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(54) Title: TELECOMMUNICATIONS CABINET MODULARIZATION

(57) Abstract: An example telecommunications cabinet includes: an enclosure including sidewalls extending between a bottom of the enclosure and a top of the enclosure to define an interior of the enclosure; telecommunications equipment disposed within the interior of the enclosure; and a data distribution arrangement disposed on one of the sidewalls within the interior of the enclosure.



TELECOMMUNICATIONS CABINET MODULARIZATION

CROSS-REFERENCE TO RELATED APPLICATION

5 [0001] This application is being filed on 11 July 2013, as a PCT International Patent application and claims priority to U.S. Patent Application Serial No. 61/670,414 filed on 11 July 2012, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND

10 [0002] Telecommunications cabinets are used to hold equipment used in fiber optic and electrical networks. The equipment can be used to split and switch connections between origins and terminations. The equipment can perform other functions as well, such as to add power in Power-Over-Ethernet networks.

15 [0003] Fiber optic cables are typically run into and out of the cabinet to terminate with the equipment in the cabinet. Further, jumper cables can be used to make connections between different equipment within the cabinet. Excess cable can be looped and housed within the cabinet until needed. Heat generated by the equipment can be significant within the cabinet. The amount of cable run within the cabinet can disrupt cooling, thereby exacerbating the heating problems.

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SUMMARY

[0004] In one aspect, an example telecommunications cabinet includes: an enclosure including sidewalls extending between a bottom of the enclosure and a top of the enclosure to define an interior of the enclosure; telecommunications equipment
25 disposed within the interior of the enclosure; and a data distribution arrangement disposed on one of the sidewalls within the interior of the enclosure.

[0005] In another aspect, a telecommunications cabinet includes: an enclosure including sidewalls extending between a bottom of the enclosure and a top of the enclosure to define an interior of the enclosure; telecommunications equipment
30 disposed within the interior of the enclosure; an optical flexible foil cable disposed on one of the sidewalls within the interior of the enclosure, wherein the optical flexible foil cable is formed from a flexible polycarbonate material; wherein the optical flexible foil cable extends from the top of the enclosure through one of the sidewalls towards the bottom.

[0006] In yet another aspect, a method of distributing cables in a telecommunications cabinet includes: providing an enclosure including sidewalls extending between a bottom of the enclosure and a top of the enclosure to define an interior of the enclosure; positioning telecommunications equipment within the interior of the enclosure; and running a cable from the top of the enclosure, through the sidewalls within the interior of the enclosure, and to the telecommunications equipment.

DESCRIPTION OF THE DRAWINGS

- [0007] Figure 1 is a front view of an example telecommunications cabinet.
- [0008] Figure 2 is a perspective view of example cabling provided within the cabinet of Figure 1.
- [0009] Figure 3 is a schematic view of example cabling provided within the cabinet of Figure 1.
- [0010] Figure 4 is a schematic view of an example top wall of the cabinet of Figure 1.
- [0011] Figure 5 is a front view of a portion of the cabinet of Figure 1.
- [0012] Figure 6 is a side view of example cabling provided within the cabinet of Figure 1.
- [0013] Figure 7 is a side view of example cabling provided within the cabinet of Figure 1.
- [0014] Figure 8 is a side view of example cabling provided within the cabinet of Figure 1.
- [0015] Figure 9 is a side view of example cabling provided within the cabinet of Figure 1.
- [0016] Figure 10 is a side view of another example telecommunications cabinet.
- [0017] Figure 11 is a side view of another example telecommunications cabinet.
- [0018] Figure 12 is a side view of another example telecommunications cabinet.

DETAILED DESCRIPTION

[0019] The present disclosure is directed towards configurations for cabinets for telecommunications equipment. Although not so limited, an appreciation of the various aspects of the present disclosure will be gained through a discussion of the examples provided below.

[0020] Figures 1-5 illustrate one example embodiment for a telecommunications cabinet 100. In this example, the cabinet 100 includes a top wall 126, a bottom wall 128, and side walls 122, 124. A front wall (not shown) is also typically included so that the cabinet 100 provides an enclosed environment for telecommunications equipment.

[0021] In the example shown, telecommunications equipment 132, 134, 136 is provided within the cabinet 100. The equipment 132, 134, 136 can perform various tasks, such as splitting and/or routing optical and electrical connections from an origin to a destination. The equipment 132, 134, 136 can also perform such tasks as injecting power in a Power-Over-Ethernet environment. Other configurations are possible.

[0022] The telecommunications equipment 132, 134, 136 must be connected with a plurality of cables (fiber and/or electrical) to perform these functions. In this example, cables 104, 106 are routed from a fiber guide system 102 located above the cabinet 100. The cables 104, 106 are terminated at the top wall 126 of the cabinet 100.

[0023] As shown in Figure 4, the top wall 126 includes modules 310, 314 with a plurality of ports 312 provided therein. Each of the ports 312 can terminate a fiber and/or electrical connection. The ports 312 can be used to make connections with the equipment 132, 134, 136 located within the cabinet 100, as described further below. The ports 312 can provide data and/or power to the equipment 132, 134, 136.

[0024] In one example, the modules 310, 314 are equipped with connection point identification technology (CPID) so that information contained in integrated circuit boards on the connectors connected to the modules 310, 314 is communicated to the equipment 132, 134, 136. One example of such CPID technology is the Quareo Technology provided by TE Connectivity of Berwyn, Pennsylvania.

[0025] In this example, the ports 312 can accept a variety of connectors. For example, fiber connectors can include an LC connector, although other connector types can be used. For example, in alternative embodiments, SC, MU, or LX.5 connectors can be used, such as that illustrated in U.S. Patent No. 6,629,782.

