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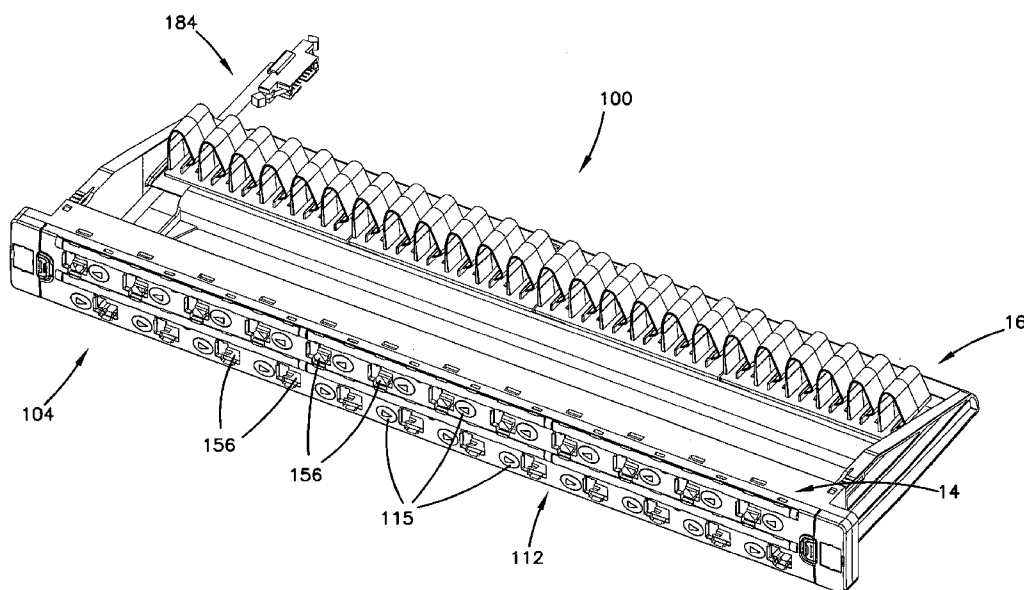
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[Continued on next page]

(54) Title: UPGRADEABLE PATCH PANEL



(57) Abstract: An upgradeable patch panel assembly and associated method of upgrading a patch panel assembly. The upgradeable patch panel assembly including a panel base having an aperture sized to receive a scanner interface cable. The method including removing a first cover from the panel base, inserting a scanner interface cable through the existing aperture in the panel base, and attached an upgraded cover to the panel base. Upgrading the patch panel assembly is completed while the assembly remains mounted to a frame and without disconnecting rear cable connections. The upgraded patch panel assembly provides jack-occupancy monitoring capabilities.

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UPGRADEABLE PATCH PANEL

Cross-Reference to Related Applications

This application is being filed on 10 October 2007, as a PCT
5 International Patent application in the name of ADC Telecommunications, Inc., a
U.S. national corporation, applicant for the designation of all countries except the
U.S., and Alastair HOATH, a citizen of Great Britain, Steve HOUGH, a citizen of
Great Britain, Stephen James MORRIS, a citizen of Great Britain, and Gordon
WHITE, a citizen of the U.S., applicants for the designation of the U.S. only, and
10 claims priority to U.S. Provisional Patent Application Serial No. 60/851,002 filed on
10 October 2006, U.S. Provisional Patent Application Serial No. 60/856,384 filed on
01 November 2006, and U.S. Utility Patent Application Serial No. [Unknown] filed
on 05 October 2007.

Field of the Invention

This disclosure relates to methods and devices for use in the
telecommunications industry. More specifically, this disclosure relates to methods
and devices for patch panel systems.

Background of the Invention

Local Area Networks and telecommunications connections often use
patch panels, especially at the customer's premises to enable cross-connection
between telecommunications equipment. Patch panels typically include front and
rear connection locations. The rear connections are typically a more permanent type
25 of connection, such as an insulation displacement connector that connects to a
copper based, twisted pair telecommunications cable. The front connection
locations of the patch panel may include any of a variety of jacks, which allows
fairly rapid connection and disconnection between two jacks in the same patch
panel, or between one jack in the patch panel and another jack in a nearby patch
30 panel via a patch cord.

In most applications, numerous patch panels are provided to
accommodate a significant number of interconnections that must be made.
Managing the system requires monitoring the availability and occupancy of the
connection locations. In conventional patch panel arrangements, the

availability/occupancy of the front connection locations of a patch panel or patch panel system is manually or physically monitored. Such methods of management can be improved; the improvement preferably being effected in a cost efficient and time-saving manner.

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Summary of the Invention

One feature of the present disclosure relates to a method and device that permits a user to upgrade an existing patch panel assembly to a patch panel assembly having monitoring capabilities.

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A variety of examples of desirable product features or methods are set forth in part in the description that follows, and in part will be apparent from the description, or may be learned by practicing various aspects of the disclosure. The aspects of the disclosure may relate to individual features as well as combinations of features. It is to be understood that both the foregoing general description and the following detailed description are explanatory only, and are not restrictive of the claimed invention.

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Brief Description of the Drawings

FIG. 1 is a front perspective view of a patch panel assembly, in accordance with the principles disclosed.

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FIG. 2 is a front elevation view of a panel base of the patch panel assembly of FIG. 1;

FIG. 3 is a rear elevation view of the panel base of FIG. 2;

25

FIG. 4 is a perspective view of a jack of the patch panel assembly of FIG. 1;

FIG. 5 is an exploded perspective view of the jack of FIG. 4;

FIG. 6 is a perspective view of a jack plug used with the patch panel assembly of FIG. 1;

30

FIG. 7 is a front elevation view of a cover of the patch panel assembly of FIG. 1;

FIG. 8 is a top plan view of the cover of FIG. 7;

FIG. 9 is an enlarged detail view of a portion of the cover of FIG. 8;

FIG. 10 is an enlarged detail view of another portion of the cover of

FIG. 7;

FIG. 11 is an enlarged detail view of a portion of the panel base of FIG. 2;

FIG. 12 is an enlarged detail view of another portion of the panel base of FIG. 3;

5 FIG. 13 is a top plan view of a cable manager of the patch panel assembly of FIG. 1;

FIG. 14 is a bottom plan view of the cable manager of FIG. 13;

FIG. 15 is a front perspective view of an upgraded patch panel assembly, in accordance with the principles disclosed;

10 FIG. 16 is a exploded, front perspective view of the upgraded patch panel assembly of FIG. 15;

FIG. 17 is a front elevation view of a cover of the upgraded patch panel assembly of FIG. 15;

FIG. 18 is a rear elevation view of the cover of FIG. 17;

15 FIG. 19 is a further exploded, front perspective view of the upgraded patch panel assembly of FIG. 16;

FIG. 20 is a rear perspective view of the upgraded patch panel assembly of FIG. 15; and

20 FIG. 21 is a perspective view of a connector used with the upgraded patch panel assembly of FIG. 15.

Detailed Description

Reference will now be made in detail to exemplary aspects of the present disclosure 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.

FIG. 1 illustrates a patch panel assembly 10 in accordance with the principles disclosed. The assembly 10 includes a cover 12 (e.g., facia or front plate), a panel base or frame 14, and a cable manager 16.

30 Referring to FIGS. 2 and 3, the panel base 14 has a front 18 (FIG. 2), a rear 20 (FIG. 3), and opposing sides 22, 24. Mounting flanges 26, 28 are located at the sides 22, 24 of the panel base. In use, the patch panel assembly 10 is typically mounted by the mounting flanges 26, 28 to a frame or telecommunications structure 30 (shown schematically in FIG. 1), such as a rack, for example. The patch panel

assembly can also be mounted to or within other types of structures, such as enclosures or cabinets, for instance.

Still referring to FIGS. 2 and 3, the panel base 14 defines a plurality of openings 32. The openings 32 are sized to receive jacks 34 (FIG. 4). In the illustrated embodiment, the openings 32 are provided in a staggered arrangement; that is, two rows of spaced apart openings: the spaced apart openings 32 of one row being offset from the spaced apart openings 32 of the other row. The staggered arrangement reduces high-frequency interference between the individual jacks 34 of the assembly.

The jacks 34 can be RJ style jacks, such as RJ 45 jacks, for example. Other types of jacks can be also be used in accordance with the principles disclosed. FIGS. 4 and 5 illustrate the details of one type of RJ 45 jack 34 that is used in the present assembly. In the illustrated embodiment, the jack 34 includes a two-piece dielectric housing 66 and a printed circuit board 68 having insulation displacement contacts ID1-ID8. The housing 66 defines a front port 36. The insulation displacement contacts ID1-ID8 are accessible from the rear of the housing 66 and define rear connection locations 106 (see FIG. 20). Further details of one RJ 45 jack embodiment that can be used in the present patch cord assembly are provided in U.S. Application No. 11/583,995, which application is incorporated herein by reference.

The jacks 34 of the present patch cord assembly 10 are each positioned within the openings 32 (FIG. 2) of the panel base 14 such that the front port 36 of the jack 34 faces toward the front 18 of the panel base (see FIG. 16, for example). The front port 36 of each jack 34 is sized and configured to receive a jack plug 38 (e.g. a patch cord connector) (FIG. 6).

Referring to FIG. 6, the jack plug 38 has a first structural plug configuration defined by an insertion end 40 of the plug 38. The plug 38 includes a flexible snap-fit tab 42. The insertion end 40 inserts or plugs into the front port 36 of the jack 34 and detachably secures in place by the snap-fit tab 42.

Referring now to FIGS. 1, 7, and 8, the cover 12 of the patch cord assembly 10 is a first removable cover. In one embodiment, the cover 12 is made of plastic. The removable cover 12 secures to the front 18 of the panel base 14 by first and second attachments 44, 46 (FIGS. 9-12). The first attachment 44 includes first and second hooks or catch elements 48 formed on the cover 12 (FIGS. 7 and 10) that

engage corresponding hooks or catch elements 50 (FIGS. 3 and 12) formed on the panel base 14. The elements 48, 50 of the first attachment 44 function as a hinge such that the cover 12 hinges at the one side (e.g. 22) of the panel base 14.

