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# (54) FORMWORK FOR THE CONSTRUCTION OF PAVEMENT

(57) A formwork (100) comprises a plurality of walls (102). The walls (102) define a plurality of cells (104). Each cell (102) extends in an axial direction (110) from a first cell opening (124) to a second cell end (122). The plurality of cells (104) comprises a plurality of peripheral cells (130) and a plurality of internal cells (140). An axial dimension (126) of one or more of the peripheral cells (130) is less than an axial dimension (126) of one or more of the internal cells (140).

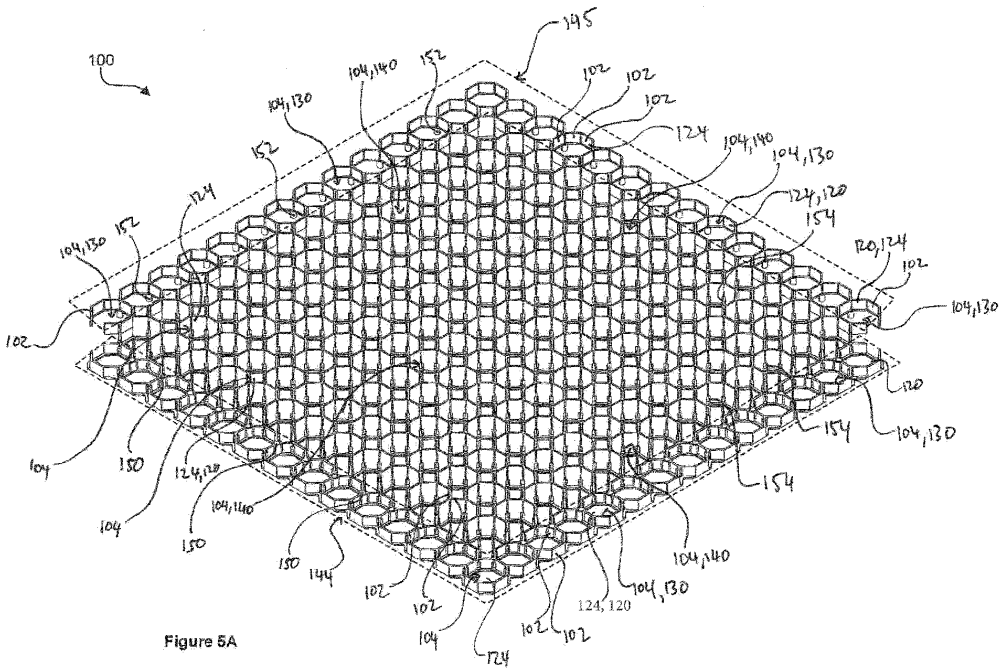


Figure 5A

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## Description

### TECHNICAL FIELD

**[0001]** This disclosure relates to a formwork. In particular, this disclosure relates to a formwork with a plurality of cells that are defined by walls of the formwork.

### BACKGROUND

**[0002]** Pavements may be constructed as either flexible pavements or rigid pavements. Each type of construction has specific benefits and drawbacks. Pavements as described herein include any trafficable structure, material and/or substance that is positioned on an area that is intended to sustain vehicular or foot traffic. For example, pavements include, but are not limited to, footpaths, cycle paths, roads, rail track beds, parking lots and runways.

**[0003]** Flexible pavements include a sub-base course laid onto subgrade or existing native material, a base course laid on top of the sub-base, and a bituminous surface course laid on the base course. The surface course includes one or more bituminous or hot mix asphalt (HMA) layers.

**[0004]** The structural characteristics of the flexible pavement are determined by the combination of the different layers, and the surface course alone has negligible structural integrity, as the load is distributed into the subjacent layers.

**[0005]** Although by volume the materials required to construct flexible pavements are relatively cheap, the nature of the construction means that, especially in roads that are required to support high loads, the depth and material volume required is significant, with highways requiring over a metre of additional material to be provided on top of the subgrade.

**[0006]** Therefore, the cost of construction of flexible pavements, especially those experiencing high loads, is significant. Similarly, the logistical requirements of getting the required volume of material to remote locations can also be problematic.

**[0007]** Damage to flexible pavements is also common, as the surface course does not have significant structural integrity, and holes can be caused by impacts, such as impacts resulting from rocks being forced into the surface by traffic loads.

**[0008]** As vehicles pass across the surface course of a flexible pavement, the friction from the tires causes it to expand. Over time, this can lead to surface cracks, allowing water to gradually erode the surface course from underneath and/or within, causing larger cracks and pot holes to form.

**[0009]** Where cavities or voids appear in either the base course or sub-base, which may result from a pothole or other defect, repair of the flexible pavement is difficult and costly, as the entire section of pavement must be excavated and re-laid. Flexible pavement is also affected by extreme temperatures which cause the surface to become tacky. This can lead to further deterioration of the flexible pavement.

**[0010]** Rigid pavements, on the other hand, include a surface course, typically in the form of a concrete slab, poured above a base course and optionally a sub-base laid upon the subgrade. The rigidity provided by the concrete slab allows the load to be distributed more evenly, potentially allowing for fewer, or shallower, subjacent courses.

**[0011]** Concrete is adversely affected by temperature changes, and expansion associated cracking may be mitigated by having a number of separate slabs, with adjacent slabs tied together with steel dowels or tie bars, for example.

**[0012]** Concrete is also relatively expensive by volume, and although the construction of a rigid pavement requires less depth than a flexible pavement, the cost of construction is greater by area. Additionally, the logistics of providing concrete to remote locations is significant, and as such, rigid pavements are simply not a viable option for many remote applications.

