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COMPACT STACKABLE TRAYS WITH POSITIONING RACKS

STATEMENT OF GOVERNMENT INTEREST

[0001] The invention described herein was made in the performance of official duties by employees of the U.S. Department of the Navy and may be manufactured, used, or licensed by or for the Government of the United States for any governmental purpose without payment of any royalties thereon.

CROSS REFERENCE TO OTHER PATENT APPLICATIONS

[0002] None.

BACKGROUND OF THE INVENTION

1) Field of the Invention

[0003] The present invention relates to cable trays and specifically to cable trays with positioning racks that allow the stacking of the cable trays.

2) Description of the Prior Art

[0004] A towed array can be several miles in length and can contain a network of delicate telemetry and sensor components. Construction of a towed array electrical harness requires multiple long benches to map, construct and test the components of the array.

[0005] This construction process has phases that may span several months and requires a significant amount of labor. As a result, sensitive and fragile array components remain exposed on open benches. This exposure creates the potential for damage which then leads to a great deal of cost and rework due to the significant length and delicate soldered connections in the electrical harness of the towed array.

SUMMARY OF THE INVENTION

[0006] In accordance with the present invention, a cable tray is provided which includes a tray bottom extending along a horizontal plane. The tray bottom has two opposite side edges and a pair of sidewalls vertically attached to the side edges to form the open cable tray.

[0007] A first positioning rack and a second positioning rack extend between the sidewalls. The positioning racks are orthogonal to the tray bottom and the sidewalls. A first foot bar is positioned on an underside of the tray bottom in which the foot bar vertically aligns with the first positioning rack. A second foot bar is on the underside of the tray bottom in which the foot bar vertically aligns with the second positioning rack. Each of the positioning racks includes cable support apertures and opening slots.

[0008] A method of storing a wiring harness is also provided. The method includes providing a tray with a bottom extending along a horizontal plane and having opposite side edges. The tray has a pair of side walls attached to the side edges. A first positioning rack and a second positioning rack extend between the side walls. Each of the positioning racks includes cable support apertures having upwardly opening slots. A wiring harness is laid along the tray bottom with the wires of the harness positioned in the upwardly opening slots. Each of the components is held in a cable support aperture.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Other objects, features and advantages of the present invention will become apparent upon reference to the following description of the preferred embodiments and to the drawings, wherein corresponding reference characters indicate corresponding parts throughout the several views of the drawings and wherein:

[0010] **FIG. 1** depicts a stackable tray in accordance with the present invention;

[0011] **FIG. 2** depicts a positioning rack of the stackable tray in accordance with the present invention;

[0012] **FIG. 3** depicts the stackable tray of FIG. 1 with a wire harness and connectors therein;

[0013] **FIG. 4** depicts a side view of the stackable tray of **FIG. 1**;

[0014] **FIG. 5** depicts a detail portion of **FIG. 4**;

[0015] **FIG. 6** depicts a side and section view of a stack of stackable trays; and

[0016] **FIG. 7** depicts a front view and section cut of the stack of stackable trays of **FIG. 6**.

DETAILED DESCRIPTION OF THE INVENTION

[0017] **FIG. 1** depicts a cable tray **100** with a tray bottom **102** extending along a horizontal panel. The tray bottom **102** has two opposite long side edges **104** along two opposing long sides **106** and two opposite short side edges **108** along two opposing short sides **110**. A pair of side walls **112** attach to the tray bottom **102** at the long side edges **104**. A first positioning rack **114** extends between the side walls **112**. The first positioning rack **114** is orthogonal to the tray bottom **102** and the side walls **112**.

[0018] A second positioning rack **116** extends between the side walls **112**. The second positioning rack **116** is orthogonal to the tray bottom **102** and the side walls **112**. Doors **118** are connected to the opposing short sides **110** at the short side edges **108**.

Hinges **120** allow the doors **118** to move between an open position that is outward from the tray bottom **102** and a closed position that is perpendicular to the tray bottom. Latches **122** hold the

doors **118** in the closed position. The doors **118** may also be removable.