The second attachment 46 includes a flexible retaining clip or latch 52 (FIGS. 8 and 9) that engages a corresponding aperture 54 (FIGS. 2 and 11). In the illustrated embodiment, the latch 52 (FIG. 8) is provided on the cover 12 while the aperture is formed in the panel base 14 (FIG. 2). In the alternative, the latch may be provided on the panel base and the aperture formed in the cover. The latch 52 snap-fits within the aperture 54 to releasably secure the cover 12 to the front 18 of the panel base 14 when the cover is hinged to a closed position.

Referring back to FIGS. 1 and 7, the cover 12 defines a plurality of jack openings 56. The jack openings 56 provide access to the front ports 36 of the jacks 34 located within the openings 32 of the panel base 14.

As shown in FIG. 7, each of the jack openings 56 defined by the first cover 12 is constructed to receive the plug 38 having the first structural plug configuration. In particular, the openings 56 generally have a larger rectangular upper opening portion 58 and a smaller rectangular lower opening portion 60. This arrangement corresponds to the footprint, or the first structural plug configuration, of the insertion end 40 of the jack plug 38 (FIG. 6).

Referring now to FIGS. 1, 13, and 14, the cable manager 16 of the patch panel assembly 10 is attached to the rear 20 of the panel base 14. In particular, latching clips 94 formed on arms 96 of the cable manager 16 engage corresponding structure 108 (FIG. 1) of the panel base 14 to secure the manager 16 to the rear 20 of the panel base 14. The cable manager 16 includes a plurality of guide structures 62 (FIG. 1) that organize cables 64 (shown schematically) interconnected to the jacks 34.

In accordance with the principles of the present disclosure, the patch panel assembly 10 of FIG. 1 is an upgradeable patch panel assembly. In particular, the patch panel assembly 10 is configured to permit a user to upgrade the patch panel assembly with scanner management technology. Referring again to FIG. 2, the panel base 14 includes an upgrade or conversion aperture 70 located adjacent to the staggered rows of openings 32 (see also FIG. 16). The conversion aperture 70 extends through the panel base 14 in a direction from the front 18 to the rear 20. The conversion aperture 70 is sized and configured to receive a scanner interface

cable 184 (FIG. 16) when the patch panel assembly is upgraded. In the illustrated embodiment of FIG. 1, the patch panel assembly 10 is not upgraded; accordingly, the conversion aperture 70 is void of any components or elements passing through the aperture, as depicted in FIG. 2.

5 One feature of the present upgradeable patch panel assembly 10 is that the upgrade can be accomplished without removing or un-mounting the assembly 10 from the frame 30. Moreover, the cables 64 that interconnect to the jacks 34 need not be disconnected from or re-wired to the jacks. The present upgradeable patch panel assembly accordingly saves a significant amount of time
10 and labor in completing a system upgrade, in addition to reducing system down time during the upgrade.

To upgrade the patch panel assembly 10 of FIG. 1, the jack plugs 38 (FIG. 6) having the first structural plug configuration are unplugged from the front ports 36 (FIG. 4) of the jacks 34. The cover 12 is then removed from the front 18 of
15 the panel base 14. The cover 12 can be removed by flexing the latch 52 (FIG. 9) of the second attachment 46 to release the latch 52 from the aperture 54 (FIG. 11) of the panel base 14, and hinging the cover 12 away from the panel base 14 such that the catch elements 48, 50 of the first attachment 44 disengage.

Referring to FIGS. 15 and 16, an upgrade assembly 104 is installed to
20 the existing panel base 14 to provide an upgraded patch panel assembly 100 having monitoring capabilities. The upgrade assembly 104 includes the scanner interface cable 184 and a second upgraded cover 112 that attaches to the front 18 of the panel base 14.

The upgraded cover 112 of the assembly 100 is a removable cover
25 secured to the front 18 of the panel base 14 by first and second attachments (e.g., elements 148, 50 and latch 152 and aperture 54; partly shown in FIGS. 17-19). The first and second attachments are the same as those described with respect to the first cover 12. In one embodiment, the upgraded cover 112 is made of plastic. The upgraded cover 112 also defines a plurality of jack openings 156. The jack openings
30 156 provide access to the front ports 36 of the jacks 34 located within the openings 32 of the panel base 14.

Referring to FIG. 17 and 18, the jack openings 156 defined by the upgraded cover 112 are constructed to receive upgraded jack plugs 138 (FIG. 21) having a second structural plug configuration that is different from the first

structural plug configuration of the first jack plug 38 (FIG. 6). In particular, the openings 156 of the second cover 112 generally have a larger rectangular upper opening portion 158 and a smaller rectangular lower opening portion 160. The openings 156 further define an offset notch 172 extending from the larger
5 rectangular upper opening portion 158 of the opening. The notch 172 is sized to accommodate and receive a contact element 174 (FIG. 21) provided on the upgraded plug 138.

Referring now to FIG. 21, the contact element 174 of the upgraded jack plug 138 is located at an insertion end 140 of the plug 138. The contact
10 element 174 partly defines the second different structural plug configuration. Similar to the first plug 38, the insertion end 140 of the upgraded plug 138 includes a flexible snap-fit tab 142. The insertion end 140 inserts or plugs into the front port 36 of the jack 34 and detachably secures in place by the snap-fit tab 142. The upgraded jack plugs 138 are configured for use with the same jacks 34 as those to
15 which the first jack plugs interconnect.

Referring now to FIGS. 16 and 19, the upgraded cover 112 of the assembly 100 includes a printed circuit board 176. The printed circuit board 176 is attached to or held against the rear side 178 of the cover 112 such that the printed circuit board 176 is positioned between the cover 112 and the panel base 16 when
20 the cover is attached to the panel base. The printed circuit board 176 includes a plurality of holes or openings 180. The openings 180 are sized and arranged to permit the jack plugs 138 to pass through the circuit board 176 to engage the jacks 34 secured in the openings 32 of the panel base 14.

The printed circuit board 176 of the upgraded cover 112 includes a
25 plurality of electrical contacts 182. In the illustrated embodiment, the electrical contacts 182 are located such that the electrical contacts 182 are accessible through the offset notches 172 of the openings 156 in the cover 112. As will be described in greater detail hereinafter, the contact elements 174 of the upgraded plugs 138 contact the electrical contacts 182 of the printed circuit board 176 to indicate the
30 presence of the plug 138 in the jack 34.

Referring now to FIGS. 16 and 20, the scanner interface cable 184 has a first end 186 and a second end 188. The first end 186 electrically couples to the printed circuit board 176, either directly or via a first interface connector (not shown). The second end 188 includes a second interface connector 192. When

upgrading the patch panel assembly, the second end 188 the interface cable 184 is inserted through the existing conversion aperture 70 of the panel base 14. The existing conversion aperture 70 is accordingly sized to permit the passage of the second interface connector 192. In the illustrated embodiment, the second interface
5 connector 192 of the cable 184 is a ribbon cable connector. The ribbon cable connector 192 interconnects to a scanner lead 102 (FIG. 20), which in turn connects to a scanning device 110 (schematically represented).

As previously described, to upgrade the patch panel assembly 10 of FIG. 1, the plugs 38 are unplugged from the jacks 34 of the assembly and the cover
10 12 removed. The upgrade assembly 104 is then installed by first positioning the end 188 of the scanner interface cable 184 through the conversion aperture 70 of the panel base 14. With the interface cable 184 positioned through the existing aperture 70 of the panel base 14, the upgraded cover 112 is attached to the front 18 of the panel base 14, as previously described with respect to the first cover. As shown in
15 FIG. 20, the scanner interface cable 184 can be routed through cable guide structure 190 formed in the cable manager 16 and positioned at the rear of the assembly 100 for interconnection to the scanner device 110.

To complete the upgrade of the assembly, the upgraded jack plugs
138 are inserted within the openings 156 of the cover 112. When the upgraded jack
20 plug 138 engages or snap-fits to the jacks 34, the contact elements 174 (FIG. 21) of the upgraded plug 138 contacts the electrical contacts 182 provided on the printed circuit board 176 (FIG. 19) to establish an electrical connection. In the illustrated embodiment, a detent 198 (FIG. 19) is provided on the electrical contact 182 to ensure such contact or connection.

25 The upgraded patch panel assembly 100 is now enhanced with scanner management technology provided in part by the connection between the contact element 174 of the plug 138 and the electrical contact 182 of the printed circuit board 176. That is, the occupancy of each individual jack 34 can now be monitored by way of the connection between the element 174 and the electrical
30 contact 182. The scanner interface cable 184 transfers the occupancy information to the scanner device 110. This information is useful to a user in managing system connections availability. In particular, a user can collect and monitor occupancy/availability information of the patch panel connections without having to manually or physically inspect how many jack ports are in use.

In the illustrated embodiment, the upgraded patch panel assembly 100 includes light emitting diodes 115 (FIG. 15) that illuminate to indicate that a particular patch panel port or jack is occupied. In instances where visual inspection of the patch panel assembly 100 is necessary, the illuminated diodes aids in directing the user's attention to the occupied jack ports.

The patch panel assembly of FIG. 1 offers the adaptability to upgrade to scanner management technology while minimizing the impact of the upgrade. That is, the present upgradeable patch panel assembly 10 can be upgraded without removing or un-mounting the assembly 10 from the frame, and does not require rear cable disconnection or re-wiring. The present upgradeable patch panel assembly accordingly minimizing the impact of an upgrade by reducing the time and labor needed to complete the upgrade, and by reducing system down time during the upgrade.

The above specification provides a complete description of the present invention. Since many embodiments of the invention can be made without departing from the spirit and scope of the invention, certain aspects of the invention reside in the claims hereinafter appended.