**[0013]** Cracking of concrete is common due to high loads, especially towards edges of slabs where the supporting base course may be more susceptible to movement. Repair of concrete slabs is also more difficult than flexible pavements, as a cracked concrete slab must be cut out and new concrete poured in place, rather than simply filling a small hole with bituminous or HMA product. In addition, where cavities or subsidence appears in either the base course or sub-base, repair of the rigid pavement is difficult and costly, as the entire section of pavement must be excavated and re-laid. Installing rigid pavements can involve significant $CO_2$ and other greenhouse gas emissions, with the total emissions during construction potentially being 5 to 6 times higher than flexible pavements, largely due to the concrete volumes.

**[0014]** Thus, known methods of construction of pavements are expensive, requiring large material volumes and involving the emission of a considerable amount of $CO_2$ and other greenhouse gas emission. Further, existing pavements, whether they be flexible or rigid, are difficult to repair when damaged.

**[0015]** It is to be understood that, if any prior art publication is referred to herein, such reference does not constitute an admission that the publication forms a part of the common general knowledge in the art, in Australia or any other country.

### SUMMARY OF THE DISCLOSURE

**[0016]** In some embodiments, there is provided a formwork. The formwork may comprise a plurality of walls. The walls at least partially define a plurality of cells. In some embodiments, the walls define the plurality of cells. Each cell extends in an axial direction from a first cell end to a second cell end. The first cell end of each cell comprises a first cell opening. Each cell extends in the axial direction from the first cell opening to the second cell end. The plurality of cells comprises a plurality of peripheral cells. The plurality of cells comprises a plurality of internal cells. An axial dimension of one or more of the peripheral cells is less than an axial dimension of one or more of the internal cells.

**[0017]** In some embodiments, the axial dimension of a particular cell of the plurality of cells is a distance, measured in the axial direction, between the first cell opening and the second cell end of the particular cell.

**[0018]** In some embodiments, the axial dimension of the particular cell is a shortest distance, measured in the axial direction, between the first cell opening and the second cell end of the particular cell.

**[0019]** In some embodiments, the plurality of peripheral cells comprises a first subset of peripheral cells.

**[0020]** In some embodiments, the first cell openings of the peripheral cells of the first subset of peripheral cells are axially offset from the first cell opening of one or more of the internal cells.

**[0021]** In some embodiments, there is provided a formwork. The formwork may comprise a plurality of walls. The walls at least partially define a plurality of cells. In some embodiments, the walls define the plurality of cells. Each cell extends in an axial direction from a first cell end to a second cell end. The first cell end of each cell comprises a first cell opening. Each cell extends in the axial direction from the first cell opening to the second cell end. The plurality of cells may comprise a plurality of peripheral cells. The plurality of cells may comprise a plurality of internal cells. The first cell openings of a first subset of the peripheral cells may be axially offset from the first cell opening of one or more of the internal cells.

**[0022]** In some embodiments, the internal cells are internal with respect to the peripheral cells.

**[0023]** In some embodiments, the peripheral cells define at least part of a peripheral portion of the formwork.

**[0024]** In some embodiments, the internal cells define at least part of an internal portion of the formwork.

**[0025]** In some embodiments, the peripheral portion at least partially encircles the internal cells.

**[0026]** In some embodiments, the peripheral portion at least partially encircles the internal portion.

**[0027]** In some embodiments, an axial dimension of one or more of the peripheral cells is less than an axial dimension of one or more of the internal cells.

**[0028]** In some embodiments, the axial dimension of a particular cell of the plurality of cells is a distance, measured in the axial direction, between the first cell opening and the second cell end of the particular cell.

**[0029]** In some embodiments, the axial dimension of the particular cell is a shortest distance, measured in the axial direction, between the first cell opening and the second cell end of the particular cell.

**[0030]** In some embodiments, the first cell opening and the second cell end of one or more of the peripheral cells are closer together than the first cell opening and the second cell end of one or more of the internal cells.

**[0031]** In some embodiments, the first cell openings of at least some of the peripheral cells of the first subset of peripheral cells are coplanar.

**[0032]** In some embodiments, the first cell opening of one or more of the peripheral cells is parallel to the first cell opening of one or more of the internal cells.

**[0033]** In some embodiments, a number of the cells comprise a respective second cell opening, the second cell opening of each cell being at its second cell end.

**[0034]** In some embodiments, each cell comprises a second cell opening, the second cell opening being at the second cell end of the respective cell.

**[0035]** In some embodiments, one or more of the peripheral cells of the first subset of peripheral cells comprises a respective second cell opening, the second cell opening of each of the one or more peripheral cells being at the second cell end of the respective peripheral cell.

**[0036]** In some embodiments, one or more of the internal cells comprises a respective second cell opening, the second cell opening of the one or more internal cells being at the second cell end of the respective internal cell.

**[0037]** In some embodiments, the second cell openings of the peripheral cells of the first subset of peripheral cells are coplanar.

**[0038]** In some embodiments, the second cell openings of the peripheral cells of the first subset of peripheral cells are coplanar with the second cell openings of the internal cells.

**[0039]** In some embodiments, the first cell opening of one or more of the peripheral cells of the first subset of peripheral cells is transverse to the second cell opening of the respective peripheral cell.

**[0040]** In some embodiments, the first cell opening of one or more of the peripheral cells of the first subset of peripheral cells is transverse to the first cell opening of one or more of the internal cells.

