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(54) **ELECTRICAL CONNECTOR HAVING AN IMPROVED CONNECTOR SHIELD AND A MULTI-PURPOSE STRAIN RELIEF**

STECKVERBINDER MIT VERBESSERTER ABSCHIRMUNG UND MEHRZWECKE ZUGENTLASTUNG

CONNECTEUR ELECTRIQUE POSSEDANT UN BLINDAGE AMELIORE ET UN SERRE-CABLE POLYVALENT

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Description

FIELD OF THE INVENTION

[0001] The present invention relates generally to improvements in electrical data connectors. More particularly, the present invention relates to a compact data connector with an improved connector ground shield and a multi-purpose strain relief.

BACKGROUND OF THE INVENTION

[0002] In the field of data/communications technology, information in the form of electrical signals is being transmitted at ever increasing speeds. Along with the desire to transmit information at faster data rates, the industry has also seen the need to reduce the size of hardware employed so as to increase portability and ease of use. In order to keep pace with these improvements, the interconnection technology, which includes electrical cables and electrical connectors designed to connect such hardware, has also undergone significant changes. Electrical connectors and cables are now available which are much smaller in size and capable of transmitting data at higher rates.

[0003] Continued improvement in connection technology is not without problems. When decreasing the size of electrical connectors while requiring the connectors to transmit data at higher rates, cross-talk between adjacent conductive components of the connector becomes a factor which must be addressed. Additionally, as these components are normally used in close proximity to other electronic components, the individual connector components must be shielded from electro-magnetic interferences and radio-frequency interferences. These interferences can adversely affect the performance levels of the connectors especially at higher data rates.

[0004] European Patent application No. 0,587,303A to The Whitaker Corporation discloses a shielded electrical connector having an insulative housing carrying at least two signal contacts and outer shielding means. The contacts include forward contact sections and rear wire connecting sections and the outer shielding means at least partially surrounds the insulating housing. Cross-talk shield means is disposed between the electrical contacts and is electrically connected to the shielding means.

[0005] Commonly owned U.S. Patent Nos. 5,538,440 and 5,564,940 to Rodrigues et al, the latter of which discloses a connector according to the preamble of claim 1, disclose compact electrical connectors which provide for the termination of discrete insulated conductors of a multi-conductor cable. The connectors include an insulative connector housing supporting a plurality of electrical contacts having insulation displacing contact portions. The connector also features an internal contact shield to shield individual contact pairs from adjacent contact pairs. The shield is a die cast metallic member having horizontal and vertical walls which intersect perpendicularly in "cross" configurations to provide horizontal and vertical shielding of the contacts. The contact shield disclosed in these patents also includes an extended ground element for electrical engagement with the multi-conductor cable to maintain electrical ground continuity between the cable and the contact shield. The cable-receiving end of the connector also includes a two component strain relief device which helps secure the cable in the connector. The strain relief device engages the folded back portion of the cable braid which electrically engages the extended ground element of the contact shield to establish electrical continuity between the cable braid and the contact shield.

[0006] One of the disadvantages of the above-disclosed connectors is that vertical and horizontal walls of the connector shield extend only as far as the insulation displacing contact portions of the electrical contacts. Thus, a portion of the individual conductors of the multi-conductor cable between the end of the cable braid and the insulation displacing contacts is left unshielded.

[0007] Furthermore, strain relief devices of conventional connectors typically only provide the function of securing the cable to the connector. Grounding of the cable is normally accomplished by the use of one or more separate components, such as a separate ground clip as an interface between the cable ground braid and the contact shield. This adds to the complexity and cost of the connector.

[0008] Therefore, it would be desirable to provide an electrical connector which provides overall and individual shielding of the electrical contacts as well as the termination ends of the conductors engaging therewith. It would also be desirable to eliminate the requirement for separate components within the connector to ensure electrical continuity between the cable ground braid and the connector contact shield.

SUMMARY OF THE INVENTION

[0009] It is an object of the present invention to provide an electrical connector for terminating discrete conductors of a multi-conductor cable.

[0010] It is a further object of the present invention to provide an electrical connector having a contact shield for shielding the electrical contacts of the connector as well as the discrete conductors of the multi-conductor cable engaging therewith.

[0011] It is still a further object of the present invention to provide a strain relief device for an electrical connector which in addition to securing the multi-conductor cable to the connector also provides for electrical grounding of the cable to the connector thereby eliminating the need for separate components.

[0012] In accordance with the present invention, there is provided an electrical connector for terminating discrete conductors of a multi-conductor cable comprising:

at least one insulative contact support member; a plurality of electrical contacts supported by the contact support member, each of the contacts having a connecting end and insulation displacement termination end portions for electrical connection with the conductors of one of said cables; at least one dressing block including receiving openings therein for said conductors, the dressing block guiding and moving the conductors into engagement with the insulation displacement termination end portions of said contacts; and an electrically conductive shield member for supporting therein said at least one contact support member, said shield member comprising an outer housing formed of at least two side walls, an upper wall and a lower wall which surround a portion of said contacts and a cross member formed between and integral with said at least two side walls, said cross member having a horizontal extent for supporting at least a portion of said contact support member thereon and a vertical extent, said horizontal extent and said vertical extent providing for shielding both horizontally and vertically between at least a portion of two contacts separated by said cross member, characterised in that said cross member extends a distance rearwardly past the at least one dressing block and, wherein said side walls, said upper and lower walls and said cross member entirely surround a length of at least two of the discrete conductors of the multi-conductor cable separated by said cross member to provide improved shielding between the pairs of conductors terminated to the connector.

[0013] In accordance with one embodiment of the present invention, the improved electrical connector generally includes an electrically insulative contact support member having a rearward cable termination end, a plurality of electrical contacts supported thereon and an electrically conductive contact shield housing substantially surrounding the support member. Preferably, the connector also includes an electrically insulative housing which may be in the form of two halves which snap-fit together to substantially enclose the contacts and the shield. The contacts include conventional conductor termination end portions which are electrically connected to individual conductors of the multi-conductor cable. Dressing blocks may also be provided which snap-fit to the contact support member over the contact end portions to secure the conductors in place. The contacts are positioned upon the contact support member so that the termination end portions are spaced forward of the termination end of the support member to allow for a length of the separated individual conductors of the multi-conductor cable to be supported on a conductor support portion of the contact support member. The contact shield housing includes an outer wall which substantially surrounds the contacts and one or more inner walls are positioned so as to physically separate one or more contacts from the others. The contact support member includes one or more longitudinal slots between the contacts for receiving the one or more inner walls of the contact shield housing. Unlike prior art connectors, the outer and inner walls of the contact shield housing extend rearward beyond the contact conductor termination end portions and terminate adjacent the termination end of the contact support member. Thus, the extended contact shield not only electrically isolates the contacts but also shields a length of individual conductors supported on the conductor support portion of the contact support member positioned within the shield housing. The result is a dramatic improvement in "cross-talk" performance of the connector.

[0014] The present invention may also include a novel strain relief device positioned adjacent the termination end of the shield housing for securing the multi-conductor cable to the connector. The strain relief device is made from an electrically conductive material, preferably formed from a metallic material. The strain relief device is comprised of mirrored strain relief member which, when engaged, define a substantially circular bounded opening adjacent the termination end of the housing. The circular bounded opening is reduced in size as the strain relief members are moved toward each other to frictionally secure and electrically engage a ground braid of the multi-conductor cable. The strain relief members are preferably received in opposing slots which extend through an outer wall of the contact shield housing adjacent the termination end thereof and are in electrical communication with the shield housing. The strain relief members may also include one or more raised protrusions to enhance electrical contact between the strain relief member and the shield housing. Thus, unlike prior art strain relief devices, the electrically conductive strain relief members of the present invention provide ground continuity between the cable ground braid and the connector shield housing. The strength of the metallic members also allows for the use of a thinner strain relief device thereby reducing the overall size of the connector.

[0015] A preferred embodiment of an electrical data connector with an improved connector shield and a multi-purpose strain relief, as well as other objects, optional features and advantages of this invention, will be apparent from the following detailed description which is to be read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

Figure 1 is an exploded rear perspective view of the electrical connector formed in accordance with the present invention.

Figure 2 is an exploded front perspective view of the electrical connector of Figure 1.

Figure 3 is a perspective view of a cross-section of the electrical connector of Figures 1 and 2 as-

sembled.

Figure 4 is a perspective view of the contact support member with contacts.

Figure 5 is a perspective view of the contact support member with the contacts electrically connected to a multi-conductor cable.

Figures 6a and 6b are cross-sectional views of the termination sub-assembly of Figure 3 taken along line 6-6 with the rear end of contact support member and the strain relief device removed and showing alternate embodiments of the contact shield.

Figure 7 is a perspective view of the preferred embodiment of a strain relief member.

Figure 8 is a perspective view of an alternate embodiment of a strain relief member.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0017] Referring to Figures 1-3, a shielded electrical data connector 10 is shown in an exploded view. Connector 10 may be employed to terminate electrical cable 12 having an insulative outer jacket 14, an inner ground conductor or cable braid 16 and a plurality of individually insulated electrical conductors 18 extending therethrough. In order to prepare cable 12 for termination in connector 10, jacket 14 is cut-away exposing a portion of cable braid 16 and a length of conductors 18 suitable for termination. While it may be appreciated that the invention may be employed with cables having any number of conductors, in the present illustrated embodiment, cable 12 is an eight conductor cable comprising four pairs of individual conductors.

