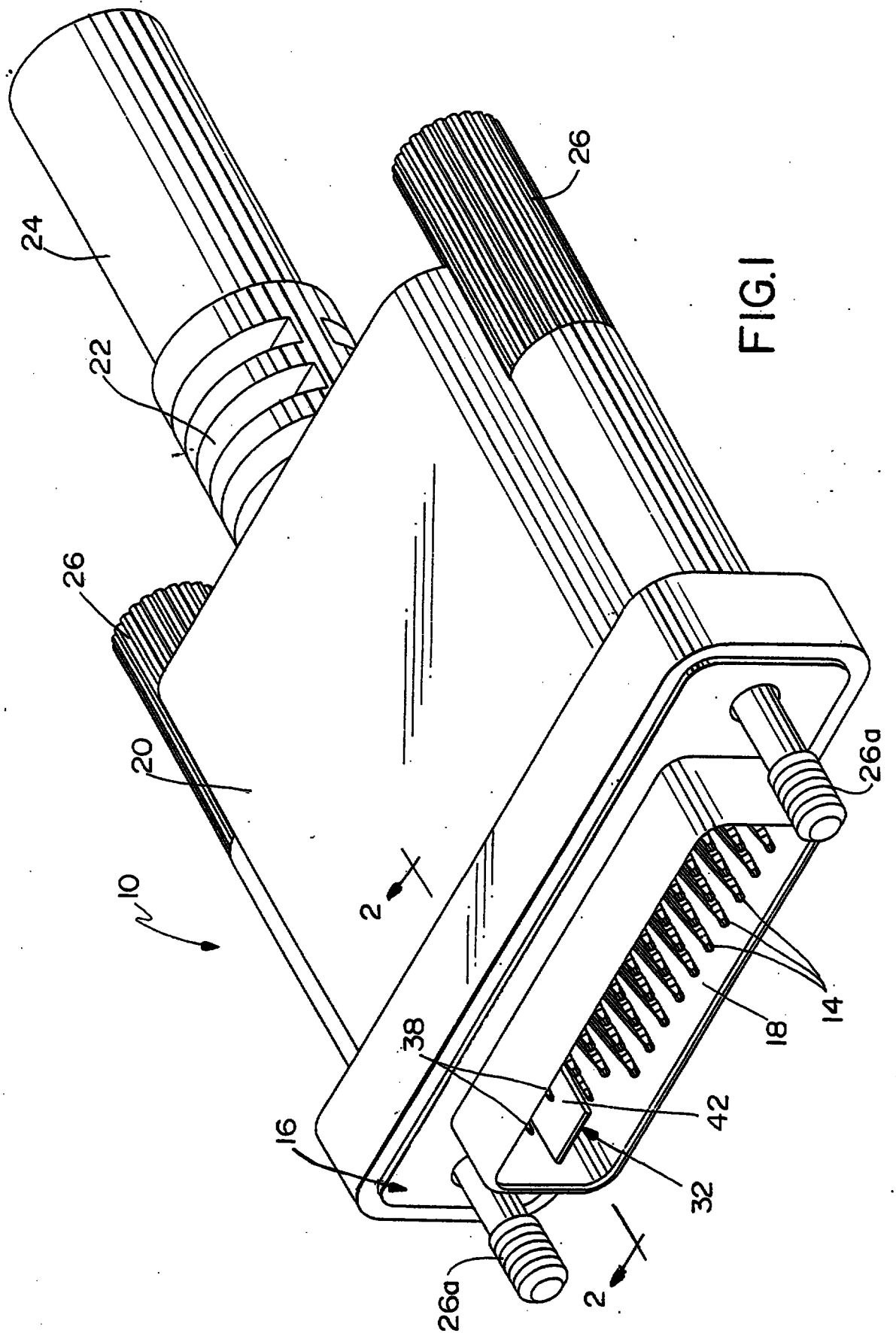
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33. The method of claim 29 wherein said exposed portion (64) of said metallic shield (64) of each of said cables (40) has a longitudinal axis and each of said cables is positioned within a respective one of said cable receiving areas (54) by positioning said exposed portion of said metallic shield at a location spaced from said respective cable receiving area and then moving said cable in a direction of its longitudinal axis and into said respective cable receiving area and wherein said additional exposed portion (64) of said additional metallic shield (64) of said additional cable (40) has an additional longitudinal axis and said additional cable is positioned within a respective one of said additional cable receiving areas (54) by positioning said additional exposed portion of said additional metallic shield at a location spaced from said respective additional cable receiving area and then moving said additional cable in a direction of its additional longitudinal axis and into said respective additional cable receiving area.

ABSTRACT:

SYSTEM FOR TERMINATING THE SHIELD OF A HIGH SPEED CABLE

5 A terminal is disclosed for terminating the
shields of a plurality of high speed cables each having an
outer jacket and an inner metallic shield with a portion of
the outer jacket removed to expose a portion of the
metallic shield. The terminal includes a conductive ground
plate portion. A gripping arm projects from the ground
10 plate portion for embracing all of the plurality of high
speed cables in direct engagement with the exposed portions
of the metallic shields thereat. A solder connection is
disposed between the gripping arm and the metallic shields.

(1-4)



(2-4)