[0019] The cable tray **100** is approximately eighty-four inches long and approximately thirty-six inches wide. The first positioning rack **114** and second positioning rack **116** are positioned on the tray bottom **102** and displaced from the short edges **108**. That is, the doors **118** may be approximately eighty-four inches apart with the first positioning rack **114** and second positioning rack **116** approximately fifty inches apart.

[0020] **FIG. 2** depicts the first positioning rack **114**. The first positioning rack **114** and the second positioning rack **116** are identical to each other so that only one positioning rack **114** is described herein. The positioning rack **114** includes cable support apertures **126**. The support apertures **126** are arranged in a top row **128** and a bottom row **130**. The apertures **126** are also arranged in pairs; however, other arrangements may be used. The apertures **126** are sized and configured to retain and organize components in their respective groupings.

[0021] The positioning rack **114** protects components and connectors in a wiring harness from unintended motion. In another embodiment, the apertures **126** include an upwardly opening slot **132** to allow for wires to pass through to set in the apertures. The positioning rack **114** may also include a wire channel **134**.

[0022] Referring to **FIG. 3**, the cable tray **100** is equipped with the positioning racks **114**, **116** that organize wires **200** and components **202** to prevent the wires and components of a towed array system from becoming twisted, entangled, and/or damaged. The wires **200** are wound between and through the positioning racks **114**, **116**. The positioning racks **114**, **116** organize and maintain the wires **200** in their intended configuration.

[0023] Returning to **FIG. 3**, the cable tray **100** has a center retaining piece **136** located between the positioning racks **114**, **116**. The retaining piece **136** prevents the wires **200** from shifting. The retaining piece **136** may include a dowel **154** that is approximately one inch in diameter to prevent pinching on the wires **200**. See **FIG. 6**.

[0024] The retaining piece **136** is installed in guide tracks **138** to allow vertical movement and to prevent lengthwise movement of the retaining piece **136**. The guide tracks **138** are mounted on an inner surface of the side walls **112**. Apertures or holes **140** or other appropriate devices restrain the center retaining piece **136**. In this manner, the electrical harness remains organized.

[0025] As further shown in **FIG. 3**, handles **142** are provided on the side walls **112** to ease lifting the cable tray **100**. The handles **142** fold flat against the side walls **112**. The doors **118**

can be opened or removed for access when the cable trays 100 are stacked.

[0026] As shown in **FIG. 4**, a first foot bar **144** is affixed to an underside of the tray bottom **102**. The first foot bar **144** vertically aligns with the first positioning rack **114**. A second foot bar **146** is affixed to the underside of the tray bottom **102**. The second foot bar **146** vertically aligns with the second positioning rack **116**. The foot bars **144**, **146** act as structural components when the cable tray **100** is on a flat surface and act as spacing devices when the cable trays are stacked.

[0027] As shown in **FIG. 5**, the foot bars (in an example foot bar **146**) may be L-shaped when rotated on a side by having a seating surface **148** and an alignment protuberance **150**. The foot bars **144**, **146** are sized and configured so the seating surface **148** sets on a top surface of the positioning racks **114**, **116**, respectively, of a tray below. As shown in **FIG. 6**, this action directly transfers the load of the cable tray **100** to the foot bars **144**, **146** of the tray below.

[0028] The shape of the foot bars **144**, **146** can guide the cable tray **100** lengthwise on the positioning racks **114**, **116**, respectively, of a cable tray below. Furthermore, the foot bars **144**, **146** may span across the underside of the tray bottom **102** to allow minimal widthwise shifting when the cable trays **100** are stacked. As shown in **FIG. 7**, the slots **132** and the wire channel

134 allow for wires to pass through and remain connected without being pinched when the cable trays **100** are stacked.

[0029] The handles **142** facilitate transport and can fold flat to minimize the overall width of the cable tray **100**.

Furthermore, the cable trays **100** protect the internal components and wires during handling, as part of the fabrication process, and during shipping. The cable trays **100** allow multiple harnesses to be simultaneously populated with components while occupying minimal space by being stackable.