[0018] Connector 10 includes outer connector housing halves 20a and 20b which when assembled may take the form of a plug as shown in Figures 1-3 or a jack (not shown). The assembled housing for the jack is designed to receive and to connect with the housing of the plug. Connector housing halves 20a and 20b include a plurality of locking arms 22 which cooperatively engage recesses 24 to provide for a snap-fit engagement of the halves. Housing halves 20a and 20b may be formed of any suitably electrically insulative plastic material such as polyester. Connector housing halves 20a and 20b each have a cable termination end 26 which when assembled define a rearwardly opening circular passage which permits entry of cable 12 into connector 10.

[0019] Connector housing halves 20a and 20b support therein a termination subassembly 30 which is identical for both the jack and the plug configurations of the connector. Termination subassembly 30 includes a contact support member 32, a plurality of electrical contacts 34, a plurality of dressing blocks 35, a contact shield 58 and a strain relief device 72.

[0020] Referring now to Figures 4 and 5, contact support member 32 supports the plurality of electrical contacts 34 thereon. Each of contacts 34 are elongate electrically conductive metallic members formed of beryllium-copper having a connection end 36 and a termination end 38. Connection end 36 includes a cantilevered element 40 for making mating resilient electrical engagement with similar contacts in the mating jack or plug connector. Termination end 38 includes blade type insulation displacing contact (IDC) portions which are constructed for insulation displacing termination with conductors 18 of cable 12. In the present illustrative embodiment, contacts 34 are positioned in upper and lower longitudinally aligned transversely spaced rows. Termination ends 38 of the lower row extend in the opposite direction than the termination ends of the upper row.

[0021] Contact support member 32 is formed of a suitable insulative plastic, such as polyester, and includes a forward interconnection end 42 and a rear termination end 44. Contact support member 32 includes contact grooves 45 in upper and lower platforms 46 and 47 which support contacts 34 in individual electrical isolation. Contact support member 32 includes a conductor support portion 48 which extends rearwardly beyond the IDC termination ends 38 of contacts 34 to the to rear termination end 44 to support the conductors of the cable thereon. Conductor support portion 45 includes raised longitudinal projections 49 which define therebetween conductor receiving spaces 50 and dressing block receiving spaces 51.

[0022] Support member 32 also includes a vertical slot 52 disposed between lateral pairs of contacts 34 and a horizontal slot 53 disposed between the upper and lower rows of contacts. Slots 52 and 53 extend longitudinally from the forward interconnection end 42 of support member 32 through the conductor support portion 48 and terminate at a point 54 just intermediate rear end 44 of support member 32. As illustrated, contact support member 32 is designed to accommodate four pairs of contacts, however, it may be appreciated that the contact support member may be designed to accommodate additional pairs of contacts by increasing the width of the support member and providing additional vertical slots between each lateral pair of contacts.

[0023] Referring specifically to Figure 5, the conductors 18 of cable 12 are electrically connected to the contacts 34 on support member 32 prior to assembly of the connector 10. Extending pairs of conductors 18 of cable 12 are separated and positioned for insulation displacing connection with termination ends 38 of contacts 34. Ends of the conductors 18 are placed within receiving openings in the dressing blocks 35 and are electrically connected to contacts 34 in a conventional insulation displacing method. The insulative dressing blocks 35 secure the conductors in place and are provided with one or more raised bosses 55 extending below a bottom portion thereof to be snap-fit into the dressing block re-

ceiving spaces 51 of the conductor support portion 48 of support member 32.

[0024] As contacts 34 are maintained in close proximity in contact support member 32, it becomes necessary to shield individual contact pairs from adjacent contact pairs to minimize the effects of cross-talk. Returning to Figures 1-3, an internal contact shield 58 is provided which encloses the pre-assembled contact support member 32. Shield housing 58 is a die cast conductive, e.g., metallic, member which is slidably insertable into and around contact support member 32 from the forward interconnection end 42 thereof. Contact shield housing 58 serves to shield the contacts 34 as a group and also to shield pairs of contacts 34 from one another both laterally and vertically. Contact shield 58 is an elongate housing roughly the same length as contact support member 32 and has an interconnection end 60 and a termination end 62. Contact shield 58 includes upper and lower U-shaped shield platforms 63a and 63b, each having a central wall 64 at the interconnection end 60 thereof. The upper and lower shield platforms 63a and 63b provide effective vertical and horizontal shielding as between the connection ends 36 of contacts 34. When connecting with a mating connector, the interconnection ends are rotated 180 degrees with respect to each other. Thus, the U-shaped platforms of mating connectors will totally enclose, and thereby shield, the connection ends 36 of the contacts 34.

[0025] Contact shield 58 includes an enclosed chamber 65 defined by an outer wall 66 at the termination end 62 of the shield. The outer wall 66 provides overall shielding to the termination ends 38 of contacts 34. Referring additionally to Figures 6a and 6b, contact shield 58 further includes a vertical and a horizontal internal wall 68 and 70 extending along the length of the chamber 65 and terminating intermediate termination end 62 of shield 58. Vertical internal wall 68 separates and shields lateral pairs of contacts 34 and horizontal wall 70 separates and shields the upper and lower rows of contacts 34. Unlike prior art connectors, the outer and inner walls of the contact shield 58 extend further rearward past the termination ends 38 of contacts 34 to the conductor supporting portion 48 of the contact support member 32 thereby also providing effective overall and individual shielding of the exposed pairs of conductors 18 positioned within the connector housing. Again, it may be appreciated that contact shield 58 may be designed to shield additional pairs of contacts 34 and conductors 18 by increasing its width and providing additional horizontal and/or vertical walls.

[0026] Termination sub-assembly 30 is provided with a strain relief device 72 for securing the cable 12 to the connector 10. Strain relief device 72 is comprised of a pair of matching strain relief components which are formed from an electrically conductive metallic material. The preferred embodiment of the strain relief component 74 is shown in Figures 1-3 and 7. Alternate embodiments of the strain relief components are discussed further in detail below. Generally, a pair of strain relief components are inserted in oppositely disposed receiving slots 75 located at the termination end 62 of the contact shield housing 58. Preferably, the receiving slots 75 are sized so that the strain relief components are in close electrical contact with the slots when inserted therein. The strain relief components when inserted in receiving slots 75 define a circular opening which is generally concentric with the chamber 65 of contact shield 58. When the strain relief components are inserted in receiving slots 75 and brought together, the circular opening defined therebetween will be reduced in size in order to frictionally secure and electrically engage the outer cable braid 16 of the cable 12 therebetween and secure the cable thereat.

[0027] Strain relief device 72 also provides continuity of ground between the cable 12 and the contact shield housing 58. Prior to installation of the cable 12, a portion of the cable jacket 14 is removed to reveal the cable ground braid 16. It is this portion of the cable 12 that the strain relief components frictionally engage. Thus, the strain relief components are in electrical contact with the cable braid 16. Since the strain relief components are made of an electrically conductive metallic material, and since they are in electrical communication with the receiving slots 75 of the electrically conductive contact shield housing 58, the ground of the cable 12 may be carried from the cable braid 16 through the strain relief component to the contact shield housing 58. To enhance electrical contact between the strain relief components and the receiving slot 75, the strain relief component may be provided with one or more raised contact protrusions. When the strain relief components are inserted into receiving slots 75 of the contact shield 58, the raised contact protrusion "skives" or cuts into a wall of the slot 75 and is mechanically forced thereagainst thereby providing secure electrical contact between the strain relief component and the contact shield 58. Alternatively, the raised contact protrusion provides for an interference fit making good electrical continuity between the shield housing 58 and the strain relief component.

[0028] Figure 7 illustrates the preferred embodiment of the strain relief component 74. Strain relief component 74 generally includes a top wall 76 and a pair of J-shaped side arms 78 extending downwardly from the top wall. The "hooks" 80 of the J-shaped arms 78 are directed inwardly and engage cooperating outwardly directed ratchet teeth 82 formed on the outer wall 66 of the shield housing 58 at the termination end 62 thereof, as shown in Figures 1, 2 and 6a. Side arms 78 are deflectable which, along with the positioning of ratchet teeth 82, allow for one-way downward movement of the strain relief components 74 within receiving slots 75 of shield 58. The internal surface of top wall 76 of strain relief component 74 is generally curved and is provided with a rib 84 to assist in frictional securement of the cable braid 16. Strain relief component 74 also includes an arrangement of upper and lower raised contact protru-

sions 86 and 88 which provide two-position enhanced electrical contact between strain relief component 74 and contact shield 58. Upper protrusions 86 are oppositely disposed on the major surfaces of strain relief component 74 and are laterally offset from similarly disposed lower protrusions 88.

[0029] Strain relief components 74 operate in the following manner. Strain relief components 74 are inserted into the opposing slots 75 of the contact shield 58 with the side arms 88 positioned along the sides of contact shield 58. Strain relief components 74 are then manually pushed toward each other to provide for ratchet engagement of the J-hooks 80 and respective teeth 82 of contact shield 58. When the strain relief components 74 are inserted within receiving slots 75 and make electrical contact with the cable braid 16 in a pre-load stage, the lower protrusions 88 are in forced electrical contact with the receiving slot 75. As the strain relief components 94 are pressed downwardly to frictionally secure the cable braid 16 under load, the upper protrusions 106 are mechanically forced against the receiving slot 75. Thus, electrical ground continuity is maintained in both a preload and a loaded position. Strain relief components 74 are pushed toward each other until the outer cable braid 16 of cable 12 is secured within the circular opening which is continually decreasing in size by the movement of the components 74 with respect to each other. As the strain relief components 74 press together, the side arms 78 move downwardly along the ratchet teeth 82 thereby preventing the strain relief components 74 from backing away from each other. Thus, strain relief components 74 independently engage and lock to the shield housing ratchet teeth 82. Because the locking zone is totally separate from the strain relieving zone and grounding zone, the strain relief of the present invention provides more stability since the locking zone is not subjected to strains that could be caused during cable pull out.