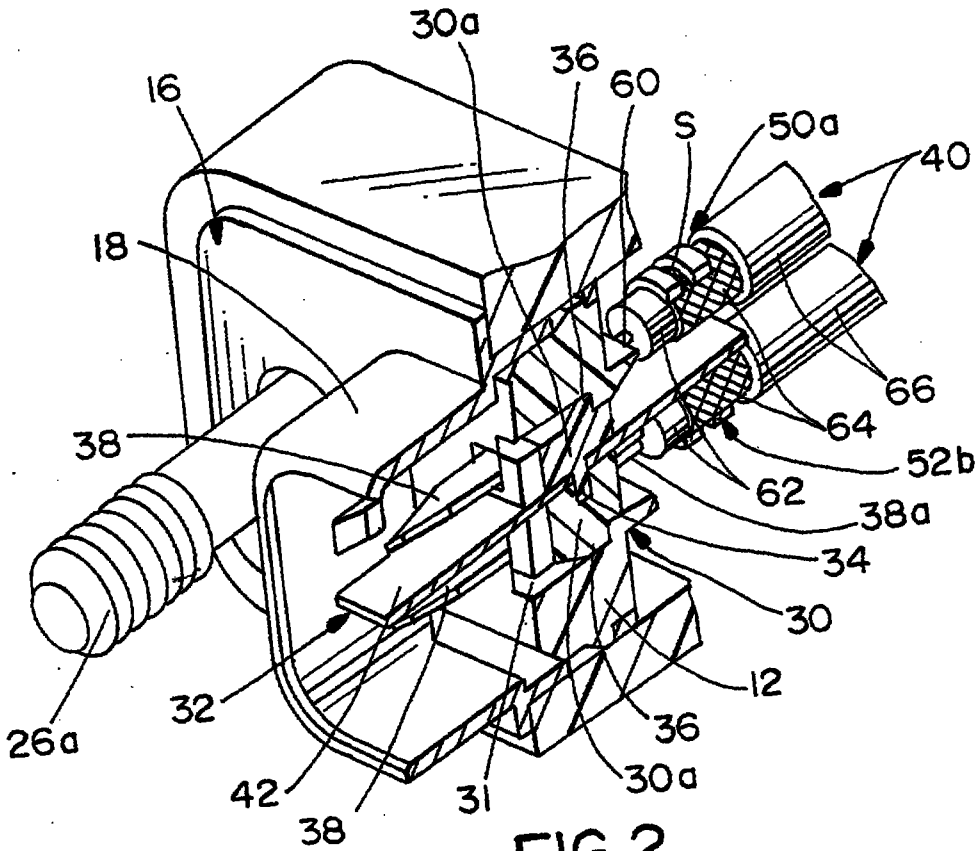


FIG. 2

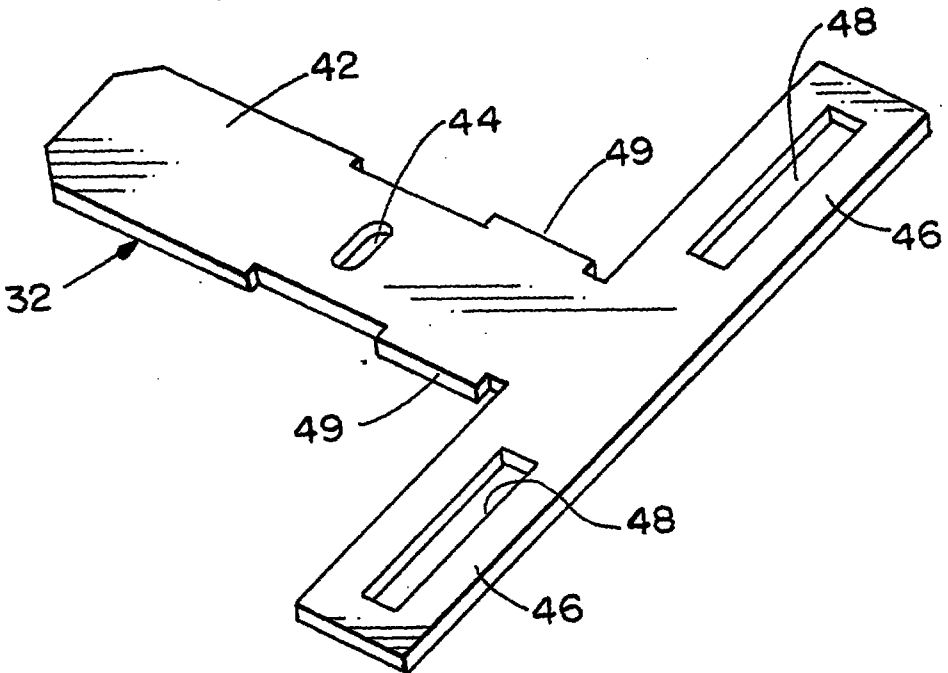
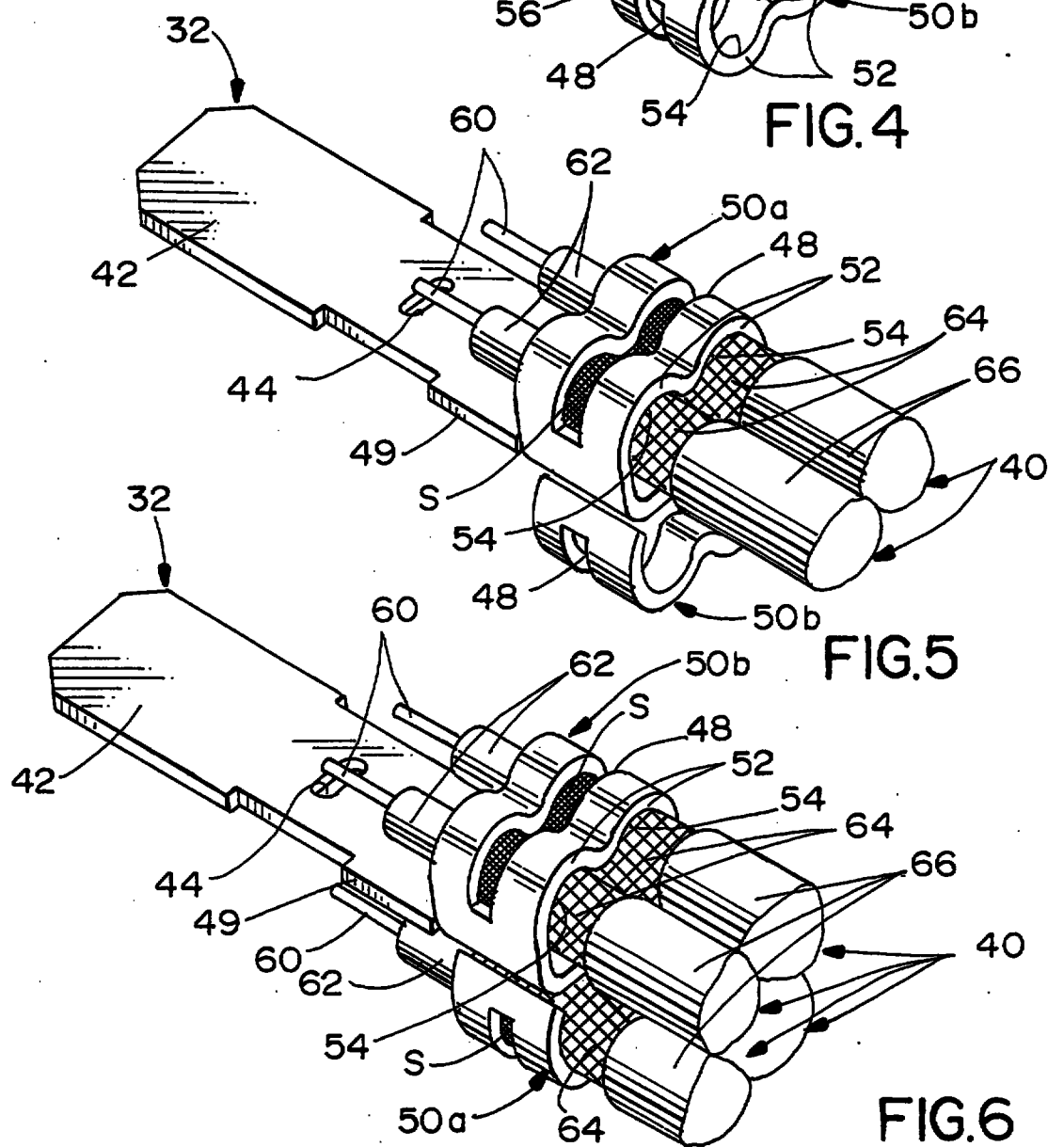
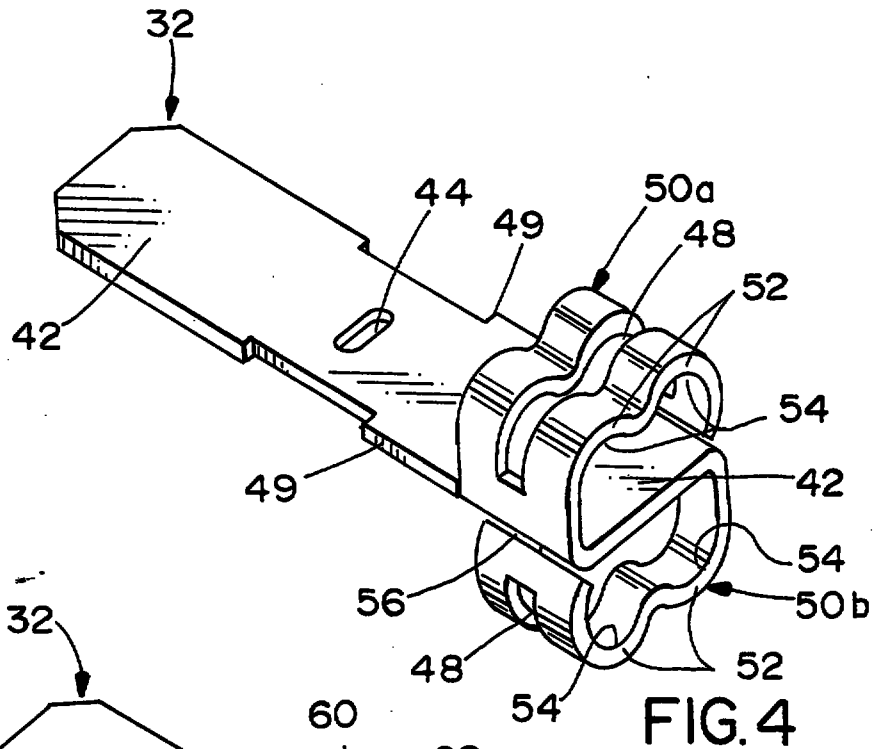
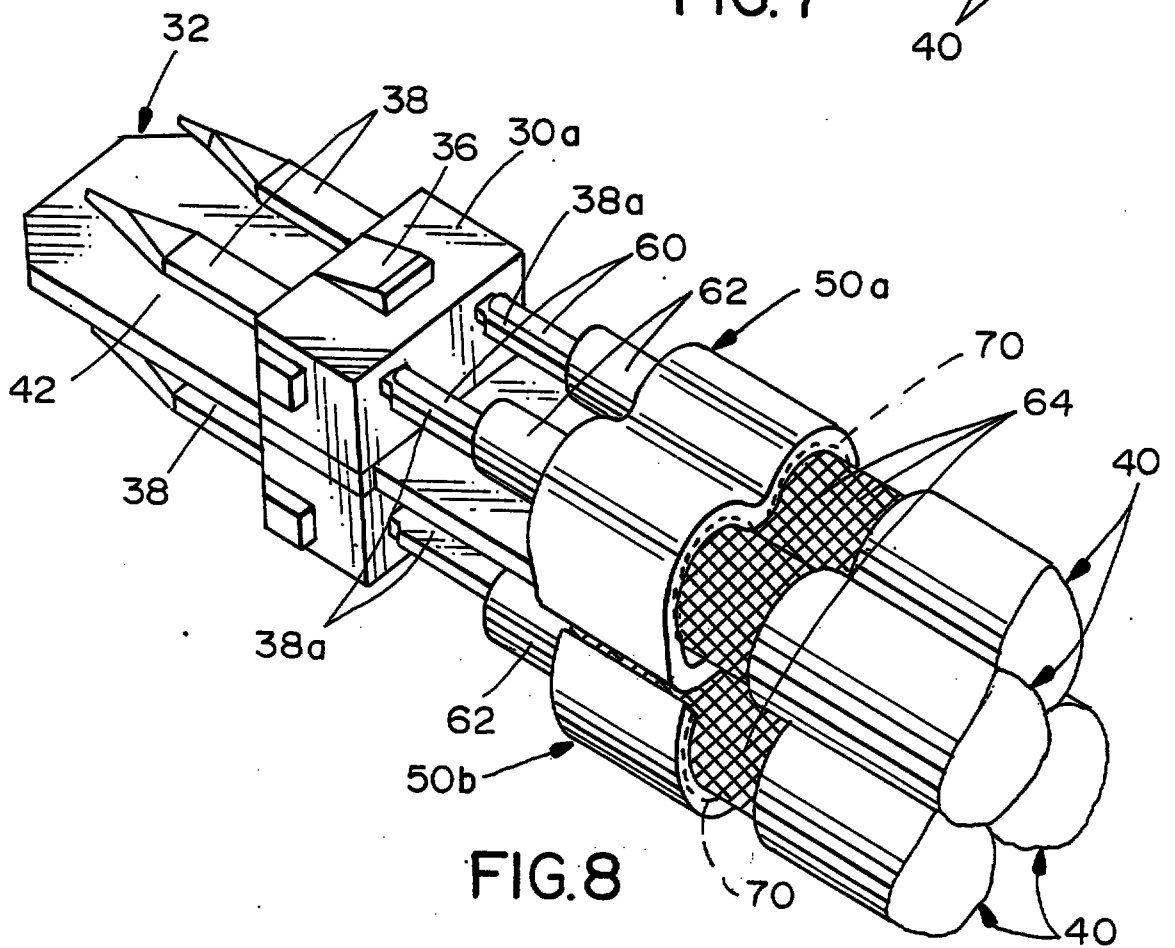
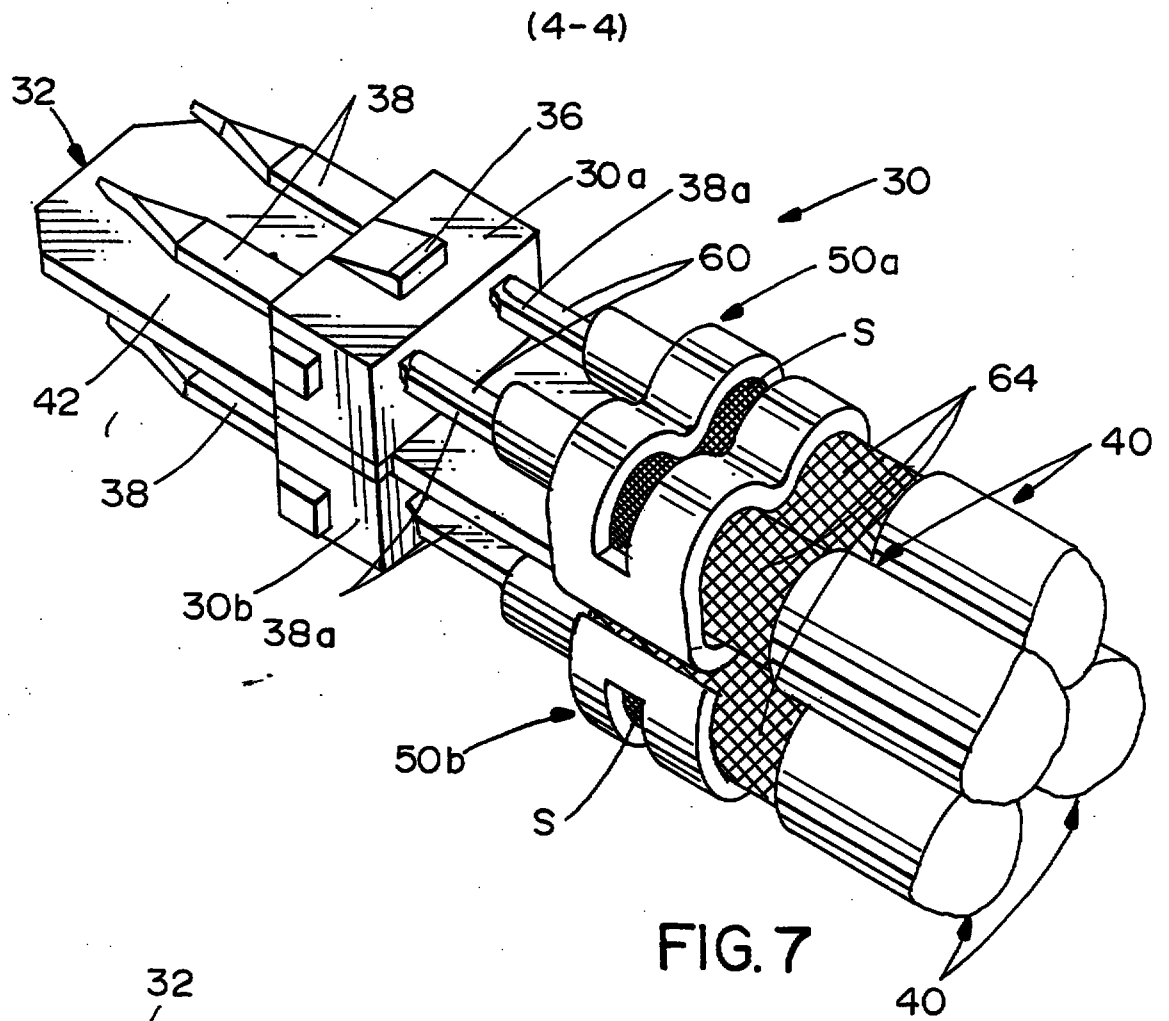