[0030] In use, a cable tray **100** is provided. A wiring harness having a plurality of components **202** is laid along the tray bottom **102**. The wires **200** are positioned in the upwardly opening slots **132**. By using the cable trays **100**, an entire array (for example, thirteen acoustic modules plus one forward interface module and one aft interface module) can be assembled. When the cable trays **100** are stacked, the hinged doors **118** provide access to array components and allow multiple wire harnesses to connect to one another.

[0031] The examples described herein are long, towed array systems for acoustic arrays; however, the cable trays described herein are equally applicable to other wiring systems including fiber optic cables, telecommunication lines, seismic arrays, and network sensors.

[0032] It will be understood that many additional changes in the details, materials, steps and arrangement of parts, which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

COMPACT STACKABLE TRAYS WITH POSITIONING RACKS

ABSTRACT OF THE DISCLOSURE

A cable tray and method of use is provided with the cable tray having a bottom extending along a horizontal panel with two opposite side edges. A pair of side walls attaches to the two opposite side edges. A first positioning rack extends between the side walls. The first positioning rack is orthogonal to the tray bottom and the side walls. A second positioning rack extends between the side walls. The second positioning rack is orthogonal to the tray bottom and the side walls. A first foot bar affixes to an underside of the tray bottom. The first foot bar is vertically aligns with the first positioning rack. A second foot bar affixes to the underside of the tray bottom. The second foot bar vertically aligns with the second positioning rack. Each of the first positioning rack and second positioning rack includes cable support apertures.