[0030] Figure 8 illustrates an alternate embodiment of a strain relief component 90. Strain relief component 90 is generally U-shaped having a top wall 92 and downwardly extending side walls or legs 94 and 96. Legs 94 and 96 are deflectable and include ratchet teeth 98. Ratchet teeth on leg 94 are directed outwardly while ratchet teeth on leg 96 are directed inwardly. The strain relief components 90 are oriented within the receiving slots 75 of the contact shield 58b so that legs 94 of each component engage legs 96 of the other. The positioning of ratchet teeth 98 permit the moveable one-way ratchet engagement of the components 90 with respect to the other. The deflectability of legs 94 and 96 permits such ratchet movement of components 90. The internal surface of legs 94 as well as the internal surface of top wall 92 are generally curved so as to form a circular opening which is generally concentric with the chamber 65 of contact shield 58b. In order to assist in frictional securement of the cable braid 16, a rib 100 is provided on the internal surface of the top wall 92. These ribs provide increased localized friction against the cable braid 16.

[0031] Strain relief component 90 also includes one or more raised contact protrusions 102, for providing enhanced electrical contact between the shield 58 and the strain relief component 90 as described above, and a locking arm 104 which extends downwardly from top wall 92. As shown in Figure 6b, locking arm 104 fits into a cooperating locking hole 106 of an alternate embodiment of the contact shield 58b when strain relief component 90 is inserted in receiving slot 75. Locking holes 106 also initially serve to properly orientate strain relief components 90 within the opposing receiving slots 75 of the shield 58b. Locking arm 104 includes a tapered end 108 and one or more locking protrusions 110. Locking protrusions 110 engage cooperating ribs 112 formed in locking hole 106 as shown in Figure 6b.

[0032] Strain relief components 90 operate in the following manner. Strain relief components 90 are inserted into the opposing slots 75 of the contact shield 58b with the locking arms 104 being inserted into the adjacent locking hole 106. Strain relief components 90 are then manually pushed toward each other to provide for ratchet engagement of the respective teeth of legs 94 and 96. Strain relief components 90 are pushed toward each other until the outer cable braid 16 of cable 12 is secured within the circular opening which is continually decreasing in size by the movement of the components 90 with respect to each other. As the strain relief components 90 press together, the locking arm 104 moves downwardly in locking hole 106 until the locking protrusions 110 engage and pass the locking ribs 112 of the hole 106. The tapered end 108 of locking arm 104 allows for inward movement of the locking arm, but the arrangement of locking protrusions 110 and cooperating ribs 112 prevent outward movement. Thus, in addition to the ratchet teeth 98 of the strain relief component 90, the locking arm with locking protrusions 110 prevent strain relief components 90 from backing away from each other.

[0033] Once the strain relief device 72 is engaged, housing halves 20a and 20b may be snap-fitted together to complete the assembly. Housing halves 20a and 20b shown in Figures 1-3 are formed in a plug configuration, but may alternatively be formed in a jack configuration. The plug and jack are mating connectors which may be mechanically and electrically connected by rotating the interconnection end of the plug 180 degrees and inserting it into the interconnection end of the jack. A deflectable latch 114 may be provided on either the plug or jack to provide for secure repeated connections and disconnections between the connectors.

[0034] The present invention thus provides an electrical connector having an improved connector shield and dual use strain relief component. Unlike prior connectors, the present invention features a contact shield which extends further back into the cable dressing area. By extending the shield further back, the cross-talk performance of the connector is dramatically improved. Al-

so, the optional metallic strain relief components provide an improved ground path from the cable braid to the contact shield while eliminating the need for extra grounding components, such as spring clips, within the connector. Furthermore, the high strength of the metallic strain relief component allows for the use of a thinner strain relief device than conventional connectors.

[0035] Although the illustrative embodiments of the present invention have been described herein with reference to the accompanying drawings, it is to be understood that the invention is not limited to those precise embodiments, and that various other changes and modifications may be effected therein by one skilled in the art without departing from the scope of the claims.

Claims

1. An electrical connector (10) for terminating discrete conductors (18) of a multi-conductor cable (12) comprising:

at least one insulative contact support member (32);
a plurality of electrical contacts (34) supported by the contact support member (32), each of the contacts (34) having a connecting end (36) and insulation displacement termination end (38) portions for electrical connection with the conductors (18) of one of said cables (12);
at least one dressing block (35) including receiving openings therein for said conductors (18), the dressing block (35) guiding and moving the conductors (18) into engagement with the insulation displacement termination end portions (38) of said contacts (34); and
an electrically conductive shield member (58) for supporting therein said at least one contact support member (32), said shield member (58) comprising an outer housing formed of at least two side walls, an upper wall and a lower wall which surround a portion of said contacts (34) and a cross member formed between and integral with said at least two side walls, said cross member having a horizontal extent (70) for supporting at least a portion of said contact support member thereon and a vertical extent (68), said horizontal extent (70) and said vertical extent (68) providing for shielding both horizontally and vertically between at least a portion of two contacts (34) separated by said cross member,

characterised in that said cross member extends a distance rearwardly past the at least one dressing block (35) and, wherein said side walls, said upper and lower walls and said cross member entirely surround a length of at least two of the discrete conductors (18) of the multi-conductor cable (12) separated by said cross member to provide improved shielding between the pairs of conductors terminated to the connector.

2. The electrical connector (10) as defined in claim 1, wherein said side walls and said upper and lower walls extend a distance rearwardly past the at least one dressing block (35).

3. The electrical connector (10) as defined in Claim 1 or 2, wherein the shield member (58) is formed of a die-cast metal.

4. The electrical connector (10) as defined in any preceding claim, comprising a single contact support member (32), wherein said contact support member (32) includes a horizontal (53) and a longitudinal (52) slot for receiving said cross member portion of said shield member (58).

5. The electrical connector (10) as defined in any of claims 2 to 4, wherein said contact end portions (38) comprise insulation displacement contacts (34) and said dressing blocks (35) are snap-fit over the insulation displacement contacts (34) to secure said conductors (34) thereto.

6. The electrical connector (10) as defined in any preceding claim, further including an insulative connector housing having two connector halves (20a, 20b) which are snap-fit together to substantially enclose said shield member (58).

7. The electrical connector (10) as defined in any preceding claim, further comprising a cable strain relief device (72) for securing the cable (12) thereat and the strain relief device (72) being in direct contact with said shield member (58) for providing ground continuity between the cable (12) and the shield member (58).

8. The electrical connector (10) as defined in claim 7, wherein said cable strain relief device (72) comprises first and second strain relief members (90), each strain relief member (90) having a pair of legs (94, 96) positioned along opposed edges thereof, each of said legs (94, 96) including an engagement member (110) thereon, said first and second strain relief members (90) defining a bounded opening therebetween and being moveable with respect to each other to reduce the size of said bounded opening for securingly engaging the cable (12) thereat and wherein said shield member (58) includes engagement elements (112) arranged along at least two opposed side walls thereof for mating co-operation with the engagement members of said strain relief members (90) to thereby lockingly engage said first and second strain relief members (90) to said cable

(12).

9. The electrical connector as defined in claim 8, wherein said engagement member on said first and second strain relief members and said engagement elements on said shield member include interengageable teeth (98) for permitting ratchet-type movement therebetween.

10. The electrical connector as defined in claim 8 or 9, wherein said shield member (58) includes an upper and a lower wall each having a slot (75) disposed therethrough for receiving each of said strain relief members (90).

11. The electrical connector as defined in claim 10, wherein said first and second strain relief members (90) are made from an electrically conductive material and wherein at least one of said first and second strain relief members (90) includes at least one raised protrusion (102) which is mechanically forced against an inner wall of said slot (75) of said shield member (58) when said strain relief member (90) is inserted in said slot (75) thereby ensuring electrical contact between said strain relief member (90) and said shield member (58).

12. The electrical connector as defined in any of claims 7 to 11, wherein said cable strain relief device (72) comprises first and second interengageable strain relief members (90) each having a pair of spaced legs (94, 96), one leg (94) having outwardly directed engagement elements (98) and the opposing leg (96) having inwardly directed engagement elements (98), the outwardly directed engagement elements (98) on a leg (94) of one strain relief member (90) engaging the inwardly directed engagement elements (98) on a leg (96) of the other strain relief member (90), said first and second strain relief members (90) defining a bounded opening therebetween and being movable with respect to each other to reduce the size of said opening and for frictionally securing said cable (12) thereat.

13. The electrical connector as defined in any preceding claim, wherein the contact support member (32) includes an elongated supporting surface extending rearwardly past the insulation displacement termination end (38) portions and further wherein the cross member extends to a position adjacent the end of the elongated supporting surface of the contact support member (32).

14. The electrical connector (10) as defined in any preceding claim, wherein the electrical contacts (34) are blade-type contacts.