**[0041]** In some embodiments, the second cell opening of one or more of the peripheral cells is parallel to the first cell opening of one or more peripheral cells.

**[0042]** In some embodiments, the second cell opening of one or more of the peripheral cells is parallel to the first cell opening of one or more of the internal cells.

**[0043]** In some embodiments, the second cell opening of one or more of the peripheral cells is transverse to the first cell opening of one or more of the peripheral cells.

**[0044]** In some embodiments, the second cell opening of one or more of the peripheral cells is transverse to the first cell opening of one or more of the internal cells.

**[0045]** In some embodiments, the plurality of peripheral cells comprises a second subset of peripheral cells.

**[0046]** In some embodiments, one or more of the peripheral cells of the second subset of peripheral cells comprises a respective second cell opening, the second cell opening being at the second cell end of the respective cell.

**[0047]** In some embodiments, the second cell openings of the peripheral cells of the second subset of peripheral cells are axially offset from the second cell opening of one or more of the internal cells.

**[0048]** In some embodiments, the second cell openings of the peripheral cells of the second subset of peripheral cells are axially offset from the second cell opening of one or more of the peripheral cells of the first subset of peripheral cells.

**[0049]** In some embodiments, the second cell openings of at least some of the peripheral cells of the second subset of peripheral cells are coplanar.

**[0050]** In some embodiments, the first cell openings of at least some of the peripheral cells of the second subset of peripheral cells are coplanar.

**[0051]** In some embodiments, the first cell openings of the peripheral cells of the second subset of peripheral cells are coplanar with the first cell openings of the internal cells.

**[0052]** In some embodiments, the first cell opening of one or more of the peripheral cells of the second subset of peripheral cells is transverse to the second cell opening of the respective peripheral cell.

**[0053]** In some embodiments, the first cell opening of one or more of the peripheral cells of the second subset of peripheral cells is transverse to the first cell opening of one or more of the internal cells.

**[0054]** In some embodiments, the second cell opening of one or more of the peripheral cells of the first subset of peripheral cells is smaller than the first cell opening of the respective cell.

**[0055]** In some embodiments, the second cell opening of one or more of the internal cells is smaller than the first cell opening of the respective cell.

**[0056]** In some embodiments, the second cell opening of one or more of the peripheral cells of the second subset of peripheral cells is smaller than the first cell opening of the respective cell.

**[0057]** In some embodiments, the formwork further comprises a cantilever wall.

**[0058]** In some embodiments, the cantilever wall extends inwardly into a respective peripheral cell.

**[0059]** In some embodiments, the cantilever wall defines at least part of a cell of the plurality of cells.

**[0060]** In some embodiments, the formwork comprises a plurality of cantilever walls.

**[0061]** In some embodiments, one or more of the cantilever walls extends inwardly into a respective cell.

**[0062]** In some embodiments, one or more of the cantilever walls defines at least part of a cell of the plurality of cells.

**[0063]** In some embodiments, one or more of the cantilever walls extends inwardly into a respective peripheral cell.

**[0064]** In some embodiments, one or more of the cantilever walls defines at least part of a respective peripheral cell.

**[0065]** In some embodiments, one or more of the cantilever walls is parallel with another of the cantilever walls.

**[0066]** In some embodiments, one or more of the cantilever walls is coplanar with one or more other cantilever walls.

**[0067]** In some embodiments, one or more of the cantilever walls extends inwardly into a respective internal cell.

**[0068]** In some embodiments, one or more of the cantilever walls defines at least part of a respective internal cell.

**[0069]** In some embodiments, one or more of the cantilever walls is axially offset with respect to one or more other cantilever wall.

**[0070]** In some embodiments, one or more of the cantilever walls that defines at least part of a peripheral cell is axially offset with respect to one or more of the cantilever walls that defines at least part of an internal cell.

**[0071]** In some embodiments, a distance, measured in the axial direction, between one or more of the cantilever walls that define part of a respective peripheral cell and the first cell opening of the respective peripheral cell is less than a distance, measured in the axial direction, between one or more of the cantilever walls that define part of an internal cell and the first cell opening of the respective internal cell.

**[0072]** In some embodiments, the cantilever walls define at least part of the second cell opening of the respective cell.

**[0073]** In some embodiments, at least some of the cells are arranged into a plurality of rows and a plurality of columns.

**[0074]** In some embodiments, a shape of the cells in a particular row is the same as the shape of the other cells in that row.

**[0075]** In some embodiments, the plurality of rows comprises alternating rows of cells of a first shape.

**[0076]** In some embodiments, the plurality of rows comprises alternating rows of cells of a second shape.

**[0077]** In some embodiments, the first shape is hexagonal.

**[0078]** In some embodiments, the second shape is rectangular.

**[0079]** In some embodiments, the first subset of peripheral cells comprises a first row of cells.

**[0080]** In some embodiments, the first subset of peripheral cells comprises a first column of cells.

**[0081]** In some embodiments, the first row of cells and the first column of cells comprise one cell in common.

**[0082]** In some embodiments, the second subset of peripheral cells comprises a second row of cells.

**[0083]** In some embodiments, the second subset of peripheral cells comprises a second column of cells.

**[0084]** In some embodiments, the second row of cells and the second column of cells comprise at least one cell in common.

**[0085]** In some embodiments, the peripheral cells are hexagonal.

**[0086]** In some embodiments, a volume of one or more of the peripheral cells is less than a volume of one or more of the internal cells.