[0026] The top wall 126 also includes ports 320, 322, 324, 326 that perform various other functions. In this example, the ports 320, 322 are power ports that connect with electrical cables to provide power to the equipment 132, 134, 136 within the cabinet 100.

[0027] The ports 324, 326 are optical CPID ports that allow the cabinet 100 to be connected with other equipment, such as other cabinets of similar configuration. In this example, the cabinet 100 can be connected to a network having various configurations. For example, wired to other cabinets to provide interconnections
5 therebetween. In another example, each cabinet can be wired to a switch matrix or patch panel to provide connectivity between cabinets.

[0028] Referring to Figures 1-3 and 5, the side walls 122, 124 define passages 366 through which cabling 210 is run from the top wall 126 to the equipment 132, 134, 136 within the cabinet 100. In example embodiments, the sidewalls 122, 124 can be
10 formed of two or more panels 125, 127 that together form the passage 366 therethrough. The passage 366 can be partially and/or completely enclosed as the side walls 122, 124 extend from the top wall 126 to the bottom wall 128. Other configurations can be used to form the passage 366. For example, in alternative embodiments, the passage 366 can be formed by other structures, such as beams
15 with hollow interiors that are used to form portions of the side walls 122, 124.

[0029] Specifically, cables that originate from the modules 310, 314 and ports 320, 322, 324, 326 on the top wall 126 are run through the side walls 122, 124. In this example, the cabling can be a dense-type cabling, such as multi-mode and/or single mode fibers that have been embedded in a flexible foil structure. The foil structure
20 can be made of various materials, such as a polycarbonate or a polyimide film, such as Kapton® polyimide film made by DuPont of Wilmington, Delaware. The foil allows for increased density when running a plurality of fibers while minimizing heat.

[0030] The cabling 210 is terminated along the side walls 122, 124 at modules 220, 230 that include ports 222, 232. The modules 220, 230 can be of different types. For example, in this illustration, the port 222 on the module 220 is an MTP port, and the ports 232 on the module 230 are LC ports. Other configurations are possible.

[0031] Short jumper cables 123, 143, 144 can be connected from the modules 220, 230 to ports located on the equipment 132, 134, 136 within the cabinet 100. By
30 optimizing (i.e., minimizing) the size of the jumper cables 123, 143, 144, any slack within the cabinet is minimized. For example, the jumper cables 123, 143, 144 can be provided in different sizes so that the correct size can be used to route a jumper cable from a particular port on the side wall 122, 124 to a particular port on the

equipment 132, 134, 136. In this manner, excess cable within the cabinet 100 is minimized.

[0032] In addition to running fiber through the side walls 122, 124, electrical cabling can also be provided through the side walls 122, 124. For example, electrical wires providing data and/or power can be run through the side walls 122, 124 to terminations within the cabinet 100.

[0033] Referring now to Figures 6 and 7, examples of the cabling 210 are shown. In Figure 6, the cabling 210 includes the foil 372 in which optical fibers 374 are embedded. The foil 372 is flexible so that it can be positioned within the passages 366 to run from the top wall 126 to the bottom wall 128. The foil 372 expands at the top to provide connections with the modules located at the top wall 126. The foil 372 tapers into a more compact structure as the foil extends from the top wall 126 to allow for a greater density of cabling within the passages 366.

[0034] In Figure 7, an alternative configuration for the cabling is shown. In this example, circular cables 510 are fed into a convex foil 512 that is extended through the passages 366. Other configurations are possible. Further, as noted previously, the foil can be used to carry both data and/or power.

[0035] For example, referring now to Figure 8, an example flat power cable 500 is shown. The cable 500 is configured to be run within the passages 366 on the side walls 122, 124.

[0036] The cable 500 includes a module 514 that is positioned at the top wall 126 so that external cabling can be connected thereto. A flat cable 520 extends from the module 514. In this example, the flat cable 520 is a multi-layered cable wrapped in a polymeric housing. Multiple wires can be run therethrough while maintaining optimal density and thermal characteristics.

[0037] The cable 520 is terminated at a plurality of connections 522. In the example shown, one or more of the connections 522 includes a port interface 532, such as a Quareo CPID interface shown in Figure 8. The connection 522 also includes indicator lights 534, 536 for each electrical outlet 538. In this example, the lights 534, 536 are LEDs, with the light 534 indicating voltage within specified limits (e.g., for a Power-Over-Ethernet implementation) for the outlet 538, and the light 536 indicates that the electrical outlet 538 is active (e.g., by sensing a current at the outlet). Each outlet 538 can also include a removable fuse 540.

[0038] Referring now to Figure 9, another example cable 600 is shown. The cable 600 provides both control and monitoring on the ports 1-5. Specifically, the cable 600 includes a control module 614 that communicates on a wire 622. The control module 614 can function to provide control and monitoring of the ports, such as CPID, LED signaling, and current sensing. A power bus 612 provides power to each of the ports. The wire 622 and the bus 612 are both run through a flexible foil 620 made of a material like Kapton® polyimide film.

[0039] In example embodiments, the control module 614 can include various logical components. For example, the control module 614 can include a microprocessor to control monitoring of the network. The control module 614 can include storage and one or more removable storage devices (e.g., an SD Card port) that allows for event-related storage. The control module 614 can include communications circuitry that allows the control module 614 to communicate with the remainder of the network using Ethernet.