15. The electrical connector (10) as defined in claim 14, wherein the connection end (36) of the blade-type contact (34) includes a resilient spring portion (40).

Patentansprüche

1. Ein elektrischer Verbinder (10) zum Abschließen diskreter Leiter (18) eines Vielleiterkabels (12) mit:

mindestens einem isolierenden Kontakthalteglied (32),
einer Vielzahl von von dem Kontakthalteglied (32) gehaltenen elektrischen Kontakten (34), von denen jeder ein Verbindungsende (36) und die Isolation verdrängende Anschlußendabschnitte (38) zum elektrischen Anschluß an die Leiter (18) eines der Kabel (12) aufweist,
mindestens einem Aufbereitungsblock (35) mit Aufnahmeöffnungen in diesem für die Leiter (18), wobei der Aufbereitungsblock (35) die Leiter (18) mit den die Isolation verdrängenden Anschlußendabschnitten (38) der Kontakte (34) in Anlage führt und bewegt, und
einem elektrisch leitenden Abschirmglied (58) zum In-ihm-Halten des mindestens einen Kontakthaltegliedes (32), wobei das Abschirmglied (58) ein Außengehäuse, gebildet aus mindestens zwei Seitenwänden, einer Ober- und einer Unterwand, aufweist, die einen Abschnitt der Kontakte (34) und ein zwischen und integral mit den mindestens zwei Seitenwänden ausgebildetes Querglied umschließen, wobei das Querglied eine horizontale Erstreckung (70) zum Halten mindestens eines Abschnitts des Kontakthaltegliedes auf ihm und eine vertikalen Erstreckung (68) aufweist, wobei die horizontale Erstreckung (70) und die vertikale Erstrekkung (68) eine Abschirmung sowohl horizontal als auch vertikal zwischen mindestens einem Abschnitt der durch das Querglied getrennten beiden Kontakte (34) ausbilden,

dadurch gekennzeichnet, daß das Querglied eine Strecke rückwärts an dem mindestens einem Aufbereitungsblock (35) vorbei verläuft, und wobei die Seiten-, die Ober- und die Unterwände und das Querglied eine Länge von mindestens zwei der diskreten Leiter (18) des Vielleiterkabels (12), getrennt durch das Querglied, zum Ausbilden einer verbesserten Abschirmung zwischen den durch den Verbinder abgeschlossenen Leiterpaaren vollständig umschließen.

2. Der elektrischer Verbinder (10) nach der Definition in Anspruch 1, wobei die Seiten-, die Ober- und die Unterwände eine Strecke rückwärts an dem mindestens einen Aufbereitungsblock (35) vorbei verlaufen.

3. Der elektrische Verbinder (10) nach der Definition in Anspruch 1 oder 2, wobei das Abschirmglied (58) aus einem Spritzgußmetall hergestellt ist.

4. Der elektrische Verbinder (10) nach der Definition in irgendeinem vorhergehenden Anspruch mit einem einzigen Kontakthalteglied (32), wobei dieses Kontakthalteglied (32) einen horizontalen Schlitz (53) und einen Längsschlitz (52) zur Aufnahme des Quergliedabschnitts des Abschirmgliedes (58) aufweist.

5. Der elektrische Verbinder (10) nach der Definition in irgendeinem der Ansprüche 2 bis 4, wobei die Kontaktendabschnitte (38) die Isolation verdrängende Kontakte (34) aufweisen und die Aufbereitungsblöcke (35) im Schnappsitz über den die Isolation verdrängenden Kontakten (34) zum Befestigen der Leiter (34) an diesen sitzen.

6. Der elektrische Verbinder (10) nach der Definition in irgendeinem vorhergehenden Anspruch, weiter mit einem isolierenden Verbindergehäuse mit zwei Verbinderhälften (20a, 20b), die im Schnappsitz zum wesentlichen Einschließen des Abschirmglieds (58) zusammengehalten sind.

7. Der elektrische Verbinder (10) nach der Definition in irgendeinem vorhergehenden Anspruch, weiter mit einer Kabelzugentlastungsvorrichtung (72) zum Befestigen des Kabels (12) an diesem, und wobei die Zugentlastungsvorrichtung (72) mit dem Abschirmglied (58) in unmittelbarem Kontakt steht zum Ermöglichen einer Massekontinuität zwischen dem Kabel (12) und dem Abschirmglied (58).

8. Der elektrische Verbinder (10) nach der Definition in Anspruch 7, wobei die Kabelzugentlastungsvorrichtung (72) ein erstes und ein zweites Zugentlastungsglied (90) aufweist, jedes Zugentlastungsglied (90) zwei entlang entgegengesetzt gerichteten Kanten positionierte Schenkel (94, 96) aufweist, jeder der Schenkel (94, 96) auf sich ein Anlageglied (110) enthält, das erste und das zweite Zugentlastungsglied (90) zwischen sich eine umgrenzte Öffnung definieren und gegeneinander verschiebbar sind zum Herabsetzen der Größe der umschlossenen Öffnung zum haltenden Erfassen des Kabels (12) an dieser Stelle und wobei das Abschirmglied (58) entlang den mindestens beiden entgegengesetzt gerichteten Seitenwänden angeordnete Anlageelemente (112) enthält zum passenden Zusammenwirken mit den Anlagegliedern der Zugentlastungsglieder (90) zum verriegelnden Halten des ersten und des zweiten Zugentlastungsgliedes (90) an dem Kabel (12).

9. Der elektrische Verbinder nach der Definition in Anspruch 8, wobei das Anlageglied auf dem ersten und dem zweiten Zugentlastungsglied und die Anlageelemente auf dem Abschirmglied miteinander in Eingriff bringbare Zähne (98) zum Ermöglichen einer zahnstangenartigen Bewegung zwischen diesen enthalten.

10. Der elektrische Verbinder nach der Definition in Anspruch 8 oder 9, wobei das Abschirmglied (58) eine Ober- und eine Unterwand aufweist, von denen jede zum Aufnehmen jedes der Zugentlastungsglieder (90) einen durch sie durchtretenden Schlitz (75) aufweist.

11. Der elektrische Verbinder nach der Definition in Anspruch 10, wobei das erste und das zweite Zugentlastungsglied (90) aus einem elektrisch leitenden Werkstoff hergestellt sind und wobei mindestens eins des ersten und des zweiten Zugentlastungsglieds (90) mindestens eine angehobene Vorwölbung (102) aufweist, die bei Einschieben des Zugentlastungsglieds (90) in den Schlitz (75) mechanisch gegen eine Innenwand des Schlitzes (75) des Abschirmgliedes (58) gedrückt wird und damit einen elektrischen Kontakt zwischen dem Zugentlastungsglied (90) und dem Abschirmglied (58) sicherstellt.

12. Der elektrische Verbinder nach der Definition in irgendeinem der Ansprüche 7 bis 11, wobei die Kabelzugentlastungsvorrichtung (72) ein erstes und ein zweites miteinander in Eingriff bringbares Zugentlastungsglied (90) aufweist, von denen jedes ein Paar auseinanderliegende Schenkel (94, 96) aufweist, ein Schenkel (94) nach außen gerichtete Anlageelemente (98) und der entgegengesetzt gerichtete Schenkel (96) nach innen gerichtete Anlageelemente (98) aufweist, die nach außen gerichteten Anlageelemente (98) auf einem Schenkel (94) eines Zugentlastungsgliedes (90) die nach innen gerichteten Anlageelemente (98) auf einem Schenkel (96) des anderen Zugentlastungsgliedes (90) erfassen und das erste und das zweite Zugentlastungsglied (90) zwischen sich eine umgrenzte Öffnung definieren und zum Herabsetzen der Größe der Öffnung und zum Bewirken eines Reibungsschlusses des Kabels (12) an dieser gegeneinander verschiebbar sind.

13. Der elektrische Verbinder nach der Definition in irgendeinem vorhergehenden Anspruch, wobei das Kontakthalteglied (32) eine nach rückwärts an den die Isolation verdrängenden Anschlußendabschnitten (38) vorbei verlaufende langgestreckte Halteoberfläche aufweisen und wobei das Querglied weiter zu einer Stelle am Ende der langgestreckten Halteoberfläche des Kontakthaltegliedes (32) verläuft.

14. Der elektrische Verbinder (10) nach der Definition in irgendeinem vorhergehenden Anspruch, wobei die elektrischen Kontakte (34) klingenartige Kontakte sind.

15. Der elektrische Verbinder (10) nach der Definition in Anspruch 14, wobei das Verbindungsende (36) des klingenartigen Kontaktes (34) einen elastischen Federabschnitt (40) aufweist.

