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(54) **HIGH DENSITY PATCHING SYSTEM**

VERBINDUNGSPANEL MIT HOHER DICHTHE

SYSTEME DE CORRECTION HAUTE DENSITE

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Description

Field of the Invention

[0001] The present invention relates generally to high density patching systems. More particularly, present invention relates patching systems for voice or data communication applications such as audio and video entertainment applications.

Background of the Invention

[0002] Patching systems are frequently used in data transmission applications to improve system flexibility and reliability - see in particular US-A-5 348 482. One type of existing patching system includes a plurality of jack access cards that are mounted in a chassis. Each jack access card interfaces with a pair of rear connectors. A first rear connector of each pair is typically connected to a user's transmitter (e.g., a machine or other piece of equipment that transmits signals or data). A second rear connector of each pair is typically connected to user's receiver (e.g., a machine or other piece of equipment that receives signals or data). Transmissions from the transmitter enter the patching system through the first rear connector, travel through a circuit path provided by one of the jack access cards, and exit the patching system through the second rear connector. Normally, the circuit is closed. However, by inserting a patch plug into a patch port defined by the jack access card, the circuit is opened and the transmission from the user's transmitter is diverted through the patch plug to a secondary piece of equipment (e.g., a back-up receiver, diagnostic equipment, equipment performing alternative functions, etc.).

[0003] Ease of use and reliability are factors relevant to the design of patching systems. Other factors include cost, circuit density, and interchangeability or modularity of parts.

Summary of the Invention

[0004] One aspect of the present invention relates to a jack access card adapted for use with patch cords equipped with patch plugs each having a width W_1 and height H_1 . The jack access card includes a circuit board having a front end positioned opposite from a rear end. A plurality of card edge contacts are positioned at the rear end of the circuit board. Upper and lower sets of spring contacts are also positioned on the circuit board. The upper and lower sets of spring contacts each include front contacts positioned near the front of the circuit board, and intermediate contacts positioned generally between the front contacts and the card edge contacts. A first plurality of tracings electrically connect selected ones of the intermediate contacts to selected ones of the card edge contacts. A second plurality of tracings electrically connect selected ones of the front contacts corresponding to the upper set of spring contacts with se-

lected ones of the front contacts corresponding to the lower set of spring contacts. The jack access card also includes upper and lower sets of springs adapted to selectively provide electrical connections between the front and intermediate contacts. The jack access card further includes a front interface piece positioned at the front of the circuit board. The front interface piece has a height H_2 that is greater than two times the height H_1 , and a width W_2 that is less than two times the width W_1 . The front interface piece defines upper and lower patch plug ports that are vertically spaced along the height H_2 of the front interface piece. The upper and lower patch plug ports are sized and shaped to each receive only a single one of the patch plugs at a time.

[0005] Another aspect of the present invention relates a rear interface module for a high density patching system. The rear interface module includes a frame including a front end positioned opposite from a rear end. The frame also includes opposing top and bottom walls extending between the front and rear ends. The frame further includes a rear wall that interconnects the top and bottom walls. The rear wall is located at the rear end of the frame and defines two vertically spaced-apart rows of openings. The rear interface module also includes a single row of card edge connectors positioned at the front end of the frame. The card edge connectors include a plurality and first pins that project toward the rear end of the frame. The rear interface module further includes two vertically spaced-apart rows of rear connectors mounted at the rear wall of the frame. At least portions of the rear connectors extend through the vertically spaced-apart openings. The rear connectors include a plurality of second pins that project toward the front end of the frame. The first pins corresponding to the card edge connectors are electrically connected to the second pins corresponding to the rear connectors by a flexible circuit board that is positioned between the top and bottom walls of the frame.

[0006] A further aspect of the present invention relates to a high density patching system. The system includes a card housing having a front end positioned opposite from a rear end. The card housing includes top and bottom walls extending between the front and rear ends. The top and bottom walls define opposing sets of top and bottom slots. The patching system also includes a plurality of patch cords including patch plugs each having a width W_1 and a height H_1 . The high density patching system further includes a plurality of jack access cards adapted to be mounted through the front end of the card housing, and a rear interface module positioned at the rear end of the card housing. The jack access cards of the patching system include circuit boards having top and bottom edges adapted to fit within the sets of top and bottom slots defined by the card housing. The jack access cards also include a plurality of card edge contacts positioned at a rear of each circuit board, and a front interface piece positioned at a front of each circuit board. The front interface pieces have heights H_2 that are each great-

er than two times the height H_1 , and widths W_2 that are less than two times the width W_1 . The front interface pieces each define upper and lower patch plug ports that are vertically spaced along the height H_2 of each interface piece. The upper and lower patch plug ports are sized and shaped to receive only a single one of the patch plugs at a time. The rear interface module of the patching system includes a single row of card edge connectors adapted for providing electrical connections with the card edge contacts of the jack access cards. The rear interface module also includes an array of rear connectors. The array of rear connectors is electrically connected to the card edge connectors by a flexible circuit board. The frame of the module spaces the card edge connectors from the rear connectors.

[0007] A variety of advantages of the invention will be set forth in part and the description that follows, and in part will be apparent from the description, or may be learned by practicing the invention. It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the invention as claimed.

Brief Description of the Drawings

[0008] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate several aspects of the invention and together with the description, serve to explain the principles of the invention. A brief description of the drawings is as follows:

Fig. 1 is a perspective view of a high density patching system constructed in accordance with the principles of the present invention;
 Fig. 2 is an exploded view of the patching system of Fig. 1;
 Fig. 3 is a perspective view of jack access card adapted for use with the patching system of Fig. 1;
 Fig. 4 is an exploded view of the jack access card of Fig. 3;
 Fig. 5 is a perspective view of the back side of one of the spring holders of Fig. 4;
 Fig. 6A illustrates a patch cord suitable for use with the patching system of Fig. 1;
 Fig. 6B is a right end view of one of the patch plugs of the patch cord of Fig. 6A;
 Fig. 6C is a top view of one of the patch plugs of the patch cord of Fig. 6A;
 Fig. 7 is a front view of the jack access card of Fig. 3;
 Fig. 8 is a top view of the jack access card of Fig. 3;
 Fig. 9A illustrates a normally closed circuit path of the jack access card of Fig. 3;
 Fig. 9B illustrates an open or "patched" circuit of the jack access card of Fig. 3;
 Fig. 10 is a rear perspective view of a rear interface module suitable for use with the high density patching system of Fig. 1;

Fig. 11 is an exploded view of the rear interface module of Fig. 10;

Fig. 12A is a front view of a card edge connector suitable for use with the rear interface module of Fig. 10;

Fig. 12B is a side view of the card edge connector of Fig. 12A;

Fig. 12C is a rear view of the card edge connector of Fig. 12A;

Fig. 12D is a bottom view of the card edge connector of Fig. 12A;

Fig. 13A is a rear view of a rear connector suitable for use with the rear interface module of Fig. 10;

Fig. 13B is a side view of the rear connector of Fig. 13A;

Fig. 13C is a front view of the rear connector of Fig. 13A;

Fig. 13D is a bottom view of the rear connector of Fig. 13A;

Fig. 14 illustrates a flexible circuit wiring diagram for one of the card edge connectors of the rear interface module, and its corresponding pair of rear connectors; and

Fig. 15 illustrates an alternative rear interface module constructed in accordance with the principles of the present invention.

Detailed Description

[0009] Reference will now be made in detail to exemplary aspects of the present invention that are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0010] Figs. 1 and 2 illustrate a patching system constructed in accordance with the principles of the present invention. The patching system 20 includes a chassis 22 including a card housing 24. The patching system 20 also includes a plurality of jack access cards 26 adapted to be mounted in the card housing 24. The patching system 20 further includes a rear interface module 28 mounted at a rear side of the card housing 24. As shown in Figure 2, the jack access cards 26 include rear card edge contacts 30. When the jack access cards 26 are mounted within the card housing 24, the rear card edge contacts 30 fit within corresponding card edge connectors 32 of the rear interface module 28. In this manner, electrical connections are provided between the jack access cards 26 and the rear interface module 28.

[0011] The chassis 22 includes opposing left and right sidewalls 34_L and 34_R. At the front of the chassis 22. Left and right flanges 36_L, 36_R project transversely outward from the sidewalls 34_L, 34_R. The flanges 36_L, 36_R are adapted for use in connecting the chassis 22 to a rack (not shown). A rear support member 43 is connected between the left and right side walls 34_L, 34_R to enhance the structural rigidity of the chassis 22.

[0012] The chassis 22 also includes opposing top and

bottom walls 38 and 40 that extend between the left and right sidewalls 34_L, 34_R. The sidewalls 34_L, 34_R and the top and bottom walls 38, 40 cooperate to form the card housing 24. The card housing defines a hollow bay 42 that preferably has a width of about 19 inches and a height of about 3.5 inches. As shown in Fig. 1, the bay 42 is fully loaded with a plurality (e.g., 32) individual jack access cards 26. The jack access cards 26 are connected to upper and lower flanges of the card housing 24 by conventional fasteners (e.g., bolts, screws, snap-fit connectors, etc.).

[0013] Referring to Fig. 2, the chassis 22 is illustrated with the jack access cards 26 removed from the bay 42. For clarity, only one of the jack access cards 26 is shown exploded from the chassis 22. The illustrated jack access card 26 includes a circuit board 44 having upper and lower edges 46 and 48 adapted to slide within corresponding upper and lower slots 50 and 52 defined by the card housing 24. Preferably, the card housing 24 defines 32 pairs of the upper and lower slots 50 and 52 such that 32 of the jack access cards 26 can be mounted in the chassis 22.

[0014] Referring to Figs. 3 and 4, one of the jack access cards 26 is illustrated in isolation from the entire patching system 20. The jack access card 26 includes a front interface piece 54 defining upper and lower patch plug ports 56 and 58. The front interface piece 54 is connected to the circuit board 44. Upper and lower sets of springs 60 and 62 are secured to the board 44. The upper set of springs 60 is connected to the circuit board 44 by an upper spring holder 64, and the lower set of springs 62 is connected to the circuit board 44 by a lower spring holder 66. As shown in Fig. 5, the spring holders 64 and 66 (which have identical configurations) include a plurality of parallel slots or channels 68 for receiving and isolating the springs 60 and 62. The upper and lower spring holders 64 and 66 are preferably fastened to the circuit board 44 by conventional fasteners 70. The upper and lower holders 64 and 66 also preferably include alignment pegs 72 that fit within corresponding alignment openings defined by the circuit board 44.

[0015] The upper and lower patch plug ports 56 and 58 are each sized and shaped to receive only a single patch plug 74 (shown in Figs. 6A-6C) at a time. For example, the ports 56 and 58 each have a generally rectangular shape that complements a rectangular profile (see Fig. 6B) of a single one of the patch plugs 74.

[0016] Referring to Fig. 6A, a patch cord 76 having patch plugs 74 is illustrated. As shown in Fig. 6B, each of the patch plugs 74 has a width W_1 and a height H_1 . Each of the patch plugs 74 also includes a housing 78 having a receptacle or open end 80 (shown in Fig. 6B). A single row of contact springs 82 is mounted in the open end 80 of each housing 78. Each housing 78 also defines two recesses 84. As will be described later in the specification, the recesses 84 are used to assist in mechanically securing the patch plugs 74 within the patch plug ports 56 and 58.

[0017] Referring to Fig. 7, the front interface piece 54 of the jack access card 26 has a height H_2 and a width W_2 . Preferably, the height H_2 is greater than two times the height H_1 of each patch plug 74, and the width W_2 is preferably less than two times the width W_1 of each patch plug 74. By selecting the width W_2 to be less than two times the width W_1 , improved circuit density can be achieved. Also, by selecting the height H_2 to be greater than two times the height H_1 , two or more of the patch plug ports 56 and 58 can be vertically spaced or aligned along a common vertical axis 86. This also assists in improving circuit density. The vertical axis 86 on which the patch plug ports 56 and 58 are preferably centered, is preferably offset from a central axis 88 of the front interface piece 54. The vertical axis 86 is aligned along a plane P that extends rearwardly through the front interface piece 54. As shown in FIG. 8, the circuit board 44 is offset from the plane P.

[0018] Referring back to Figs. 3 and 4, the jack access card 26 also includes an upper resilient retaining member 90 corresponding to the upper patch plug port 56, and a lower resilient retaining member 92 corresponding to the lower patch plug port 58. The upper and lower retaining members 90 and 92 each have a generally cantilevered configuration and include inwardly projecting retaining tabs 94 (best shown in Fig. 7). When one of the patch plugs 74 is inserted within one of the patch plug ports 56 and 58, the retaining tabs 94 snap within the recesses 84 of the patch plug 74 to mechanically hold the plug 74 within the plug port.

[0019] The ports 56 and 58 preferably complement the profile of each plug 74 such that the plugs 74 can not be improperly inserted (i.e., inserted backwards or up-side-down) in the ports 56 and 58. For example, referring again to Fig. 7, each of the upper and lower patch plug ports 56 and 58 defines a generally rectangular recess 96 positioned opposite from the retaining tabs 94. Each rectangular recess 96 is configured to receive a corresponding rectangular projection 98 that extends outward from one side of each patch plug 74. As shown in Fig. 6B, the projection 98 is formed between two end notches 99.

[0020] Referring to Fig. 8, the jack access card 26 also includes left and right connecting structures 100 and 102. The left and right connecting structures 100 and 102 oppose one another and are generally parallel. Portions of the circuit board 44 and the upper and lower spring housings 64 and 66 are positioned between the left and right connecting structures 100 and 102.

[0021] Referring to Fig. 3, the right connecting structure 102 includes an upper extension 104, a lower extension 106, and an intermediate extension 108. The upper extension 104 is located above the upper retaining member 90, the lower extension 106 is located below the lower retaining member 92, and the intermediate extension 108 is located between the upper and lower retaining members 90 and 92. The intermediate extension 108 overlaps both of the upper and lower spring housings 64 and 66. Conventional fasteners 110 fasten the circuit

board 44 and the spring housings 64 and 66 between the left and right connecting structures 100 and 102.

[0022] Referring to Fig. 4, the card edge contacts 30 of the circuit board 44 are positioned on an extension 112 that projects rearwardly from a main body of the circuit board 44. It will be appreciated that each card edge contact 30 has a corresponding contact located on the opposite side of the rear extension 112.

[0023] Still referring to Fig. 4, the circuit board 44 includes an upper set of spring contacts 114 and a lower set of spring contacts 116. The upper set of spring contacts 114 includes a column of front contacts 118 and a column of intermediate contacts 120. Similarly, the lower set of spring contacts 116 includes a column of front contacts 122 and a column of intermediate contacts 124. The front contacts 118 and 122 are positioned adjacent to a front edge of the circuit board 44, while the intermediate contacts 120 and 124 are positioned between the front contacts 118, 122 and the card edge contacts 30.