**[0087]** In some embodiments, a volume of one or more of the peripheral cells is greater than a volume of one or more of the internal cells.

**[0088]** In some embodiments, the plurality of cells comprises one or more connecting cells, the connecting cells being configured to receive part of a second formwork, thereby inhibiting movement between the formwork and the second formwork in at least one direction.

**[0089]** In some embodiments, the connecting cells are circular.

**[0090]** In some embodiments, the one or more connecting cells are defined, at least in part, by walls that also define at least part of one or more peripheral cells.

**[0091]** In some embodiments, the one or more connecting cells are defined, at least in part, by walls that also define at least part of one or more peripheral cells of the first subset of peripheral cells.

**[0092]** In some embodiments, the first cell openings of the one or more connecting cells are coplanar with one or more of the first cell openings of the peripheral cells of the first subset of peripheral cells.

**[0093]** In some embodiments, the second cell openings of one or more connecting cells are coplanar with one or more of the second cell openings of the peripheral cells of the first subset of peripheral cells.

**[0094]** In some embodiments, the formwork further comprises one or more projections, the one or more projections being configured to cooperate with another formwork to inhibit relative movement between the formwork and the other formwork.

**[0095]** In some embodiments, each of the one or more projections is configured to fit within a corresponding connecting cell of the other formwork.

**[0096]** In some embodiments, a shape of one or more of the projections is such that it can be received within a volume that has the same dimensions as one or more of the connecting cells.

**[0097]** In some embodiments, the one or more projections project outwardly from one or more of the walls defining the peripheral cells of the second subset of peripheral cells.

**[0098]** In some embodiments, the one or more projections project away from the first openings of the peripheral cells of the second subset of peripheral cells.

**[0099]** In some embodiments, the one or more projections are closer to the second cell openings of the peripheral cells of the second subset of peripheral cells than the first cell openings of those peripheral cells.

**[0100]** In some embodiments, the first subset of peripheral cells and the second subset of peripheral cells are mutually exclusive.

**[0101]** In some embodiments, the walls defining one or more of the peripheral cells form a closed loop.

**[0102]** In some embodiments, the walls defining one or more of the peripheral cells do not form a closed loop. That is, they may form at least part of an open loop.

**[0103]** In some embodiments, the formwork is a permanent formwork.

**[0104]** In some embodiments, there is provided a formwork. The formwork may comprise a plurality of walls. The walls may define a plurality of cells. Each cell may extend in an axial direction from a first cell opening to a second cell end. The plurality of cells may comprise a plurality of peripheral cells. The plurality of cells may comprise a plurality of internal cells.

**[0105]** In some embodiments, an axial dimension of one or more of the peripheral cells is less than an axial dimension of one or more of the internal cells.

**[0106]** In some embodiments, the first cell openings of a first subset of the peripheral cells are axially offset from the first cell opening of one or more of the internal cells.

**[0107]** In some embodiments, the peripheral cells define at least part of a peripheral portion of the formwork.

**[0108]** In some embodiments, the internal cells define at least part of an internal portion of the formwork.

**[0109]** In some embodiments, the peripheral portion at least partially encircles the internal portion.

**[0110]** In some embodiments, the axial dimension of a particular cell of the plurality of cells is a shortest distance, measured in the axial direction, between the first cell opening and the second cell end of the particular cell.

**[0111]** In some embodiments, the first cell opening and the second cell end of one or more of the peripheral cells are closer together than the first cell opening and the second cell end of one or more of the internal cells.

**[0112]** In some embodiments, each cell comprises a second cell opening, the second cell opening being at the second cell end of the respective cell.

**[0113]** In some embodiments, the second cell openings of the peripheral cells of the first subset of peripheral cells are coplanar.

**[0114]** In some embodiments, the second cell openings of the peripheral cells of the first subset of peripheral cells are coplanar with the second cell openings of the internal cells.

**[0115]** In some embodiments, the plurality of peripheral cells comprises a second subset of peripheral cells.

**[0116]** In some embodiments, the second cell openings of the peripheral cells of the second subset of peripheral cells are axially offset from the second cell opening of one or more of the internal cells.

**[0117]** In some embodiments, the second cell openings of the peripheral cells of the second subset of peripheral cells are axially offset from the second cell opening of one or more of the peripheral cells of the first subset of peripheral cells.

**[0118]** In some embodiments, the first cell openings of the peripheral cells of the second subset of peripheral cells are coplanar.

**[0119]** In some embodiments, the first cell openings of the peripheral cells of the second subset of peripheral cells are coplanar with the first cell openings of the internal cells.

**[0120]** In some embodiments, the formwork comprises a plurality of cantilever walls.

**[0121]** In some embodiments, one or more of the cantilever walls defines at least part of a cell of the plurality of cells.

**[0122]** In some embodiments, the cantilever walls define at least part of the second cell opening of the respective cell.

**[0123]** In some embodiments, the plurality of cells comprises one or more connecting cells, the connecting cells being configured to receive part of a second formwork, thereby inhibiting movement between the formwork and the second formwork in at least one direction.

**[0124]** In some embodiments, the formwork further comprises one or more projections. The one or more projections may be configured to fit within a corresponding connecting cell of another formwork to inhibit relative movement between the formwork and the other formwork.