WHAT IS CLAIMED IS:

1. A method of upgrading a telecommunications patch panel, the method including the steps of:

- a) providing a patch panel assembly mounted to a frame; the assembly including:
 - i) a panel base having a front and a rear;
 - ii) a plurality of jacks positioned within openings defined by the panel base;
 - iii) a first cover attached to the front of the panel base, the cover including jack openings to provide access to the jacks; and
 - iv) a plurality of first jack plugs plugged into the jacks; and
- b) upgrading the patch panel assembly while the patch panel assembly remains mounted to the frame, the step of upgrading including:
 - i) unplugging the first jack plugs from the jacks;
 - ii) removing the first cover from the front of the panel base;
 - iii) inserting an interface cable through an existing aperture formed in the panel base;
 - iv) attaching an upgraded cover to the front of the panel base, the upgraded cover including jack openings to provide access to the jacks; and
 - v) plugging upgraded jack plugs into the jacks of the patch panel assembly.

2. The method of claim 1, further including cables connected to connections at the rear of the panel base, the method including upgrading the patch panel assembly without disconnecting the cables from the connections at the rear of the panel base.

3. The method of claim 1, wherein the jack openings of each of the first cover and the upgraded cover include a larger rectangular portion and a smaller rectangular portion, each of the jack openings of the upgraded cover further including a notch sized to correspond to the upgraded jack plugs.

4. The method of claim 1, wherein the step of attaching the upgraded cover to the front of the panel base includes hinging the cover at a first attachment location and releasably latching the cover to the base at a second attachment location.
5. The method of claim 1, wherein the step of upgrading the patch panel assembly includes providing jack-occupancy monitoring capabilities.
6. The method of claim 5, wherein the step of providing jack-occupancy monitoring capabilities includes providing the upgraded jack plugs with contact elements and providing the upgraded cover with a printed circuit board.
7. The method of claim 6, wherein the step of plugging the upgraded jack plugs into the jacks of the patch panel assembly includes establishing electrical connections between electrical contacts on the printed circuit board and the contact elements of the upgraded jack plugs.
8. The method of claim 1, further including interconnecting the interface cable to a scanner lead of a scanning device.
9. The method of claim 1, wherein the upgraded cover includes light emitting diodes that indicate when an associated jack is occupied by one of the upgraded jack plugs.
10. A method of upgrading a telecommunications patch panel, the method including the steps of:
 - a) providing a patch panel assembly mounted to a frame; the assembly including a panel base having a front and a rear, a plurality of jacks positioned within openings defined by the panel base, and a cover attached to the front of the panel base, the cover including jack openings that provide access to the jacks, the jack openings being constructed to receive plugs having a first structural plug configuration;
 - b) removing the cover from the front of the panel base; and
 - c) upgrading the patch panel assembly while the patch panel assembly remains mounted to the frame, the step of upgrading including:

- i) inserting an interface cable through an existing aperture formed in the panel base; and
- ii) attaching an upgraded cover to the front of the panel base, the upgraded cover including jack openings constructed to receive plugs having a second, different structural plug configuration.

11. The method of claim 10, further including cables connected to connections at the rear of the panel base, the method including upgrading the patch panel assembly without disconnecting the cables from the connections at the rear of the panel base.

12. The method of claim 10, wherein the jack openings of each of the first cover and the upgraded cover include a larger rectangular portion and a smaller rectangular portion, each of the jack openings of the upgraded cover further including a notch sized to correspond to the second different structural plug configuration.

13. The method of claim 10, wherein the step of attaching the upgraded cover to the front of the panel base includes hinging the cover at a first attachment location and releasably latching the cover to the base at a second attachment location.

14. The method of claim 10, wherein the step of upgrading the patch panel assembly includes providing jack-occupancy monitoring capabilities.

15. The method of claim 14, further including plugging upgraded plugs into the jacks of the patch panel assembly.

16. The method of claim 15, wherein the second different structural plug configuration is defined by a contact element provided on each of the upgraded plugs.

17. The method of claim 16, wherein the step of plugging the upgraded jack plugs into the jacks of the patch panel assembly includes establishing electrical connections between electrical contacts provided on a printed circuit board of the upgraded cover and the contact elements of the upgraded jack plugs.

18. The method of claim 1, further including interconnecting the interface cable to a scanner lead of a scanning device.
19. The method of claim 1, wherein the upgraded cover includes light emitting diodes that indicate when an associated jack is occupied by a plug.
20. A telecommunications patch panel, comprising:
- a) a panel base having a front and a rear, the panel base defining:
 - i) a plurality of openings sized to receive jacks; and
 - ii) an conversion aperture formed adjacent to the plurality of openings, the conversion aperture extending through the panel base from the front to the rear, the conversion aperture being configured to receive a scanner interface cable when the patch panel is upgraded;
 - b) a plurality of jacks positioned within the openings of the panel base, the jacks including a front port sized to receive a plug;
 - c) a removable cover attached to the front of the panel base, the removable cover having jack openings that provide access to the front port of the jacks.
21. The patch panel of claim 20, wherein the conversion aperture is sized to receive a ribbon cable connector attached to an end of the scanner interface cable.