[0024] Figs. 9A and 9B show a representative circuit or tracing layout for the circuit board 44. For clarity, only a single circuit path is illustrated. However, those of reasonable skill in the art will appreciate that similar circuit paths can be provided for each pair of card edge contacts 30.

[0025] Referring to Fig. 9A, one of the upper springs 60 and one of the lower springs 62 are each shown in a normally closed position. With the circuit normally closed, the springs 60 and 62 provide normal-through functionality for twisted pair balanced circuit applications. For example, in the normal orientation of Fig. 9A, the circuit path extends from one of the card edge contacts 30 through tracing 126 to one of the intermediate contacts 120. From the intermediate contact 120, the circuit path extends through spring 60 to front contact 118. From front contact 118, the circuit path moves through tracing 128 to front contact 122. Next, the circuit path moves through spring 62 from the front contact 122 to the intermediate contact 124. Finally, the circuit path moves through tracing 130 to another of the card edge contacts that is located on the under side of the circuit board 44 at a position opposite from the originating contact 30.

[0026] When the jack access card 26 is in the normally closed position of Fig. 9A, a transmission from a user's transmitter enters the patching system 20 through the rear interface module 28 and travels through the circuit path shown in Fig. 9A. After traveling through the circuit path of Fig. 9A, the transmission exits the patching system 20 through the rear interface module 28 and travels to the user's normal receiver. If it is desired to divert the signal traveling through the jack access card 26, one of the patching plugs 74 is inserted into one of the patch plug ports 56, 58. With the plug 74 inserted within one of the plug ports 56, 58, the circuit path of Fig. 9A is opened and the signal is patched through the patch plug 74 to an alternative piece of receiving equipment.

[0027] Fig. 9B illustrates a representative patching configuration. In Fig. 9B, one of the patch plugs 74 (with

portions of the housing 78 removed to improve the visibility of the contact springs 82) has been inserted in the upper patch plug port 56. When the plug 74 is inserted in the upper port 56, the spring 60 is flexed away from the circuit board 44 such that the spring 60 disconnects from the front contact 118. Concurrently, the spring 60 makes contact with one of the contact springs 82 of the patch plug 74. Consequently, the signal traveling through the circuit pathway is patched from the spring 60 to the patch plug 74. From the patch plug 74, the signal travels through patch cord 76 to the alternative receiving equipment. When the user has finished patching the signal, the plug 74 is removed from the plug port 56 and the spring 60 flexes back into engagement with the front contact 118 thereby closing the circuit.

[0028] Figs. 10 and 11 show the rear interface module 28 in isolation from the patching system 20. The rear interface module 28 includes a frame 140 preferably made from bent sheet metal. The frame includes a front end 142 positioned opposite from a rear end 144. The frame 140 also includes opposing top and bottom walls 146 and 148 that extend between the front and rear ends 142 and 144. A rear wall 150 interconnects the top and bottom walls 146 and 148. As best shown in Fig. 11, the rear wall 150 defines two vertically spaced-apart rows of openings 152.

[0029] The rear interface module 28 also includes two vertically spaced-apart rows of rear connectors 154 mounted at the rear wall 150. At least portions of the rear connectors 154 preferably extend through the vertically spaced-apart openings 152. The rear connectors 154 preferably include connecting pins 156 (shown in Fig. 11) that project generally toward the front end 142 of the frame 140. The rear connectors 154 are held in place by a board 158 (shown in Fig. 10) that is snap fit within the frame 140 and held against the rear connectors 154 by resilient tabs 160. The board 158 preferably includes a plurality of openings for allowing the pins 156 to pass through.

[0030] The frame 140 includes the plurality of top and bottom ears 162 for allowing the frame 140 to be fastened (e.g., by conventional fasteners such as screws or bolts) to the rear of the card housing 24. The frame 140 also includes top and bottom flanges 164 and 166 located at the front end 142 of the frame 140. The top flange 164 extends downward from the top wall 146, and the bottom flange 166 extends upward from the top wall 148. The top and bottom flanges 164 and 166 define a plurality of openings for receiving fasteners (e.g., bolts or screws) used in securing the card edge connectors 32 to the front end 142 of the frame 140. As mounted at the front end 142 of the frame, the card edge connectors 32 are preferably aligned in a single row. Pins 168 of the card edge connectors 130 preferably extend toward the rear end 144 of the frame 140 and project through a gap defined between the top and bottom flanges 164 and 166. In other embodiments, the card edge connectors 130 can be mounted inside the flanges 164 and 166 with receptacles

of the connectors 130 projecting forwardly through the gap between the flanges 164 and 166.

[0031] The rear connectors 154 are preferably arranged in an array having two vertically spaced apart rows. The pins 156 of the rear connectors 154 are preferably connected to the pins 168 of the card edge connectors 32 through the use of a flexible circuit board 170. The flexible circuit board 170 is located between the top and bottom walls 146 and 148 of the frame 140. Preferably, the flexible circuit board 170 includes a generally planar front portion 172 having electrical contacts that contact the pins 168 of the card edge connectors 32, and generally planar rear portion 174 having electrical contacts that engage the pins 156 of the rear connectors 154. A flexed intermediate portion 175 curves between the front and rear portions 172 and 174. A tracing diagram for eight pairs of vertically spaced-apart rear connectors 154 and their corresponding card edge connectors 32 is shown in Fig. 14. In the embodiment shown, the rear connectors 154 each include nine pins 168, while the card edge connectors 32 each have a total of 20 pins. The extra pins on the card edge connectors 32 allow for expansion and/or modification of the type of rear connectors used.

[0032] The pins 156 and 168 respectively extend through plated through-holes 156' and 168' of the flexible circuit board 170. Tracings 157 electrically interconnect selected ones of the through-holes 156' with selected ones of the through holes 168'.

[0033] Referring now to Figs. 12A-12D, various views of one of the card edge connectors 32 are shown. The card edge connector 32 includes a dielectric housing 176 defining a central slot 178 sized for receiving one of the rear extensions 112 of the jack access cards 26. A plurality (e.g., 20) of opposing electrical contacts 180 are positioned within the slot 178. When the rear extension 112 of the jack access card 126 is inserted within the slot 178, the electrical contacts 180 engage the card edge contacts 30 of the jack access card 26. In this manner, an electrical connection is provided between the jack access card 26 and the card edge connector 32.

[0034] The electrical contacts 180 are connected to the pins 168 that provide electrical connections with the flexible circuit board 170. As shown in Figs. 12B-12D, the pins 168 project transversely outward from a back side of the housing 176. The housing 176 also defines top and bottom screw openings 182 and 184 for allowing the card edge connector to be fastened to the frame 140.

[0035] Figs. 13A-13D illustrate various views of one of the rear connectors 154. As shown in 13A-13D, the rear connector 154 comprises a nine-pin D-subminiature type connector. The connector 156 includes a dielectric member 186. The pins 156 project outward from one side of the dielectric member 186, while a D-type fitting 188 projects outward from the other side of the dielectric member 186. The D-fitting 188 comprises a female fitting having a plurality of receptacles 190. However, it will be appreciated that in alternative embodiments 25 pin D-

type fittings, AT&T 110 D-type connectors, EDAC-90 connectors, EDAC-120 connectors, EDAC-56 connectors, co-axial connectors, AMP-Champ 50 pin connectors, SVHS connectors and QCP-type connectors, as well as other types of connectors, could also be used.

[0036] It will be appreciated that the modular nature of the rear interface module 28 allows the entire module 28 to be disconnected from the chassis 22 and replaced with another module (e.g., a module having a different type of rear connector). In this manner, a user can easily modify the array of rear connectors so as to accommodate different types of transmitting and receiving equipment. Thus, user flexibility for cable termination connector options is improved.

[0037] Fig. 15 illustrates an alternative rear interface module 28' adapted to be connected to the chassis 22. The interface module 28' is an eight circuit module (i.e., the module includes eight card edge connectors 32' and eight pairs of rear connectors 154'). Preferably, four of the modules 28' would be removably mounted at the back end of the card housing 24 (shown in Figs. 1 and 2). In this manner, flexibility for cable termination connector options is further enhanced by allowing selected groups of the connectors to be changed/replaced without disturbing others of the connectors. It will be appreciated that other sized modules could also be used. By way of non-limiting example, one, two, four and sixteen circuit modules could be used.

[0038] With regard to the foregoing description, it is to be understood that changes can be made in detail, especially in matters of the construction materials employed and the shape, size and arrangement of the parts without departing from the scope of the present invention. It is intended that the specification and the depicted aspects be considered exemplary only, with a true scope of the invention being indicated by the broad meaning of the following claims.

Claims

1. A jack access card (26) adapted for use with patch cords (76) having patch plugs (74), each patch plug (74) having a width W_1 and a height H_1 , the jack access card (26) comprising:

a circuit board (44) including a front end positioned opposite from a rear end;
a plurality of card edge contacts (30) positioned at the rear end of the circuit board (44);
an upper set of spring contacts (114) positioned on the circuit board (44), the upper set of spring contacts (114) including front contacts (118) positioned near the front end of the circuit board (44), the upper set of spring contacts (114) also including intermediate contacts (120) positioned generally between the front contacts (118) and the card edge contacts (30);

- a lower set of spring contacts (116) positioned on the circuit board (44), the lower set of spring contacts (116) including front contacts (118) positioned near the front of the circuit board (44), the lower set of spring contacts (116) also including intermediate contacts (120) positioned generally between the front contacts (118) and the card edge contacts (30);
 a first plurality of tracings (126, 130) that electrically connect selected ones of the intermediate contacts (120, 124) to selected ones of the card edge contacts (30);
 a second plurality of tracings (128) that electrically connect selected ones of the front contacts (118) corresponding to the upper set of spring contacts (114) with selected ones of the front contacts (122) corresponding to the lower set of spring contacts (116);
 an upper set of springs (60) adapted to selectively provide electrical connections between the front and intermediate contacts (118, 120) of the upper set of spring contacts (114);
 a lower set of springs (62) adapted to selectively provide electrical connections between the front and intermediate contacts (120, 124) of the lower set of spring contacts (62);
 a front interface piece (54) positioned at the front of the circuit board (44), the front interface piece (54) having a height H_2 that is greater than two times the height H_1 and a width W_2 that is less than two times the width W_1 ;
 the front interface piece (54) defining upper and lower patch plug ports (56, 58) that are vertically spaced along the height H_2 of the front interface piece (54), the upper and lower patch plug ports (56, 58) being centered along a plane P that extends rearwardly through the front interface piece (54);
 the upper set of springs (60) at least partially extending into the upper patch plug port (56), and the upper patch plug port (56) being sized and shaped to receive only a single one of the patch plugs (74) at a time;
 the lower set of springs (62) at least partially extending into the lower patch plug port (58), and the lower patch plug port (58) being sized and shaped to receive only a single one of the patch plugs (74) at a time; and
 the circuit board (44) being offset from the plane P.
2. The jack access card (26) of claim 1, further comprising upper and lower spring housings (64, 66) for respectively securing the upper and lower sets of springs (60, 62) to the circuit board (44).
 3. The jack access card (26) of any of the preceding claims, further comprising upper and lower resilient retaining members (90, 92) each having a pair of inwardly projecting tabs, the upper retaining member (90) being adapted for retaining one of the patch plugs (74) in the upper port, and the lower retaining member (92) being adapted for retaining one of the patch plugs (74) in the lower port (58).
 4. The jack access card (26) of any of the preceding claims, in particular claim 3, wherein the front interface piece (54) includes an upper extension (104) positioned above the upper retaining member (90), a lower extension (106) positioned below the lower retaining member (92), and an intermediate extension (108) positioned between the upper and lower retaining members (90, 92), each of the extensions (104-108) being adapted for securing the front interface piece (54) to the circuit board (44).
 5. The jack access card (26) of claim 4, wherein the extensions (104-106) are connected to the circuit board (44) by fasteners (110).
 6. The jack access card (26) of any of the preceding claims, in particular claim 5, further comprising upper and lower spring housings (64, 66) for respectively securing the upper and lower sets of springs (60, 62) to the circuit board (44), wherein the upper extension (104) engages the upper spring housing (66), the lower extension (106) engages the lower spring housing, and the intermediate extension (108) engages both the upper and lower housings (64, 66).
 7. The jack access card (26) of any of the preceding claims, in particular claim 3, wherein the upper port (56) defines an upper rectangular recess (96) positioned opposite from the upper resilient retaining member (90), and the lower port (58) defines a lower rectangular recess (96) positioned opposite from the lower resilient retaining member (92).
 8. The jack access card (26) of any of the preceding claims, wherein both the upper and lower sets of springs (60, 62) are positioned along a first side of the circuit board (44), and the card edge contacts (30) are positioned on the first side of the circuit board (44) and on an opposite second side of the circuit board (44).
 9. The jack access card (26) of any of the preceding claims, wherein the upper and lower patch plug ports (56, 58) are generally rectangular and are aligned along a vertical axis (86), the vertical axis (86) being offset from a vertical centerline (88) of the front interface piece (54).
 10. A rear interface module (28) for a high density patching system (20), the rear interface module (28) comprising:

- a frame (140) including a front end (142) positioned opposite from a rear end (144), the frame (140) also including opposing top and bottom walls (146, 148) extending between the front and rear ends (142, 144), the frame (140) further including a rear wall (150) that interconnects the top and bottom walls (146, 148), the rear wall (150) being located at the rear end (144) of the frame (140) and defining two vertically spaced-apart rows of openings (152);
 a single row of card edge (32) connectors positioned at the front end (142) of the frame (144), the card edge connectors (32) including a plurality of first pins that project toward the rear end (144) of the frame (140);
 two vertically spaced-apart rows of rear connectors (154) mounted at the rear wall (150), at least portions of the rear connectors (154) extending through the vertically spaced-apart openings (152), the rear connectors (154) including a plurality of second pins (156) that project toward the front end (142) of the frame (140); and
 a flexible circuit board (170) positioned between the top and bottom walls (146, 148) of the frame (140), the flexible circuit board (170) providing electrical connections between the first and second pins (168, 156).
- 11.** The rear interface module (28) of claim 10, wherein the flexible circuit board (170) includes a generally planar front portion (172) having electrical contacts that engage the first pins (168), a generally planar rear portion (174) having electrical contacts that engage the second pins (156), and a flexed intermediate portion (175) that curves between the front and rear portions (172, 174).
- 12.** The rear interface module (28) of the claims 10 or 11, wherein the frame (140) includes top and bottom flanges (164, 166) located at the front end (142) of the frame (140), the top flange (164) extending downward from the top wall (146) and the bottom flange (166) extending upward from the bottom wall (148), the top and bottom flanges (164, 166) defining a mounting gap.
- 13.** The rear interface module (28) of any of claims 10 to 12, in particular claim 12, wherein the card edge connectors (32) are fastened to the top and bottom flanges (164, 166), and the first pins (168) extend through the mounting gap.
- 14.** The rear interface module (28) of any of claims 10 to 13, wherein the rear connectors (154) comprise nine-pin D-subminiature type connectors.
- 15.** A high density patching system (20) adapted for use with a plurality of patch cords (76) including patch plugs (74) each having a width W_1 and a height H_1 , the patching system comprising:
- a chassis (22) including card housing (24) having a front end positioned opposite from a rear end (144), the card housing (24) including top and bottom walls (38, 40) extending between the front and rear ends, the top and bottom walls (38, 40) defining opposing sets of top and bottom slots (50, 52);
 a plurality of jack access cards (26) adapted to be mounted through the front end of the card housing (24), the jack access cards (26) including circuit boards (44) having top and bottom edges (46, 48) adapted to fit within the sets of top and bottom slots (50, 52) defined by the card housing (24), the jack access cards (26) also including a plurality of card edge contacts (30) positioned at a rear of each circuit board (44), the jack access cards (26) further including front interface pieces (54), the front interface pieces (54) having heights H_2 that are each greater than two times the height H_1 and widths W_2 that are each less than two times the width W_1 , the front interface pieces (54) each defining upper and lower patch plug ports (56, 58) that are vertically spaced along the height H_2 of each front interface piece (54), the upper and lower patch plug ports (56, 58) being sized and shaped to each receive only a single one of the patch plugs (74) at a time; and
 a rear interface module (28) positioned at the rear end of the card housing (24), the rear interface module (28) including a single row of card edge connectors adapted for providing electrical connections with the card edge contacts (30) of the jack access cards (26), the rear interface module (28) also including an array of rear connectors (154), the array of rear connectors (154) being electrically connected to the card edge connectors (32) by a flexible circuit board (170), the rear interface module (28) also including a frame (140) that spaces the card edge connectors (32) from the rear connectors (154).
- 16.** The patching system (20) of claim 15, wherein the rear connectors (154) comprise nine-pin D-subminiature type connectors.
- 17.** The patching system (20) of any of claims 15 or 16, further comprising a plurality of the rear interface modules (28) that are secured to the chassis (22) behind the card housing (24), each of the rear interface modules (28) being independently removable from the chassis (22).
- 18.** The patching system (20) of any of claims 15 to 17, wherein the card housing (24) of the chassis (22)

holds thirty two of the jack access cards (26).