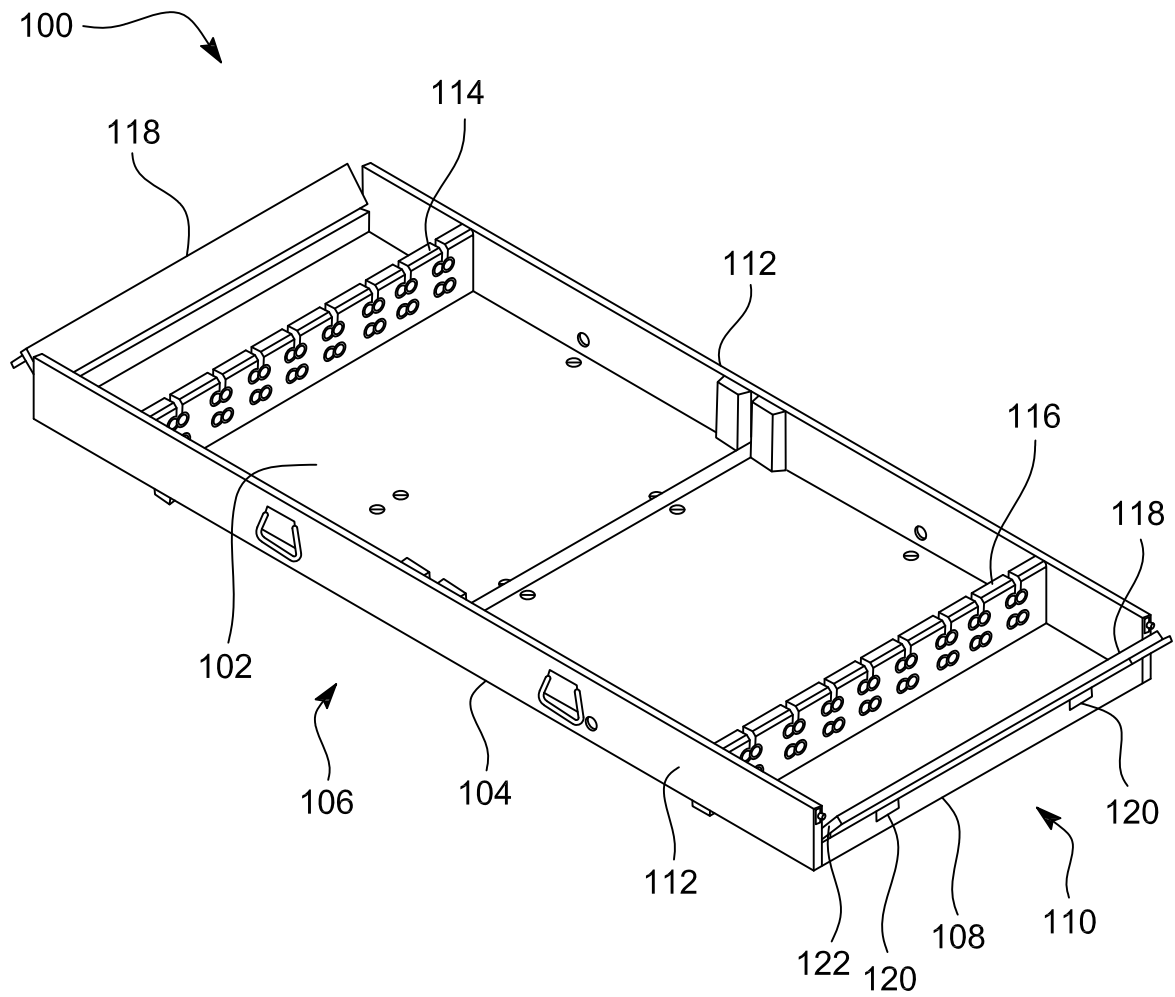


FIG. 1

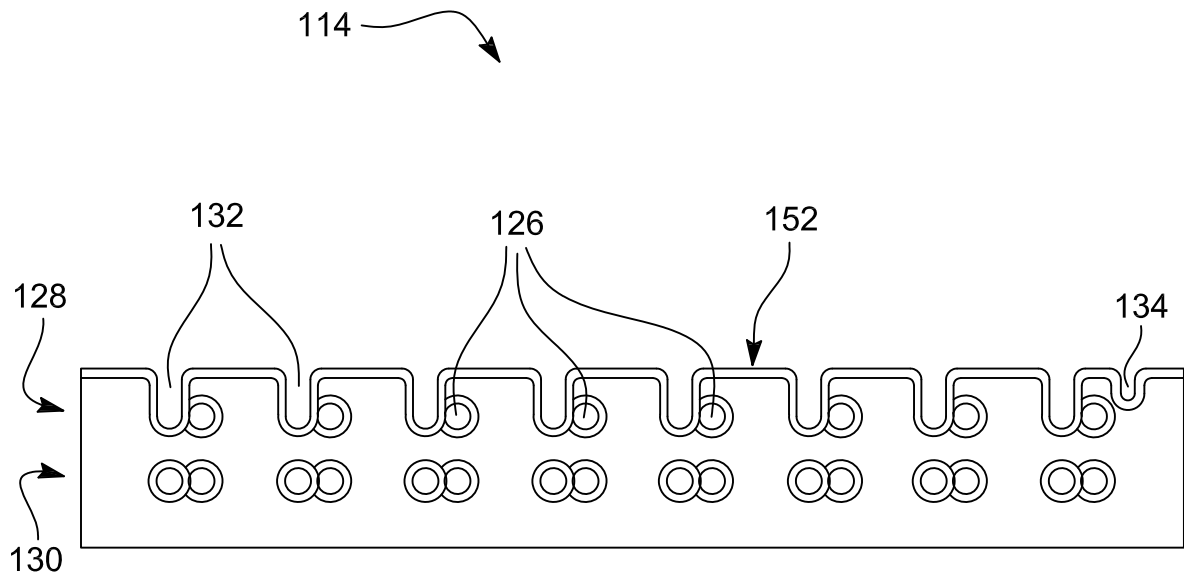