FIG. 1

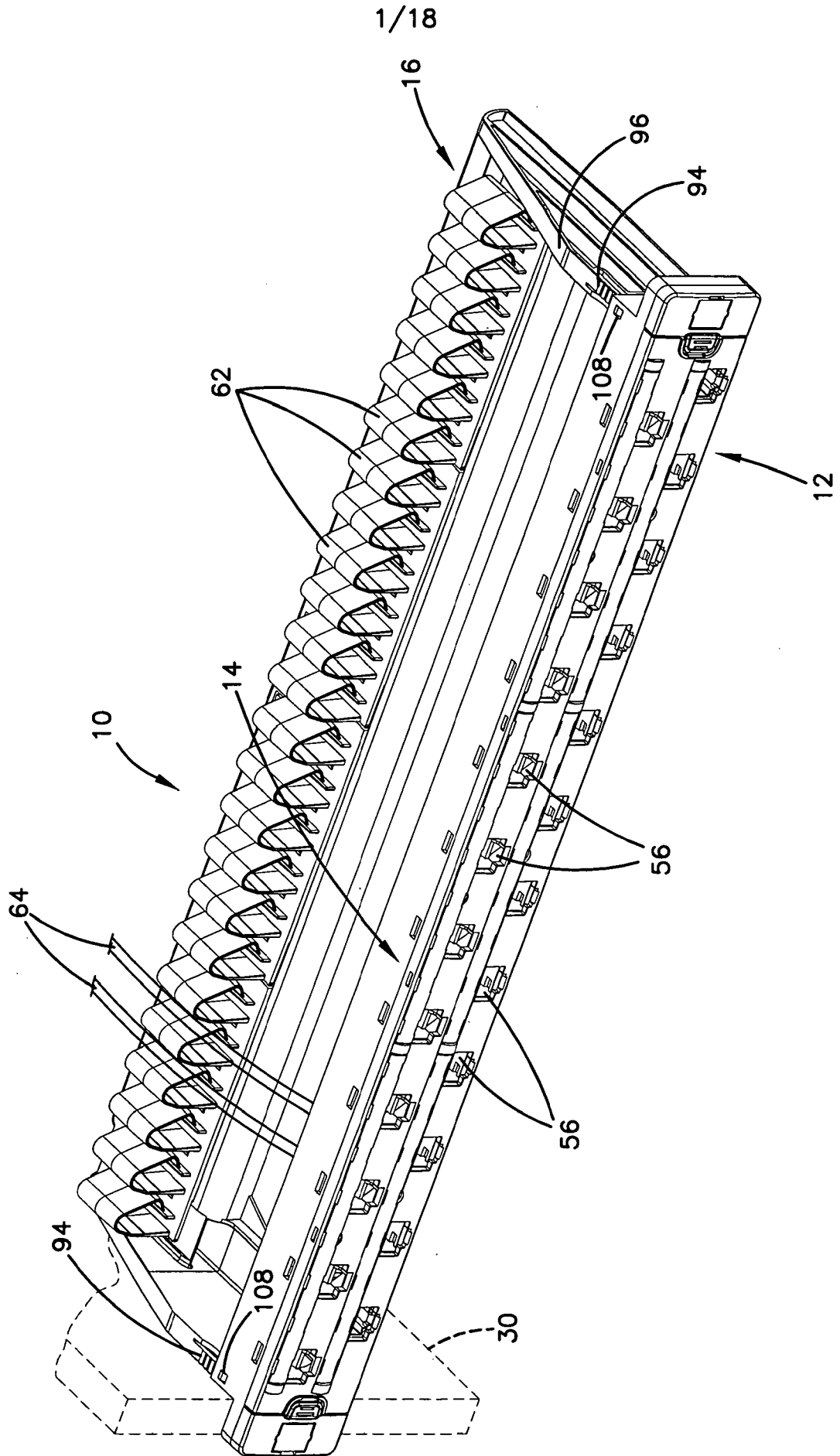


FIG.2

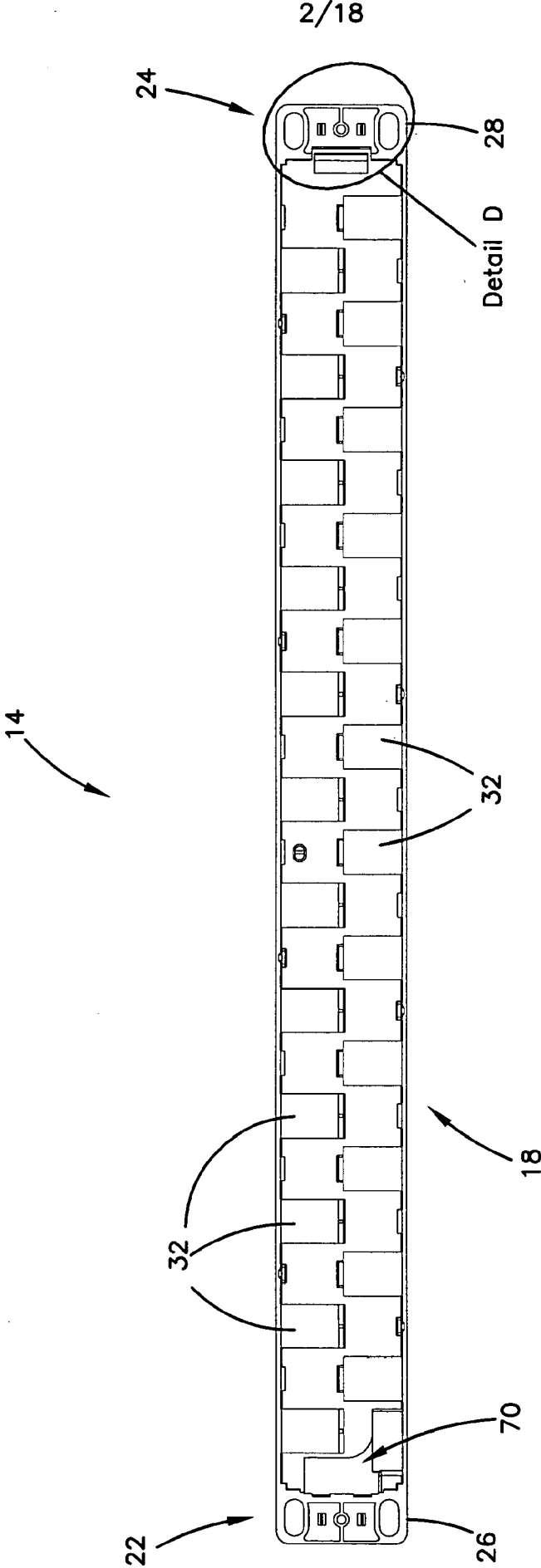


FIG.3

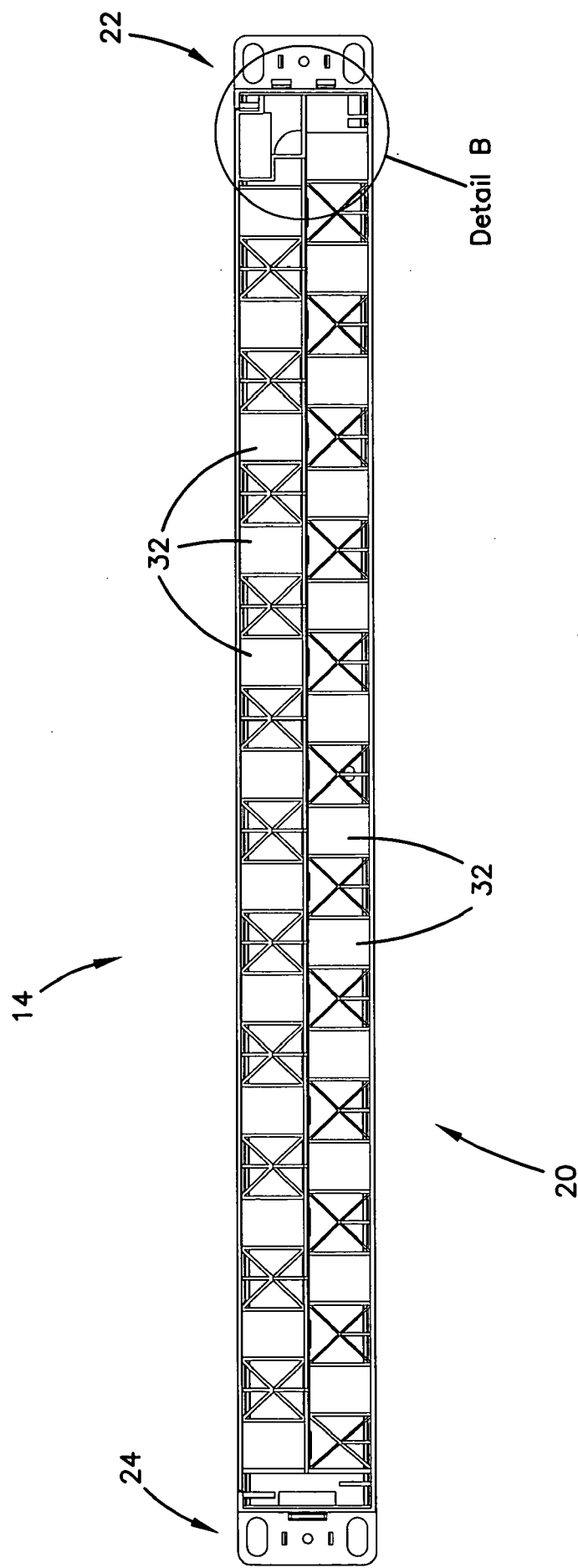


FIG.4

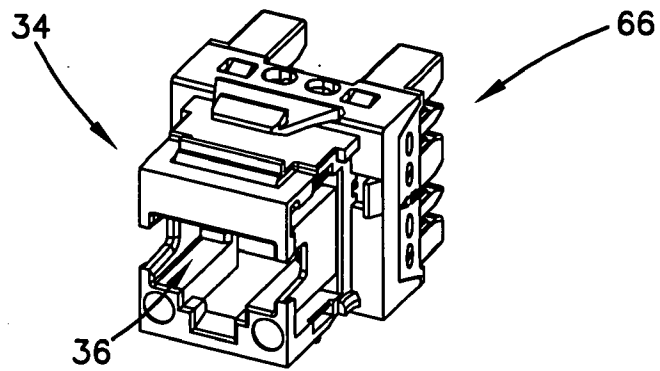


FIG.5

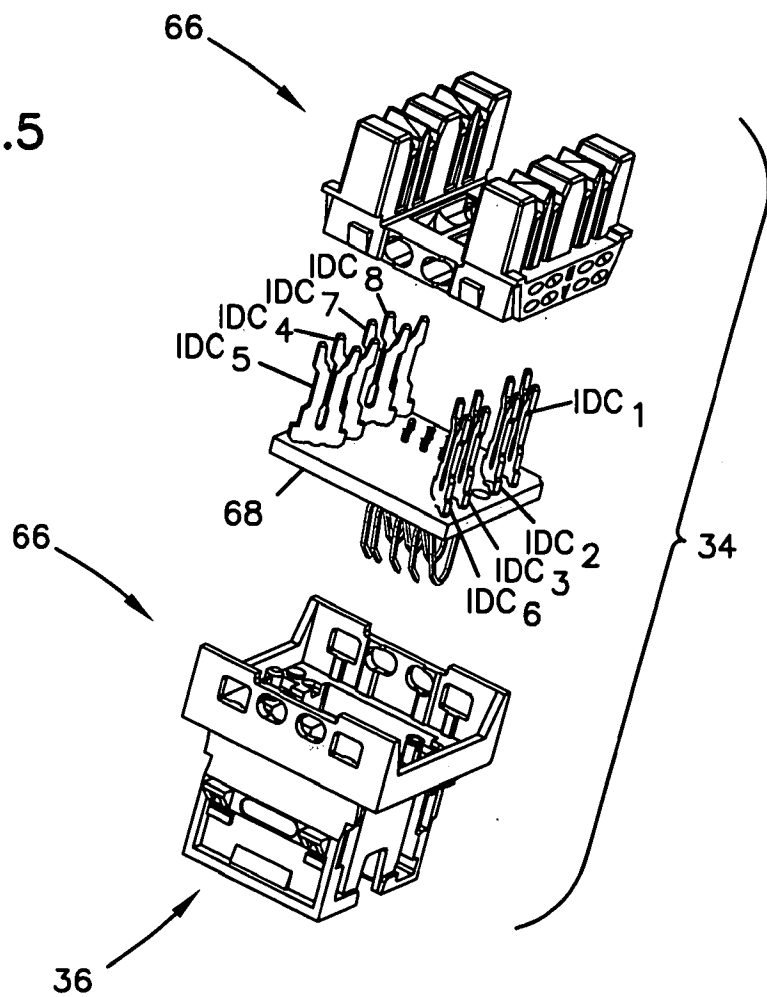


FIG. 6

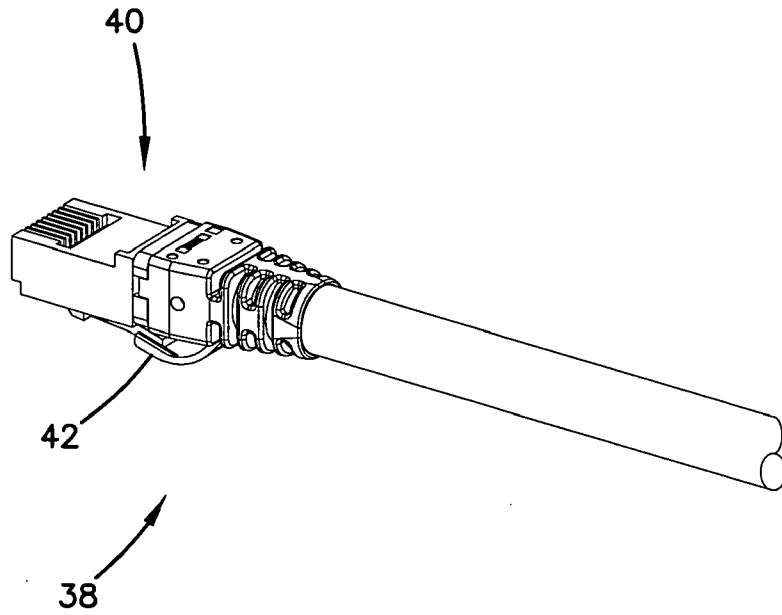
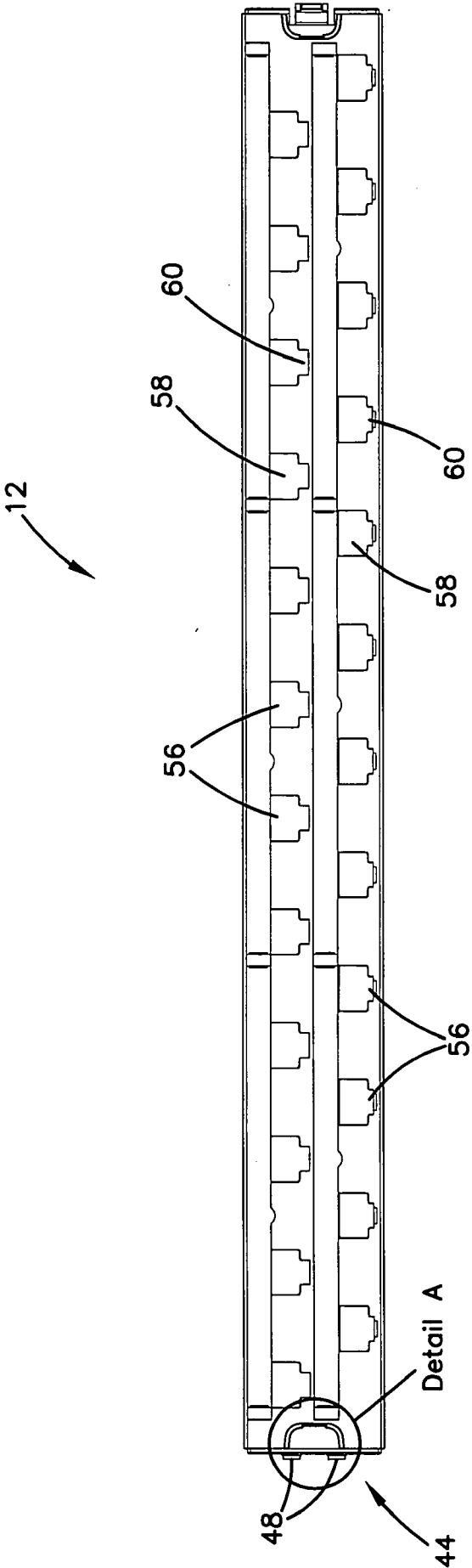