19. The jack access card of any of claims 1 to 9, wherein the upper set of springs (60) being arranged to provide a connection with a patch plug (74) inserted in the upper patch plug port (56); and the lower set of springs (62) being arranged to provide a connection with a patch plug (74) inserted in the lower patch plug port (58).

Patentansprüche

1. Buchsenzugungskarte (26), die für den Gebrauch mit Steckerleitungen (76), die Steckverbinder (74) haben, ausgebildet ist, wobei jeder Steckverbinder (74) eine Breite W_1 und eine Höhe H_1 hat, wobei die Buchsenzugungskarte (26) Folgendes aufweist:
- eine Leiterplatte (44), die ein einem Hinterende gegenüber positioniertes Vorderende hat; eine Vielzahl von Kartenrandkontakten (30), die an dem Hinterende der Leiterplatte (44) positioniert sind;
- einen oberen Satz von Federkontakten (114), die an der Leiterplatte (44) positioniert sind, wobei der obere Satz von Federkontakten (114) Frontkontakte (118) beinhaltet, die nahe dem Vorderende der Leiterplatte (44) positioniert sind, wobei der obere Satz von Federkontakten (114) ferner Zwischenkontakte (120) aufweist, die allgemein zwischen den Frontkontakten (118) und den Kartenrandkontakten (30) positioniert sind;
- einen unteren Satz von Federkontakten (116), die an der Leiterplatte (44) positioniert sind, wobei der untere Satz von Federkontakten (116) Frontkontakte (122) aufweist, die nahe der Vorderseite der Leiterplatte (44) positioniert sind, wobei der untere Satz von Federkontakten (116) ferner Zwischenkontakte (124) aufweist, die allgemein zwischen den Frontkontakten (122) und den Kartenrandkontakten (30) positioniert sind; eine erste Vielzahl von Leiterbahnen (126, 130), die ausgewählte der Zwischenkontakte (120, 124) mit ausgewählten der Kartenrandkontakte (30) elektrisch verbinden;
- eine zweite Vielzahl von Leiterbahnen (128), die ausgewählte der Frontkontakte (118), die dem oberen Satz von Federkontakten (114) entsprechen, mit ausgewählten der Frontkontakte (122), die dem unteren Satz von Federkontakten (116) entsprechen, elektrisch verbinden;
- einen oberen Satz von Federn (60), die ausgebildet sind, um selektiv elektrische Verbindungen zwischen den Front- und den Zwischenkontakten (118, 120) des oberen Satzes von Federkontakten (114) herzustellen;

einen unteren Satz von Federn (62), die ausgebildet sind, um selektiv elektrische Verbindungen zwischen den Front- und den Zwischenkontakten (120, 124) des unteren Satzes von Federkontakten (62) herzustellen;

ein vorderes Schnittstellenteil (54), das an der Vorderseite der Leiterplatte (44) positioniert ist, wobei das vordere Schnittstellenteil (54) eine Höhe H_2 hat, die größer als das Zweifache der Höhe H_1 ist, und eine Breite W_2 hat, die kleiner als das Zweifache der Breite W_1 ist;

wobei das vordere Schnittstellenteil (54) obere und untere Steckverbinderports (56, 58) definiert, die entlang der Höhe H_2 des vorderen Schnittstellenteils (54) vertikal beabstandet sind, wobei die oberen und unteren Steckverbinderports (56, 58) entlang einer Ebene P, die sich durch das vordere Schnittstellenteil (54) hindurch rückwärts erstreckt, zentriert sind;

wobei sich der obere Satz von Federn (60) mindestens teilweise in den oberen Steckverbinderport (56) erstreckt und der obere Steckverbinderport (56) so bemessen und geformt ist, dass er jeweils nur einen einzigen der Steckverbinder (74) aufnimmt;

wobei sich der untere Satz von Federn (62) mindestens teilweise in den unteren Steckverbinderport (58) erstreckt und der untere Steckverbinderport (58) so bemessen und geformt ist, dass er jeweils nur einen einzigen der Steckverbinder (74) aufnimmt; und

wobei die Leiterplatte (44) von der Ebene P versetzt ist.

2. Buchsenzugungskarte (26) nach Anspruch 1, die ferner ein oberes und ein unteres Federgehäuse (64, 66) zum jeweiligen Sichern des oberen und des unteren Satzes von Federn (60, 62) an der Leiterplatte (44) aufweist.
3. Buchsenzugungskarte (26) nach einem der vorhergehenden Ansprüche, die ferner ein oberes und ein unteres federndes Halteelement (90, 92) aufweist, die jeweils ein Paar von nach innen vorstehenden Nasen haben, wobei das obere Halteelement (90) zum Halten einer der Steckverbinder (74) in dem oberen Port ausgebildet ist und das untere Halteelement (92) zum Halten einer der Steckverbinder (74) in dem unteren Port (58) ausgebildet ist.
4. Buchsenzugungskarte (26) nach einem der vorhergehenden Ansprüche, insbesondere nach Anspruch 3, wobei das vordere Schnittstellenteil (54) aufweist:

einen oberen Fortsatz (104), der über dem oberen Halteelement (90) positioniert ist, einen unteren Fortsatz (106), der unter dem unteren Halteelement (92) positioniert ist, und einen Zwi-

- schenfortsatz (108), der zwischen dem oberen und dem unteren Halteelement (90, 92) positioniert ist, wobei jeder der Fortsätze (104-108) zum Sichern des vorderen Schnittstellenteils (54) an der Leiterplatte (44) ausgebildet ist. 5
5. Buchsenzugungskarte (26) nach Anspruch 4, wobei die Ansätze (104-106) mit der Leiterplatte (44) durch Befestigungselemente (110) verbunden sind. 10
6. Buchsenzugungskarte (26) nach einem der vorhergehenden Ansprüche, insbesondere Anspruch 5, die ferner ein oberes und ein unteres Federgehäuse (64, 66) zum jeweiligen Sichern des oberen und des unteren Satzes von Federn (60, 62) an der Leiterplatte (44) aufweist, wobei der obere Fortsatz (104) mit dem oberen Federgehäuse (66) in Eingriff ist, der untere Fortsatz (106) mit dem unteren Federgehäuse in Eingriff ist und der Zwischenfortsatz (108) sowohl mit dem oberen als auch dem unteren Gehäuse (64, 66) in Eingriff ist. 15 20
7. Buchsenzugungskarte (26) nach einem der vorhergehenden Ansprüche, insbesondere Anspruch 3, wobei der obere Port (56) eine obere rechteckige Ausnehmung (96) definiert, die dem oberen federn- den Halteelement (90) gegenüber positioniert ist, und der untere Port (58) eine untere rechteckige Ausnehmung (96) definiert, die dem unteren federn- den Halteelement (92) gegenüber positioniert ist. 25 30
8. Buchsenzugungskarte (26) nach einem der vorhergehenden Ansprüche, wobei sowohl der obere als auch der untere Satz von Federn (60, 62) entlang einer ersten Seite der Leiterplatte (44) positioniert sind und die Kartenrandkontakte (30) an der ersten Seite der Leiterplatte (44) und an einer gegenüber- liegenden zweiten Seite der Leiterplatte (44) positioniert sind. 35 40
9. Buchsenzugungskarte (26) nach einem der vorhergehenden Ansprüche, wobei die oberen und unteren Steckverbinderports (56, 58) allgemein rechteckig und entlang einer Vertikalachse (86) ausgefluchtet sind, wobei die Vertikalachse (86) von einer vertikalen Mittellinie (88) des vorderen Schnittstellenteils (54) versetzt ist. 45
10. Hinteres Schnittstellenmodul (28) für ein Hochdichte-Stecksystem (20), wobei das hintere Schnittstellenmodul (28) Folgendes aufweist: 50
- einen Rahmen (140), der ein Vorderende (142) aufweist, das einem Hinterende (144) gegenüber positioniert ist, wobei der Rahmen (140) ferner eine obere und eine untere Wand (146, 148) aufweist, die einander gegenüberliegen und sich zwischen dem Vorder- und dem Hin- 55
- terende (142, 144) erstrecken, wobei der Rahmen (140) ferner eine Rückwand (150) aufweist, welche die obere und die untere Wand (146, 148) miteinander verbindet, wobei die Rückwand (150) an dem Hinterende (144) des Rahmens (140) angeordnet ist und zwei vertikal voneinander beabstandete Reihen von Öffnungen (152) definiert; eine einzige Reihe von Kartenrandverbindern (32), die an dem Vorderende (142) des Rahmens (144) positioniert sind, wobei die Kartenrandverbinder (32) eine Vielzahl von ersten Stiften aufweisen, die zum Hinterende (144) des Rahmens (140) hin vorstehen; zwei vertikal voneinander beabstandete Reihen von hinteren Verbindern (154), die an der Rückwand (150) angebracht sind, wobei sich mindestens Bereiche der hinteren Verbinder (154) durch die vertikal voneinander beabstandeten Öffnungen (152) hindurch erstrecken und die hinteren Verbinder (154) eine Vielzahl von zweiten Stiften (156) aufweisen, die zum Vorderende (142) des Rahmens (140) hin vorstehen; und eine flexible Leiterplatte (170), die zwischen der oberen und der unteren Wand (146, 148) des Rahmens (140) positioniert ist, wobei die flexible Leiterplatte (170) elektrische Verbindungen zwischen den ersten und zweiten Stiften (168, 156) herstellt.
11. Hinteres Schnittstellenmodul (28) nach Anspruch 10, wobei die flexible Leiterplatte (170) aufweist: einen allgemein planaren vorderen Bereich (172), der elektrische Kontakte hat, die mit den ersten Stiften (168) in Eingriff sind, einen allgemein planaren hinteren Bereich (174), der elektrische Kontakte hat, die mit den zweiten Stiften (156) in Eingriff sind, und einen gebogenen Zwischenbereich (175), der zwischen dem vorderen und dem hinteren Bereich (172, 174) gekrümmt ist.
12. Hinteres Schnittstellenmodul (28) nach Anspruch 10 oder 11, wobei der Rahmen (140) einen oberen und einen unteren Flansch (164, 166) aufweist, die an dem Vorderende (142) des Rahmens (140) angeordnet sind, wobei sich der obere Flansch (164) von der oberen Wand (146) nach unten erstreckt und sich der untere Flansch (166) von der unteren Wand (148) nach oben erstreckt und der obere und der untere Flansch (164, 166) einen Montagezwischenraum definieren.
13. Hinteres Schnittstellenmodul (28) nach einem der Ansprüche 10 bis 12, insbesondere nach Anspruch 12, wobei die Kartenrandverbinder (32) an dem oberen und dem unteren Flansch (164, 166) befestigt sind und die ersten Stifte (168) sich durch den Montagezwischenraum hindurch erstrecken.

14. Hinteres Schnittstellenmodul (28) nach einem der Ansprüche 10 bis 13, wobei die hinteren Verbinder (154) neunpolige Verbinder von D-Subminiaturtyp aufweisen.

15. Hochdichte-Stecksystem (20), das zum Gebrauch mit einer Vielzahl von Steckerleitungen (76) ausgebildet ist, die Steckverbinder (74) aufweisen, die jeweils eine Breite W_1 und eine Höhe H_1 haben, wobei das Stecksystem Folgendes aufweist:

ein Chassis (22), das ein Kartengehäuse (24) aufweist, das ein Vorderende hat, das einem Hinterende (144) gegenüber positioniert ist, wobei das Kartengehäuse (24) eine obere und eine untere Wand (38, 40) aufweist, die sich zwischen dem Vorder- und dem Hinterende erstrecken, wobei die obere und die untere Wand (38, 40) einander gegenüberliegende Sätze von oberen und unteren Schlitzten (50, 52) definieren;

eine Vielzahl von Buchsenzugangskarten (26), die ausgebildet sind, um durch das Vorderende des Kartengehäuses (24) hindurch angebracht zu werden, wobei die Buchsenzugangskarten (26) Leiterplatten (44) aufweisen, die obere und untere Ränder (46, 48) haben, die ausgebildet sind, um in die Sätze von oberen und unteren Schlitzten (50, 52), die von dem Kartengehäuse (24) definiert sind, zu passen, wobei die Buchsenzugangskarten (26) ferner eine Vielzahl von Kartenrandkontakten (30) aufweisen, die an einer Rückseite jeder Leiterplatte (44) positioniert sind, wobei die Buchsenzugangskarten (26) ferner vordere Schnittstellenteile (54) aufweisen, wobei die vorderen Schnittstellenteile (54) eine Höhe H_2 haben, die jeweils größer als das Zweifache der Höhe H_1 ist, und eine Breite W_2 haben, die jeweils kleiner als das Zweifache der Breite W_1 ist, wobei die vorderen Schnittstellenteile (54) jeweils obere und untere Steckverbinderports (56, 58) definieren, die entlang der Höhe H_2 jedes vorderen Schnittstellenteils (54) vertikal beabstandet sind, wobei die oberen und unteren Schaltsteckerports (56, 58) so bemessen und geformt sind, dass jeder jeweils nur einen einzigen der Steckverbinder (74) aufnimmt; und ein hinteres Schnittstellenmodul (28), das an dem Hinterende des Kartengehäuses (24) positioniert ist, wobei das hintere Schnittstellenmodul (28) eine einzige Reihe von Kartenrandverbindern aufweist, die zum Herstellen von elektrischen Verbindungen mit den Kartenrandkontakten (30) der Buchsenzugangskarten (26) ausgebildet sind, wobei das hintere Schnittstellenmodul (28) ferner ein Array von hinteren Verbindern (154) aufweist, wobei das Array von hinteren Verbindern (154) mit den Kartenrandver-

bindern (32) durch eine flexible Leiterplatte (170) elektrisch verbunden ist, wobei das hintere Schnittstellenmodul (28) ferner einen Rahmen (140) aufweist, der die Kartenrandverbinder (32) von den hinteren Verbindern (154) im Abstand hält.