**[0125]** In some embodiments, the walls defining one or more of the peripheral cells form a closed loop.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0126]** Embodiments of the invention are described further below by way of example only with reference to the accompanying Figures, of which:

Figure 1 is a cross-section of a conventional construction of a flexible pavement, showing different courses of material;
Figure 2 is a cross-section of a conventional construction of a rigid pavement, showing different courses of material;
Figure 3 is a cross-section of a conventional construction of a flexible pavement, showing a distribution of a load applied on the flexible pavement by a wheel of a vehicle;
Figure 4 shows a cross-section of a conventional construction of a rigid pavement, showing a distribution of a load applied on the rigid pavement by a wheel of a vehicle;
Figure 5 shows a perspective view of a formwork, according to some embodiments;
Figure 5A shows the perspective view of Figure 5, with a first subset of peripheral cells and a second subset of peripheral cells identified, according to some embodiments;
Figure 6 shows the perspective view of Figure 5, with a first perspective view region, a second perspective view region, a third perspective view region and a fourth perspective view region identified, according to some embodiments;
Figure 7 shows the first perspective view region identified in Figure 6, according to some embodiments;
Figure 8 shows the second perspective view region identified in Figure 6, according to some embodiments;
Figure 9 shows an alternative perspective view of a portion of the formwork, according to some embodiments;
Figure 10 shows the third perspective view region identified in Figure 6, according to some embodiments;
Figure 11 shows the fourth perspective view region identified in Figure 6, according to some embodiments;
Figure 12 shows a perspective view of another portion of the formwork, according to some embodiments;
Figure 13 shows another perspective view of the formwork, according to some embodiments;
Figure 14 shows the perspective view of Figure 13, with a fifth perspective view region, a sixth perspective view region, a seventh perspective view region and an eighth perspective view region identified, according to some embodiments;
Figure 15 shows the fifth perspective view region identified in Figure 14, according to some embodiments;
Figure 16 shows the sixth perspective view region identified in Figure 14, according to some embodiments;
Figure 17 shows the seventh perspective view region identified in Figure 14, according to some embodiments;
Figure 18 shows the eighth perspective view region identified in Figure 14, according to some embodiments;
Figure 19 shows a top view of the formwork, with a first top view region, a second top view region, a third top view region and a fourth top view region identified, according to some embodiments;
Figure 20 shows the first top view region identified in Figure 19, with a first section plane identified, according to some embodiments;
Figure 21 shows a plan view of the first section plane, according to some embodiments;
Figure 22 shows the second top view region identified in Figure 19, according to some embodiments;
Figure 23 shows the third top view region identified in Figure 19, according to some embodiments;
Figure 24 shows the fourth top view region identified in Figure 19, with a second section plane identified, according to some embodiments;
Figure 25 shows a plan view of the second section plane, according to some embodiments;
Figure 26 shows a front view of the formwork, with a first front view region and a second front view region identified, according to some embodiments;
Figure 27 shows a first side view of the formwork, with a first side view region and a second side view region identified, according to some embodiments;
Figure 28 shows a rear view of the formwork, with a first rear view region and a second rear view region identified, according to some embodiments;
Figure 29 shows a second side view of the formwork, with a third side view region and a fourth side view region identified, according to some embodiments;
Figure 30 shows the first front view region, according

to some embodiments;

Figure 31 shows the second front view region, according to some embodiments;

Figure 32 shows the first side view region, according to some embodiments;

Figure 33 shows the second side view region, according to some embodiments;

Figure 34 shows the first rear view region, according to some embodiments;

Figure 35 shows the second rear view region, according to some embodiments;

Figure 36 shows the third side view region, according to some embodiments;

Figure 37 shows the fourth side view region, according to some embodiments;

Figure 38 shows a bottom view of the formwork, according to some embodiments;

Figure 39 shows a plurality formworks constructed in accordance with the formwork of Figure 5, with arrows indicating how the formworks can be connected together, according to some embodiments; and

Figure 40 shows a plurality of formworks constructed in accordance with the formwork of Figure 5, with arrows indicating how the formworks can be connected together to form a portion of a curved path, according to some embodiments.

## DETAILED DESCRIPTION

**[0127]** The present disclosure relates to a formwork. The formwork is configured to be used in the construction of a path. The path may be in the form of a pavement. A path as described herein includes any trafficable structure, material and/or substance that is positioned on an area that is intended to sustain vehicular or foot traffic. For example, paths include, but are not limited to, footpaths, cycle paths, roads, rail track beds, parking lots and runways. The path may include any suitable surface course. The surface course may comprise one or more of a cementitious material, bituminous material and a granular fill material. For the purposes of this disclosure, a path may be referred to as a pavement.

**[0128]** A path may be constructed using the formwork disclosed herein. A plurality of formworks, one or more of which being in the form of the formwork disclosed herein, can be used in the construction of the path. To construct the path, the formworks are installed in place and a fill material is provided over the formworks.

**[0129]** The formwork of the present disclosure comprises a plurality of walls. The walls defining a plurality of cells. Each cell extends in an axial direction from a first cell opening to a second cell end. The formwork comprises a plurality of peripheral cells that define at least part of a peripheral portion of the formwork. The formwork comprises a plurality of internal cells that are within the peripheral portion of the formwork. An axial dimension of one or more of the peripheral cells is less than an axial dimension of one or more of the internal cells. In this way, the formwork can be connected to multiple other formworks, with the peripheral cells of each adjacent formwork overlapping. This overlap is enabled by the smaller axial dimension of the peripheral cells. The cells of the formwork may be filled with a fill material, which fills the peripheral cells of adjacent formworks.