FIG.7



7/18

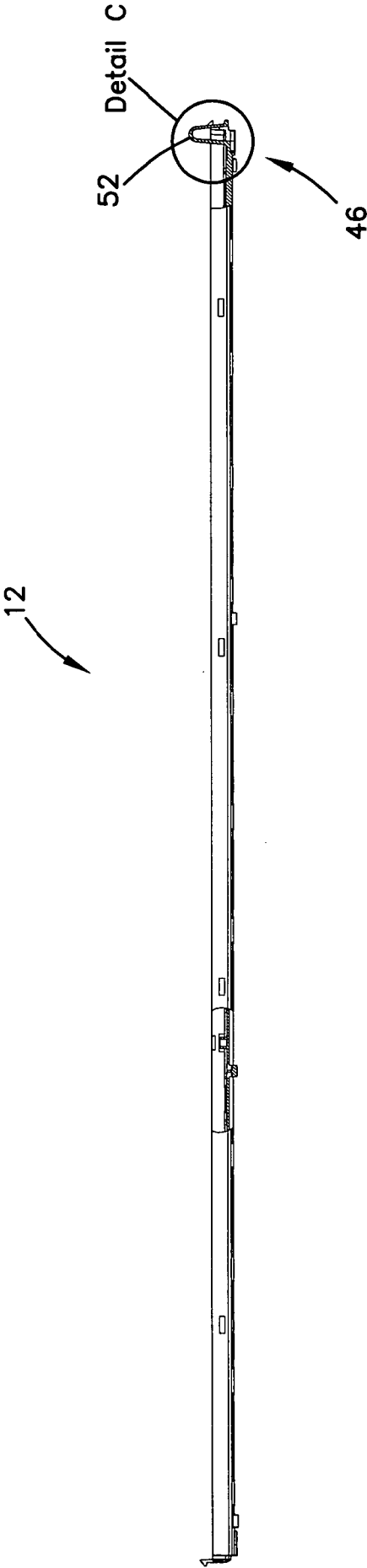


FIG. 8

FIG.9
Detail C

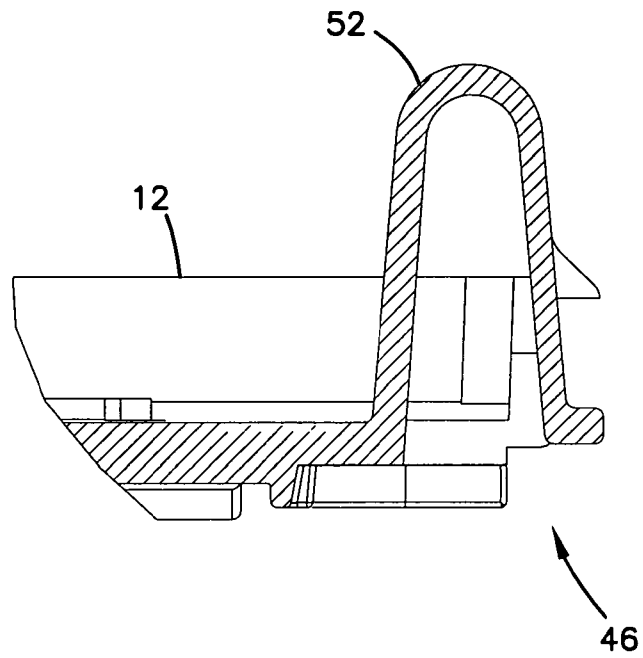


FIG.10
Detail A

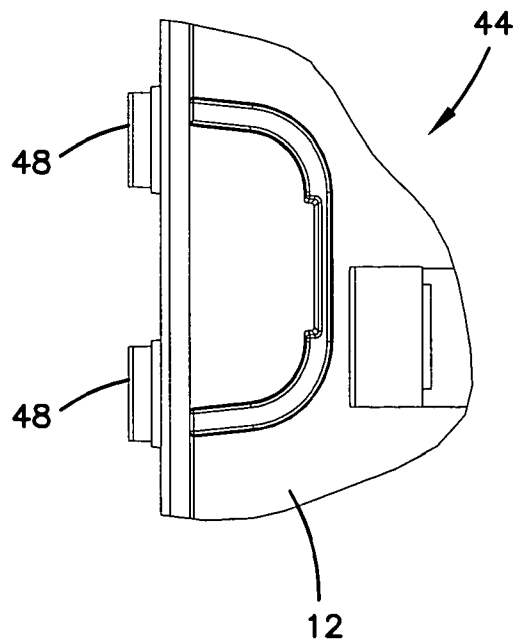


FIG. 11
Detail D

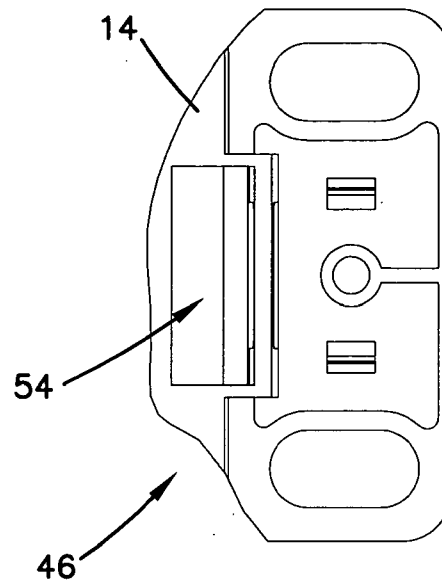
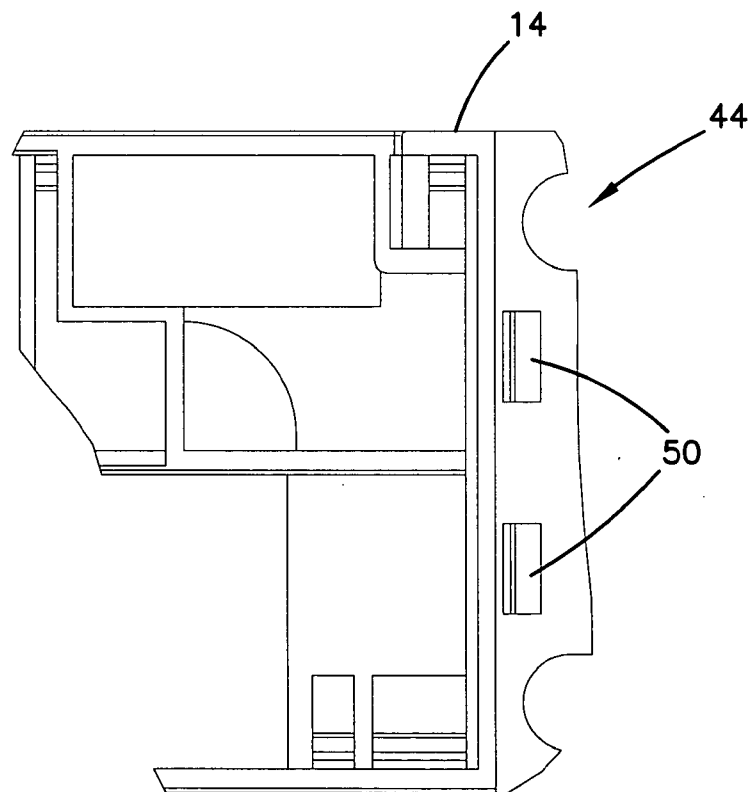