16. Stecksystem (20) nach Anspruch 15, wobei die hinteren Verbinder (154) neunpolige Verbinder vom D-Subminiaturtyp aufweisen.

17. Stecksystem (20) nach einem der Ansprüche 15 oder 16, das ferner eine Vielzahl von hinteren Schnittstellenmodulen (28) aufweist, die an dem Chassis (22) hinter dem Kartengehäuse (24) befestigt sind, wobei jedes der hinteren Schnittstellenmodule (28) einzeln von dem Chassis (22) entfernbar ist.

18. Stecksystem (20) nach einem der Ansprüche 15 bis 17, wobei das Kartengehäuse (24) des Chassis (22) zweiunddreißig Buchsenzugangskarten (26) hält.

19. Stecksystem (20) nach einem der Ansprüche 1 bis 9, wobei der obere Satz von Federn (60) so angeordnet ist, dass er eine Verbindung mit einem in den oberen Steckverbinderport (56) eingesetzten Steckverbinder (74) herstellt; und wobei der untere Satz von Federn (62) so angeordnet ist, dass er eine Verbindung mit einem in den unteren Steckverbinderport (58) eingesetzten Steckverbinder (74) herstellt.

Revendications

1. Carte d'accès à des prises (26) conçue pour une utilisation avec des cordons de connexion (76) comportant des fiches de connexion (74), chaque fiche de connexion (74) présentant une largeur W_1 et une hauteur H_1 , la carte d'accès à des prises (26) comprenant :

une carte à circuit imprimé (44) incluant une extrémité avant positionnée à l'opposé de l'extrémité arrière,

une pluralité de contacts de bord de carte (30), positionnés à l'extrémité arrière de la carte à circuit imprimé (44),

un jeu supérieur de contacts à ressort (114) positionné sur la carte à circuit imprimé (44), le jeu supérieur de contacts à ressort (114) incluant des contacts avant (118) positionnés à proximité de l'extrémité avant de la carte à circuit imprimé (44), le jeu supérieur de contacts à ressort (114) incluant également des contacts intermédiaires (120), positionnés généralement entre les contacts avant (118) et les contacts de bord de carte

(30),
 un jeu inférieur de contacts à ressort (116), positionné sur la carte à circuit imprimé (44), le jeu inférieur de contacts à ressort (116) incluant des contacts avant (118) positionnés à proximité de l'avant de la carte à circuit imprimé (44), le jeu inférieur de contacts à ressort (116) incluant également des contacts intermédiaires (120) positionnés généralement entre les contacts avant (118) et les contacts de bord de carte (30), une première pluralité de pistes (126, 130) qui relie électriquement des contacts sélectionnés parmi les contacts intermédiaires (120, 124) à des contacts sélectionnés parmi les contacts de bord de carte (30),
 une seconde pluralité de pistes (128) qui relie électriquement des contacts sélectionnés parmi les contacts avant (118) correspondant au jeu supérieur de contacts à ressort (114) à des contacts sélectionnés parmi les contacts avant (122) correspondant au jeu inférieur des contacts à ressort (116),
 un jeu supérieur de ressorts (60), conçu pour fournir sélectivement des liaisons électriques entre les contacts avant et les contacts intermédiaires (118, 120) du jeu supérieur de contacts à ressort (114),
 un jeu inférieur de ressorts (62), conçu pour établir sélectivement des liaisons électriques entre les contacts avant et les contacts intermédiaires (120, 124) du jeu inférieur de contacts à ressort (62),
 une pièce interface avant (54), positionnée à l'avant de la carte à circuit imprimé (44), la pièce interface avant (54) présentant une hauteur H_2 qui est supérieure à deux fois la hauteur H_1 et une largeur W_2 qui est inférieure à deux fois la largeur W_1 ,
 la pièce interface avant (54) définissant des ports de fiches de connexion supérieur et inférieur (56, 58) qui sont espacés verticalement le long de la hauteur H_2 de la pièce interface avant (54), les ports supérieur et inférieur de fiches de connexion (56, 58) étant centrés le long d'un plan P qui s'étend vers l'arrière au travers de la pièce interface avant (54),
 le jeu supérieur de ressorts (60) s'étendant au moins partiellement dans le port supérieur de fiches de connexion (56) et le port supérieur de fiches de connexion (56) étant dimensionné et formé pour ne recevoir qu'une seule des fiches de connexion (74) à la fois,
 le jeu inférieur de ressorts (62) s'étendant au moins partiellement dans le port inférieur de fiches de connexion (58) et le port inférieur de fiches de connexion (58) étant dimensionné et formé pour ne recevoir qu'une seule des fiches de connexion (74) à la fois, et

la carte à circuit imprimé (44) décalée du plan P.

2. Carte d'accès à des prises (26) selon la revendication 1, comprenant en outre des logements supérieur et inférieur de ressorts (64, 66) permettant respectivement de fixer les jeux supérieur et inférieur de ressorts (60, 62) à la carte à circuit imprimé (44).
3. Carte d'accès à des prises (26) selon l'une quelconque des revendications précédentes, comprenant en outre des éléments élastiques supérieur et inférieur d'arrêt (90, 92) comportant chacun une paire de pattes dépassant vers l'intérieur, l'élément supérieur d'arrêt (90) étant conçu pour retenir l'une des fils de connexion (74) dans le port supérieur et l'élément inférieur d'arrêt (92) étant conçu pour retenir l'une des fiches de connexion (74) dans le port inférieur (58).
4. Carte d'accès à des prises (26) selon l'une quelconque des revendications précédentes, en particulier la revendication 3, dans laquelle la pièce interface avant (54) inclut une extension supérieure (104) positionnée au-dessus de l'élément supérieur d'arrêt (90), une extension inférieure (106) positionnée en dessous de l'élément inférieur d'arrêt (92) et une extension intermédiaire (108) positionnée entre les éléments supérieur et inférieur d'arrêt (90, 92), chacune des extensions (104 à 108) étant conçue pour fixer la pièce d'interface avant (54) à la carte à circuit imprimé (44).
5. Carte d'accès à des prises (26) selon la revendication 4, dans laquelle les extensions (104 à 106) sont reliées à la carte à circuit imprimé (44) par des attaches (110).
6. Carte d'accès à des prises (26) selon l'une quelconque des revendications précédentes, en particulier la revendication 5, comprenant en outre des logements supérieur et inférieur de ressorts (64, 66) destinés à fixer respectivement les jeux supérieur et inférieur de ressorts (60, 62) à la carte à circuit imprimé (44), dans laquelle l'extension supérieure (104) se met en prise avec le logement supérieur de ressort (66), l'extension inférieure (106) se met en prise avec le logement inférieur de ressort et l'extension intermédiaire (108) se met en prise avec à la fois les logements supérieur et inférieur (64, 66).
7. Carte d'accès à des prises (26) selon l'une quelconque des revendications précédentes, en particulier la revendication 3, dans laquelle le port supérieur (56) définit un évidement angulaire supérieur (96) positionné en face de l'élément d'arrêt élastique supérieur (90) et dans laquelle le port inférieur (58) définit un évidement rectangulaire inférieur (96) positionné en face de l'élément d'arrêt élastique infé-

rieur (92).

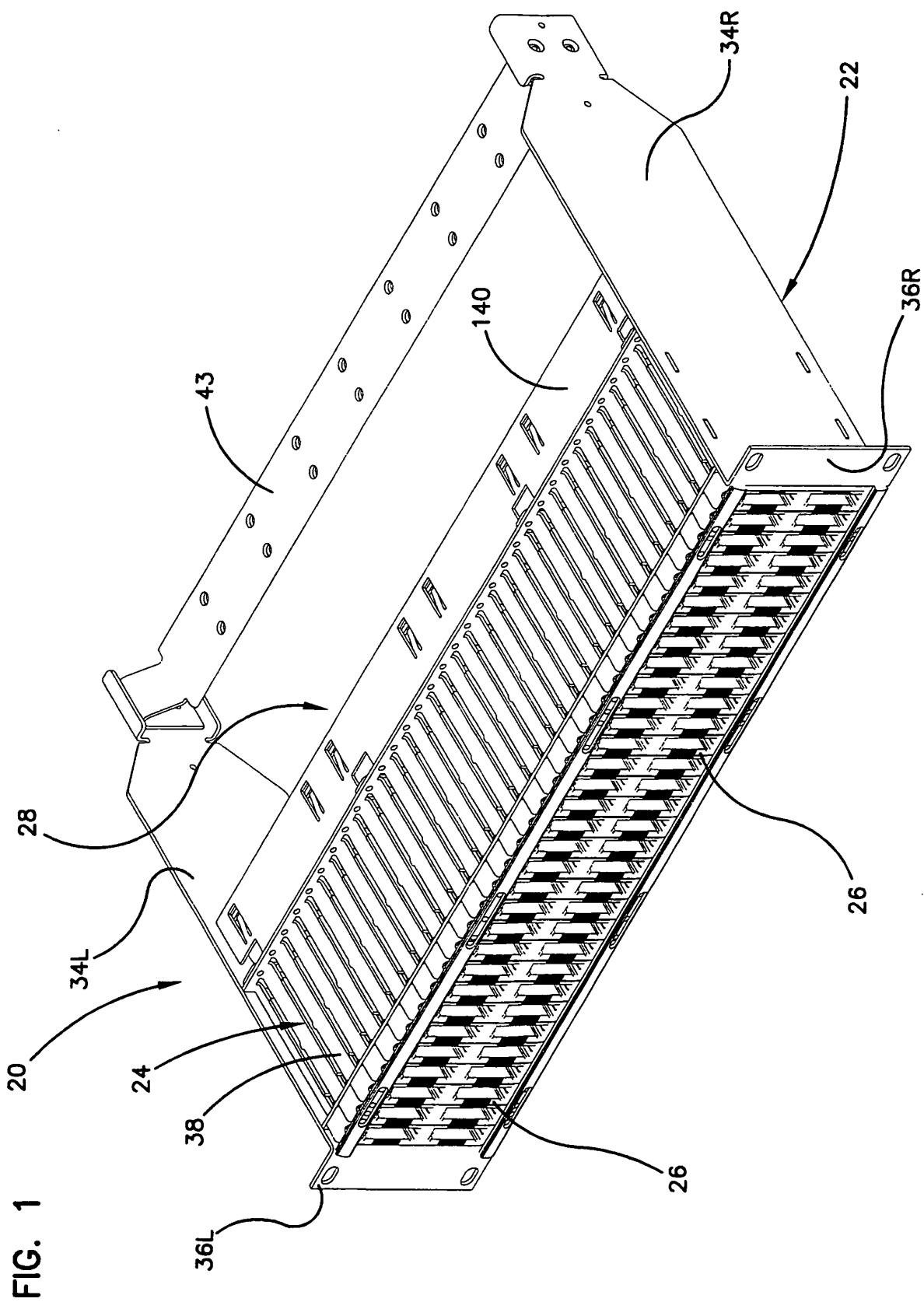
8. Carte d'accès à des prises (26) selon l'une quelconque des revendications précédentes, dans laquelle à la fois les jeux supérieur et inférieur de ressorts (60, 62) sont positionnés le long d'un premier côté de la carte à circuit imprimé (44), et dans laquelle les contacts de bord de carte (30) sont positionnés sur le premier côté de la carte à circuit imprimé (44) et sur un second côté opposé de la carte à circuit imprimé (44). 5 10
9. Carte d'accès à des prises (26) selon l'une quelconque des revendications précédentes, dans laquelle les ports supérieur et inférieur de fiches de connexion (56, 58) sont généralement rectangulaires et sont alignés le long d'un axe vertical (86), l'axe vertical (86) étant décalé par rapport à une droite centrale verticale (88) de la pièce d'interface avant (54) 15 20
10. Module interface arrière (28) destiné à un système de connexion de haute densité (20), le module interface arrière (28) comprenant :
 - un châssis (140) incluant une extrémité avant (142), positionnée à l'opposé d'une extrémité arrière (144), le châssis (140) incluant également des parois supérieure et inférieure se faisant face (146, 148) s'étendant entre les extrémités avant et arrière (142, 144), le châssis (140) incluant en outre une paroi arrière (150) qui relie les parois supérieure et inférieure (146, 148), la paroi arrière (150) étant située à l'extrémité arrière (144) du châssis (140) et définissant deux rangées verticalement espacées d'ouvertures (152), 25 30
 - une rangée unique de connecteurs de bord de carte (32) étant positionnée à l'extrémité avant (142) du châssis (144), les connecteurs de bord de carte (32) incluant une pluralité de premières broches qui dépasse vers l'extrémité arrière (144) du châssis (140), 35 40
 - deux rangées verticalement espacées de connecteurs arrière (154) montées au niveau de la paroi arrière (150), des parties des connecteurs arrière (154) s'étendant au moins au travers des ouvertures verticalement espacées (152), les connecteurs arrière (154) incluant une pluralité de secondes broches (156) qui dépasse vers l'extrémité avant (142) du châssis (140), et 45 50
 - une carte à circuit imprimé souple (170), positionnée entre les parois supérieure et inférieure (146, 148) du châssis (140), la carte à circuit imprimé souple (170) établissant des connexions électriques entre les premières et secondes broches (168, 156). 55

11. Module interface arrière (28) selon la revendication

10, dans lequel la carte à circuit imprimé souple (170) inclut une partie avant généralement plane (172) possédant des contacts électriques qui viennent en contact avec les premières broches (168), une partie arrière généralement plane (174) possédant des contacts électriques qui viennent en contact avec les secondes broches (156) et une partie intermédiaire souple (175) qui se plie entre les parties avant et arrière (172, 174).