**[0130]** When forces are applied on the formwork and/or the fill material such that the formwork is urged in a lateral direction, the walls forming the peripheral cells of the formwork, and corresponding walls on another formwork that overlaps with the peripheral cells of the formwork, may act to compress the fill material within the peripheral cells. By being configured to cooperate with adjacent formworks to compress the fill material within the peripheral cells in response to applied loads, the formwork enables the utilisation of the compressive strength of the fill material, thereby improving the structural integrity of the pavement formed using the formwork. In some embodiments, the fill material is concrete. The walls of the formwork are also dimensioned so as to accommodate the expansion and compression of the fill material, thereby reducing or eliminating the need for expansion gaps in the path.

### Flexible Pavement 2

**[0131]** Figure 1 shows a flexible pavement 2. The flexible pavement 2 is constructed using a conventional construction method. The flexible pavement 2 comprises a surface course 4, a base course 6 and a sub-base 8 provided on top of a subgrade 10. It will be understood that the sub-base 8 may be optional. Figure 2 shows a rigid pavement 12. The rigid pavement 12 is constructed using a conventional construction method. The rigid pavement 12 comprises a surface course 14, a base course 16 and a sub-base 18 provided on top of a subgrade 20. It will be understood that the sub-base 18 may be optional.

**[0132]** Figure 3 shows a typical load 24 applied to a conventionally constructed flexible pavement 22. Figure 3 also shows a distribution 26 of this load 24 into a base course 28 or other subjacent course of the flexible pavement 22. Figure 4 shows a typical load 34 applied to a conventionally constructed rigid pavement 32. Figure 4 also shows a distribution 36 of this load 34 into a base course 38 or other subjacent course of the rigid pavement 32.

### Formwork 100

**[0133]** Figures 5 to 38 show a formwork 100, according to some embodiments of the disclosure.

**[0134]** Figures 5 and 6 show a perspective view of the formwork 100. The perspective view of Figures 5 and 6 may be considered a first perspective view. The perspective view of Figures 5 and 6 may be referred to as an upper perspective view. A first perspective view region

160 is identified in Figure 6. A second perspective view region 162 is identified in Figure 6. A third perspective view region 164 is identified in Figure 6. A fourth perspective view region 166 is identified in Figure 6. Figure 7 shows a magnified view of the first perspective view region 160. Figure 8 shows a magnified view of the second perspective view region 162. Figure 9 shows another magnified perspective view of the formwork 100, showing at least part of the second perspective region 162 from a different angle to Figure 8. Figure 10 shows a magnified view of the third perspective view region 164. Figure 11 shows a magnified view of the fourth perspective view region 166.

**[0135]** Figures 13 and 14 show another perspective view of the formwork 100. The perspective view of Figures 13 and 14 may be considered a second perspective view. The perspective view of Figures 13 and 14 may be referred to as a lower perspective view. A fifth perspective view region 168 is identified in Figure 14. A sixth perspective view region 170 is identified in Figure 14. A seventh perspective view region 172 is identified in Figure 14. An eighth perspective view region 174 is identified in Figure 14. Figure 15 shows a magnified view of the fifth perspective view region 168. Figure 16 shows a magnified view of the sixth perspective view region 170. Figure 17 shows a magnified view of the seventh perspective view region 172. Figure 18 shows a magnified view of the eighth perspective view region 174.

**[0136]** Figure 19 shows a top view of the formwork 100. A first top view region 176 is identified in Figure 19. A first section plane 177 is identified in Figure 19. A second top view region 178 is identified in Figure 19. A third top view region 180 is identified in Figure 19. A fourth top view region 182 is identified in Figure 19. A second section plane 183 is identified in Figure 19. Figure 20 shows a magnified view of the first top view region 176. Figure 21 shows the first section plane 177. Figure 22 shows a magnified view of the second top view region 178. Figure 23 shows a magnified view of the third top view region 180. Figure 24 shows a magnified view of the fourth top view region 182. Figure 25 shows the second section plane 183.

**[0137]** Figure 26 shows a front view of the formwork 100. A first front view region 184 is identified in Figure 26. A second front view region 186 is identified in Figure 26. Figure 30 shows a magnified view of the first front view region 184. Figure 31 shows a magnified view of the second front view region 186.

**[0138]** Figure 27 shows a first side view of the formwork 100. The first side view may be considered a right side view. A first side view region 188 is identified in Figure 27. A second side view region 190 is identified in Figure 27. Figure 32 shows a magnified view of the first side view region 188. Figure 33 shows a magnified view of the second side view region 190.

**[0139]** Figure 28 shows a rear view of the formwork 100. A first rear view region 192 is identified in Figure 28. A second rear view region 194 is identified in Figure 28. Figure 34 shows a magnified view of the first rear view region 192. Figure 35 shows a magnified view of the second rear view region 194.

**[0140]** Figure 29 shows a second side view of the formwork 100. The second side view may be considered a left side view. A third side view region 196 is identified in Figure 29. A fourth side view region 198 is identified in Figure 29. Figure 26 shows a magnified view of the third side view region 196. Figure 27 shows a magnified view of the fourth side view region 198.

**[0141]** The formwork 100 comprises a plurality of walls 102. The walls 102 define a plurality of cells 104. One or more of the cells 104 may be considered to be a volume defined, at least partly, by respective walls 102. One or more of the cells 104 may be defined, in part, by a plurality of walls 102, and in part, by one or more openings in these walls 102. In the illustrated case, each cell 104 is defined by number of the walls 102 and by a number of openings defined by these walls 102. The openings may be considered to be a boundary of the cell 104.