FIG. 12
Detail B



10/18

FIG.13

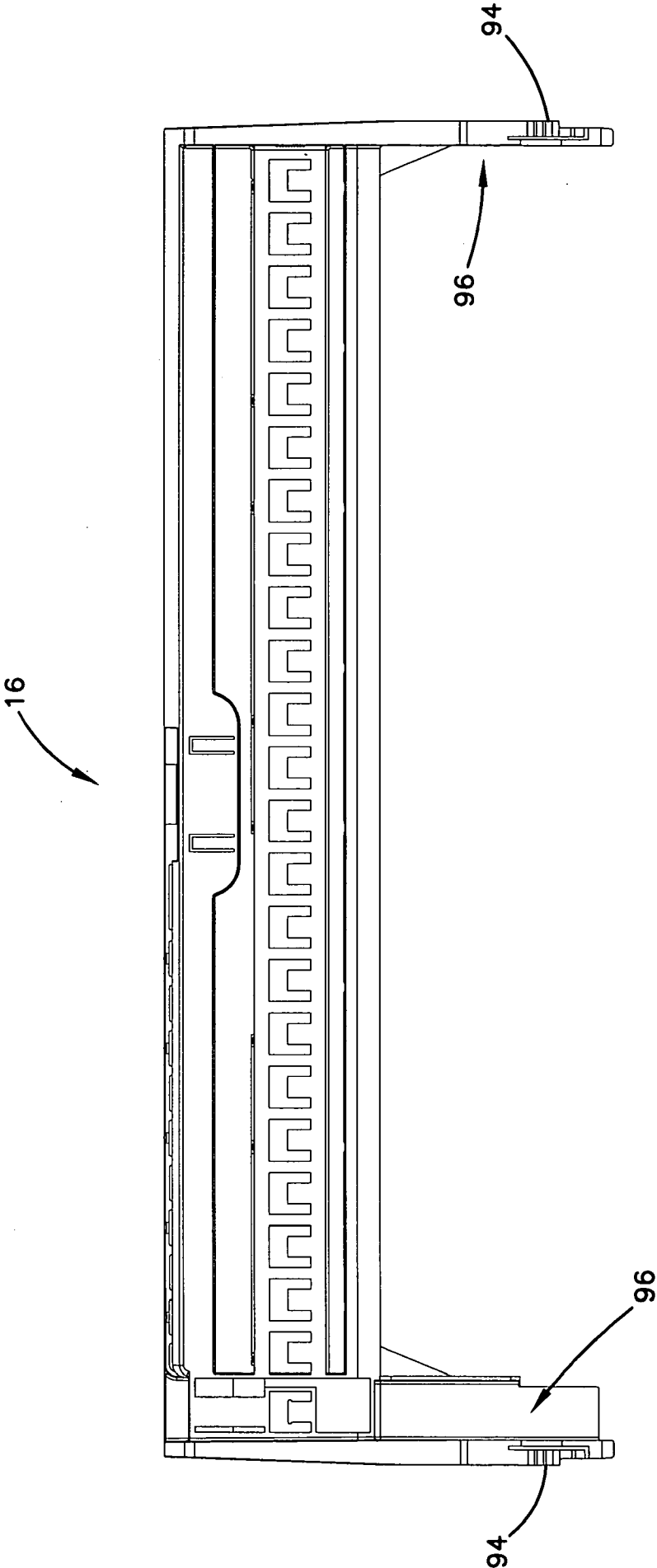
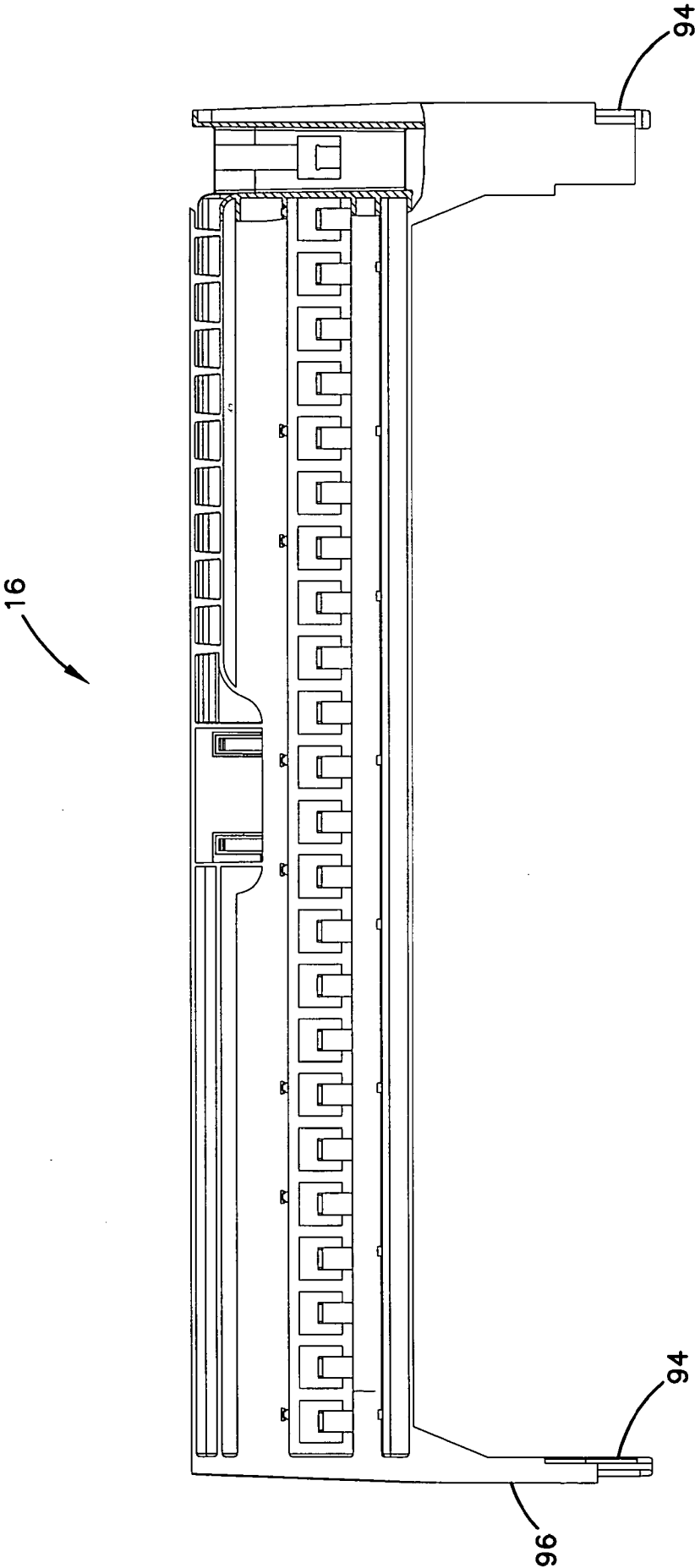