[0040] Each example port can also include enhanced functionality, including providing power in the Power-Over-Ethernet implementations. A microprocessor, such as a 16-bit DSP, can also be provided to perform functions like voltage and current sensing at the port. Other configurations are possible.

[0041] Referring now to Figure 10, another example telecommunications cabinet 700 is shown. The cabinet 700 is similar to the cabinet 100 described above. However, the cabling 710 run within the side walls 122, 124 of the cabinet 700 includes MPO cables that extend from the modules 310 in the top wall 126 to modules 230 in the side walls 122, 124. The modules 230 include LC ports, so that data that is transmitted from ports in the modules 310 is terminated in the LC ports in the modules 230. The cabling 710 can be provided on a single plane to allow for maximization of air flow.

[0042] In alternative designs, electrical cables can be run. For example, the cabling could be MRJ21 cables that extend from the modules 310 in the top wall 126 to modules 230 in the side walls 122, 124. The modules 230 could include RJ45 ports, so that data is transmitted from ports in the modules 310 is terminated in the RJ45 ports in the modules 230.

[0043] Similarly, in Figure 11, a telecommunications cabinet 800 includes modules 812 formed of rigid printed circuit boards (PCBs) with jacks attached thereto. Flexible PCB cabling 810 extends from the modules 812, through the side walls

122, 124, to modules 830. The modules 830 are again formed of rigid PCB boards having jacks attached thereto. In this example, the jacks on the modules 812 are MRJ21 jacks, and the jacks on the modules 830 are RJ45 jacks.

5 [0044] In yet another embodiment shown in Figure 12, an example telecommunications cabinet 900 includes modules 910, 930 and cabling 912, all formed of rigid PCB board. Data is electrically transmitted to/from the modules 910, 930. The rigid PCB board extends through the side walls 122, 124. Other configurations are possible.

10 [0045] There can be various advantages associated with the configurations described herein. For example, by providing the terminations at the outside of the cabinet, the amount of cabling run within the cabinet can be controlled to maximize thermal properties, such as cooling. Further, routing the cables through the side walls allows the cabinets to be “pre-wired” during assembly of the cabinets, thereby further optimizing cabling within the cabinets.

15 [0046] The routing of the cables in this manner also increases the density of the cabling that can be provided. The ribbon-like cabling allows for multiple layers of cable to be stacked, increasing the density of the cabling. Use of jumper cables of specified lengths also minimizes excess cabling (e.g., slack) within the cabinet, enhancing the thermal properties of the cabinet.

20 [0047] Further, termination of the ports outside of the cabinet minimizes the need to access the internal space of the cabinet for modifications, such as moves, adds, and changes (MAC). This results in a reduction for the need of patch panels and optimizes rack space for further equipment to be stored within the cabinet.

25 [0048] Although the subject matter has been described in language specific to structural features and/or methodological acts, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific features or acts described above. Rather, the specific features and acts described above are disclosed as example forms of implementing the claims.

What is claimed is:

1. A telecommunications cabinet, comprising:
an enclosure including sidewalls extending between a bottom of the
5 enclosure and a top of the enclosure to define an interior of the enclosure;
telecommunications equipment disposed within the interior of the enclosure;
and
a data distribution arrangement disposed on one of the sidewalls within the
interior of the enclosure.
10
2. The telecommunications cabinet of claim 1, wherein the data distribution
arrangement includes an optical flexible foil cable.
3. The telecommunications cabinet of claim 2, wherein the optical flexible foil
15 cable is formed from a flexible polycarbonate material.
4. The telecommunications cabinet of claim 2, wherein the optical flexible foil
cable is formed from a flexible Kapton material.
- 20 5. The telecommunications cabinet of claim 2, wherein the optical flexible foil
cable extends from the top of the enclosure through one of the sidewalls towards the
bottom.
6. The telecommunications cabinet of claim 1, wherein the telecommunications
25 equipment includes active telecommunications equipment.
7. The telecommunications cabinet of claim 6, wherein the active
telecommunications equipment includes an optical switch.
- 30 8. The telecommunications cabinet of claim 1, further comprising:
at least one electrical port for receiving a power feed defined at the top of the
enclosure; and

a power distribution arrangement disposed on one of the sidewalls within the interior of the enclosure, the power distribution arrangement being electrically coupled to the electrical port at the top of the enclosure.

5 9. The telecommunications cabinet of claim 8, wherein the power distribution arrangement includes an electrical ribbon cable.

10. The telecommunications cabinet of claim 1, wherein the data distribution arrangement includes one or more electrical conduits over which data is transmitted.

10

11. The telecommunications cabinet of claim 10, wherein the electrical conduits include a printed circuit board.

12. The telecommunications cabinet of claim 11, wherein the printed circuit
15 board is a flexible printed circuit board.

13. A telecommunications cabinet, comprising:

an enclosure including sidewalls extending between a bottom of the enclosure and a top of the enclosure to define an interior of the enclosure;

20 telecommunications equipment disposed within the interior of the enclosure;

an optical flexible foil cable disposed on one of the sidewalls within the interior of the enclosure, wherein the optical flexible foil cable is formed from a flexible polycarbonate material;

25 wherein the optical flexible foil cable extends from the top of the enclosure through one of the sidewalls towards the bottom.

14. The telecommunications cabinet of claim 13, wherein the optical flexible foil cable is formed from a flexible Kapton material.

30 15. The telecommunications cabinet of claim 13, wherein the telecommunications equipment includes an optical switch.

16. The telecommunications cabinet of claim 1, further comprising:

at least one electrical port for receiving a power feed defined at the top of the enclosure; and

a power distribution arrangement disposed on one of the sidewalls within the interior of the enclosure, the power distribution arrangement being electrically
5 coupled to the electrical port at the top of the enclosure.