12. Module interface arrière (28) selon les revendications 10 ou 11, dans lequel le châssis (140) inclut des brides supérieure et inférieure (164, 166) situées à l'extrémité avant (142) du châssis (140), la bride supérieure (164) s'étendant vers le bas depuis la paroi supérieure (146) et la bride inférieure (166) s'étendant vers le haut depuis la paroi inférieure (148), les brides supérieure et inférieure (164, 166) définissant un intervalle de montage.
13. Module interface arrière (28) selon l'une quelconque des revendications 10 à 12, en particulier la revendication 12, dans lequel les connecteurs de bord de carte (32) sont fixés sur les brides supérieure et inférieure (164, 166), et dans lequel les premières broches (168) s'étendent au travers de l'intervalle de montage.
14. Module interface arrière (28) selon l'une quelconque des revendications 10 à 13, dans lequel les connecteurs arrière (154) comprennent des connecteurs de type D subminiatures à neuf broches.
15. Système de connexion à haute densité (20) conçu pour une utilisation avec une pluralité de cordons de connexion (76) incluant des fiches de connexion (74) possédant chacune une largeur W_1 et une hauteur H_1 , le système de connexion comprenant :
 - un châssis (22) incluant des logements de cartes (24) possédant une extrémité avant positionnée en face d'une extrémité arrière (144), le logement de cartes (24) incluant des parois supérieure et inférieure (38, 40) s'étendant entre les extrémités avant et arrière, les parois supérieure et inférieure (38, 40) définissant des ensembles se faisant face d'encoches supérieures et inférieures (50, 52),
 - une pluralité de cartes d'accès à des prises (26) conçues pour être montées par l'intermédiaire de l'extrémité avant du logement de cartes (24), les cartes d'accès à des prises (26) incluant des cartes à circuit imprimé (44) possédant des bords supérieur et inférieur (46, 48) conçus pour s'adapter à l'intérieur des ensembles d'encoches supérieures et inférieures (50, 52) définies par le logement de cartes (24), les cartes d'accès à des prises (26) incluant également une

- pluralité de contacts de bord de carte (30) positionnés à l'arrière de chaque carte à circuit imprimé (44), les cartes d'accès à des prises (26) incluant en outre des pièces d'interface avant (54), les pièces d'interface avant (54) présentant des hauteurs H_2 qui sont chacune supérieure à deux fois la hauteur H_1 et des largeurs W_2 qui sont chacune plus petite que deux fois la largeur W_1 , les pièces d'interface avant (54) définissant chacune des ports supérieur et inférieur de fiches de connexion (56, 58) qui sont espacées verticalement le long de la hauteur H_2 de chaque pièce d'interface avant (54), les ports supérieur et inférieur de fiches de connexion (56, 58) étant dimensionnés et formés pour ne recevoir chacun qu'une seule fiche parmi les fiches de connexion (74) à la fois, et
- un module interface arrière (28) positionné à l'extrémité arrière du logement de carte (24), le module interface arrière (28) incluant une rangée unique de connecteurs de bord de carte conçus pour établir des connexions électriques avec les contacts de bord de carte (30) des cartes d'accès à des prises (26), le module interface arrière (28) incluant également un réseau de connecteurs arrières (154), le réseau de connecteurs arrières (154) étant connecté électriquement aux connecteurs de bord de carte (32) grâce à une carte à circuit imprimé souple (170), le module interface arrière (28) incluant également un châssis (140) qui espace les connecteurs de bord de carte (32) des connecteurs arrières (154).
16. Système de connexion (20) selon la revendication 15, dans lequel les connecteurs arrières (154) comprennent des connecteurs de type D subminiatures à neuf broches.
17. Système de connexion (20) selon l'une quelconque des revendications 15 ou 16, comprenant en outre une pluralité de modules interfaces arrière (28) qui sont fixés sur le châssis (22) derrière le logement de cartes (24), chacun des modules interfaces arrière (28) pouvant être démonté indépendamment du châssis (22).
18. Système de connexion (20) selon l'une quelconque des revendications 15 à 17, dans lequel le logement de cartes (24) du châssis (22) maintient trente-deux des cartes d'accès à des prises (26).
19. Carte d'accès à des prises selon l'une quelconque des revendications 1 à 9, dans laquelle le jeu supérieur de ressorts (60) est agencé pour fournir une connexion avec une fiche de connexion (74) insérée dans le port supérieur de fiches de connexion (56), et le jeu inférieur de ressorts (62) est agencé pour établir une connexion avec une fiche de connexion (74) insérée dans le port inférieur de fiches de connexion (58).