FIG. 2

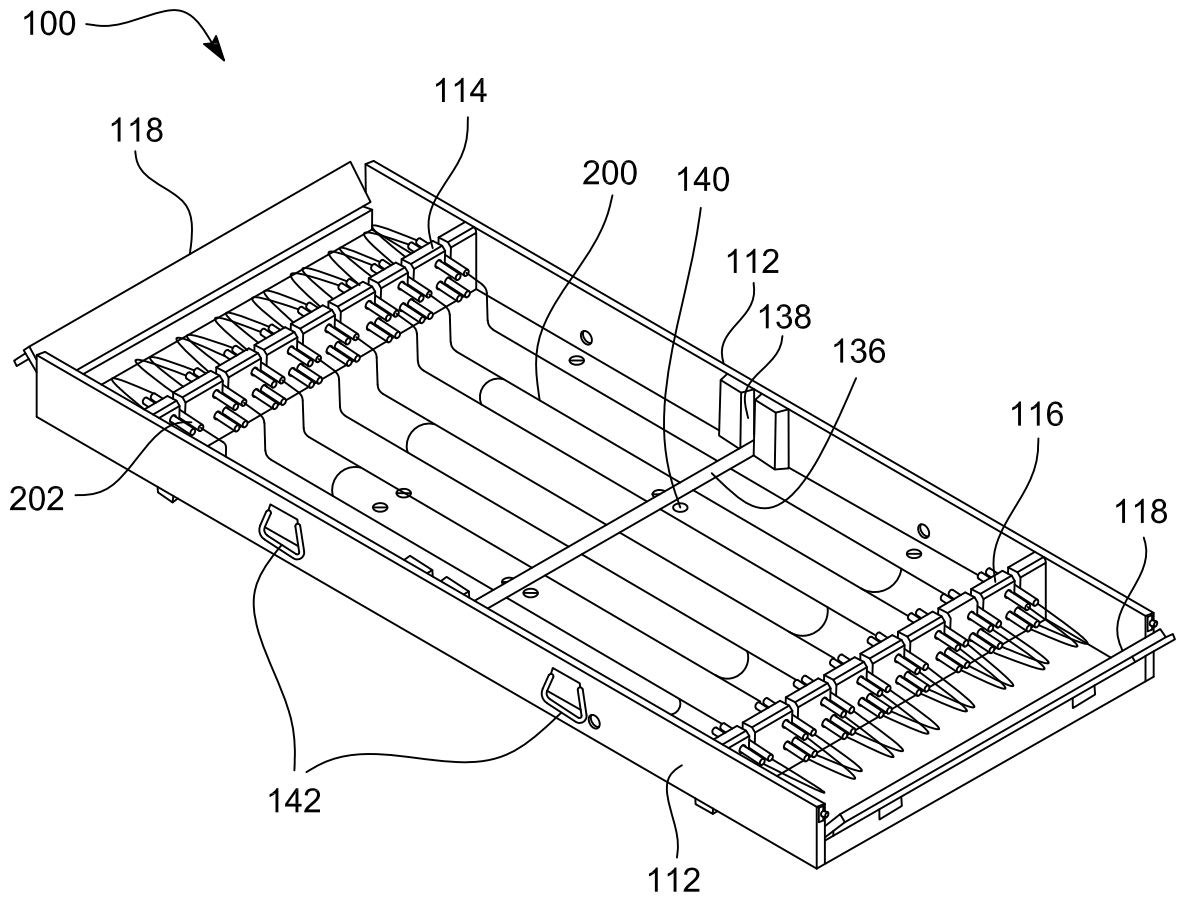


FIG. 3

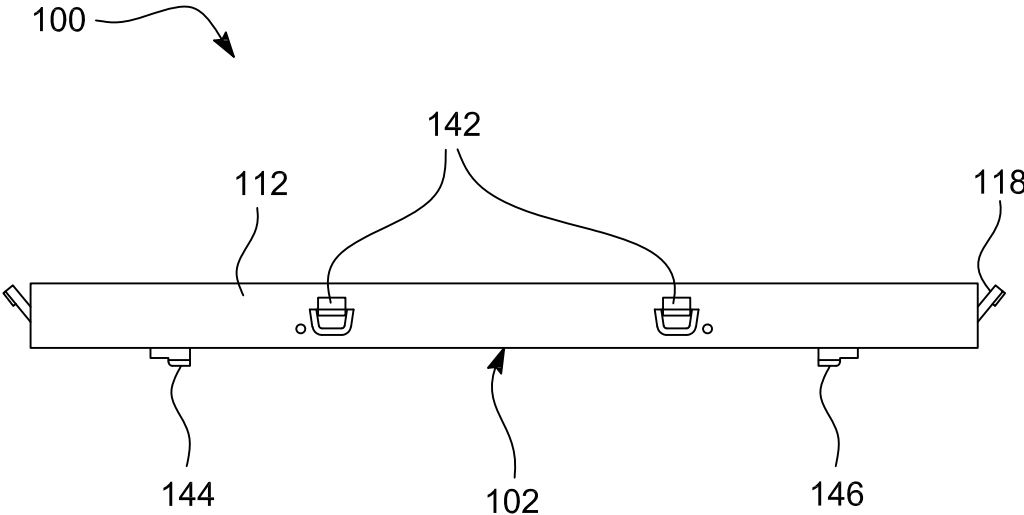