FIG.3

(3-4)





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☒ Claim(s)	: paged 15 to paged 28	
☒ Drawing(s)	: paged 1 to paged 4	
☒ Abstract	: paged 29 to paged	
DATE OF RECEIPT		2/6/97

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SPECIFICATION

SYSTEM FOR TERMINATING THE SHIELD OF A HIGH SPEED CABLE

Field of the Invention

This invention generally relates to the art of electrical connectors and, particularly, to a system for terminating the metallic shield of a high speed cable, such as the metallic braid of the cable.

Background of the Invention

A typical high speed cable includes a center conductor or core surrounded by a tube-like inner dielectric. A shield is disposed outside the inner dielectric for shielding and/or grounding the cable. The shield typically is a tubular metallic braid. However, one or more longitudinal conductive wires have also been used and are commonly called "drain wires." An insulating jacket surrounds the composite cable outside the shield.

Various types of connectors are used to terminate high speed cables. The connectors typically have contacts which are terminated to the center conductor or core of the cable. The connectors also have one form or another of a terminating member for terminating the metallic shield of the high speed cable, usually for grounding purposes. A typical system in such

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connectors terminates the metallic shield to the terminating member by soldering. Other systems use crimping procedures to crimp at least a portion of the terminating member securely to the metallic braid for commoning purposes.

With the ever-increasing miniaturization of the electronics in various industries, such as in the computer and telecommunications industries, along with the accompanying miniaturization of electrical connectors, considerable problems have been encountered in terminating miniature high speed cables, particularly in terminating the metallic shield of the cable. For instance, the outside diameter of a small coaxial cable may be on the order of 0.090 inch. The outside diameter of the inner dielectric surrounding the conductor/core may be on the order of 0.051 inch, and the diameter of the center conductor/core may be on the order 0.012 inch. Coaxial cables having even smaller dimensional parameters have been used.

The problems in terminating such very small coaxial cables often revolve around terminating the metallic shield of the cable. For instance, if soldering methods are used, applying heat (necessary for soldering) in direct proximity to the metallic shield can cause heat damage to the underlying inner dielectric and, in fact, substantially disintegrate or degrade the inner dielectric. If conventional crimp-type terminations are used, typical crimping forces often will crush or deform the inner dielectric surrounding the center conductor/core of the cable.

The above problems are further complicated when the metallic shield of the high speed cable is not terminated to a cylindrical terminating member, but the shield is terminated to

a flat terminating member or contact. For instance, it is known to terminate the tubular metallic shield or braid of a coaxial cable to a flat ground circuit pad on a printed circuit board. This is accomplished most often by simply gathering the tubular metallic braid of the coaxial cable into a twisted strand or "pigtail" which, in turn, is soldered to the flat ground pad on the circuit board.

Another example of terminating the metallic shield or braid of a coaxial cable to a flat ground member is shown in U.S. Patent No. 5,304,069, dated April 19, 1994 and assigned to the assignee of the present invention. In that patent, the metallic braids of a plurality of coaxial cables are terminated to a ground plate of a high speed signal transmission terminal module. The conductors/cores of the coaxial cables are terminated to signal terminals of the module.

In terminating the tubular metallic shields or braids of high speed cables to flat ground contact pads as in a printed circuit board, or to a planar ground plate as in the above-referenced U.S. patent, or to any other flat or non-tubular terminating member, various design considerations should be considered as has been found with the present invention. It should be understood that there is a transition zone created where the center conductor/core of the high speed cable goes from a "controlled environment" wherein the conductor/core is completely surrounded by the tubular metallic shield or braid, to an "uncontrolled environment" where the braid is spread away from the conductor/core for termination to the non-tubular terminating member. It is desirable that this transition zone be held to as small an area as possible and as short a length (i.e.,

longitudinally of the cable) as possible. Preferably, the metallic shield or braid should be terminated over an area (or at least at two points) approximately 180° apart in relation to the center conductor/core of the cable. Preferably, the flat terminating member should overlap or at least extend to the point where the metallic shield or braid is separated from its tubular configuration surrounding the conductor/core of the cable. Still further, it is desirable that the metallic shield or braid of any given high speed cable be terminated on the same side of the flat terminating member as the center conductor/core of the cable.