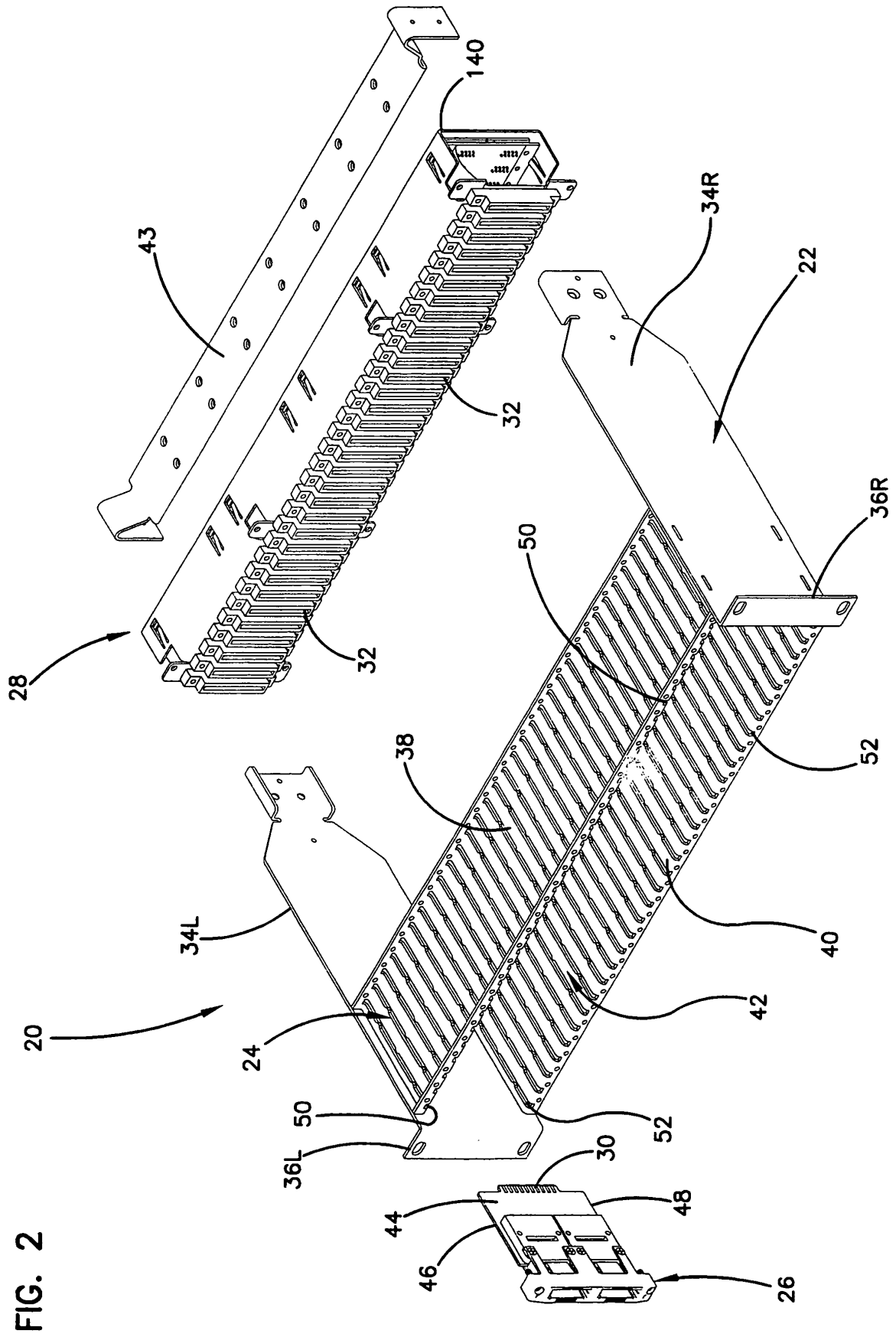


FIG. 3

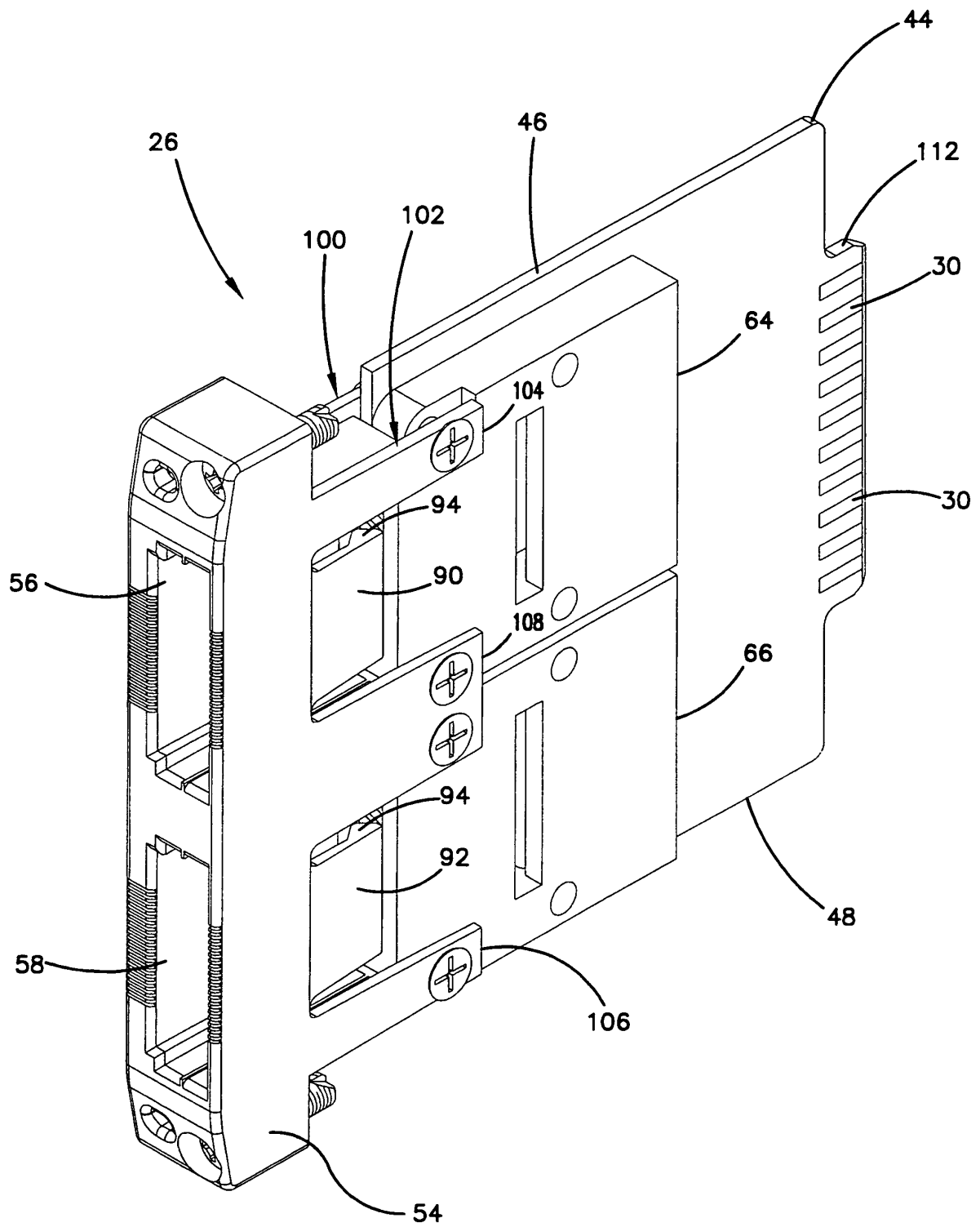


FIG. 4

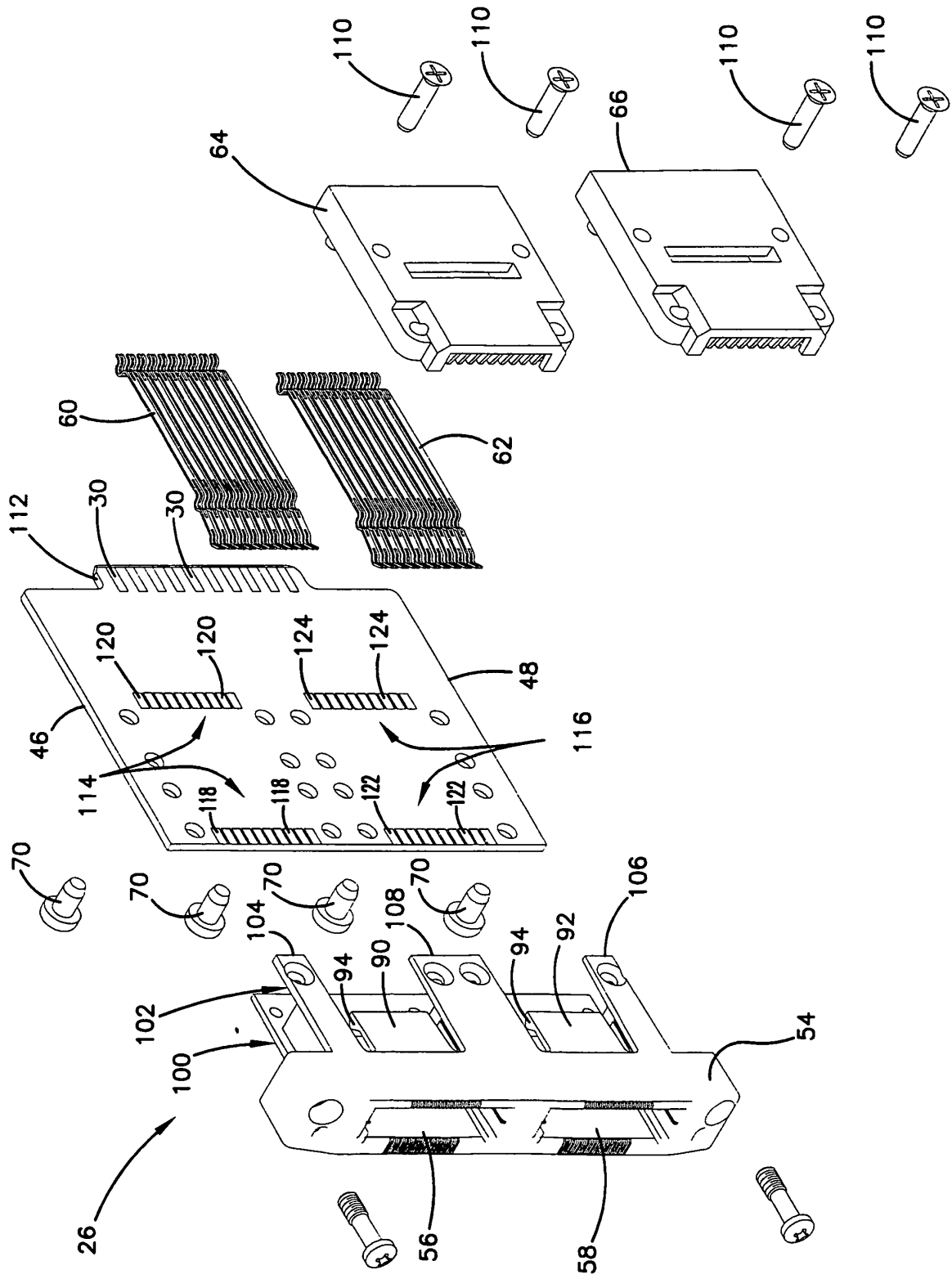
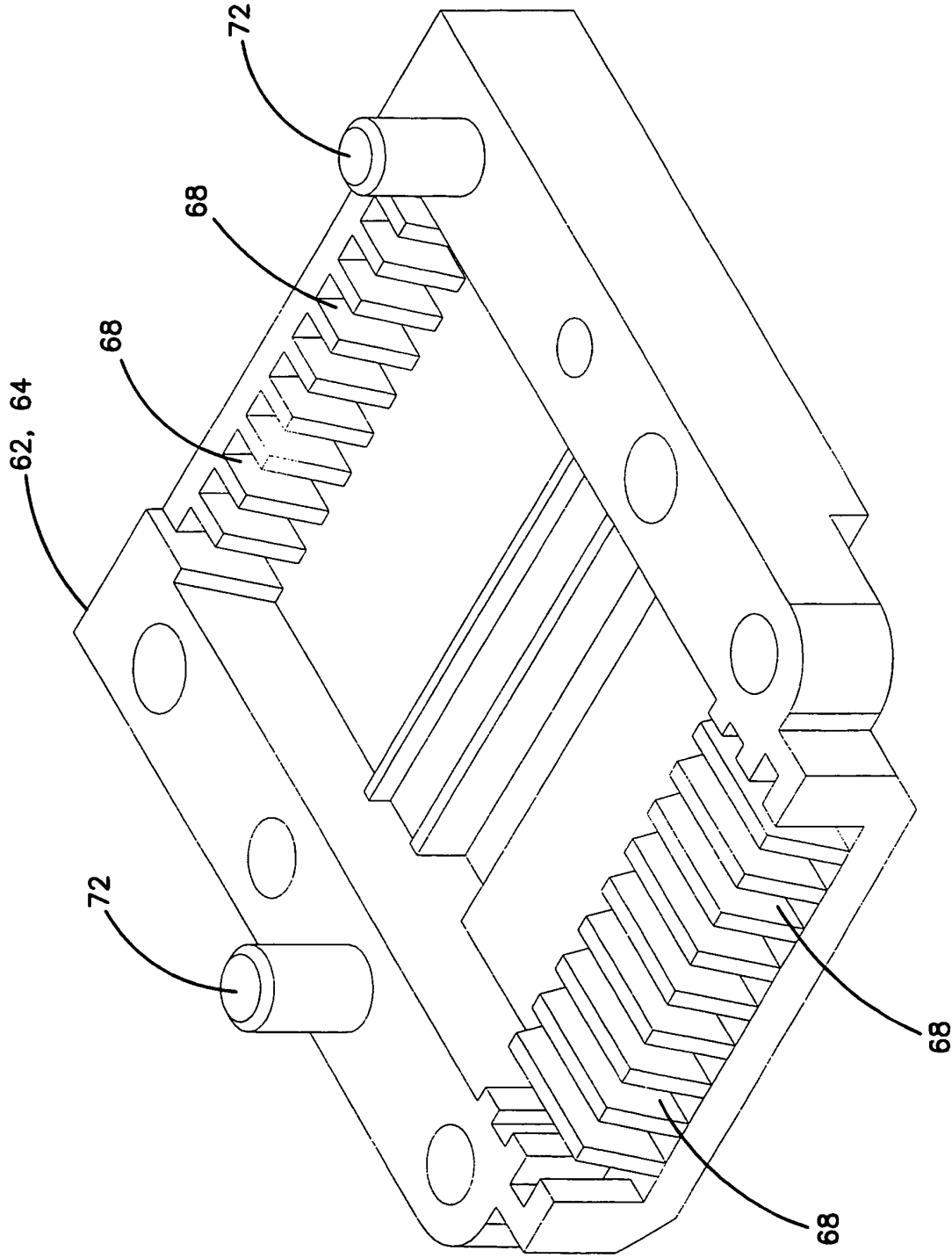
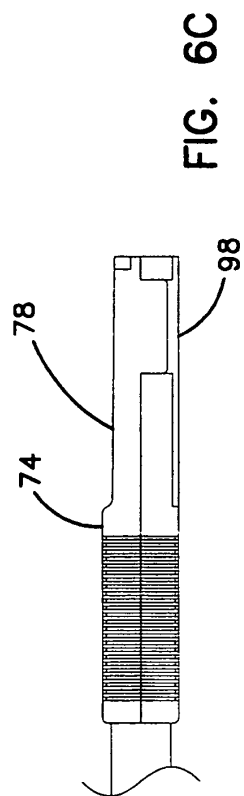
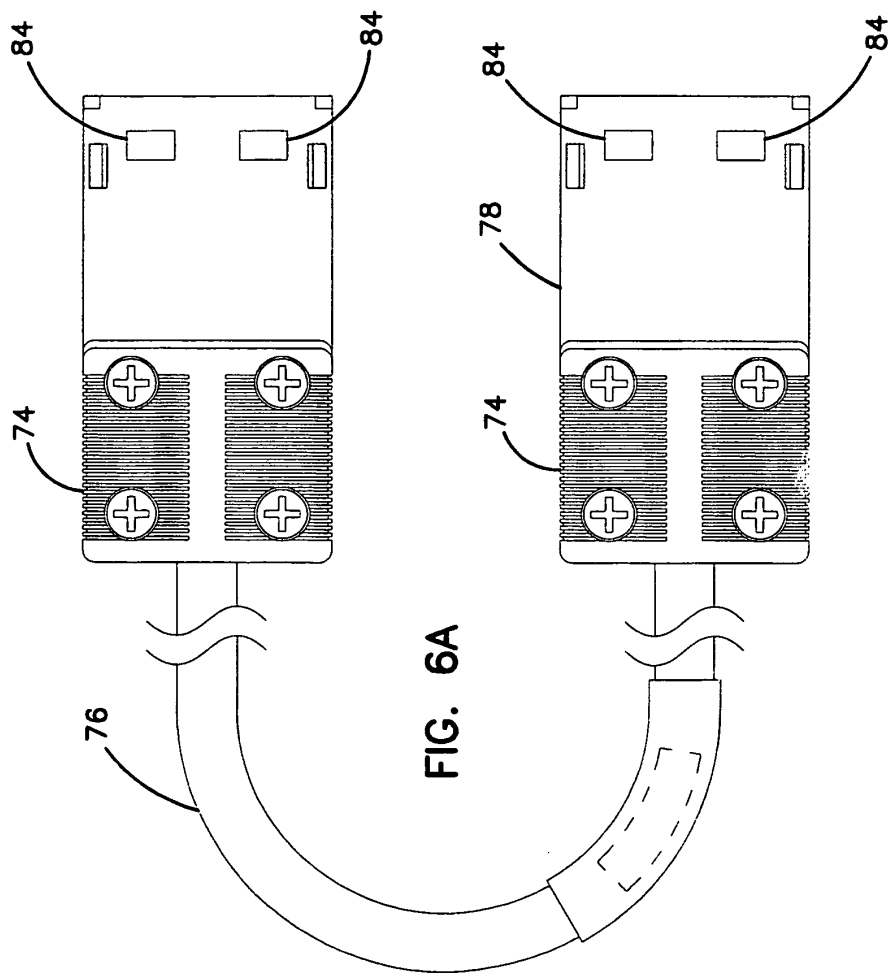
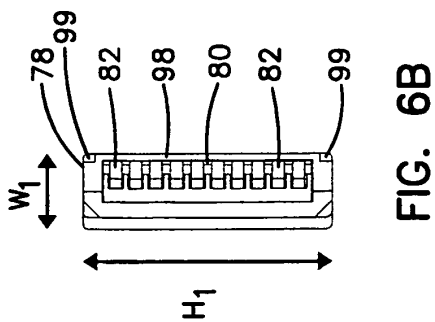


FIG. 5





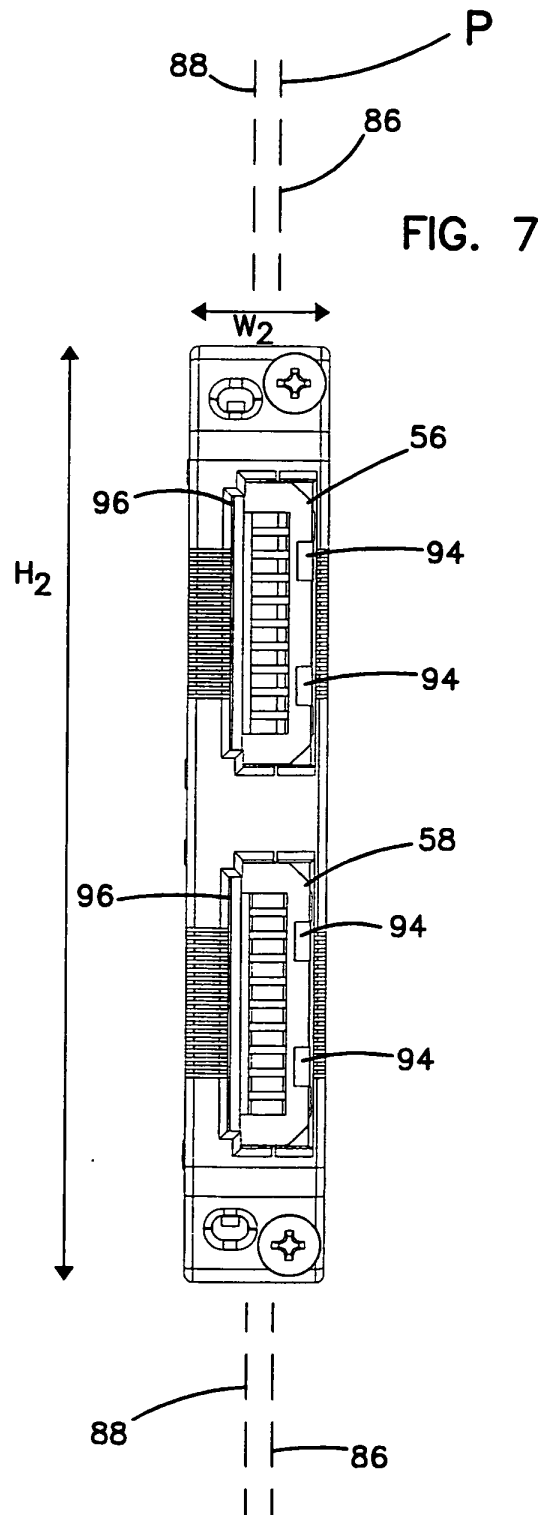
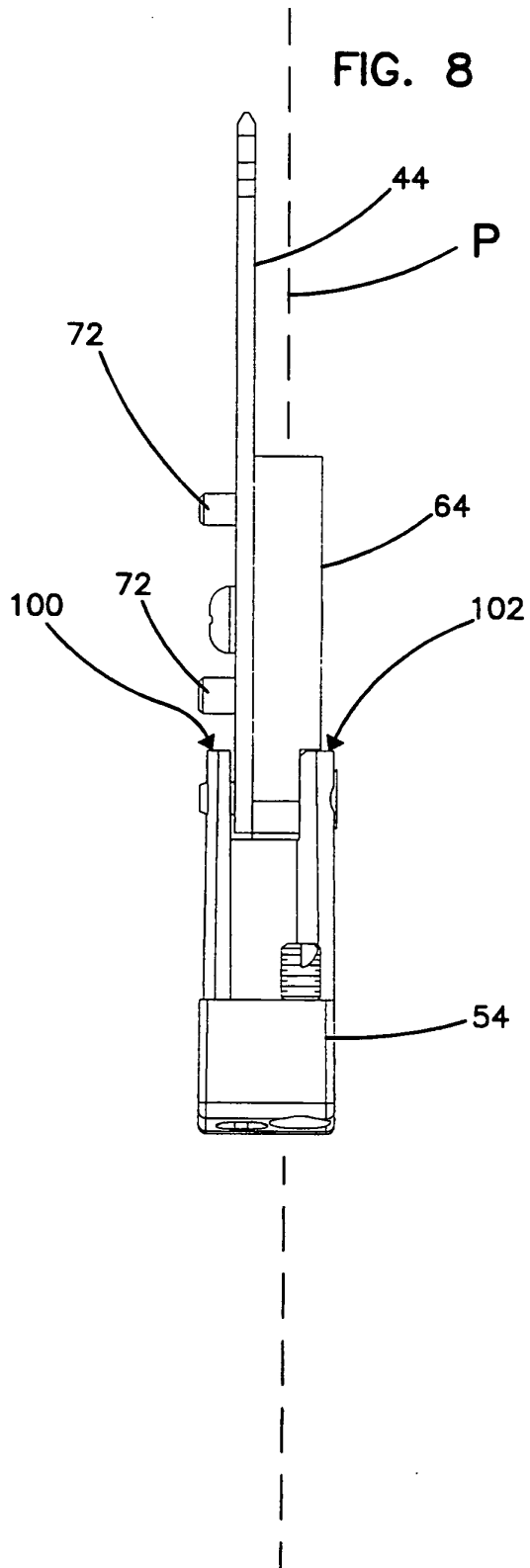