**[0142]** Each cell 104 may be said to have a shape. The shape of a cell 104 is the shape of the volume that is defined by the walls 102 that define the cell 104 and the openings defined by those walls 102. The shape of each cell 104 is three-dimensional.

**[0143]** One or more of the cells 104 is hexagonal. In the illustrated embodiment, a plurality of the cells 104 are hexagonal. Specifically, the shape of one or more of the cells 104 is at least partially a hexagonal prism. The hexagonal prism may have rounded corners. The hexagonal prism may have a curved wall portion. The shape of one or more of the cells 104 may be in the form of two connected hexagonal prisms, one being larger than the other. Such a cell 104 may still be considered to be hexagonal.

**[0144]** One or more of the cells 104 is rectangular. In the illustrated embodiment, a plurality of the cells 104 are rectangular. Specifically, the shape of one or more of the cells 104 is at least partially a rectangular prism. The rectangular prism may have rounded corners. The shape of one or more of the cells 104 may be in the form of two connected rectangular prisms, one being larger than the other. Such a cell 104 may still be considered to be rectangular.

**[0145]** One or more of the cells 104 is circular. In the illustrated embodiment, a plurality of the cells 104 are circular. Specifically, the shape of one or more of the cells 104 is at least partially a cylinder. The shape of one or more of the cells 104 may be in the form of two connected cylinders, one being larger than the other. That is, one or the cylinders may have a radius that is larger than the other cylinder. Such a cell 104 may still be considered to be cylindrical.

**[0146]** The walls 102 each comprise a first end 106 and a second end 108 (see Figure 7). The first end 106 may be referred to as an upper end. The second end 108 may be referred to as a lower end. The walls 102 each extend from the first end 106 to the second end 108. In particular, the walls 102 extend from the first end 106 to the second end 108 in an axial direction 110 of the formwork 100. The distance between the first end 106 and the second end 108 of a wall 102, measured in the axial direction 110, may be said to be a height of the respective wall 102. A wall 102 may be referred to as an axial wall 102 if its longest dimension is in the axial direction 110.

**[0147]** A normal plane of the formwork is orthogonal to the axial direction 110. The normal plane may bisect one or more of the cells 104.

**[0148]** The walls 102 each comprise a first lateral end 112 and a second lateral end 114 (see Figure 7). The walls 102 each extend from the first lateral end 112 to the second lateral end 114. In particular, each wall 102 extends from the first lateral end 112 to the second lateral end 114 in a first normal direction. The first normal direction is orthogonal to the axial direction 110. The first normal direction is parallel with the normal plane of the formwork 100. As the walls 102 are not all aligned (i.e. some walls 102 are transverse to other walls 102, or some walls 102 are curved), the first normal direction of a particular wall 102 may be different to the first normal direction of another wall 102. Where the respective wall 102 is straight, the first normal direction may be a straight direction. Where the respective wall 102 is curved, the first normal direction may curve along the length of the wall 102. The distance between the first lateral end 112 and the second lateral end 114 of a wall 102, measured in the first normal direction, may be considered the length of that wall 102. It will be appreciated that where the relevant wall 102 curves, the length of the wall 102 may be determined along the length of the curved wall 102, rather than being the straight-line distance between the first lateral end 112 and the second lateral end 114 of that wall 102. A wall 102 may be referred to as a normal wall 102 if the length of the wall 102 is its longest dimension. Alternatively, such a wall may be referred to as a cantilever wall 103.

**[0149]** Throughout this description, the term "transverse" may be interpreted as non-parallel. That is, a straight line is transverse to a plane when the straight line is not parallel to the plane. In such a case, the straight line will intersect the plane at one point. In other words, a first plane may be said to be transverse to a second plane when the first plane and the second plane intersect. Such planes can intersect at any angle greater than 0° and the planes will still be considered transverse. Thus, two of the walls 102 being transverse means that the relevant two walls 102 are non-parallel. The walls 102 therefore intersect at at least one point.

**[0150]** The walls 102 each comprise a first face end 116 and a second face end 118 (see Figure 7). The walls 102 each extend from the first face end 116 to the second face end 118. In particular, each wall 102 extends from the first face end 116 to the second face end 118 in a second normal direction. The second normal direction is orthogonal to the axial direction 110. The second normal direction is parallel to the normal plane of the formwork 100. The second normal direction is orthogonal to the first normal direction at a respective point along the wall 102. Where the wall 102 is straight, the first normal direction is straight and does not curve along the length of the wall 102. The second normal direction is therefore also straight. Where the wall 102 is curved, the first normal direction curves along the length of the wall 102. In such a case, the second normal direction may rotate along the length of the wall 102. The distance between the first face end 116 and the second face end 118, measured in the second normal direction at a particular point along a wall 102, may be considered the thickness of that wall 102 at that point. A wall 102 may be referred to as a normal wall 102 if the thickness of the wall 102 is its longest dimension. Alternatively, such a wall may be referred to as a cantilever wall 103.

**[0151]** Each wall 102 meets one or more other walls 102 at a junction 105. One or more of the walls 102 may meet one or more other walls 102 at one or more junctions 105. Referring to Figure 8, a number of junctions 105 are shown. Axial walls 102 meet other axial walls 102 at respective junctions 105. Axial walls 102 meet cantilever walls 103 at junctions 105. Each junction 105 may extend along a length of a number of walls 102. For example, the junction 105 at which two axial walls 102 meet may extend along at least part of the axial length of those walls 102. Similarly, an axial wall 102 meets a cantilever wall 103 at a junction 105. The junction 105 between the axial wall 102 and the cantilever wall 103 may extend along the length of the axial wall 102 in the first normal direction of that wall 102.