17. A method of distributing cables in a telecommunications cabinet, the method comprising:

providing an enclosure including sidewalls extending between a bottom of
10 the enclosure and a top of the enclosure to define an interior of the enclosure;

positioning telecommunications equipment within the interior of the enclosure; and

running a cable from the top of the enclosure, through the sidewalls within the interior of the enclosure, and to the telecommunications equipment.

15

18. The method of claim 17, wherein the cable is an optical flexible foil cable.

19. The method of claim 17, wherein the telecommunications equipment includes active telecommunications equipment.

20

20. The method of claim 19, wherein the active telecommunications equipment includes an optical switch.

FIG. 1

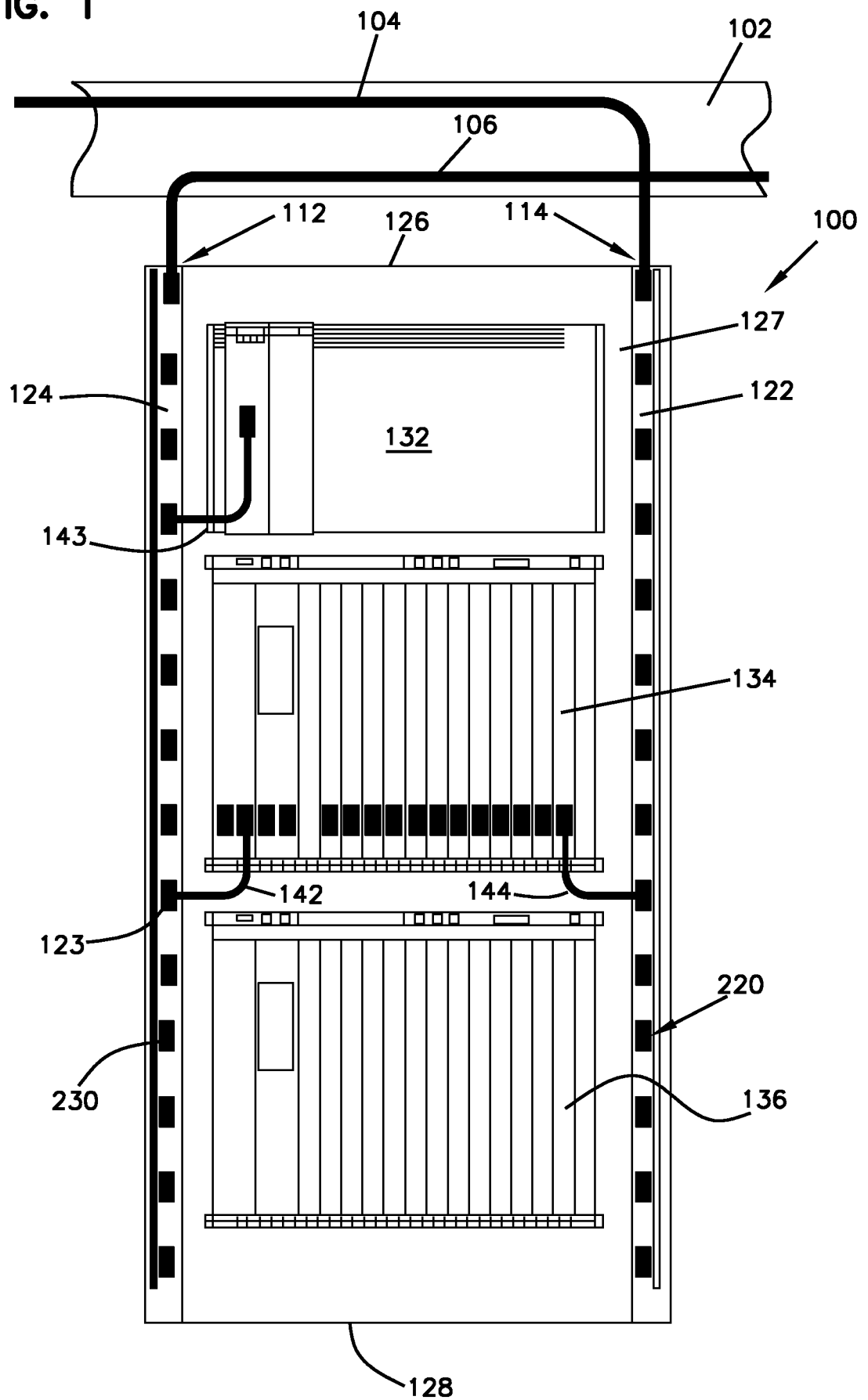


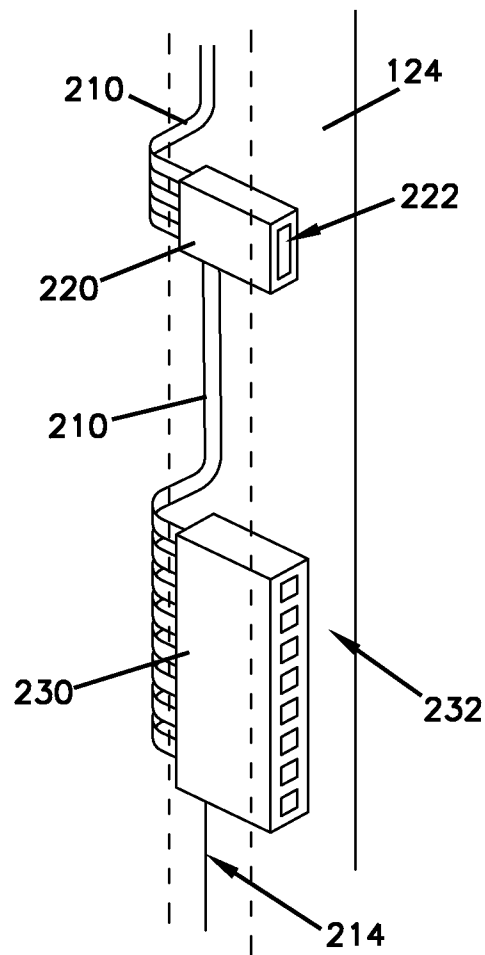
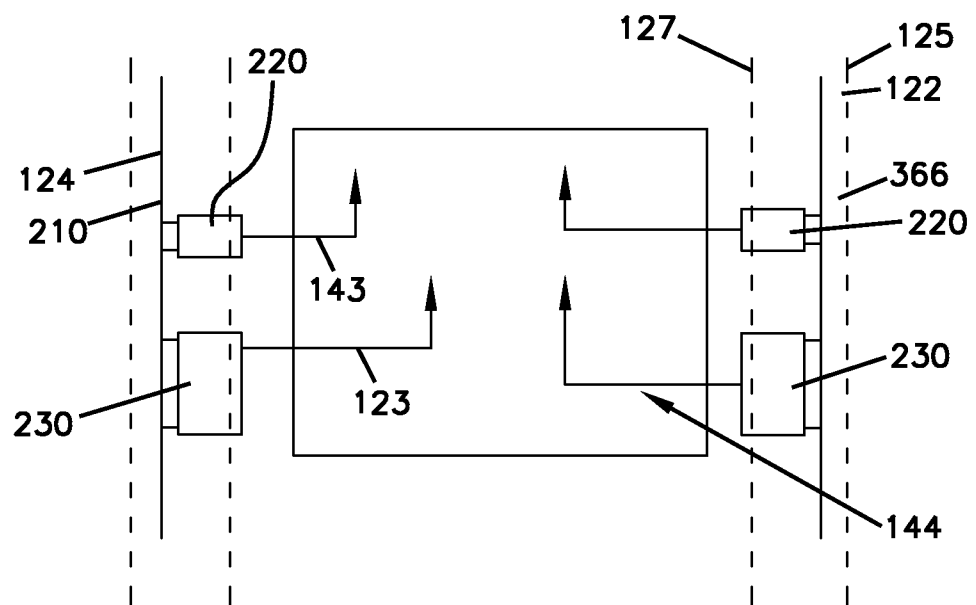
FIG. 2**FIG. 3**