Revendications

1. Connecteur électrique (10) pour raccorder des conducteurs discrets (18) d'un câble à multiples conducteurs (12), comportant :

au moins un élément de support de contact isolant (32),
une pluralité de contacts électriques (34) supportés par l'élément de support de contact (32), chacun des contacts (34) ayant une extrémité de connexion (36) et des parties d'extrémité de terminaison de déplacement isolante (38) pour une connexion électrique avec les conducteurs (18) d'un desdits câbles (12),
au moins un bloc d'ajustage (35) incluant à l'intérieur des ouvertures de réception pour lesdits conducteurs (18), le bloc d'ajustage (35) guidant et déplaçant les conducteurs (18) en prise avec les parties d'extrémité de terminaison de déplacement isolante (38) desdits contacts (34), et
un élément de blindage électriquement conducteur (58) pour supporter à l'intérieur ledit au moins un élément de support de contact (32), ledit élément de blindage (58) comportant un boîtier extérieur constitué d'au moins deux parois latérales, d'une paroi supérieure et d'une paroi inférieure qui entourent une partie desdits contacts (34) et une traverse formée entre lesdites au moins deux parois latérales, et venue de matière avec celles-ci, ladite traverse ayant une étendue horizontale (70) pour supporter dessus au moins une partie dudit élément de support de contact et une étendue verticale (68), ladite étendue horizontale (70) et ladite étendue verticale (68) permettant le blindage à la fois horizontalement et verticalement entre au moins une partie de deux contacts (34) séparés par ladite traverse,

caractérisé en ce que ladite traverse s'étend sur une distance vers l'arrière au-delà du au moins un bloc d'ajustage (35) et, dans lequel lesdites parois latérales, lesdites parois supérieure et inférieure et ladite traverse entourent entièrement une longueur d'au moins deux des conducteurs discrets (18) du câble à multiples conducteurs (12) séparés par ladite traverse pour fournir un blindage amélioré entre les paires de conducteurs raccordés au connecteur.

2. Connecteur électrique (10) selon la revendication 1, dans lequel lesdites parois latérales et lesdites parois supérieure et inférieure s'étendent sur une distance vers l'arrière au-delà du au moins un bloc d'ajustage (35).

3. Connecteur électrique (10) selon la revendication 1 ou 2, dans lequel l'élément de blindage (58) est constitué d'un métal moulé.

4. Connecteur électrique (10) selon l'une quelconque des revendications précédentes, comportant un élément de support de contact unique (32), dans lequel ledit élément de support de contact (32) comporte une fente horizontale (53) et une fente longitudinale (52) pour recevoir ladite partie de traverse dudit élément de blindage (58).

5. Connecteur électrique (10) selon l'une quelconque des revendications 2 à 4, dans lequel lesdites parties d'extrémité de contact (38) comportent des contacts de déplacement isolants (34) et lesdits blocs d'ajustage (35) sont montés par encliquetage sur les contacts de déplacement isolants (34) pour fixer lesdits conducteurs (34) à ceux-ci.

6. Connecteur électrique (10) selon l'une quelconque des revendications précédentes, comportant de plus un boîtier de connecteur isolant ayant deux moitiés de connecteur (20a, 20b) qui sont ajustées par encliquetage ensemble pour enfermer essentiellement ledit élément de blindage (58).

7. Connecteur électrique (10) selon l'une quelconque des revendications précédentes, comportant de plus un dispositif de détente de contraintes de câble (72) pour fixer le câble (12) dans celui-ci et le dispositif de détente de contraintes (72) étant en contact direct avec ledit élément de blindage (58) pour fournir une continuité de masse entre le câble (12) et l'élément de blindage (58).

8. Connecteur électrique (10) selon la revendication 7, dans lequel ledit dispositif de détente de contraintes de câble (72) comporte des premier et second éléments de détente de contraintes (90), chaque élément de détente de contraintes (90) ayant une paire de pattes (94, 96) positionnées le long de bords opposés de celui-ci, chacune desdites pattes (94, 96) incluant un élément de mise en prise (110) dessus, lesdits premier et second éléments de détente de contraintes (90) définissant une ouverture délimitée entre ceux-ci et étant mobiles l'un par rap-

port à l'autre pour réduire la taille de ladite ouverture délimitée afin de mettre en prise de manière sûre le câble (12) au niveau de celle-ci et dans lequel ledit élément de blindage (58) comporte des éléments de mise en prise (112) agencés le long d'au moins deux parois latérales opposées de celui-ci pour une coopération avec les éléments de mise en prise desdits éléments de détente de contraintes (90) de manière à mettre en prise de manière verrouillée lesdits premier et second éléments de détente de contraintes (90) avec ledit câble (12).

9. Connecteur électrique selon la revendication 8, dans lequel ledit élément de mise en prise sur lesdits premier et second éléments de détente de contraintes et lesdits éléments de mise en prise sur ledit élément de blindage comportent des dents (98) pouvant venir en prise mutuellement pour permettre un mouvement de type cliquet entre celles-ci.

10. Connecteur électrique selon la revendication 8 ou 9, dans lequel ledit élément de blindage (58) comporte une paroi supérieure et une paroi inférieure ayant chacune une fente (75) positionnée à travers celles-ci pour recevoir chacun desdits éléments de détente de contraintes (90).

11. Connecteur électrique selon la revendication 10, dans lequel lesdits premier et second éléments de détente de contraintes (90) sont constitués d'un matériau électriquement conducteur et dans lequel au moins un desdits premier et second éléments de détente de contraintes (90) comporte au moins une saillie soulevée (102) qui est forcée mécaniquement contre une paroi intérieure de ladite fente (75) dudit élément de blindage (58) lorsque ledit élément de détente de contraintes (90) est inséré dans ladite fente (75) de manière à garantir un contact électrique entre ledit élément de détente de contraintes (90) et ledit élément de blindage (58).

12. Connecteur électrique selon l'une quelconque des revendications 7 à 11, dans lequel ledit dispositif de détente de contraintes de câble (72) comporte des premier et second éléments de détente de contraintes (90) pouvant venir en prise mutuellement ayant chacun une paire de pattes espacées (94, 96), une patte (94) ayant des éléments de mise en prise dirigés vers l'extérieur (98) et la patte opposée (96) ayant des éléments de mise en prise dirigés vers l'intérieur (98), les éléments de mise en prise dirigés vers l'extérieur (98) sur une patte (94) d'un élément de détente de contraintes (90) venant en prise avec les éléments de mise en prise dirigés vers l'intérieur (98) sur une patte (96) de l'autre élément de détente de contraintes (90), lesdits premier et second éléments de détente de contraintes (90) définissant une ouverture délimitée entre ceux-ci et étant mobiles l'un par rapport à l'autre pour réduire la taille de ladite ouverture et pour fixer par frottement ledit câble (12) au niveau de celle-ci.

13. Connecteur électrique selon l'une quelconque des revendications précédentes, dans lequel l'élément de support de contact (32) comporte une surface de support allongée s'étendant vers l'arrière au-delà des parties d'extrémité de terminaison de déplacement isolante (38) et de plus dans lequel la traverse s'étend jusqu'à une position adjacente à l'extrémité de la surface de support allongée de l'élément de support de contact (32).

14. Connecteur électrique (10) selon l'une quelconque des revendications précédentes, dans lequel les contacts électriques (34) sont des contacts de type lame.

15. Connecteur électrique (10) selon la revendication 14, dans lequel l'extrémité de connexion (36) du contact de type lame (34) comporte une partie de ressort élastique (40).