FIG. 9A

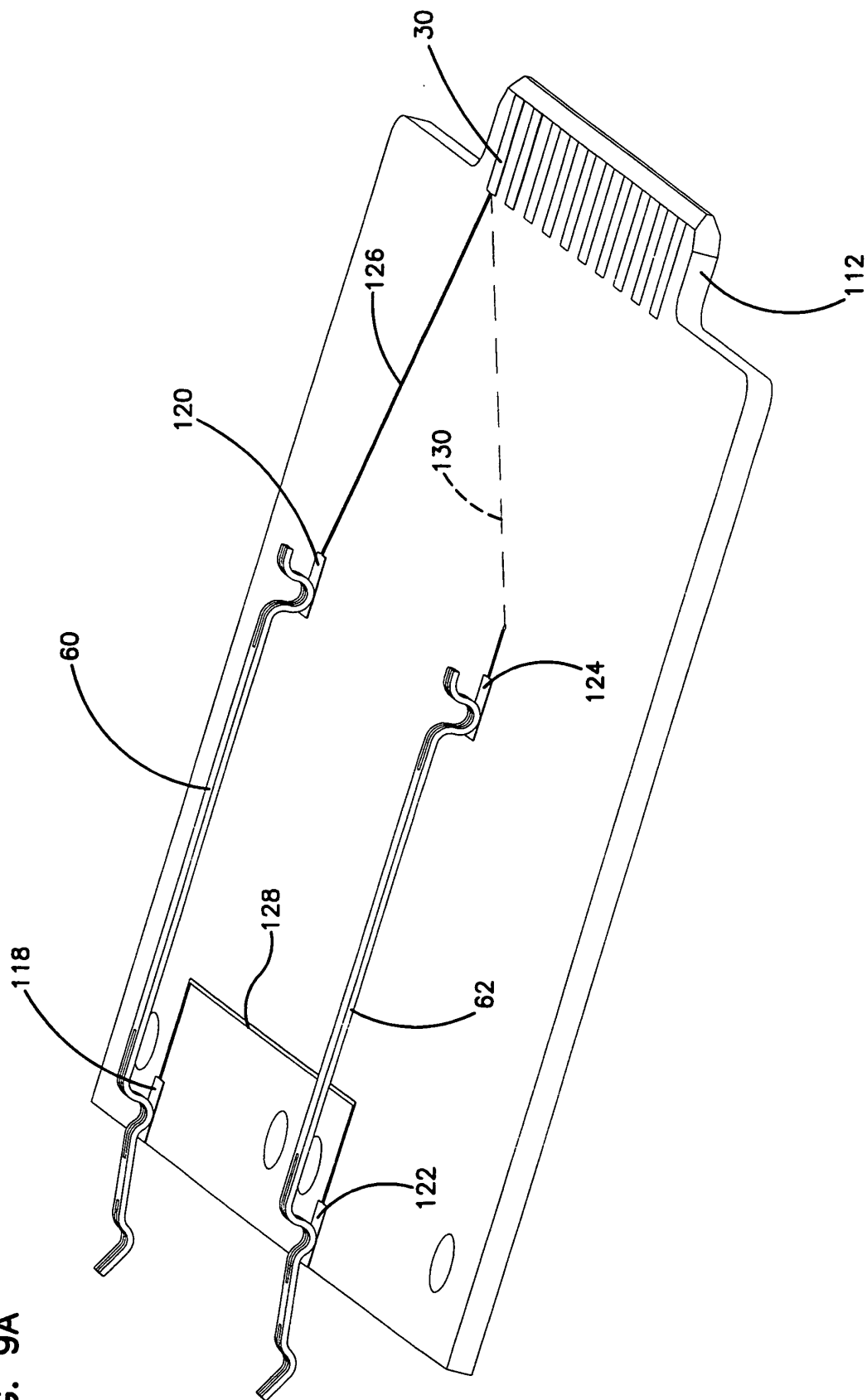
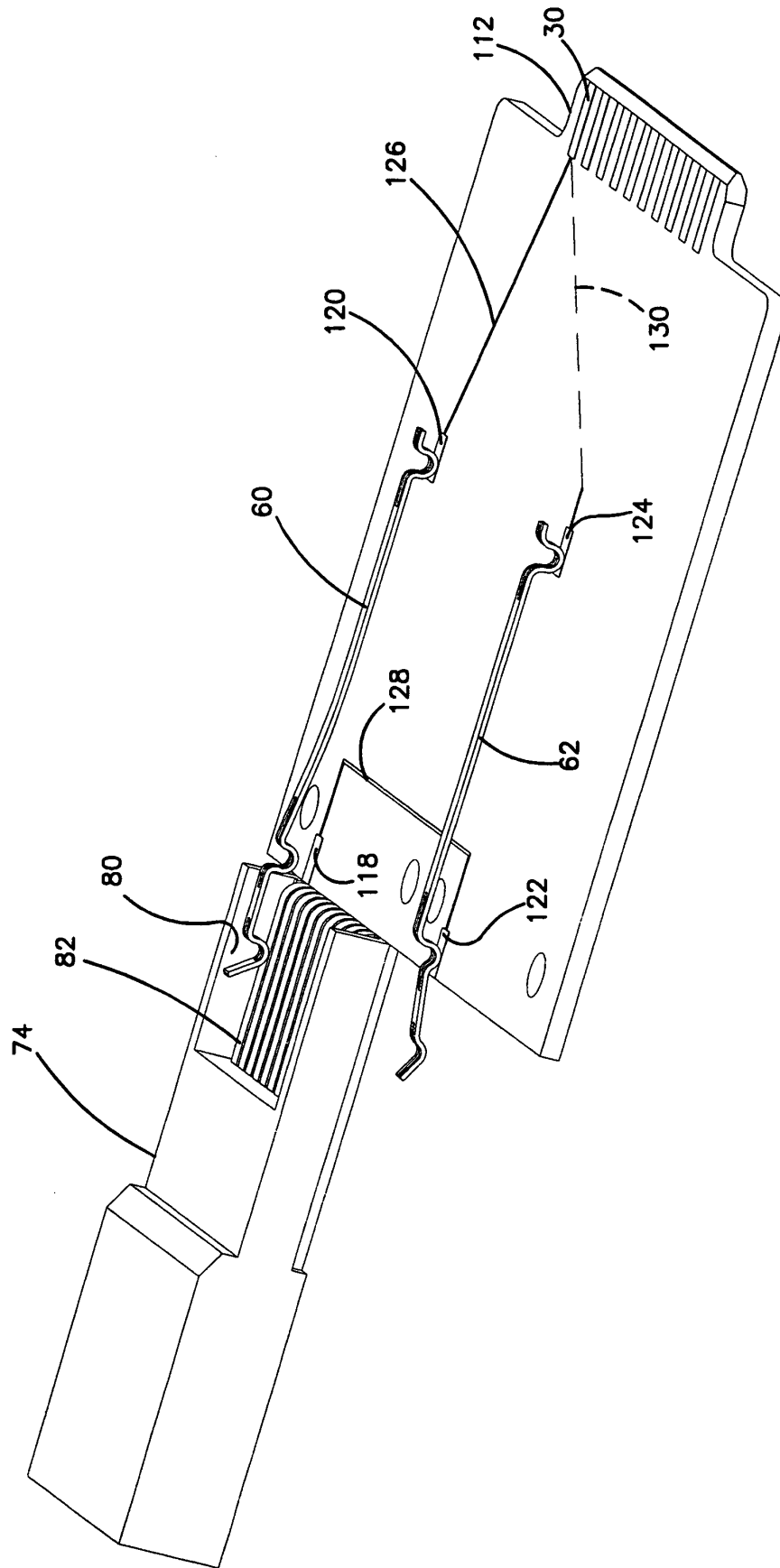
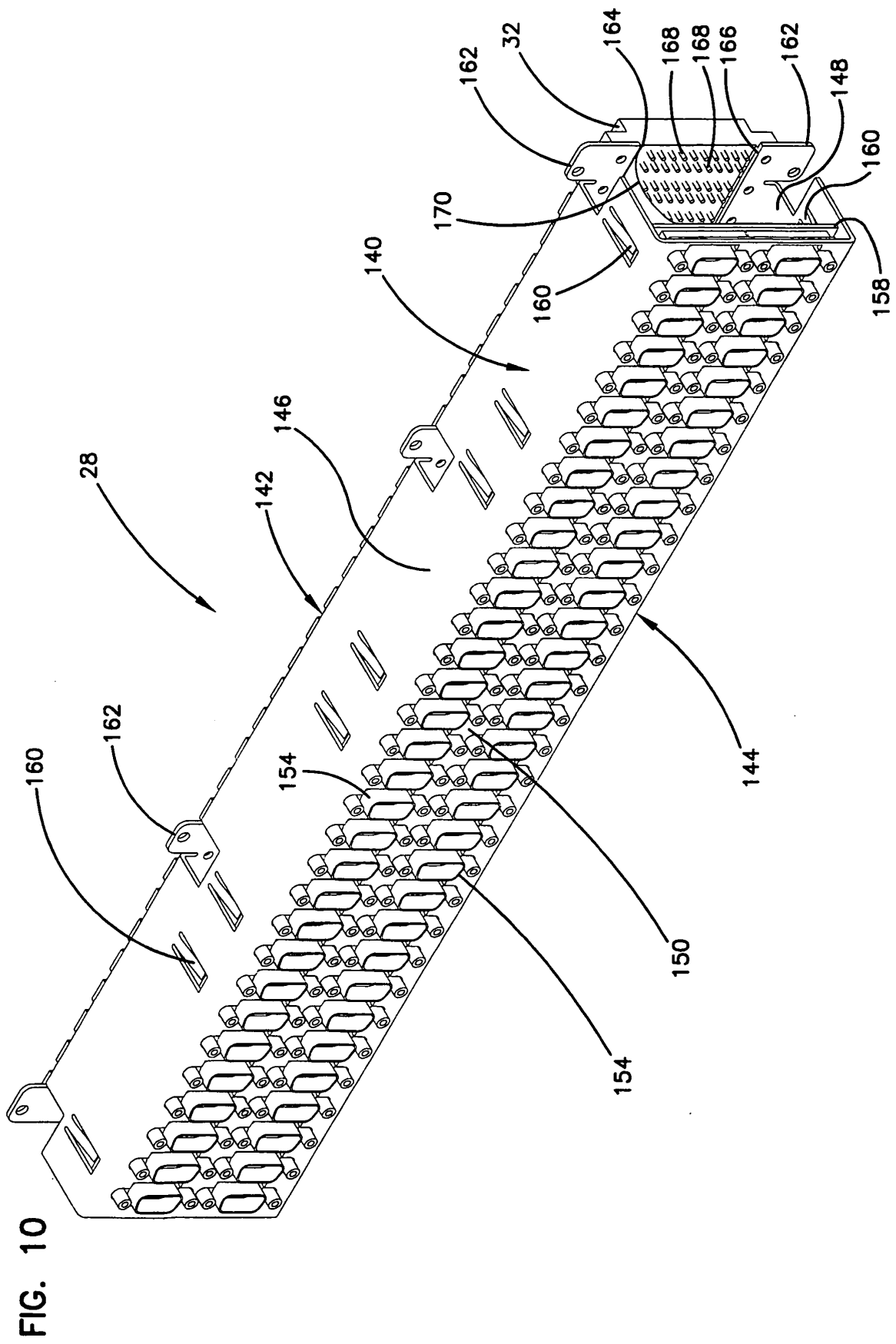
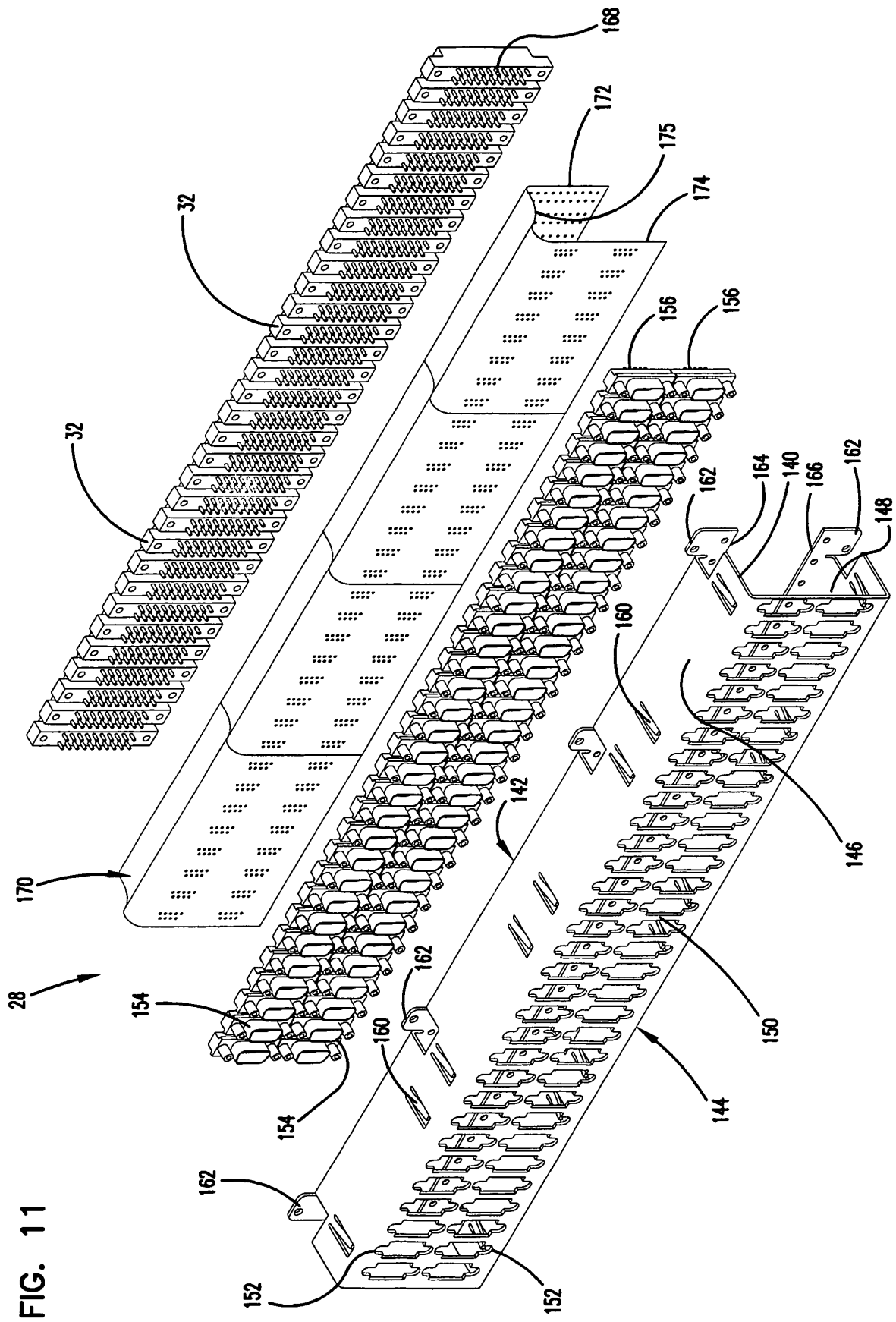