FIG.14



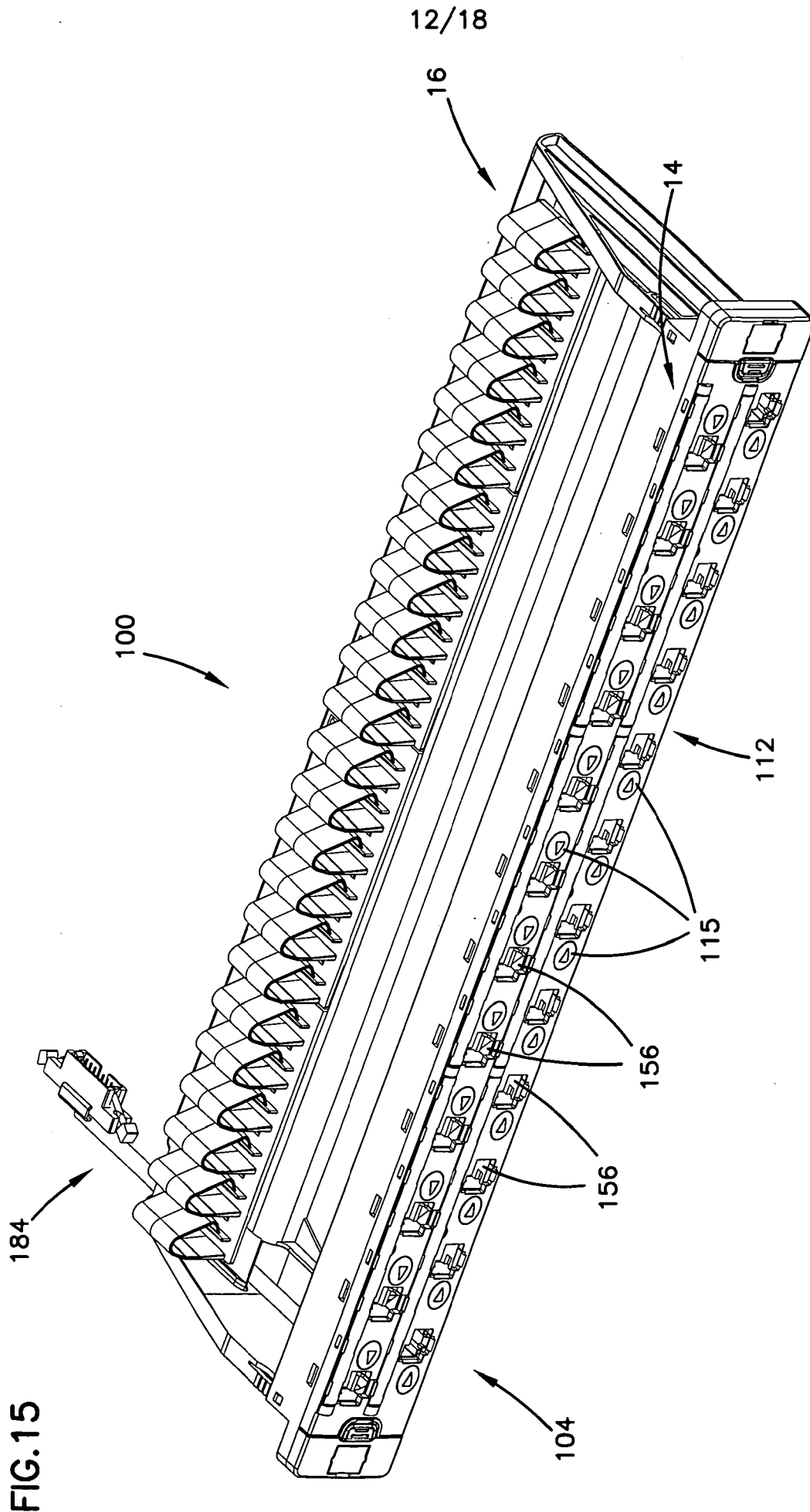


FIG. 15

FIG.16

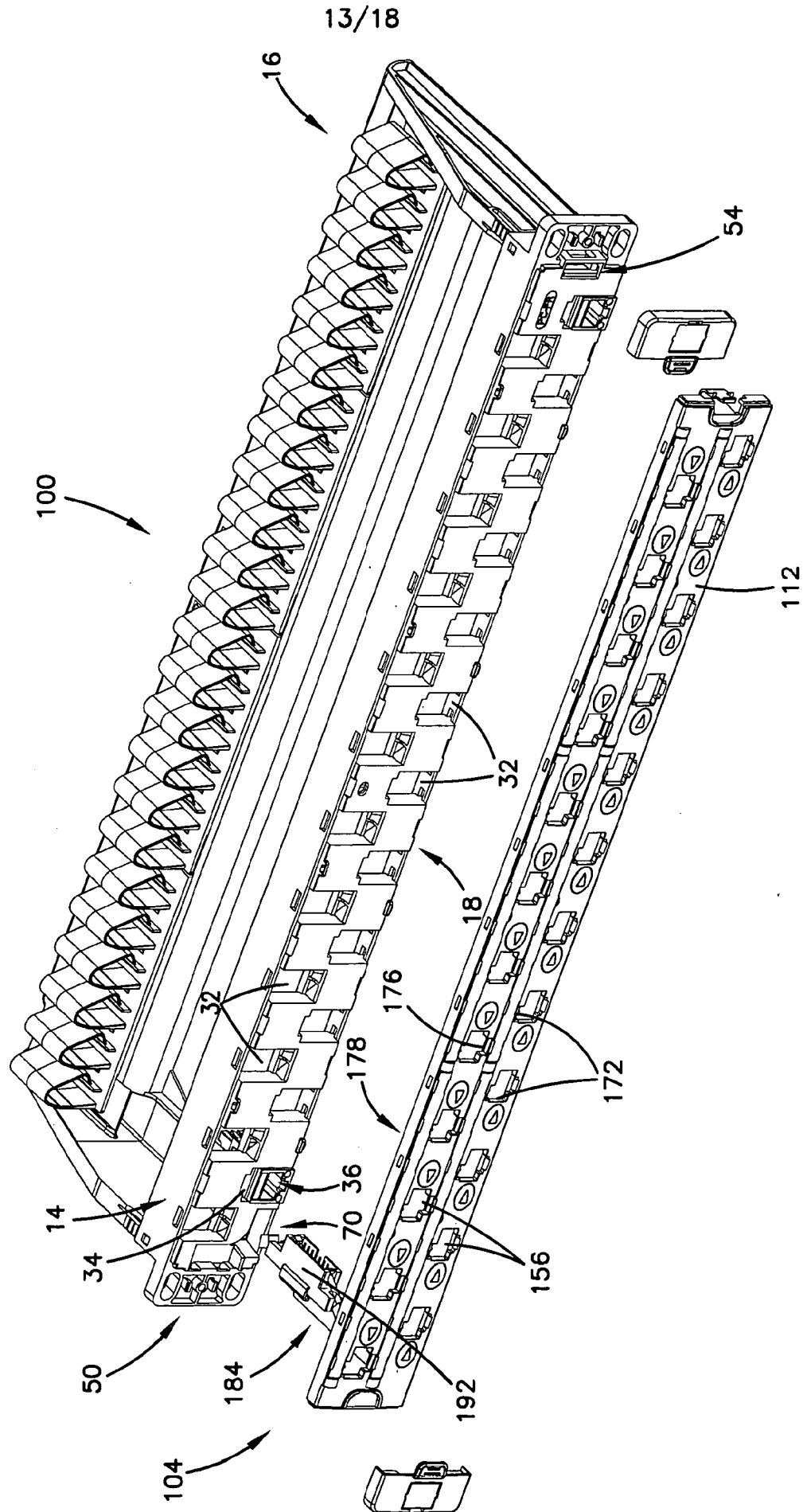


FIG.17

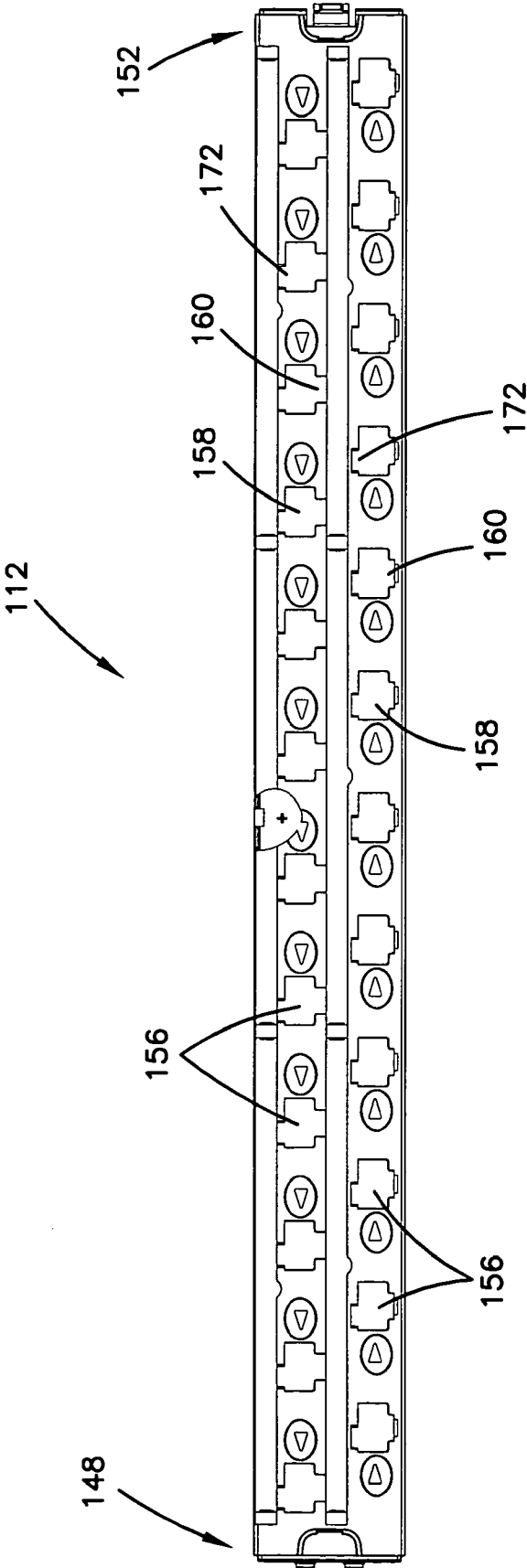


FIG.18

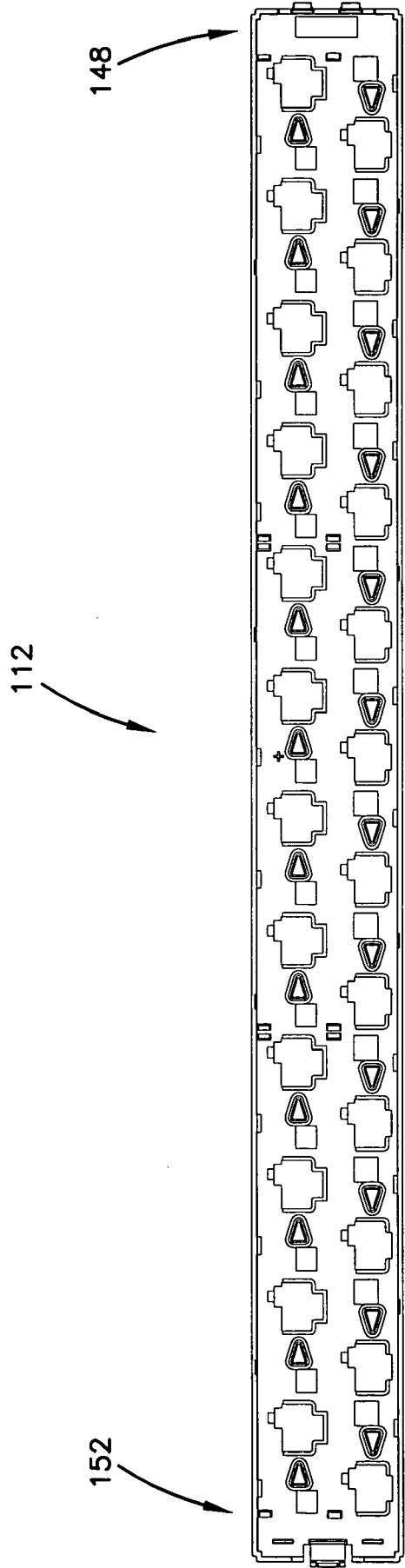


FIG. 19

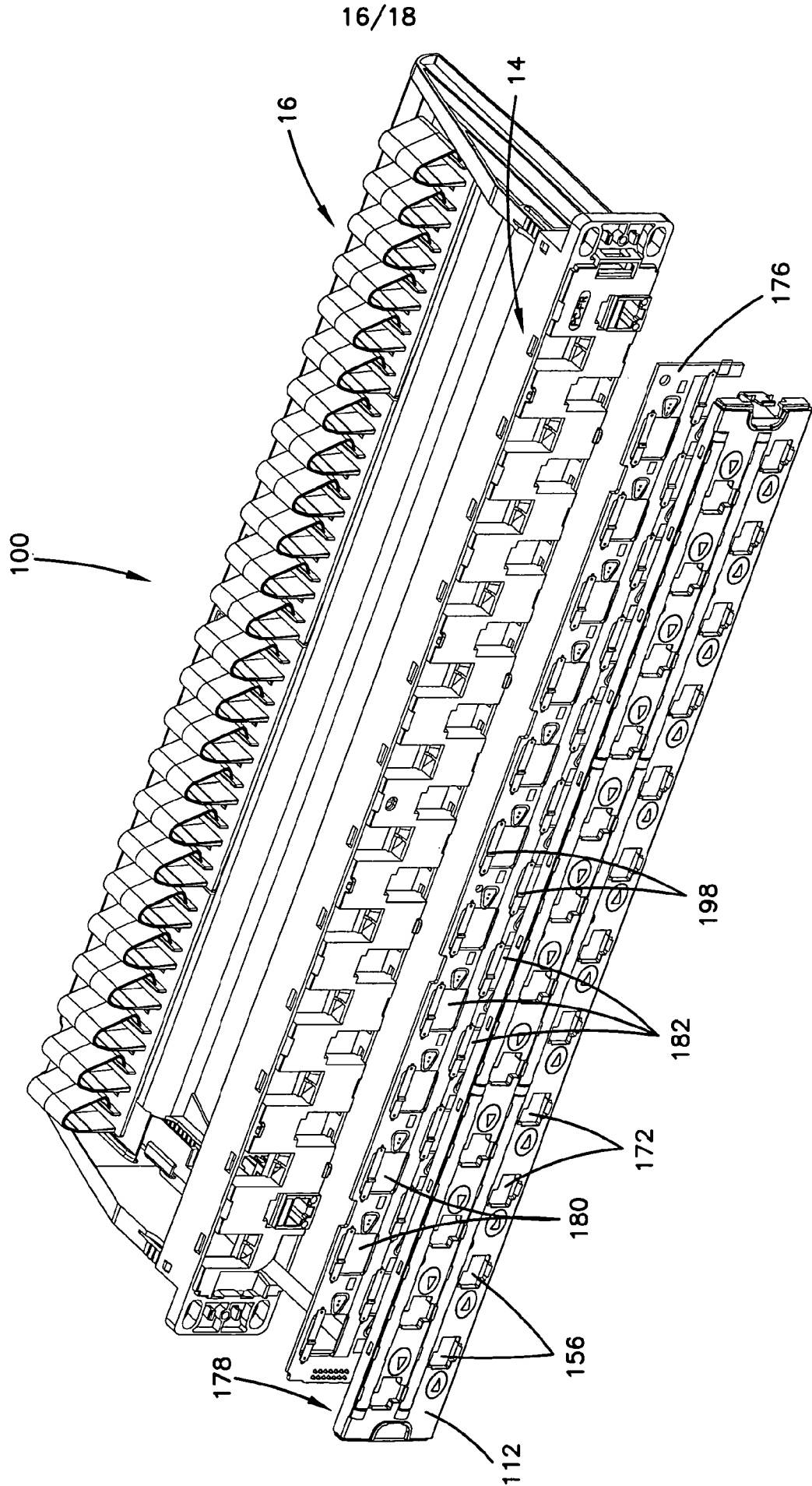
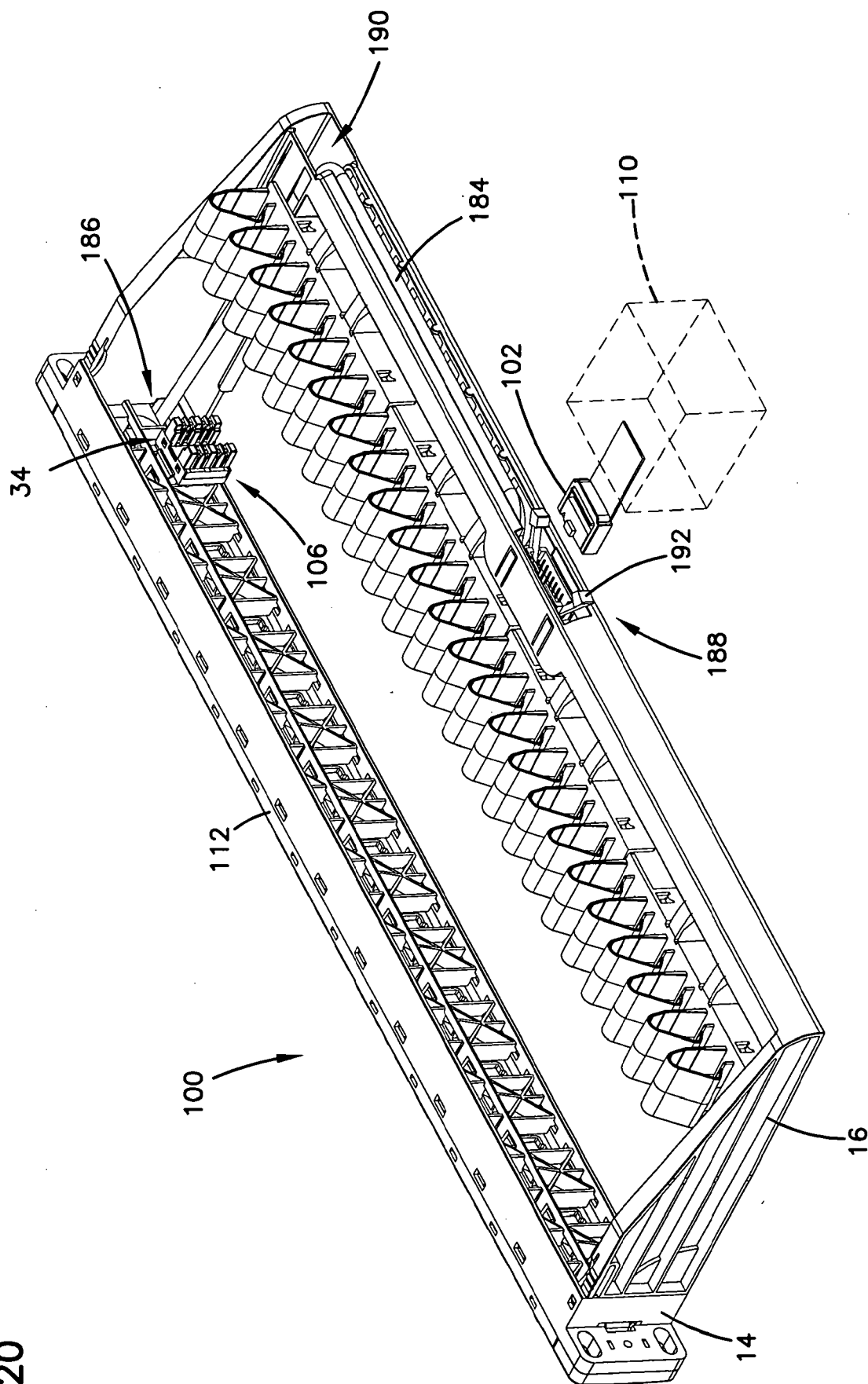


FIG. 20



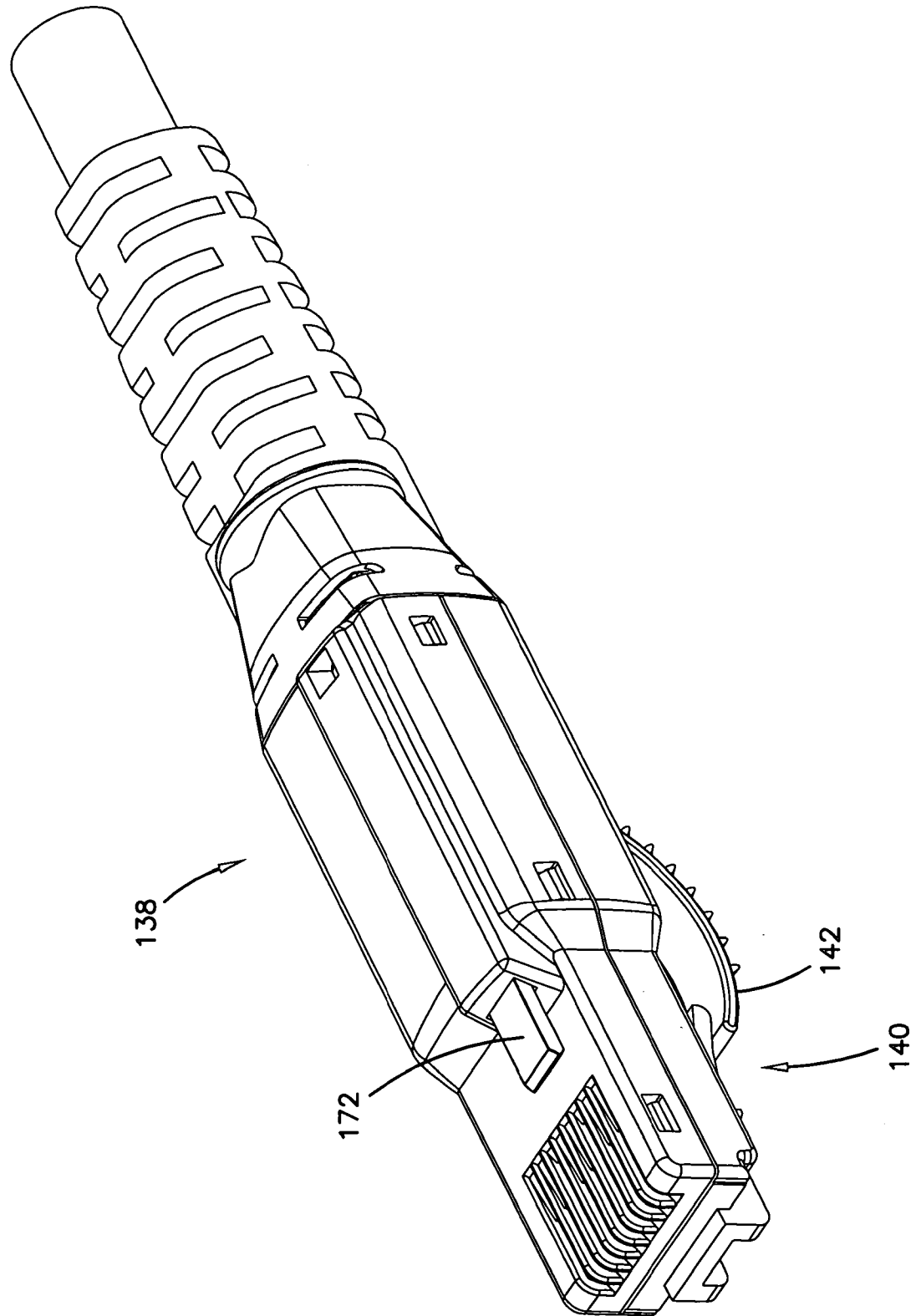


FIG. 21

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2007/021740

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04Q1/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2 344 702 A (HUBBELL INC [US]) 14 June 2000 (2000-06-14) abstract	1-21
A	EP 1 478 056 A (PANDUIT CORP [US]) 17 November 2004 (2004-11-17) abstract	1-21
A	EP 1 465 438 A (PANDUIT CORP [US]) 6 October 2004 (2004-10-06) abstract	1-21



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

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Date of the actual completion of the international search

4 March 2008

Date of mailing of the international search report

12/03/2008

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2007/021740

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