The present invention is directed to solving the above-identified problems and satisfying as many of the above-identified design parameters as possible in an improved system for terminating the metallic shield of a high speed cable to a terminating member, such as a ground plate.

Summary of the Invention

An object, therefore, of the invention is to provide a new and improved system or terminal for terminating the metallic shields of a plurality of high speed cables.

In the exemplary embodiment of the invention, a terminal is disclosed for terminating the shields of a plurality of high speed cables each having an outer jacket and an inner metallic shield with a portion of the outer jacket removed to expose a portion of the metallic shield. The terminal includes a conductive ground plate portion. A gripping arm projects from the ground plate portion for embracing the plurality of high speed cables in direct engagement with the exposed portions of

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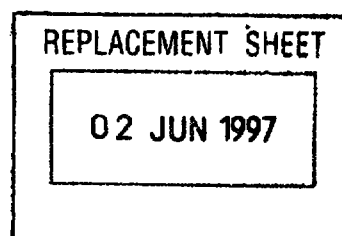
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the metallic shields thereof. A solder connection is disposed between the gripping arm and the metallic shields.

As disclosed herein, the ground plate is generally planar, and the gripping arm projects inwardly from an edge of the ground plate. Preferably, a pair of the gripping arms project from opposite sides of the ground plate, with the gripping arms projecting inwardly from opposite edges of the ground plate. In the preferred embodiment, each gripping arm is contoured to cooperate with the ground plate to define discrete chambers for respectively receiving the plurality of high speed cables. Specifically, each gripping arm is undulated to define generally semi-cylindrical portions for respectively embracing the plurality of high speed cables.

In one embodiment of the invention, each gripping arm includes an opening for receiving the solder connection therethrough. In the preferred embodiment, the opening is a circumferentially extending slot. The slot is on the order of 0.040 inch wide. In another embodiment, the solder connection is disposed on the inside of the gripping arms by solder material having been deposited thereat and subsequently reflowed. Preferably, the solder material is deposited as an inlay on the inside of the gripping arms.

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:

FIGURE 1 is a perspective view of an electrical connector of a type in which the invention is applicable;

FIGURE 2 is a fragmented vertical section taken generally along line 2-2 of Figure 1;

FIGURE 3 is a plan view of a stamped metal blank from which the terminal or ground plate is formed;

FIGURE 4 is a perspective view of the ground plate with the gripping arms formed to receive the coaxial cables;

FIGURE 5 is a perspective view of the formed ground plate with a pair of coaxial cables positioned therein, and with the cables prepared by removing portions of the outer jackets to expose the metallic shields;

FIGURE 6 is a view similar to that of Figure 5, but showing four coaxial cables positioned in the ground plate;

FIGURE 7 is a perspective view of the terminal module mountable in the connector of Figures 1 and 2; and

FIGURE 8 is a view similar to that of Figure 7, but showing an alternative embodiment of the invention wherein the solder material is inlayed on the inside of the gripping arms.

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Detailed Description of the Preferred Embodiments

Referring to the drawings in greater detail, and first to Figures 1 and 2, the invention is embodied in a shielded electrical connector, generally designated 10, which is a hybrid electrical connector for terminating both the conductors of slower data transmission lines and the conductors of high speed or high frequency transmission lines. In particular, electrical connector 10 includes a dielectric housing 12 (Fig. 2) mounting a plurality of data transmission terminals 14 (Fig. 1). A conductive shield, generally designated 16, substantially surrounds dielectric housing 12 and has a shroud portion 18 projecting forwardly about the mating ends of data transmission terminals 14. A two-piece backshell (not shown) substantially in conformance with that shown in U.S. Patent No. 5,358,428, dated October 25, 1994, projects rearwardly of housing 12 and shield 16. An overmolded boot 20 includes an integral cable strain-relief 22 that is in engagement with a composite electrical cable 24 which includes both the data transmission lines and the high speed or high frequency transmission lines. A pair of thumb screws 26 project through the overmolded boot and include externally threaded forward distal ends 26a for securing the connector to a complementary mating connector, panel or other structure.

As seen best in Figure 2, a high speed signal transmission terminal module, generally designated 30, is inserted into a passage 31 in dielectric housing 12 from the rear thereof. The terminal module includes a pair of identical terminal blocks 30a and 30b which clamp a ground plate, generally designated 32, therebetween. Each terminal block includes a post

34 and a recess. The post from each terminal block extends from each terminal block through a hole or slot 44 (Fig. 3) in the ground plate and into a recess in the other terminal block to secure terminal blocks 30a and 30b to ground plate 32 as a subassembly. Once this subassembly is inserted into passage 31 in housing 12 as shown in Figure 2, the terminal blocks are effective to clamp the ground plate therebetween. The terminal module is held within the dielectric housing by ramped latches 36 on each terminal block.

Each terminal block 30a and 30b is overmolded about at least one high speed signal terminal 38. The contact ends of a pair of the terminals 38, along with the forward end of ground plate 32, are shown projecting forwardly of the connector in Figure 1, within the surrounding shroud portion 18 of shield 16. The rear ends 38a of terminals 38 (Fig. 7) are terminated to the center conductor/cores 60 of a plurality of coaxial cables, generally designated 40 in Figure 2. The invention is particularly directed to the manner of termination of the metallic shields of the coaxial cables to ground plate 32, as described below.

More particularly, Figure 3 shows a blank, generally designated "B," stamped from conductive sheet metal material and from which ground plate 32 is formed. Blank "B" is generally T-shaped and includes a leg or stem portion 42 which will form a blade portion for ground plate 32. The blade portion includes aperture 44 through which posts 34 (Fig. 2) of terminal blocks 30a and 30b extend. A wing or arm 46 projects outwardly at one end of leg 42 generally at each opposite edge thereof. These wings will form the gripping arms of the ground plate, as will be

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seen hereinafter. Each wing or gripping arm has an elongated slot 48 to facilitate the solder termination described hereinafter.

When soldering cable shields 56 to ground plate 32, it is desirable to use a soldering iron having a relatively small tip. Although it is desirable to dimension the slot wide enough to facilitate adequate solder flow throughout the slot, it should be narrow enough to prevent the relatively small tip of the soldering iron from contacting the braid or shield 56 of the cable, which could result in damage to the underlying inner dielectric 62. Each slot is on the order of approximately 0.040 inch wide, although it is believed that such slot could be within the range of 0.010 to 0.110 inch wide. Finally, barbs or teeth 49 are stamped at the opposite edges of blade portion 42 to facilitate holding the subassembly of the ground plate and terminal blocks 30a and 30b within the housing.

As will be seen hereinafter, once formed, ground plate 32 is provided with a positioning and gripping arm on each side of the ground plate for positioning and gripping a pair of coaxial cables. The arms are located at the extreme rear distal end of blade portion 42. With this structure, the ground plate can terminate from one to four coaxial cables depending on the specifications of the connector. In some computer applications, three cables may be used to carry the red, green and blue chroma signals for a monitor. A fourth cable might be used for flat screen monitors for carrying the pixel clock timing signals.

Figure 4 shows the stamped blank "B" of Figure 3 with wings 46 having been bent inwardly to form an upper positioning and gripping arm, generally designated 50a, and a lower positioning and gripping arm, generally designated 50b. Each

gripping arm is contoured in an undulated configuration to define a pair of semi-cylindrical portions 52 which cooperate with blade portion 42 to define discrete chambers 54 for receiving a plurality of coaxial cables, as described hereinafter. It can be seen that, after forming, slots 48 in the arms extend in a circumferential direction about portions of each chamber 54. It also can be seen that each gripping arm extends entirely across blade portion 42, leaving only a very small gap 56 between the distal end of the arm and the blade portion. Therefore, the coaxial cables are substantially entirely surrounded by the gripping arms and the blade portions. With this structure, the ground plate can terminate from one to four coaxial cables depending on the specifications of the connector.

Figure 5 shows the formed ground plate 32 of Figure 4 with a pair of coaxial cables 40 positioned within chambers 54 of upper gripping arm 50a. At this point, it should be understood that each coaxial cable 40 is of a conventional construction in that each cable includes a center conductor or core 60 surrounded by a tube-like inner dielectric 62. A metallic shield in the form of a tubular metallic braid 64 surrounds inner dielectric 62. An insulating jacket 66, as of plastic or the like, surrounds metallic braid 64 to form the overall composite coaxial cable 40.

Figure 5 also shows that center conductor/core 60 of each coaxial cable 40 has been stripped to expose a given length thereof which will be soldered to the inner end of one of the high speed signal transmission terminals 38 (Fig. 7). The outer insulating jacket 66 of each cable also has been cut-back to expose a given length of the respective metallic shield 64.

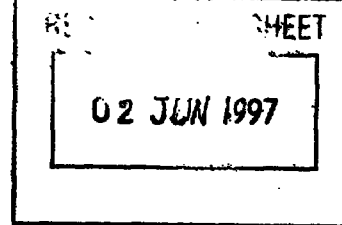
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Therefore, the exposed shields can be soldered to the gripping arms 50a or 50b of ground plate 32 as discussed below.