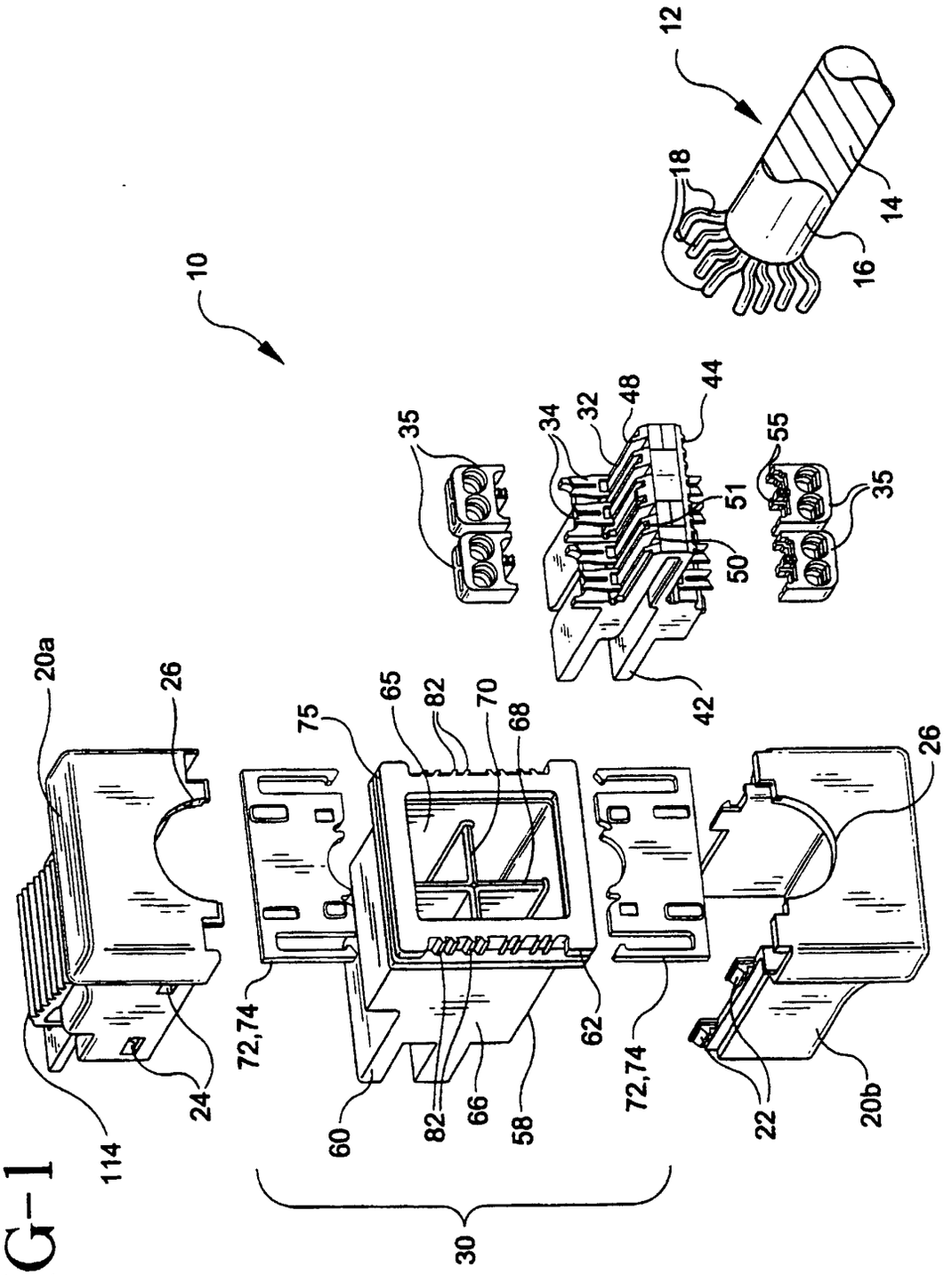
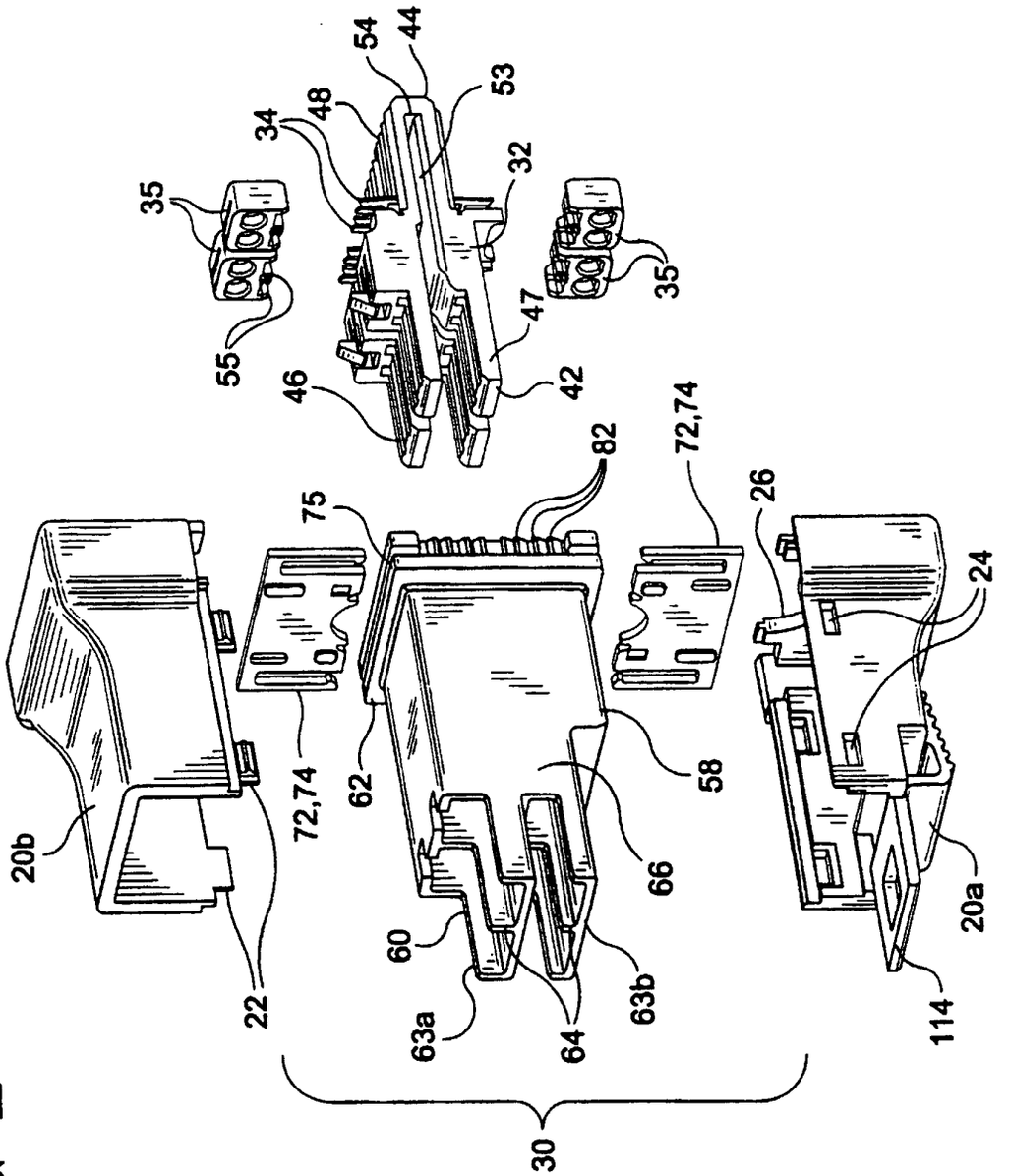

12
18
14
16
10
35
34
32
48
44
55
35
51
50
42
20a
26
75
65
82
70
68
72,74
62
72,74
26
114
24
60
82
66
58
22
20b
30

FIG-1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44
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34
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32
35
47
55
46
42
35
82
72,74
75
26
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72,74
62
58
20b
66
60
20a
63a
63b
64
22
114
30