FIG. 4

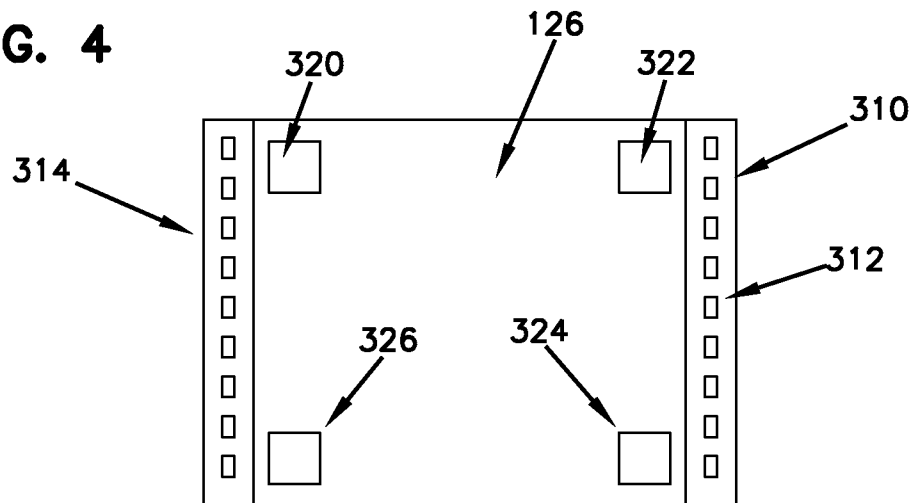


FIG. 5

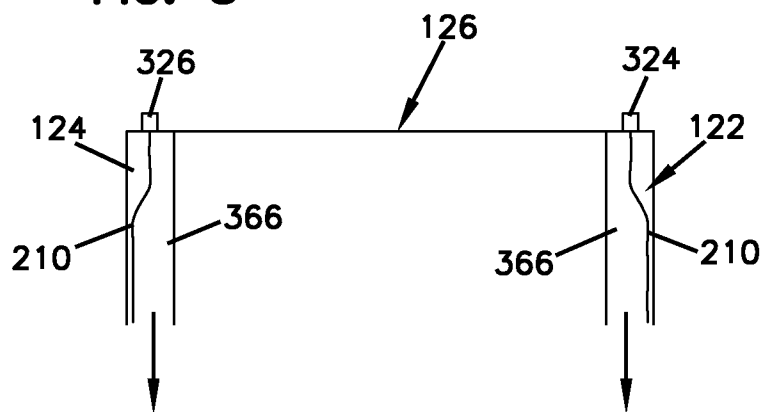