As stated, Figure 5 shows gripping arms 50a and 50b in position for receiving coaxial cables 40 prepared as described above. Figure 5 shows two coaxial cables 40 positioned within upper gripping arm 50a longitudinally so that metallic shields 64 of the cables are in registry with the gripping arm on the inside thereof. Each coaxial cable is positioned longitudinally within one of the chambers 54 defined by semi-cylindrical portions 52. The coaxial cables may be positioned within the gripping arm by a slight press-fit. Alternatively, the gripping arms may be initially formed to freely receive the coaxial cables longitudinally thereinto, whereas the arms initially function only to position the cables, and, thereafter, the arms may be further formed to positively grip the coaxial cables and completely close gaps 56. In such embodiment, the free end of gripping arms 50a and 50b could include some type of latch (not shown) to engage or overlap a portion of ground plate 32 or the other gripping arm in order to completely encircle the coaxial cable. It should be understood that the gripping arms are not crimped onto the metallic shields as is typical in the crimping art. Rather, an amount of force is used to slightly form the gripping arms inwardly, so as only to grip and retain the coaxial cables prior to soldering. The gripping or crimping pressure should not be excessive so as to damage the underlying inner dielectric material 62 to any extent, which could affect the electrical performance thereof.

Ground plate 32 then is mechanically and electrically connected to metallic shields 64 of the coaxial cables by



soldering the metallic shields to gripping arm 50a by applying solder through slot 48 in the gripping arm, as at "S" in Figure 5. As stated above, the slots are formed on the order of approximately 0.040 inch wide to prevent the application of concentrated heat directly to the metallic shield, which could cause heat damage to the underlying inner dielectric. The slot should be sufficiently narrow to at least prevent whatever soldering iron or tool is used from passing through the slot and into direct engagement with the metallic shield. Such engagement may result in damage to the underlying inner dielectric. In essence, the slots restrict the amount of soldering heat which is transmitted inwardly to the inner dielectric. On the other hand, the slots extend in a circumferential direction to provide a large circumferential area of access to the metallic shields in a circumferential direction.

Once the two coaxial cables 40 are soldered to the upper gripping arm 50a as shown in Figure 5, ground plate 32 is inverted as shown in Figure 6 and another pair of coaxial cables are inserted into chambers 54 of the other gripping arm 50b and soldered thereto as described above in relation to Figure 5.

Once the subassembly of Figure 6 is fabricated, including the soldering procedures, this subassembly is assembled to terminal blocks 30a and 30b including high speed signal transmission terminals 38 to form terminal module 30 as shown in Figure 7 and described above in relation to Figure 2. Center conductors/cores 60 of the coaxial cables are then connected, as by soldering, welding or otherwise securing to the inner ends 38a of terminals 38, while terminal blocks 30a and 30b clamp blade portion 42 of ground plate 32 therebetween, as shown in Figure 2

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and described above. The terminal module then is mounted within dielectric housing 12 as shown in Figure 2. If desired, terminal blocks 30a and 30b could be mounted to blade portion 42 of ground plate 32 prior to inserting cables 40 into gripping arms 50a and 50b. In other words, the ground plate would have the terminal blocks mounted thereon at the beginning of the termination process.

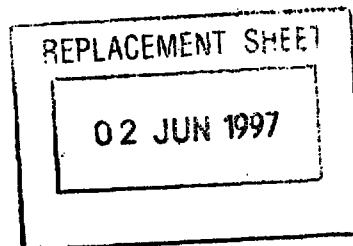
Figure 8 shows an alternative embodiment of the invention wherein slots 48 have been eliminated and solder material is deposited or inlayed on the inside of gripping arms 50a and 50b as indicated by dotted lines 70 and subsequently reflowed during the soldering process. Once the gripping arms are formed as shown in Figure 8, the inlayed solder material is not visible from the outside of the structure. During processing, after the coaxial cables are inserted into position within the gripping arms, and with the metallic braids in registry with the arms, the inlayed solder material is heated and reflowed to mechanically and electrically connect the gripping arms to the metallic shields of the coaxial cables.

In the alternative, it is believed that by using coaxial cables having inner dielectrics that can withstand relatively high temperatures without deformation or degradation, it may be possible to eliminate slots 48 or inlays 70 in gripping arms 50a and 50b. In such case, solder would be applied along the leading or trailing (or both) edges of the gripping arms where they contact the metallic shields.

The concepts of the invention have been shown and described herein in conjunction with terminating the metallic

shields of a plurality of coaxial cables to a terminating member in the form of a ground plate. However, it should be understood that the concepts of the invention are equally applicable for terminating the metallic shields to other types of terminating members, such as individual electrical terminals themselves.

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:

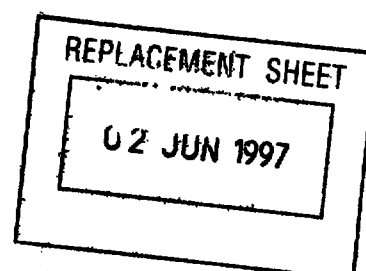
1. A termination assembly comprising:

a pair of cables (40) each of which cables having an inner conductor (60), an inner dielectric (62) surrounding at least a portion of said inner conductor, a metallic shield (64) surrounding at least a portion of said inner dielectric and an outer insulating jacket (66) surrounding at least a portion of said metallic shield, a portion of said outer jacket being removed to expose an exposed portion (64) of said metallic shield;

a terminal (32) to which said metallic shields are to be terminated, said terminal being at least partially disposed in a dielectric housing (12) of an electrical connector (10) and having a termination portion (42); and

a gripping arm (50a) projecting from said termination portion and configured to grip at least a portion of said exposed portion of said metallic shield of each of said cables without deformation of said inner dielectric, said gripping arm having a slot (48) used in bonding said exposed portions of said metallic shields to said gripping arm.

2. The termination assembly of claim 1 wherein said termination portion (42) includes a generally planar base (42) and wherein said slot (48) in said gripping arm (50a) extends across a substantial portion of said gripping arm.





3. The termination assembly of claim 1 wherein said termination portion (42) includes a generally planar base (42) having opposed lateral edges and wherein said gripping arm extends from one of said lateral edges of said base toward the other opposite lateral edge of said base such that said gripping arm extends arcuately about said exposed portions (64) of said metallic shields (64) to thereby grip said exposed portions of said metallic shields.

4. The termination assembly of claim 3 wherein said gripping arm (50a) is contoured (52) and cooperates with said base to generally form a pair of receiving areas (54) for receiving said exposed portions (64) of said metallic shields (64), each of said receiving areas being dimensioned such that said gripping arm maintains said cable (40) relative to said base (42) by gripping said exposed portion of said metallic shield disposed therein without deformation of said inner dielectric.

5. The termination assembly of claim 4 wherein said gripping arm (50a) is undulated (52) to define generally semi-cylindrical receiving areas (54) for respectively embracing said exposed portions (64) of said metallic shields (64) of said cables (40).

6. The termination assembly of claim 2 wherein said exposed portions (64) of said metallic shields (64) are bonded to said gripping arm (50a) by soldering (S) said exposed portions (64) to said gripping arm by using said slot (48) in said gripping arm.

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7. The termination assembly of claim 1 including at least one additional cable (40) terminated to said termination portion (42), said additional cable including an additional inner conductor (60), an additional inner dielectric (62) surrounding at least a portion of said additional inner conductor, an additional metallic shield (64) surrounding at least a portion of said additional inner dielectric and an additional outer insulating jacket (66) surrounding at least a portion of said additional metallic shield, a portion of said additional outer jacket being removed to expose an additional exposed portion (64) of said additional metallic shield and said termination assembly further including an additional gripping arm (50b) projecting from said termination portion, said additional gripping arm being configured to be disposed about said additional exposed portion of said additional metallic shield of said additional cable and configured to grip a portion of said additional metallic shield of said additional cable without deformation of said additional inner dielectric of said additional cable, said additional gripping arm having an additional slot (48) used in bonding said additional exposed portion of said additional metallic shield to said termination portion.

8. The termination assembly of claim 7 wherein said gripping arm (50a) is spaced longitudinally on said termination portion (42) from said additional gripping arm (50b).

9. The termination assembly of claim 8 wherein said termination portion (42) includes a generally planar base (42) and wherein said slot (48) extends along a substantial portion of



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said gripping arm (50a) and wherein said additional slot (40) extends along a substantial portion of said additional gripping arm (50b).

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10. The termination assembly of claim 9 wherein said exposed portions (64) of said metallic shields (64) are bonded to said gripping arm (50a) by using said slot (48) to solder (S) said exposed portions to said gripping arm and wherein said additional exposed portion (64) of said additional metallic shield (64) is bonded to said additional gripping arm (50b) by using said additional slot (48) to solder (S) said additional exposed portion to said additional gripping arm.

11. The termination assembly of claim 8 wherein said termination portion (42) has opposed edges and opposite sides and wherein said additional gripping arm (50b) extends from an opposite side of said termination portion from the side from which said gripping arm (50a) extends and from an edge of said termination portion opposite to the edge of said termination portion from which said gripping arm extends.