FIG-2

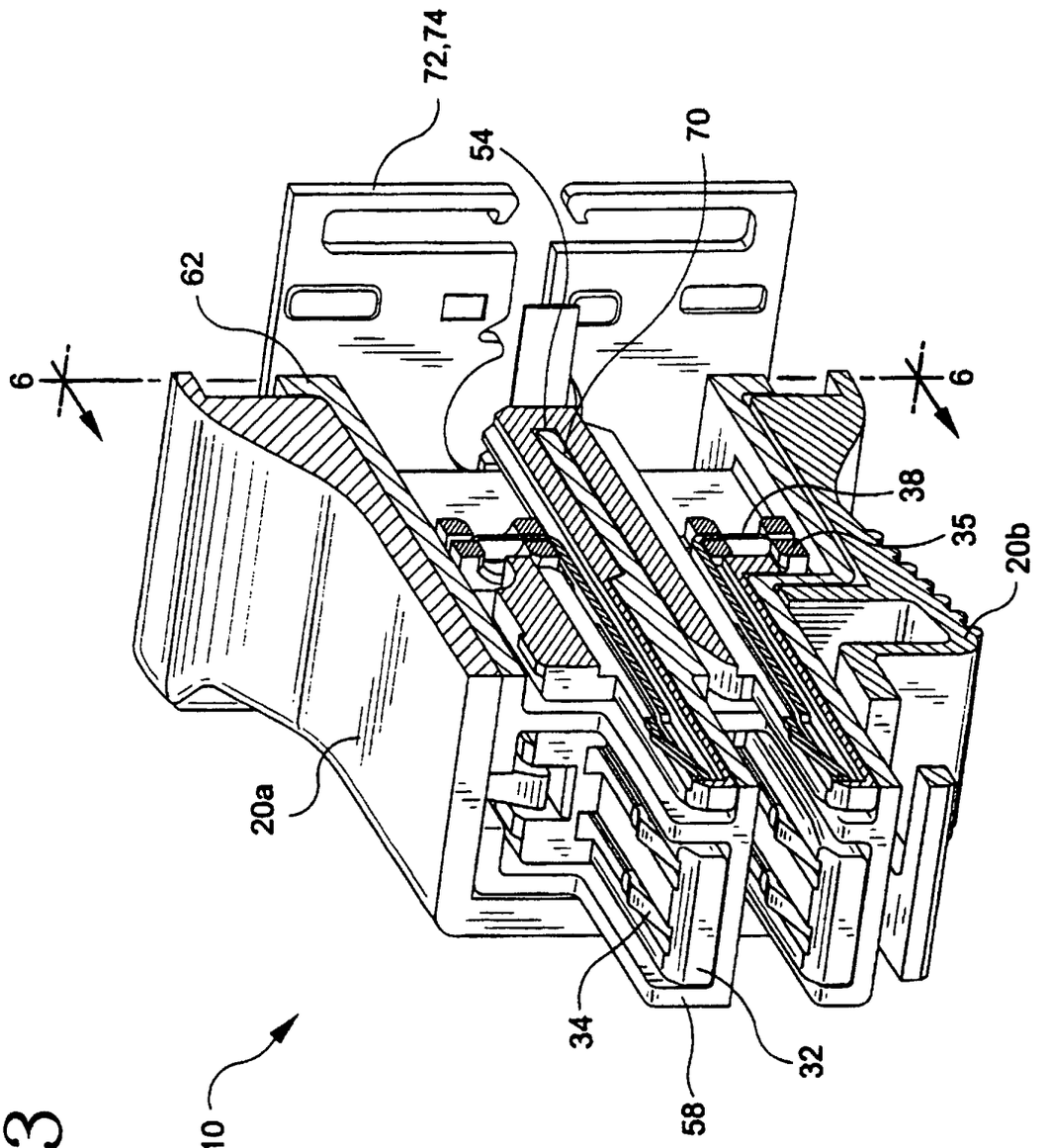


FIG-3

FIG-4

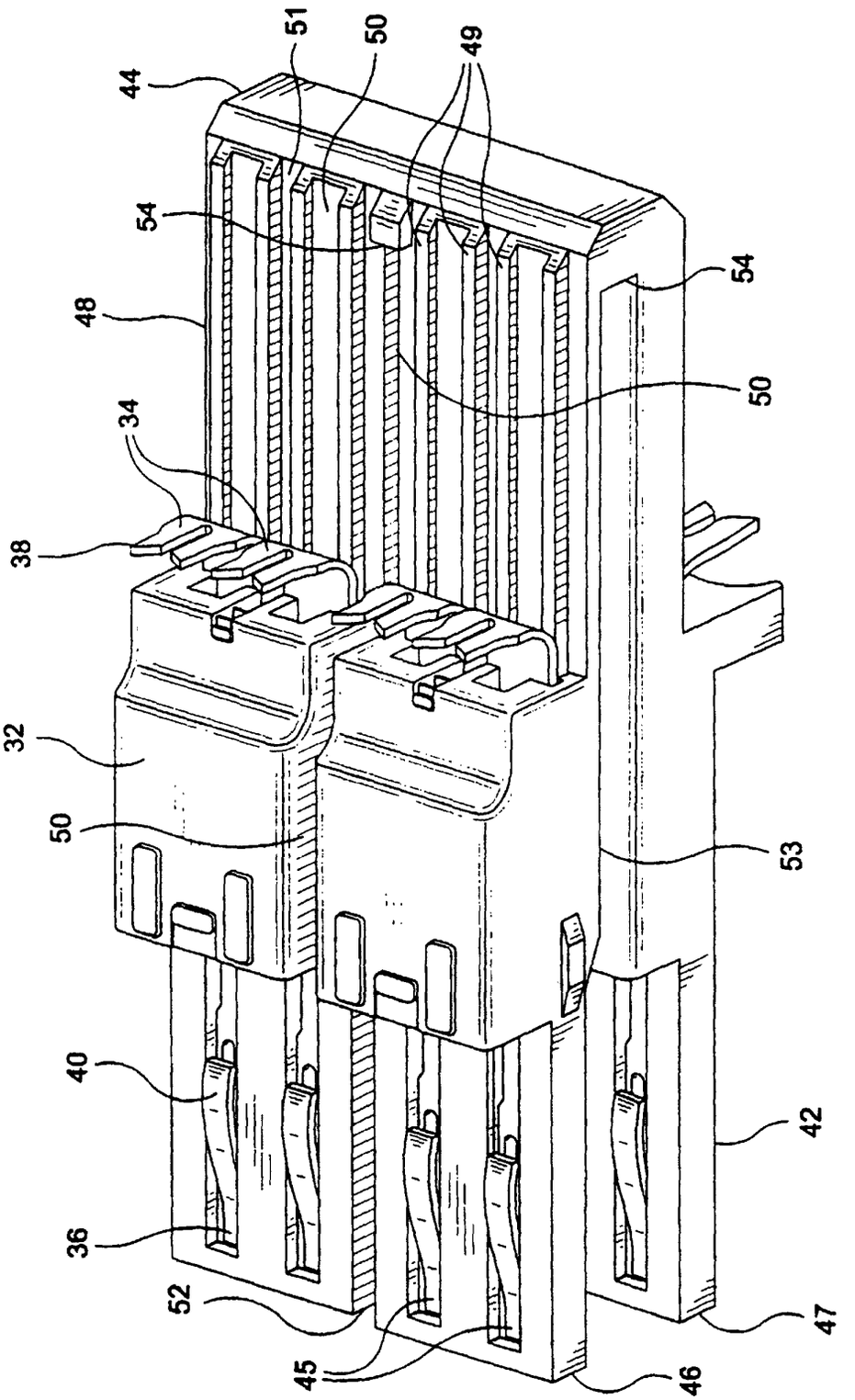
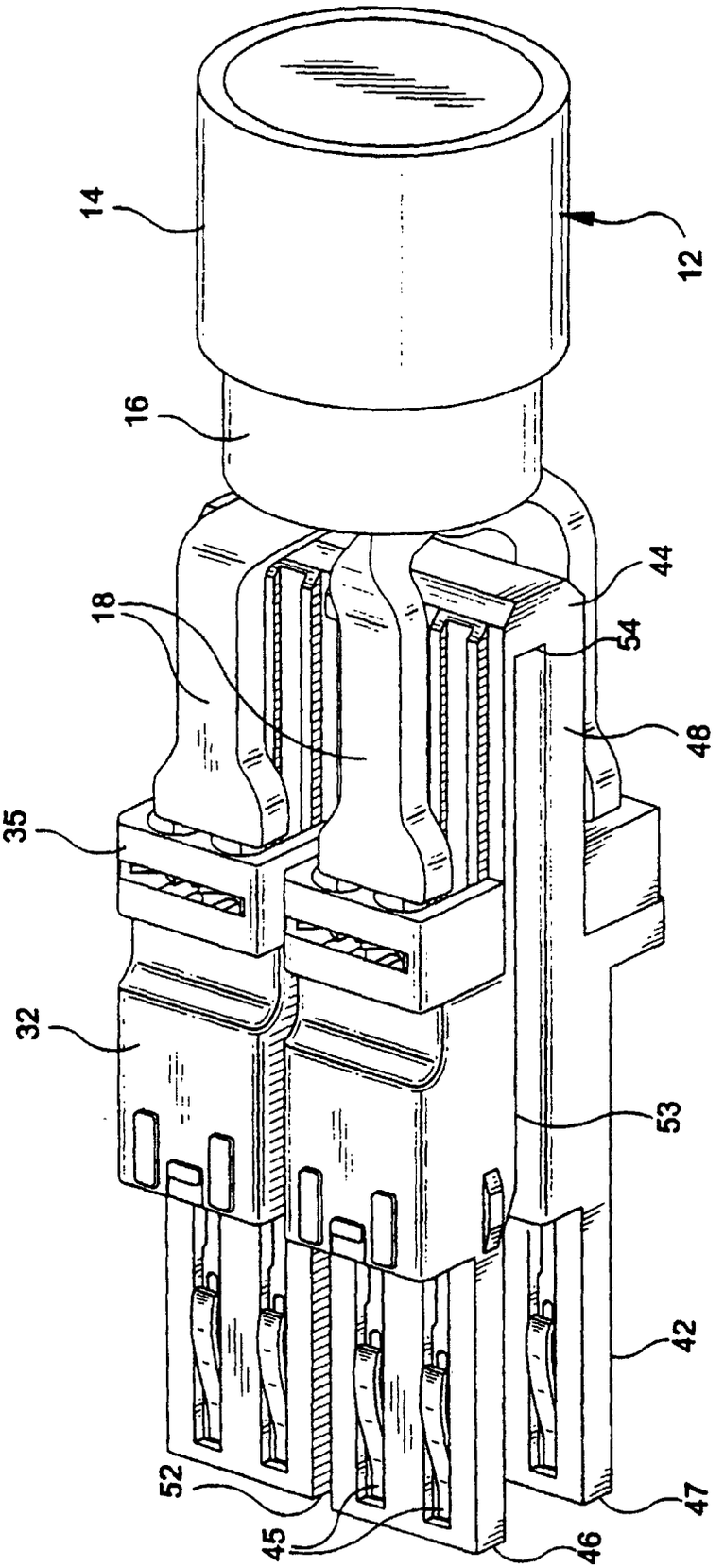