FIG. 6

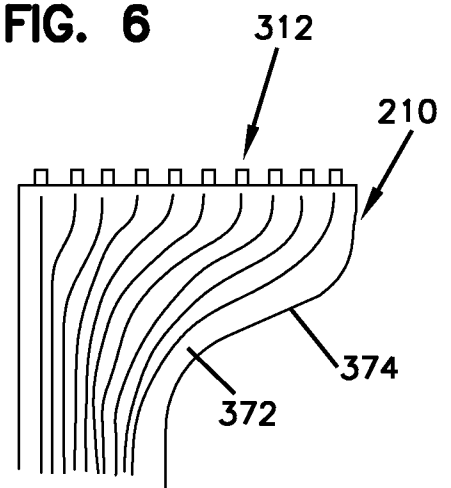


FIG. 7

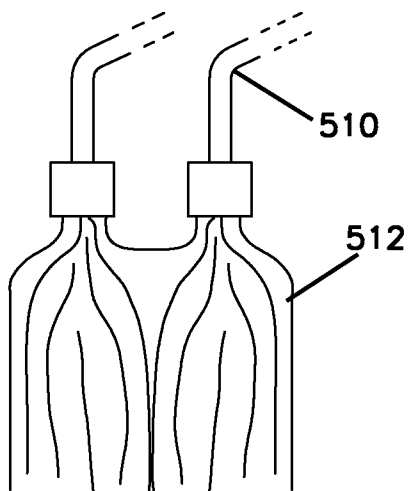


FIG. 8