12. An electrical connector (10) for termination to a pair of cables (40) each of which includes an inner conductor (60), an inner dielectric (62) surrounding at least a portion of said inner conductor, a metallic shield (64) surrounding at least a portion of said inner dielectric and an outer insulating jacket (66) surrounding at least a portion of said metallic shield, a portion of said outer jacket being removed to expose an exposed portion (64) of said metallic shield, said electrical connector comprising:

a dielectric housing (12) having a mating face, a termination face and a plurality of terminal receiving passages between said mating face and said termination face;

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a plurality of terminals (38) extending through at least some of said terminal receiving passages;

a ground member (32) disposed at least partially within said housing relative to said terminals, said ground member including a termination portion (42) for terminating said metallic shield of said cables to said ground member, said termination portion including a gripping arm (50a) projecting from said termination portion and configured to grip at least a portion of said exposed portions of said metallic shield of each of said cables without deformation of said inner dielectric, said gripping arm having a slot (48) used in bonding said exposed portions of said metallic shields to said termination portion.

13. The electrical connector (10) of claim 12 wherein said ground member (32) includes a generally planar base (42) and wherein said slot (48) in said gripping arm (50a) extends across a substantial portion of said gripping arm.

14. The electrical connector (10) of claim 12 wherein said ground member (32) includes a generally planar base (42) having opposed lateral edges and wherein said gripping arm (50a) extends from one of said lateral edges of said base toward the other opposite lateral edge of said base such that said gripping arm extends arcuately about said exposed portions (64) of said metallic shields (64) to thereby grip said exposed portions of said metallic shields.

15. The electrical connector (10) of claim 14 wherein said gripping arm (50a) is contoured (52) and cooperates with

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said base (42) to generally form a pair of receiving areas (54) for receiving said exposed portions (64) of said metallic shields (64), each of said receiving areas being dimensioned such that said gripping arm maintains said cable (40) relative to said base by gripping said exposed portion of said metallic shield disposed therein.

16. The electrical connector (10) of claim 15 wherein said gripping arm (50a) is undulated (52) to define generally semi-cylindrical receiving areas (54) for respectively embracing said exposed portions (64) of said metallic shields (64) of said cables (40).

17. The electrical connector (10) of claim 12 wherein said exposed portions (64) of said metallic shields (64) are bonded to said gripping arm (50a) by using said slot (48) to solder (S) said exposed portions to said gripping arm.

18. The electrical connector (10) of claim 12 including at least one additional cable (40) to be terminated to said termination portion, said additional cable including an additional inner conductor (60), an additional inner dielectric (62) surrounding at least a portion of said additional inner conductor, an additional metallic shield (64) surrounding at least a portion of said additional inner dielectric and an additional outer insulating jacket (66) surrounding at least a portion of said additional metallic shield, a portion of said additional outer jacket being removed to expose an additional exposed portion (64) of said additional metallic shield and said

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electrical connector further including an additional gripping arm (50b) projecting from said termination portion (42), said additional gripping arm being configured to be disposed about said additional exposed portion of said additional metallic shield of said additional cable and configured to grip at least a portion of said additional exposed portion of said additional metallic shield of said additional cable without deformation of said inner dielectric, said additional gripping arm having an additional slot (48) used in bonding said additional gripping arm to said additional exposed portion of said additional metallic shield.

19. The electrical connector (10) of claim 18 wherein said gripping arm (50a) is spaced longitudinally on said termination portion (42) from said additional gripping arm (50b).

20. The electrical connector (10) of claim 18 wherein said exposed portions (64) of said metallic shields (64) are bonded to said gripping arm (50a) by using said slot (48) to solder (S) said exposed portions to said gripping arm and wherein said additional exposed portion (64) of said additional metallic shield (64) is bonded to said additional gripping arm (50a) by using said additional slot (48) to solder (S) said additional exposed portion to said additional gripping arm.

21. The electrical connector (10) of claim 18 wherein said termination portion (42) has opposed edges and opposite sides and wherein said additional gripping arm (50b) extends from an opposite side of said termination portion from the side from

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which said gripping arm (50a) extends and from an edge of said termination portion opposite to the edge of said termination portion from which said gripping arm extends.

22. A method of terminating a pair of cables (40) each of which cables having a inner conductor (60), an inner dielectric (62) surrounding at least a portion of said inner conductor, a metallic shield (64) surrounding at least a portion of said inner dielectric and an outer insulating jacket (66) surrounding at least a portion of said metallic shield to an electrical connector (10) having a dielectric housing (12) with a mating face, a termination face and a plurality of terminal receiving passages between said mating face and said termination face through which at least some passages extend a plurality of terminals (38) and having a ground member (32) at least partially disposed in said housing, said ground member including a mating portion (42) generally adjacent said mating face and a ground termination portion (42) generally adjacent said termination face, said method comprising the steps of:

providing each of said cables with a portion of said outer insulating jacket of said cable being removed from about said metallic shield so as to expose an exposed portion (64) of said metallic shield;

positioning said exposed portion of each of said metallic shields relative to said termination portion so that said exposed portion of said metallic shield of each of said cables is positioned on said termination portion;

forming a gripping arm (50a) extending from a lateral edge of said ground member into a generally arc-shaped

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configuration such that said gripping arm defines a pair of cable receiving areas (54) wherein said exposed portions of said metallic shields are disposed and said gripping arm grips said exposed portions of said metallic shields of said cables disposed within said cable receiving areas without deformation of said inner dielectrics; and

bonding each of said gripping arms to said exposed portion of said metallic shield disposed within said cable receiving area.

23. The method of claim 22 wherein said exposed portion (64) of said metallic shield (64) of each of said cables (40) has a longitudinal axis and each of said cables is positioned within a respective one of said cable receiving areas (54) by positioning said exposed portion of said metallic shield at a location spaced from said respective cable receiving area and then moving said cable in a direction of its longitudinal axis and into said respective cable receiving area.

24. The method of claim 22 wherein a slot (48) is provided in said gripping arm (50a) and said exposed portion (64) of said metallic shield (64) of each of said cables (40) is bonded to said ground termination portion (42) by using said slot to solder (S) said exposed portion to said gripping arm.

25. The method of claim 22 further including terminating said inner conductor (60) of each of said cables (40) to one of said terminals (38) and forming said ground member (32) with said metallic shields (64) bonded thereto and said terminals

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with said inner conductors terminated thereto into a subassembly (30) for disposition in said housing (12).

26. The method of claim 22 wherein said ground member (32) includes a generally planar base (42) having opposed lateral edges and wherein said gripping arm (50a) extends from one of said lateral edges of said base toward the other opposite lateral edge of said base such that said gripping arm extends arcuately about said exposed portions (64) of said metallic shields (64) to thereby grip said exposed portions of said metallic shields.

27. The method of claim 26 wherein said gripping arm (50a) is contoured (52) and cooperates with said base (42) to generally form a pair of receiving areas (54) for receiving said exposed portions (64) of said metallic shields (64), each of said receiving areas being dimensioned such that said gripping arm maintains said cable relative to said base by gripping said exposed portion of said metallic shield disposed therein.

28. The method of claim 27 wherein said gripping arm (50a) is undulated (52) to define generally semi-cylindrical receiving areas (54) for respectively embracing said exposed portions (64) of said metallic shields (64) of said cables (40).

29. The method of claim 22 including at least one additional cable (40) to be terminated to said termination portion (42), said additional cable including an additional inner conductor (60), an additional inner dielectric (62) surrounding at least a portion of said additional inner conductor, an

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additional metallic shield (64) surrounding at least a portion of said additional inner dielectric and an additional outer insulating jacket (66) surrounding at least a portion of said additional metallic shield, a portion of said additional outer jacket being removed to expose an additional exposed portion (64) of said additional metallic shield and said method further including positioning said additional exposed portion of said additional metallic shield of said additional cable within one of a pair of receiving areas (54) formed by an additional gripping arm (50b) projecting from said termination portion, said additional gripping arm being configured to encircle a portion of said additional metallic shield of said additional cable; forming said additional gripping arm to grip said additional exposed portion of said additional metallic shield without deforming said additional inner dielectric and bonding said additional gripping arm to said additional exposed portion of said additional metallic shield.

30. The method of claim 29 wherein said gripping arm (50a) is spaced longitudinally on said termination portion (42) from said additional gripping arm (50b).

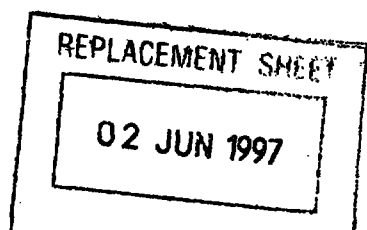
31. The method of claim 29 wherein said termination portion (42) includes a generally planar base (42), wherein said gripping arm (50a) includes a slot (48) extending along a substantial portion of said gripping arm, said slot being used to bond said exposed portions (64) of said metallic shields (64) to said gripping arm and wherein said additional gripping arm (50b) includes an additional slot (48) extending along a substantial



portion of said additional gripping arm, said additional slot being used to bond said additional exposed portion (64) of said additional metallic shield (64) to said additional gripping arm.