FIG. 4

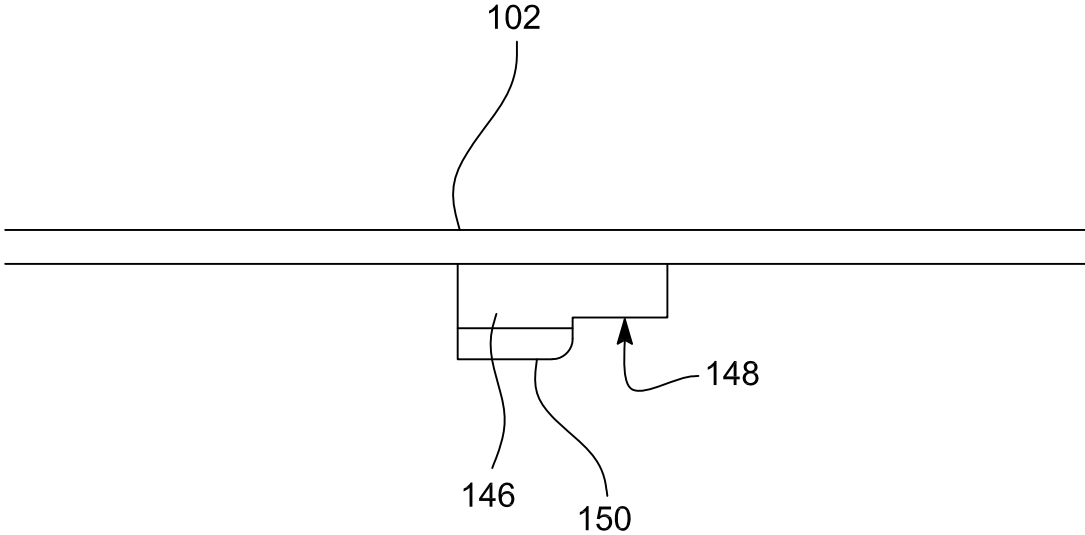


FIG. 5