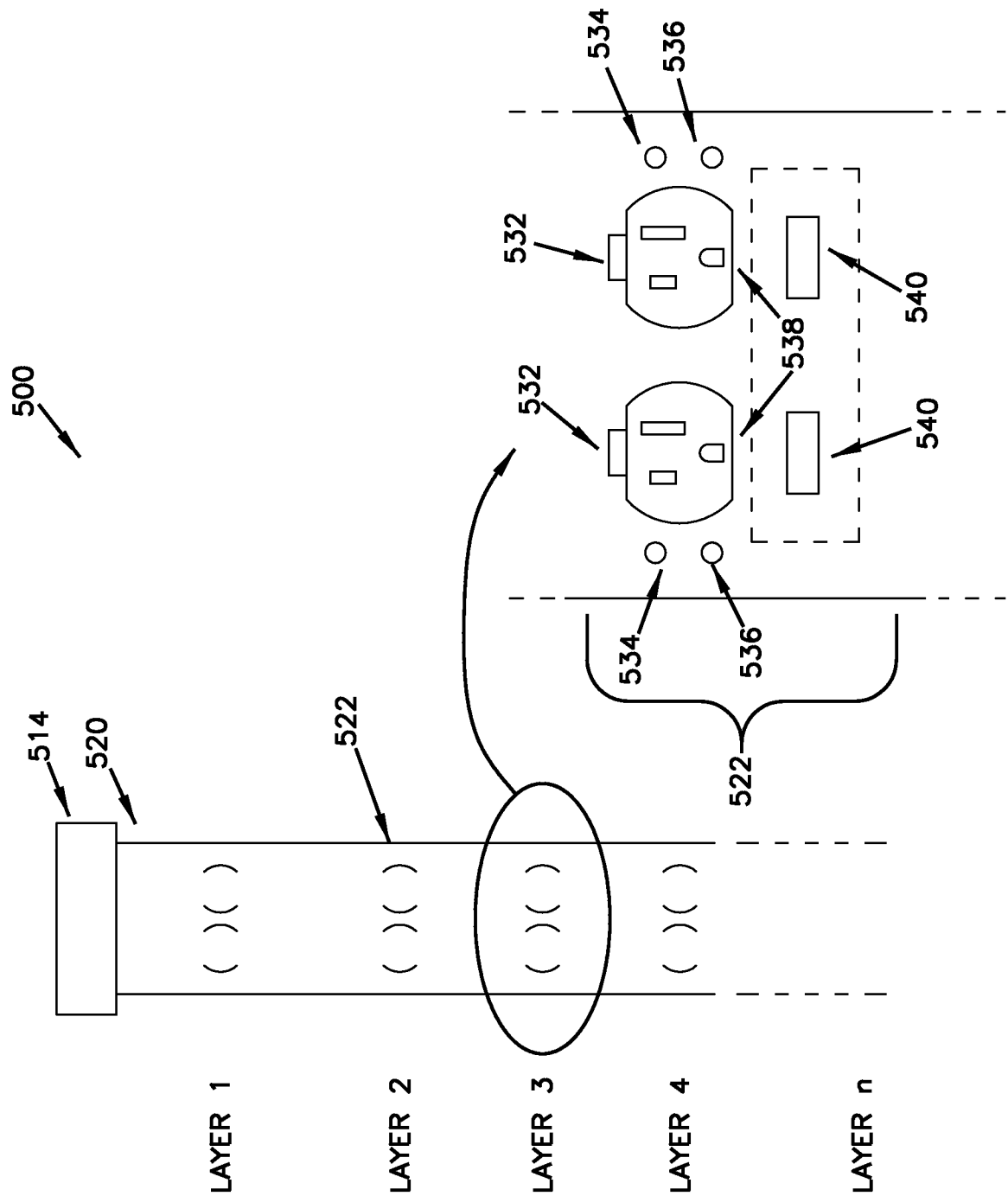


FIG. 9

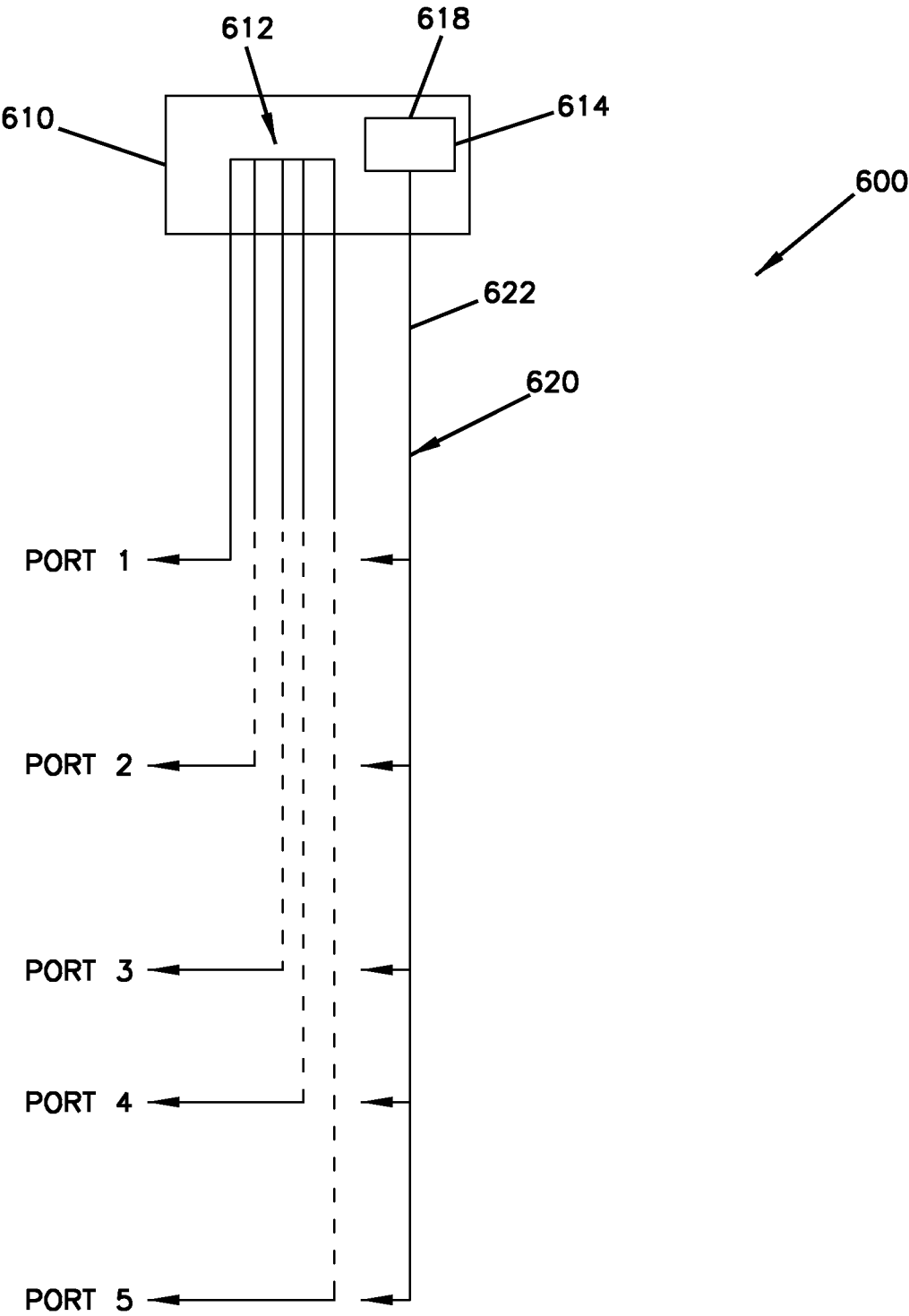