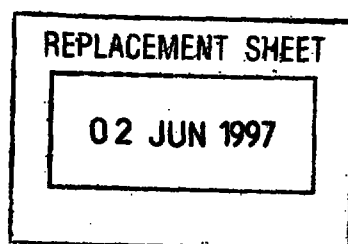
32. The method of claim 29 wherein said termination portion (42) has opposed lateral edges and opposite sides and wherein said additional gripping arm (50b) extends from one of said opposite sides of said termination portion and said gripping arm (50a) extends from said other of said opposite sides and said additional gripping arm extends from said edge of said termination portion opposite to the edge of said termination portion from which said gripping arm extends.

33. The method of claim 29 wherein said exposed portion (64) of said metallic shield (64) of each of said cables (40) has a longitudinal axis and each of said cables is positioned within a respective one of said cable receiving areas (54) by positioning said exposed portion of said metallic shield at a location spaced from said respective cable receiving area and then moving said cable in a direction of its longitudinal axis and into said respective cable receiving area and wherein said additional exposed portion (64) of said additional metallic shield (64) of said additional cable (40) has an additional longitudinal axis and said additional cable is positioned within a respective one of said additional cable receiving areas (54) by positioning said additional exposed portion of said additional metallic shield at a location spaced from said respective additional cable receiving area and then moving said additional





cable in a direction of its additional longitudinal axis and into said respective additional cable receiving area.

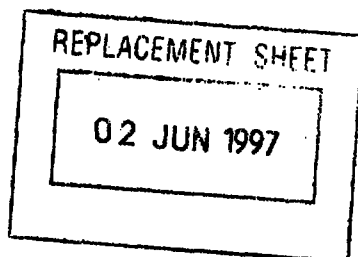


ABSTRACT:

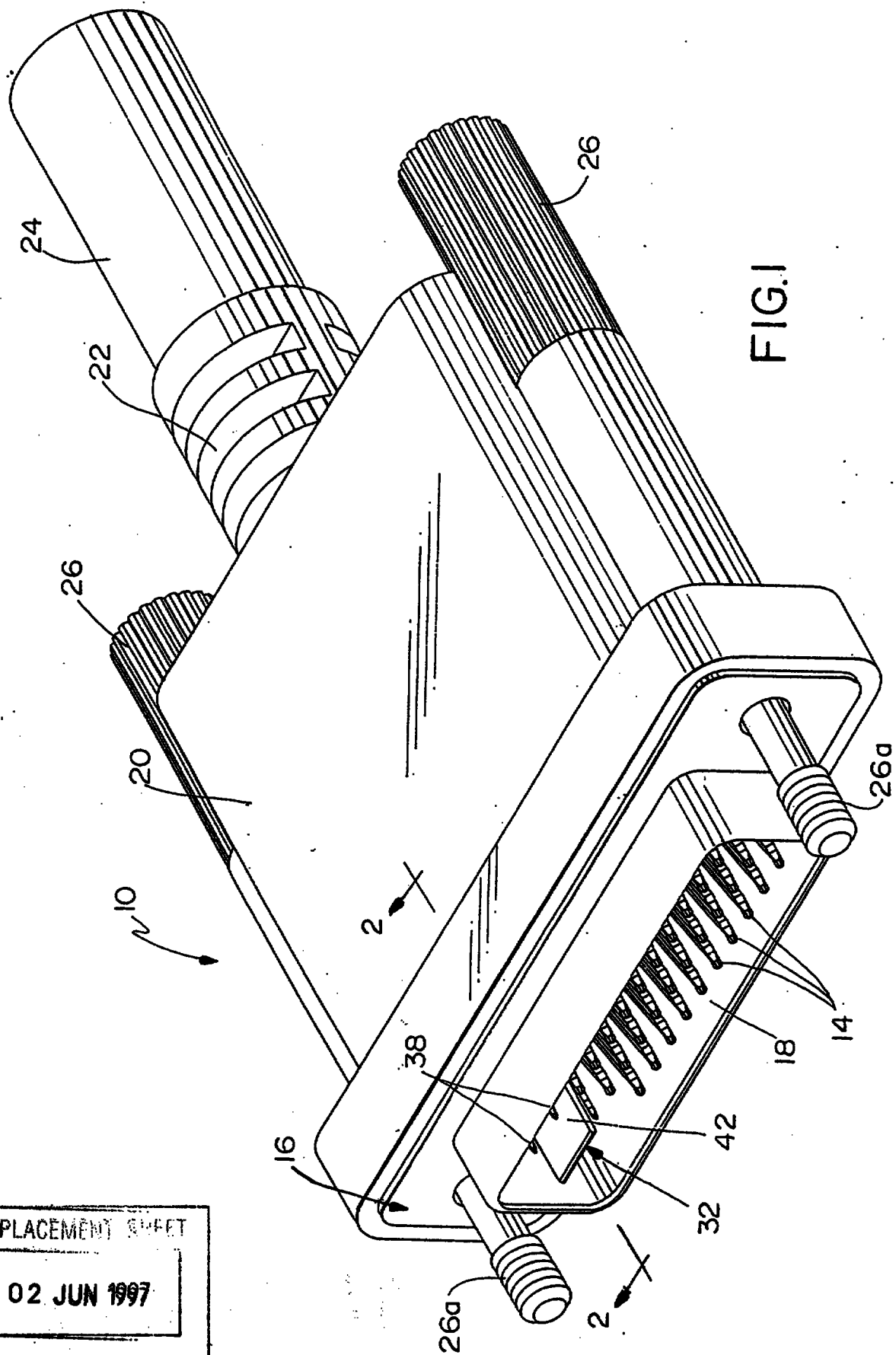
SYSTEM FOR TERMINATING THE SHIELD OF A HIGH SPEED CABLE

A terminal is disclosed for terminating the shields of a plurality of high speed cables each having an outer jacket and an inner metallic shield with a portion of the outer jacket removed to expose a portion of the metallic shield. The terminal includes a conductive ground plate portion. A gripping arm projects from the ground plate portion for embracing all of the plurality of high speed cables in direct engagement with the exposed portions of the metallic shields thereat. A solder connection is disposed between the gripping arm and the metallic shields.

FIG. 7



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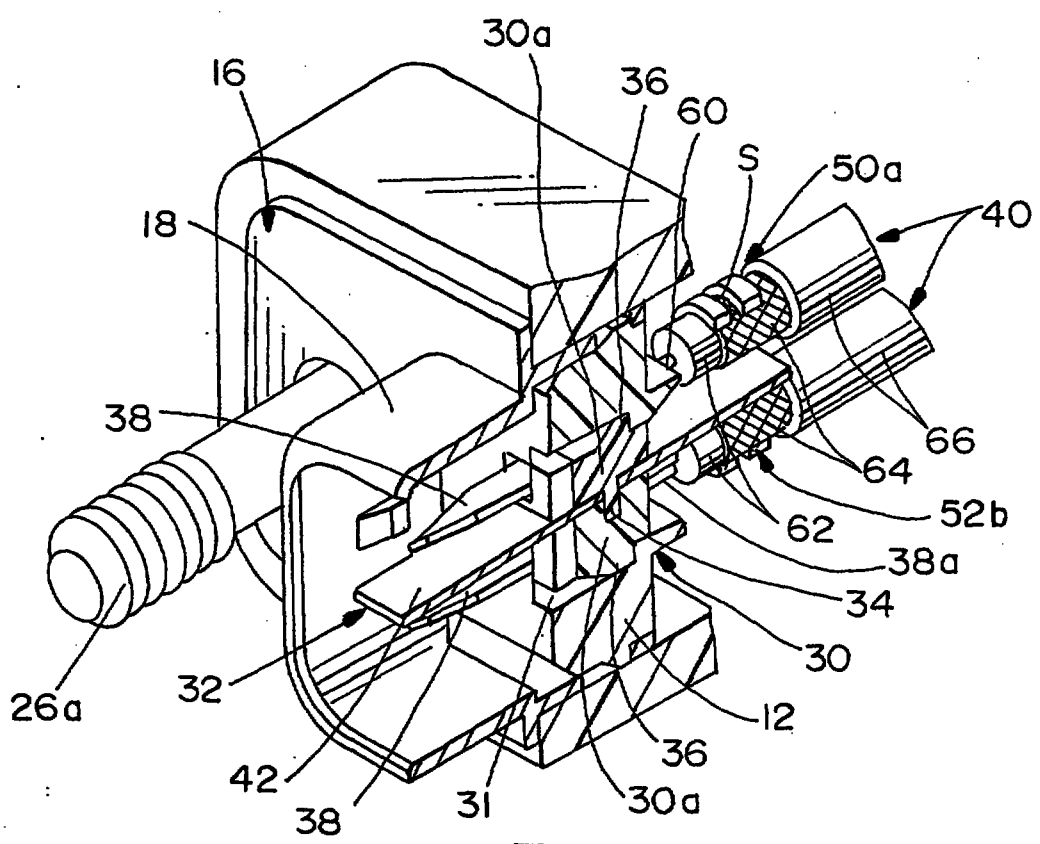