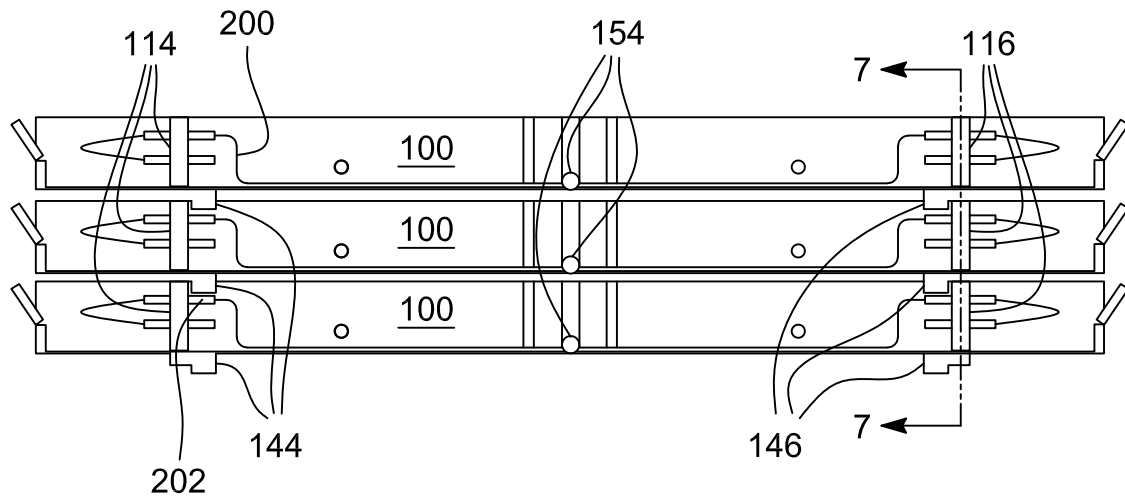


FIG. 6

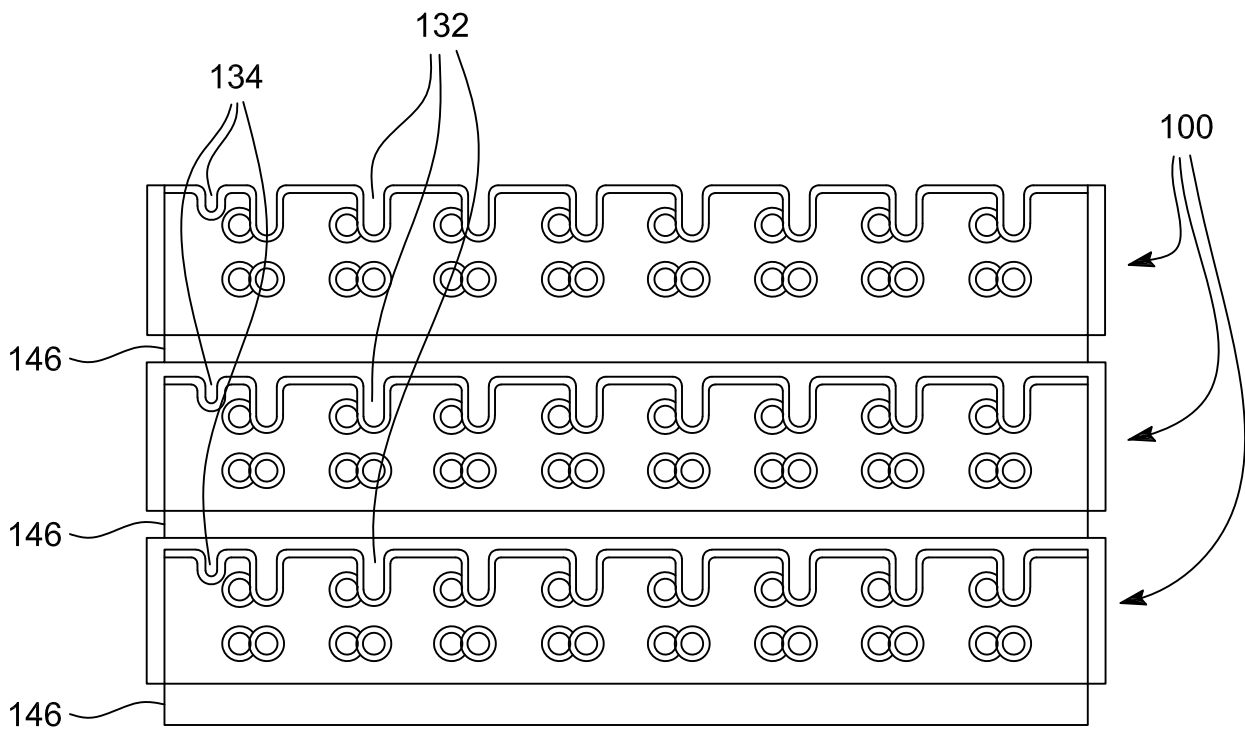


FIG. 7