FIG. 9B







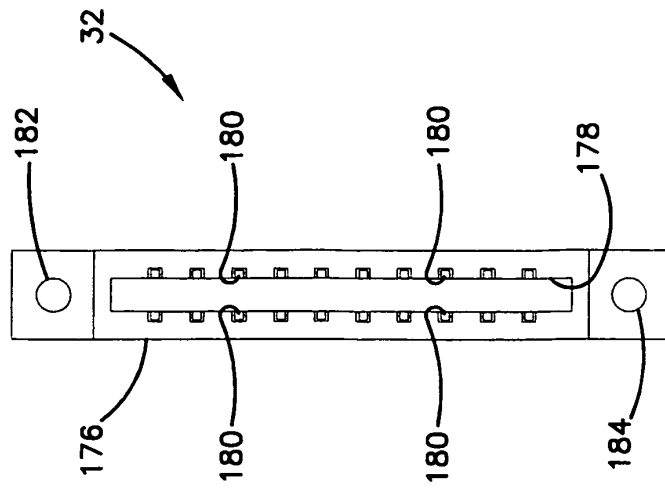


FIG. 12A

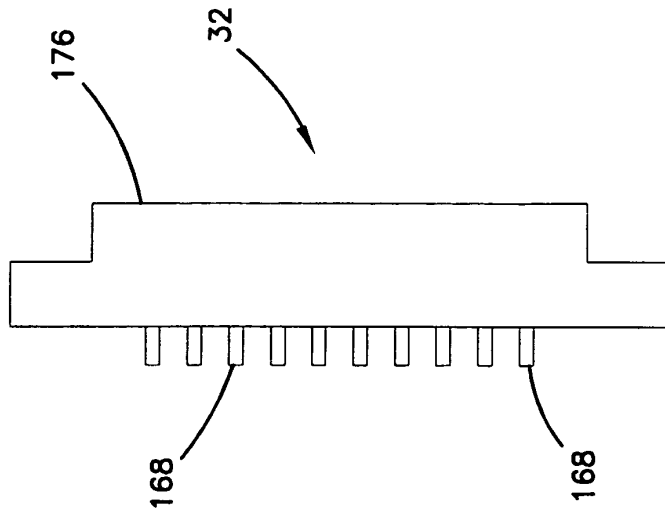


FIG. 12B

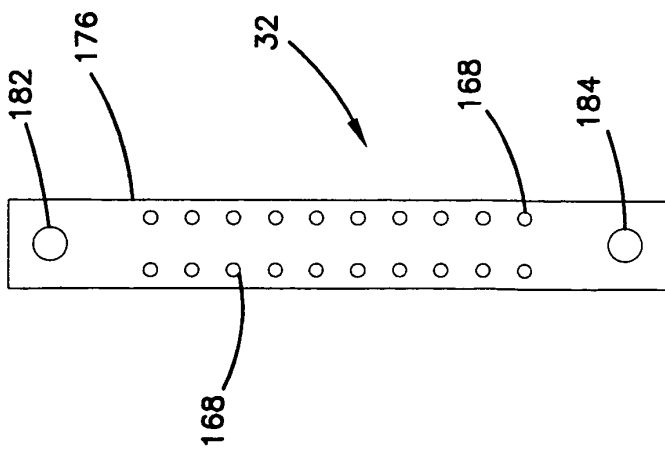


FIG. 12C

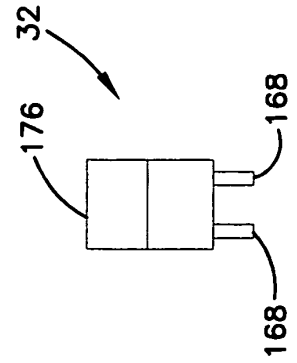


FIG. 12D

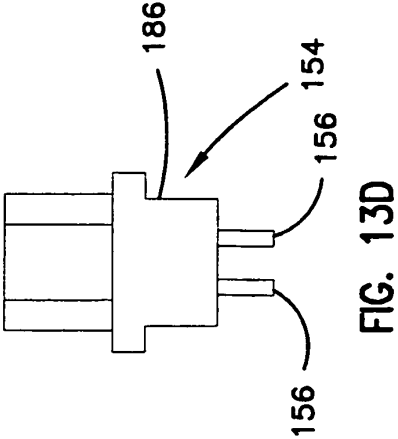
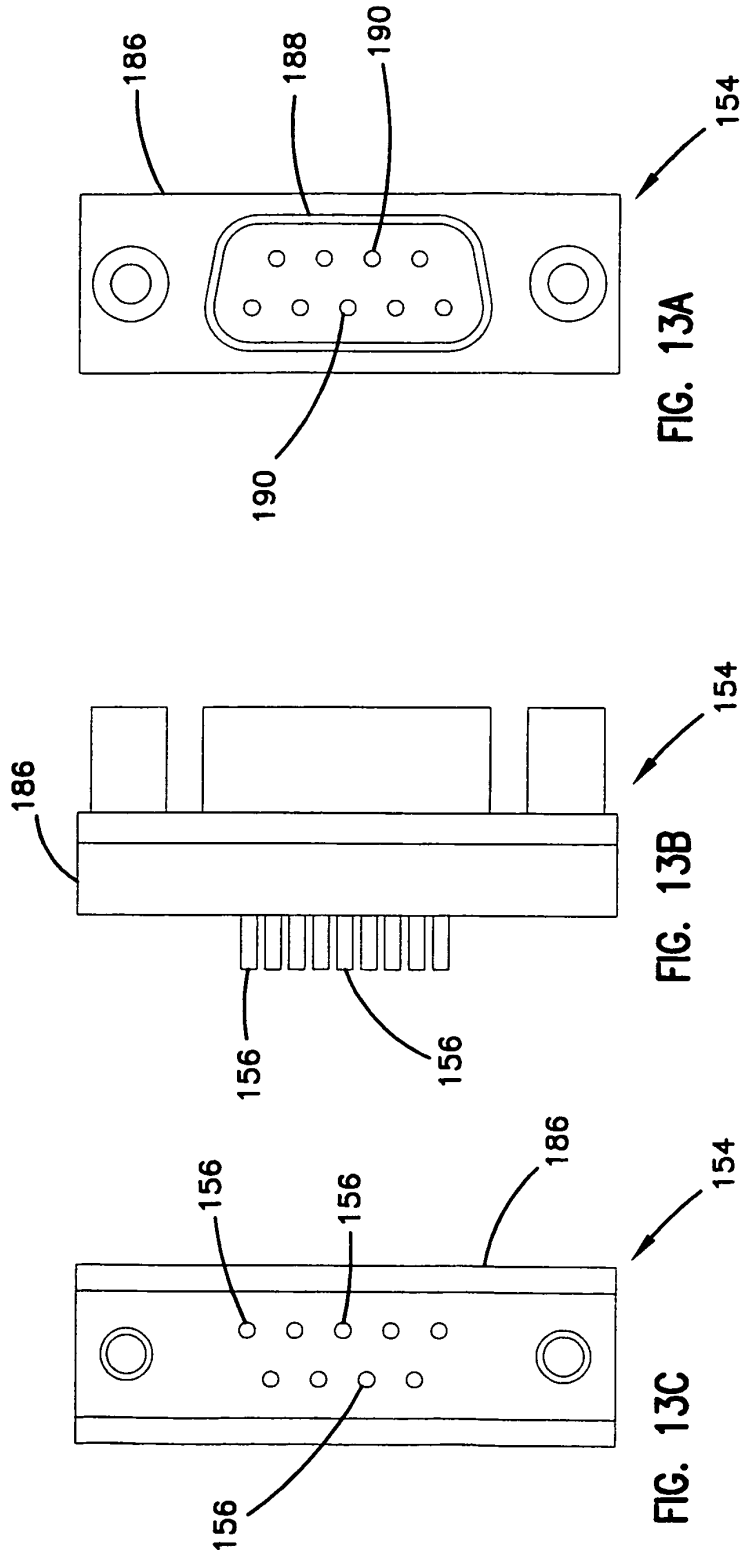


FIG. 14

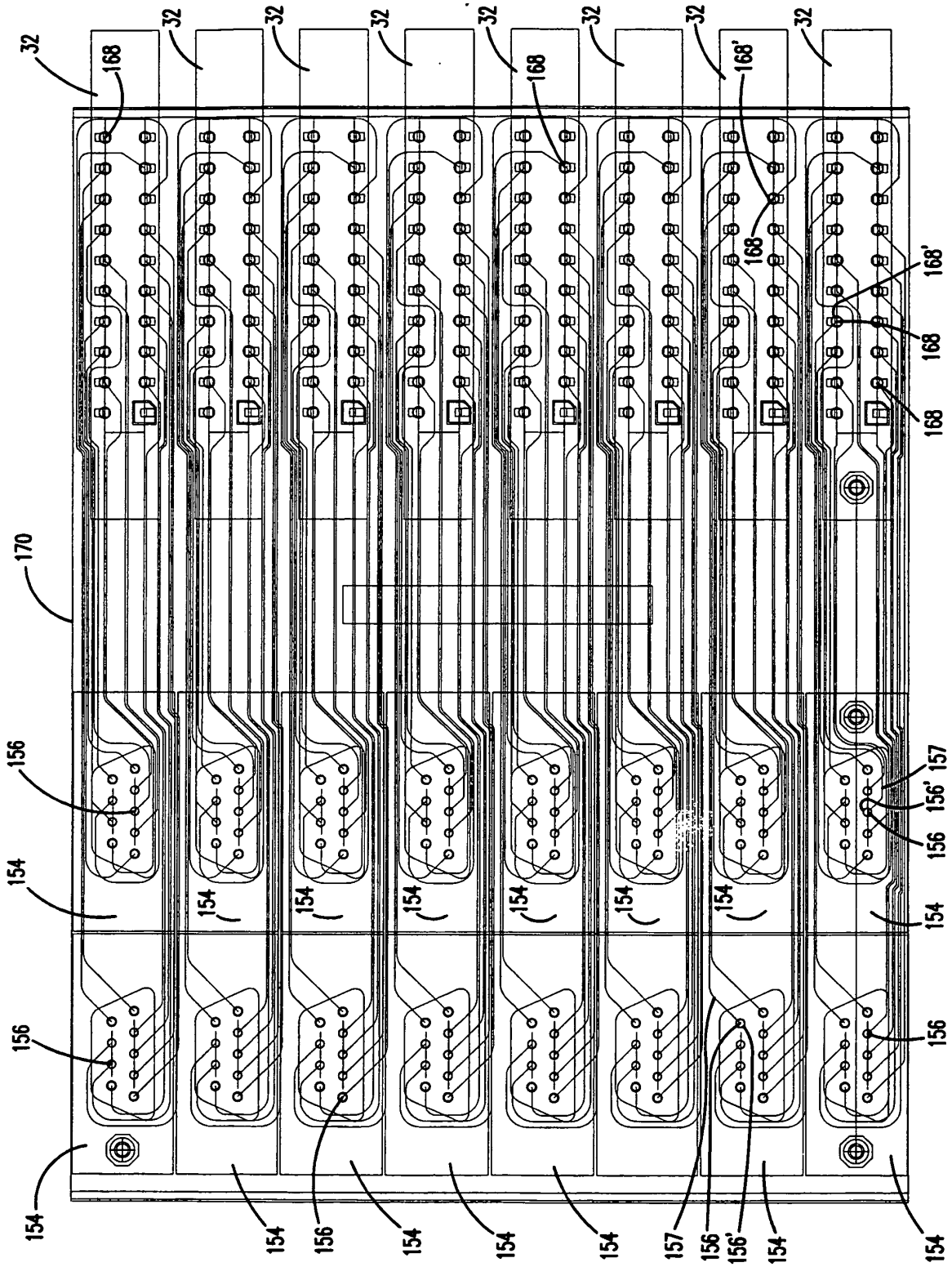
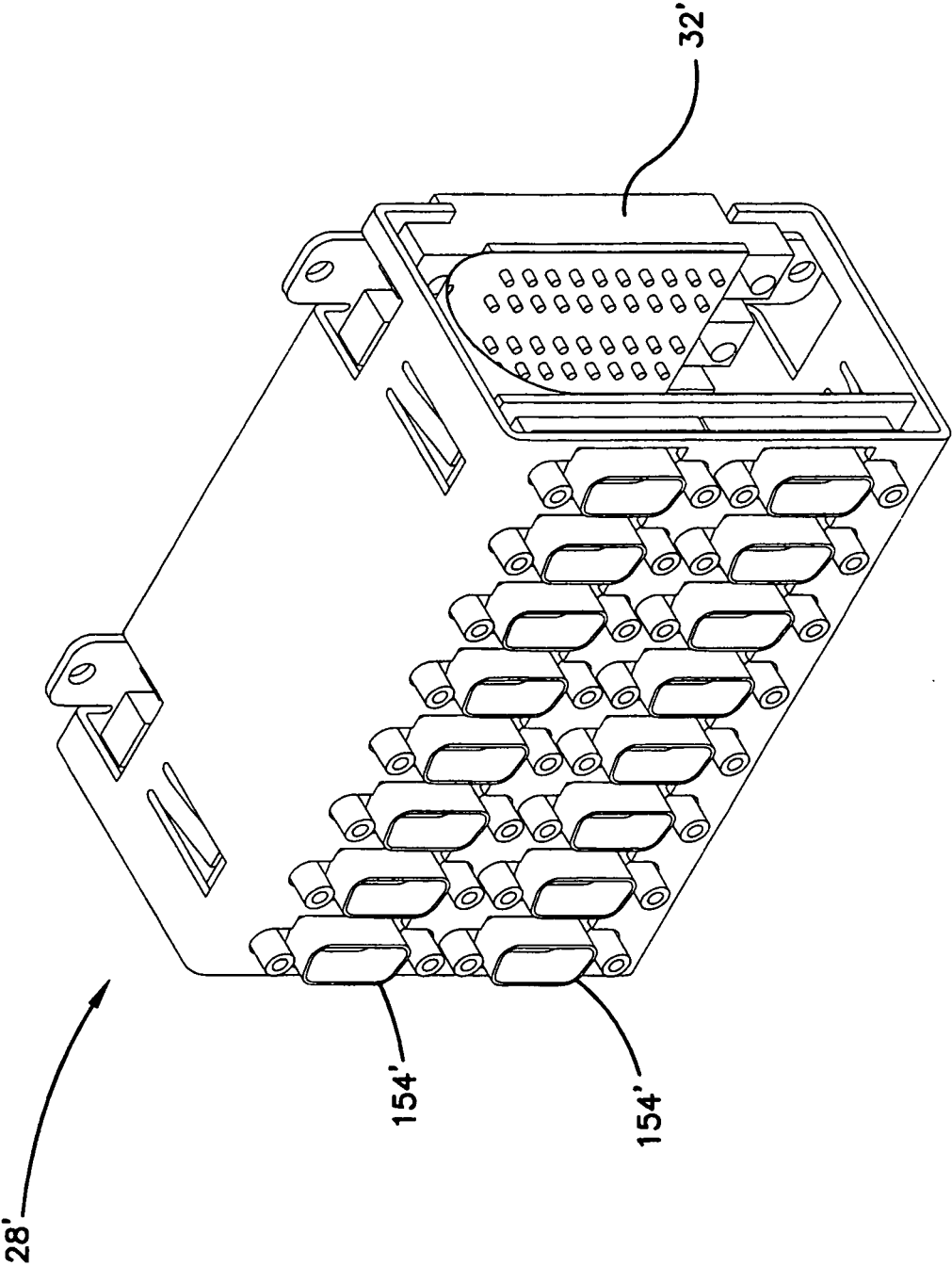


FIG. 15



REFERENCES CITED IN THE DESCRIPTION

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