FIG. 2

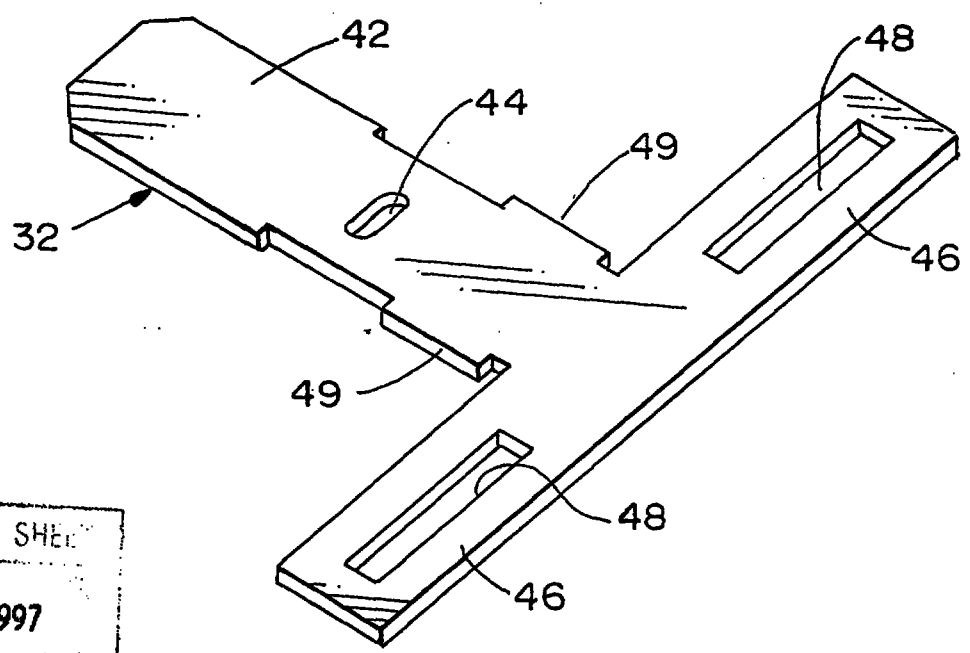
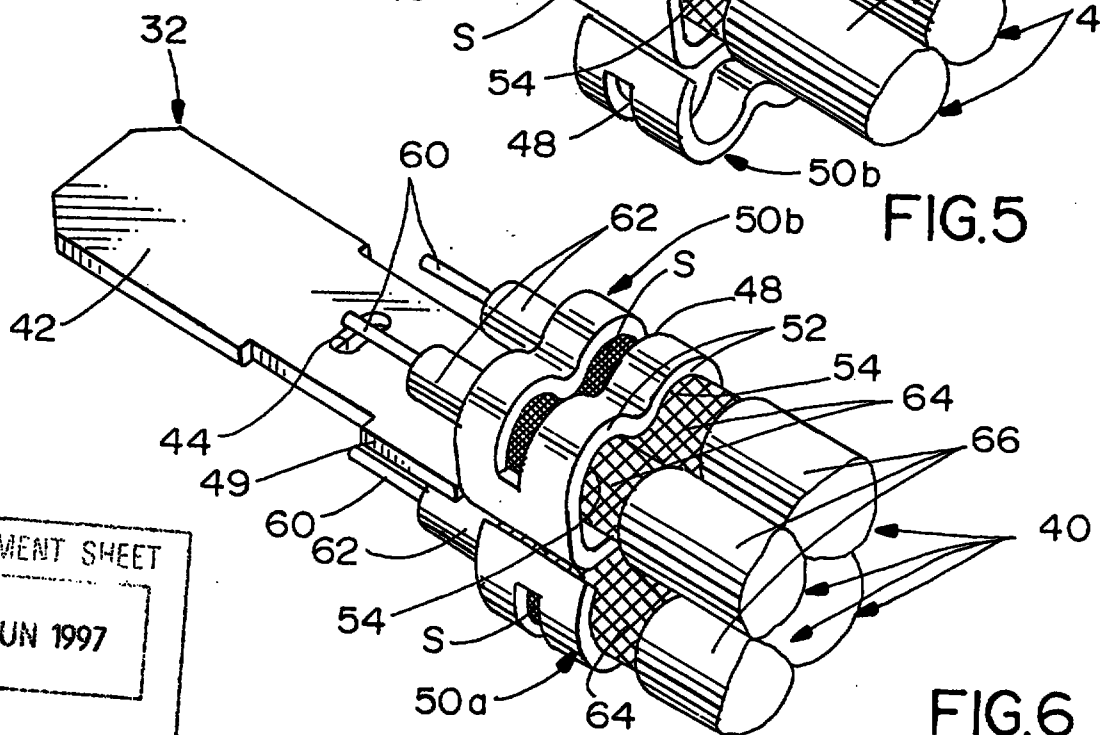
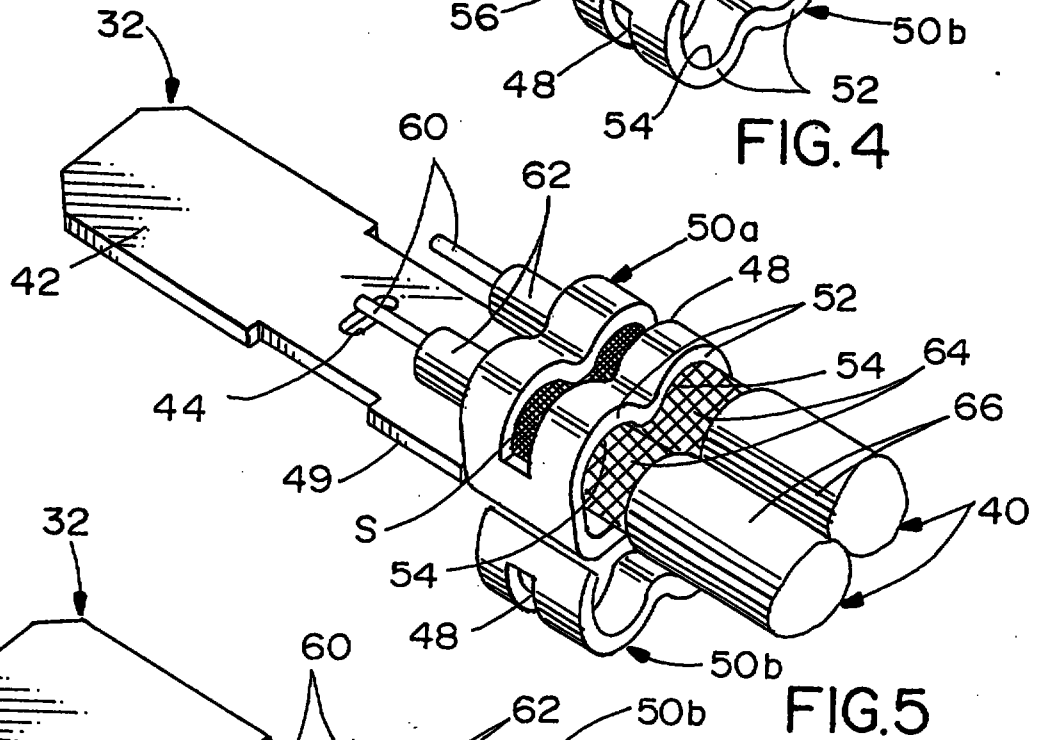
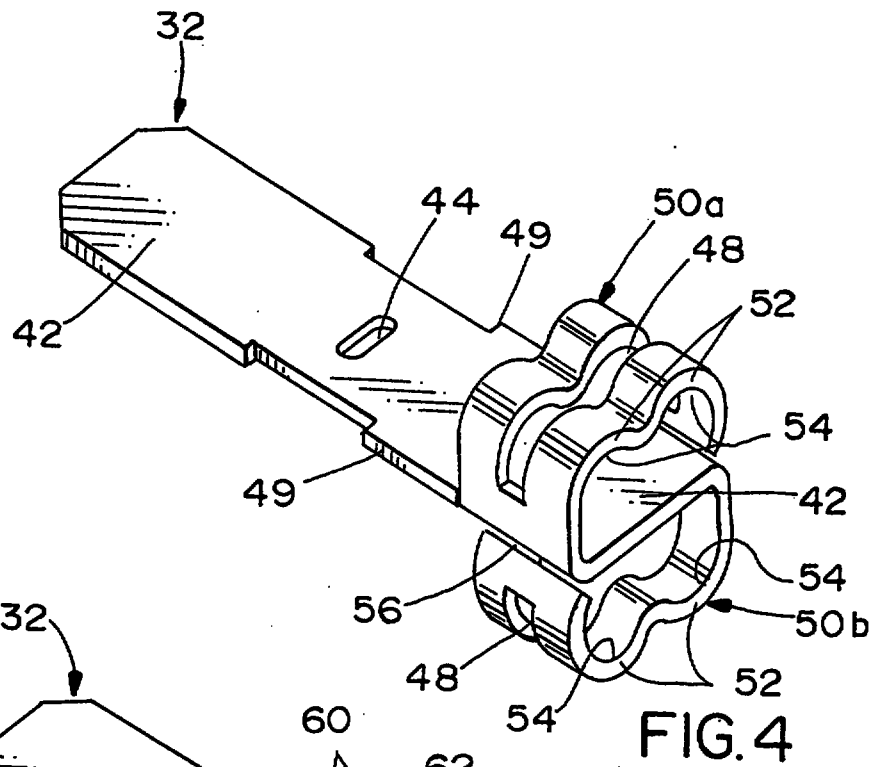


FIG. 3

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