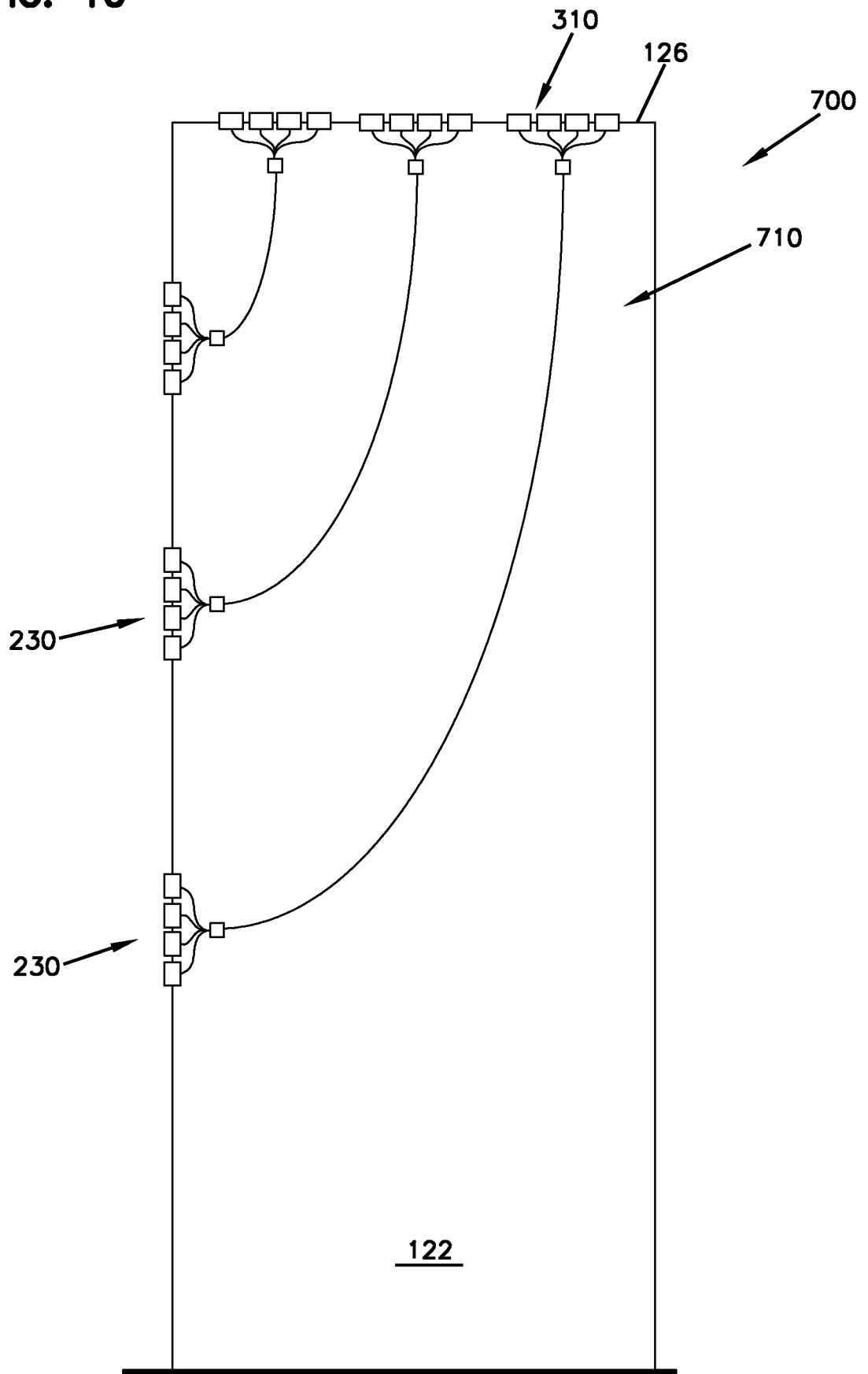
FIG. 10

FIG. 11

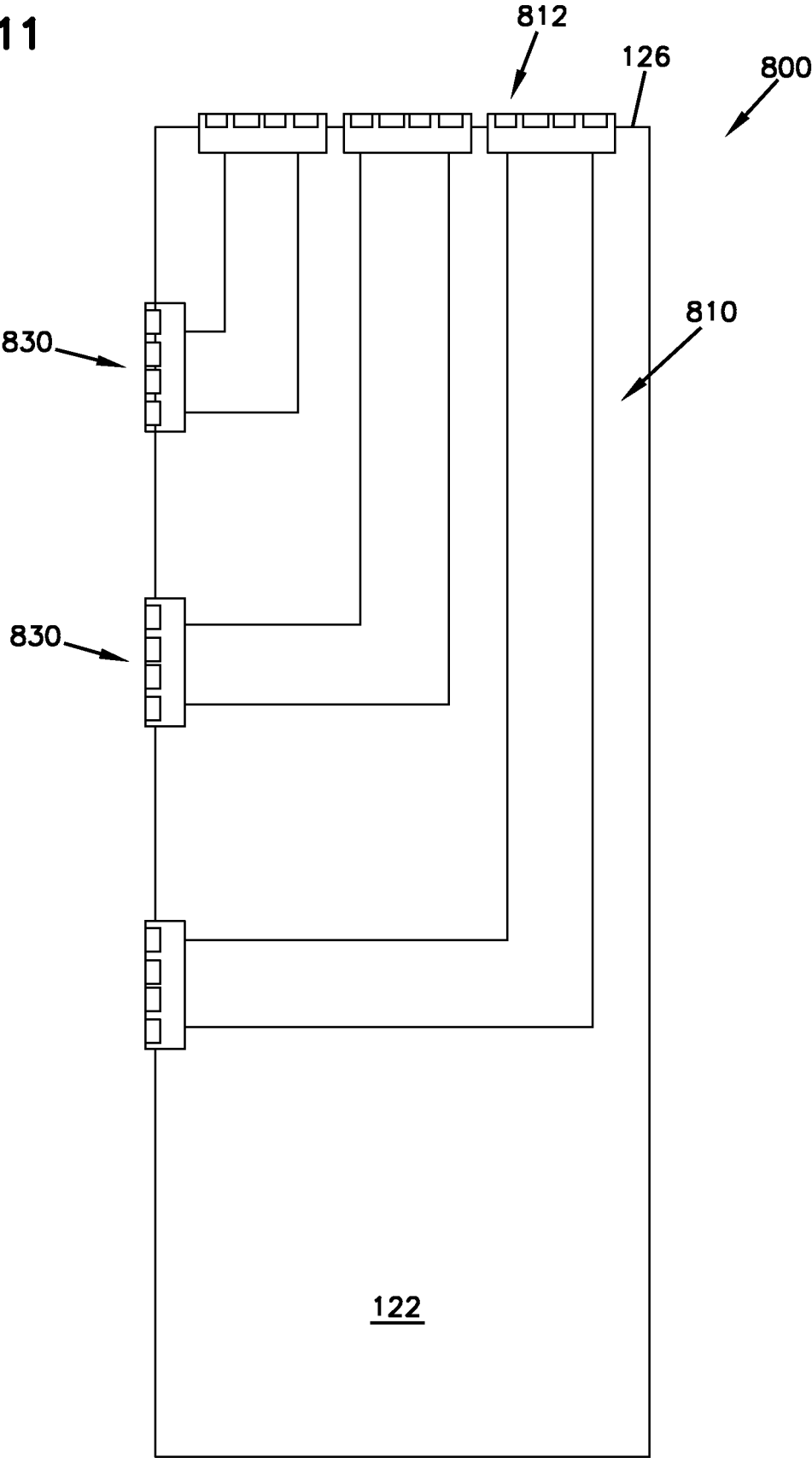


FIG. 12