FIG-5



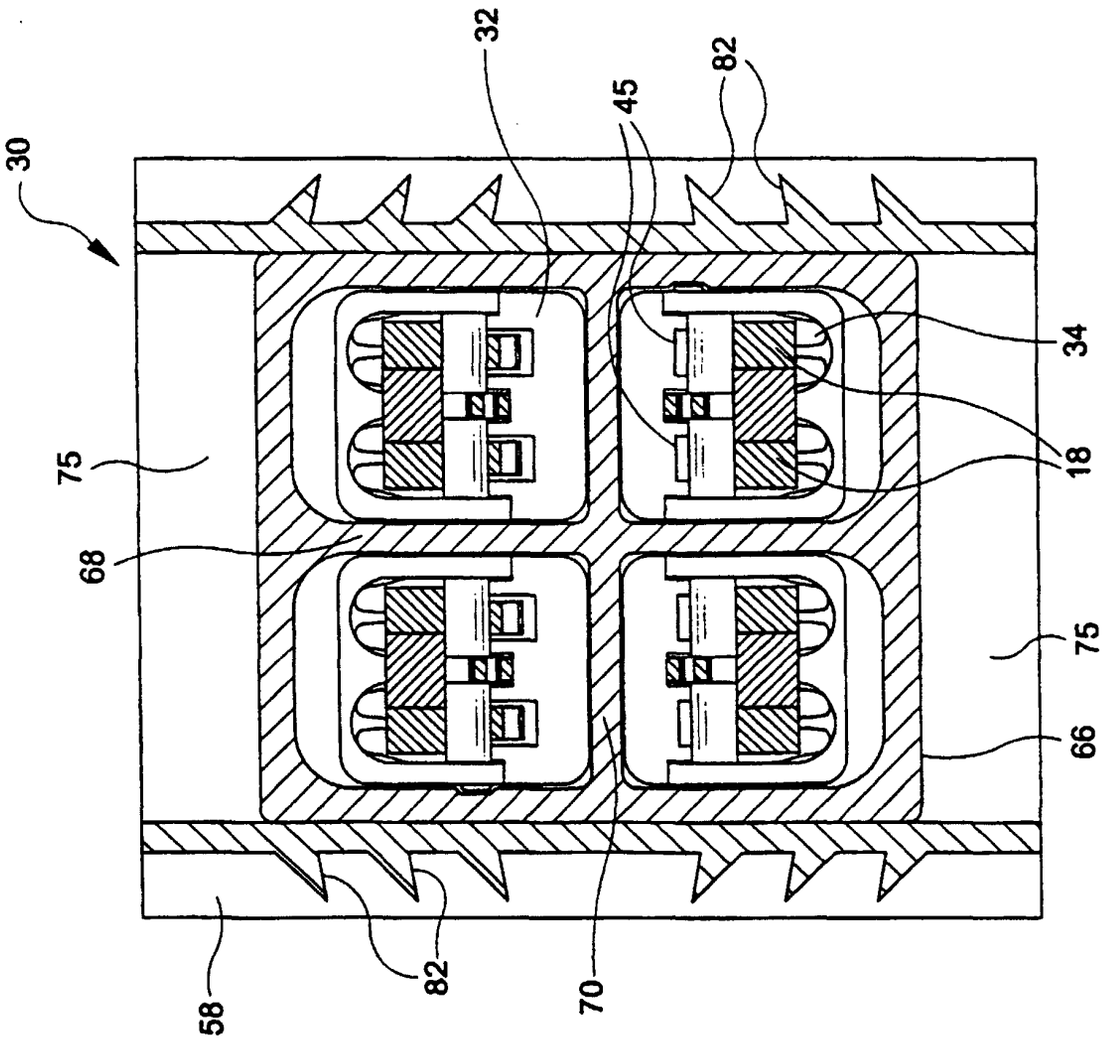


FIG-6a

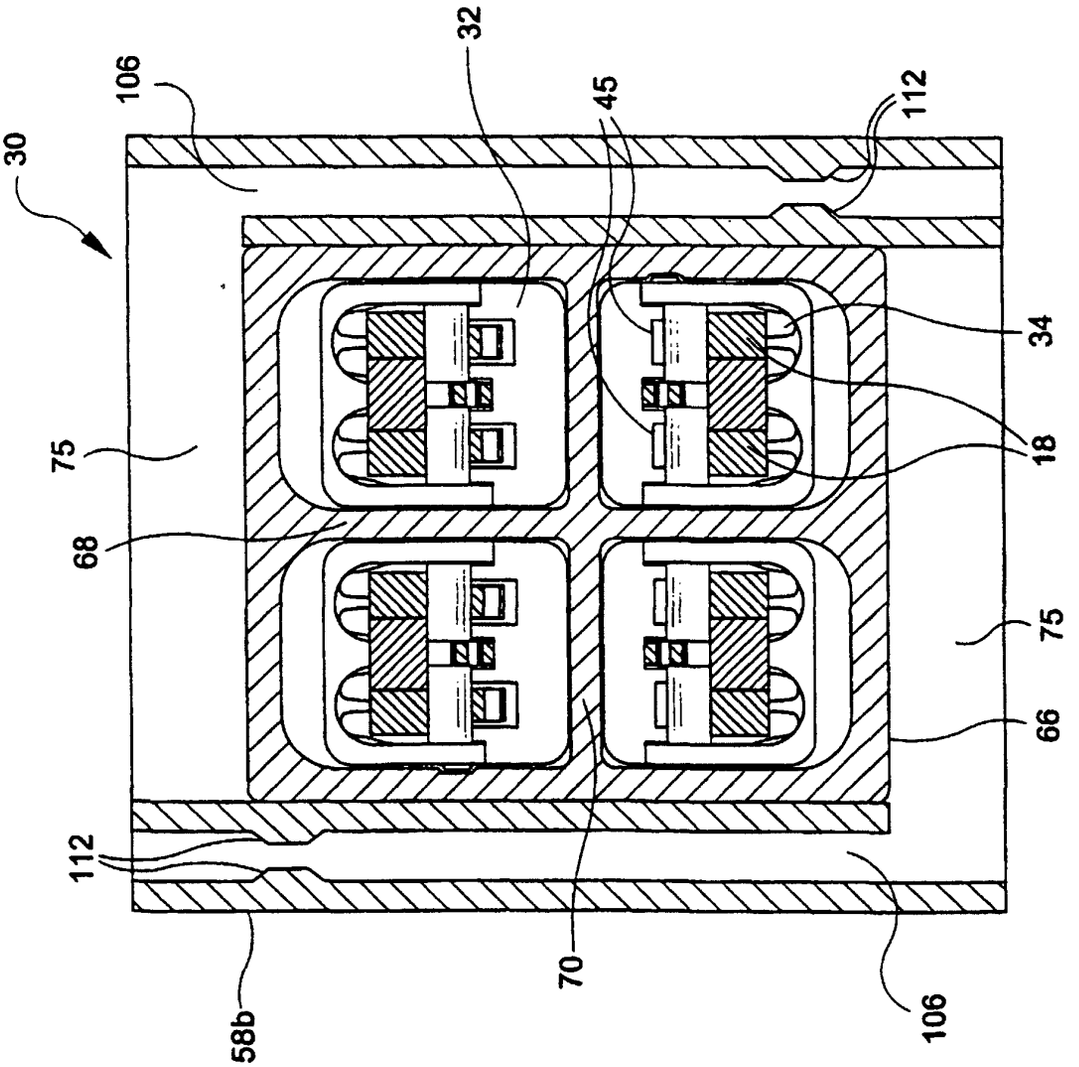


FIG-6b

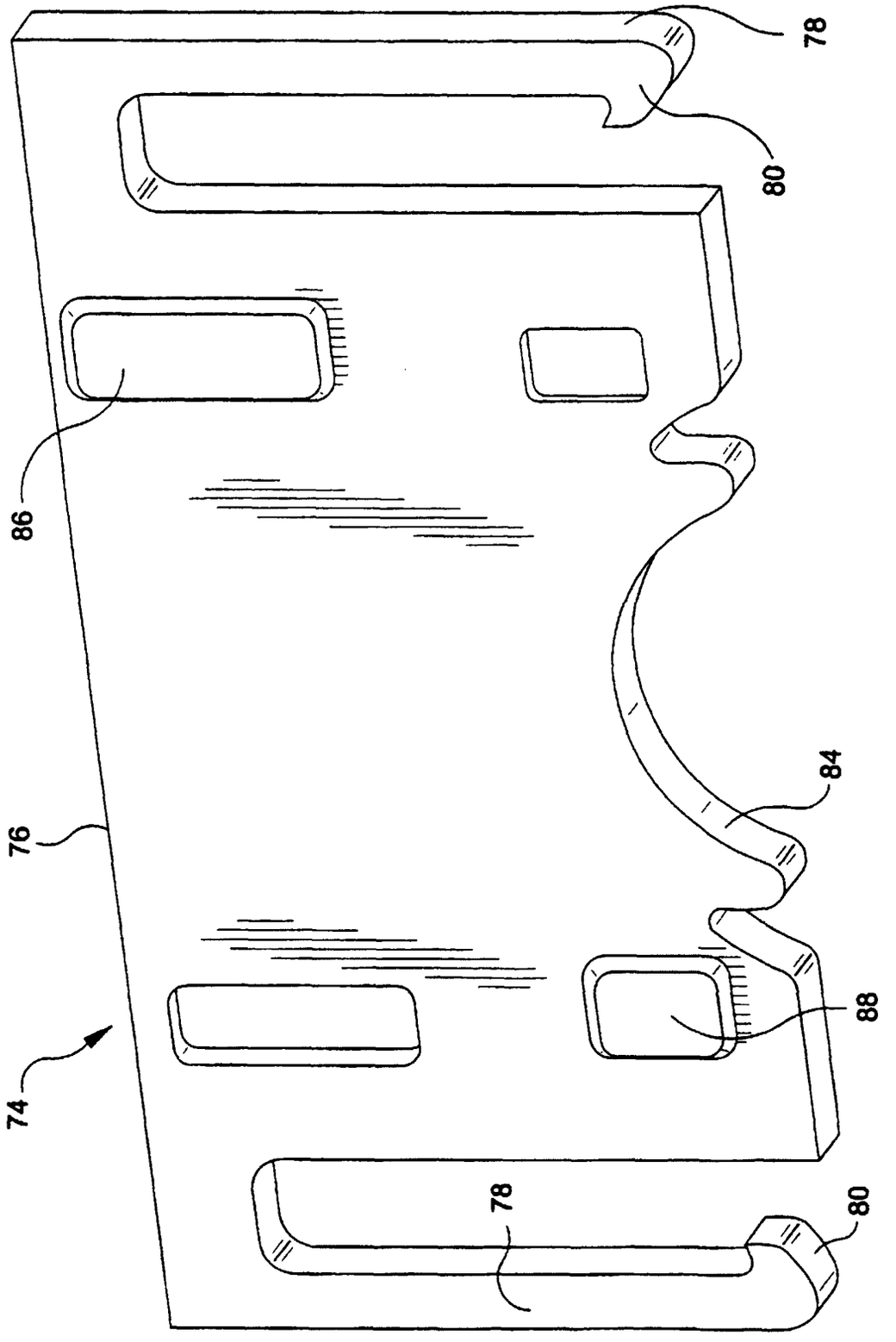


FIG-7

FIG-8