**[0152]** The walls 102 define a number of internal volumes that are at least partially bounded by the walls 102. In the illustrated embodiment, the walls 102 define a number of openings, with a volume being defined by a number of the walls 102 and the openings defined by those walls 102. This volume is referred to herein as a cell 104. It is understood that a cell 104 of the formwork may be missing one or more walls 102, or a portion of one or more of the walls 102 that at least partially define the respective cell 104. Such a volume is still considered a cell 104 for the purposes of this description.

**[0153]** A number of the cells 104 are arranged into a plurality of rows 146 (see Figure 19). A number of the cells 104 are arranged into a plurality of columns 148 (see Figure 19). The shape of the cells 104 in a particular row 146 is the same as the shape of the other cells 104 in that row 146. The plurality of rows 146 comprises alternating rows 146 of cells 104 of a first shape and cells of a second shape.

**[0154]** The first shape is hexagonal. The first shape may be a hexagonal prism. The hexagonal prism may have rounded corners. The first shape may comprise connected hexagonal prisms, one being larger than the other. In the illustrated embodiment, this is the case, where rows 146 of hexagonal cells 104 are formed by the axial walls 102 and the cantilever walls 103. Specifically, a group of axial walls 102 defines a volume in the shape of a first hexagonal prism. A group of the cantilever walls 103 that meet these axial walls 102 at respective junctions 105 forms a volume in the shape of another hexagonal prism. This hexagonal prism is smaller than that formed by the axial walls 102. The two hexagonal prism volumes are connected to form the hexagonal cell 104.

**[0155]** The second shape is rectangular. The second shape may be a rectangular prism. The rectangular prism may have rounded corners. The second shape may comprise connected rectangular prisms, one being larger than the other. In the illustrated embodiment, this is the case, where rows 146 of rectangular cells 104 are formed by the axial walls 102 and the cantilever walls 103. Specifically, a group of axial walls 102 defines a volume in the shape of a first rectangular prism. A group of the cantilever walls 103 that meet these axial walls 102 at respective junctions 105 forms a volume in the shape of another rectangular prism. This rectangular prism is smaller than that formed by the axial walls 102. The two rectangular prism volumes are connected to form the rectangular cell 104.

**[0156]** Each cell 104 comprises a first cell end 120. Each cell 104 comprises a second cell end 122. Each cell 104 extends from its first cell end 120 to its second cell end 122. In particular, each cell 104 extends in the axial direction 110 from its first cell end 120 to its second cell end 122. The first cell end 120 may therefore be referred to as a first axial end of the respective cell 104. Similarly, the second cell end 122 may be referred to as a second axial end of the respective cell 104. A number of the walls 102 define at least part of the first cell end 120 of each cell 104. A number of the walls 102 define at least part of the second cell end 122 of each cell 104.

**[0157]** One or more of the cells 104 comprises a first cell opening 124. The first cell opening 124 of a particular cell 104 is an opening of that cell 104. The first cell opening 124 of one or more of the cells 104 is at the first cell end 120 of the respective cell 104. The first cell opening 124 of a particular cell 104 is defined by the walls 102 that define at least part of that cell 104. In the illustrated embodiment, each cell 104 comprises a first cell opening 124 at its respective first cell end 120. The first cell opening 124 of one or more cells 104 is planar. Each cell 104 extends in the axial direction 110 from the respective first cell opening 124 to the respective second cell end 122.

**[0158]** The formwork 100 comprises a plurality of parallel cells 104. That is, the axial direction 110 of one or more of the cells 104 is aligned with the axial direction 110 of one or more other cells 104. In other words, a longitudinal axis of one or more of the cells 104 is parallel with a longitudinal axis of one or more other cell 104. The longitudinal axes of the cells 104 extend in the axial direction 110. In the illustrated embodiment, the axial direction 110 of each cell is aligned with the axial direction 110 of each other cell 104.

**[0159]** Each cell 104 may be said to have an axial dimension 126 (see Figure 21). The distance between the first cell end 120 and the second cell end 122 of a particular cell 104, measured in the axial direction 110, is the axial dimension 126 of that cell 104. In other words, the axial dimension 126 of a particular cell 104 of the plurality of cells 104 is a distance, measured in the axial direction 110, between a point on the first cell end 120 and a second point on the second cell end 122 of the particular cell 104. The axial dimension 126 may be referred to as the height of the cell 104.

**[0160]** In some embodiments, the first cell end 120 and/or the second cell end 122 of one or more cells 104 are such that the distance between the first cell end 120 and the second cell end 122 of those cells 104, measured in the axial direction 110, changes across the cell 104. In such a case, the axial dimension 126 of the cell 104 may be considered to be the shortest distance between the first cell end 120 and the second cell end 122 of the cell 104, measured in the axial direction 110. Alternatively, the axial dimension 126 of the cell 104 may be considered to be the longest distance between the first cell end 120 and the second cell end 122 of the cell 104, measured in the axial direction 110. Alternatively, the axial dimension 126 of the cell 104 may be considered to be the average distance between the first cell end 120 and the second cell end 122 of the cell 104, measured in the axial direction 110.

**[0161]** As described herein, the first cell end 120 of one or more of the cells 104 comprises the first cell opening 124 of that cell 104. Thus, the axial dimension 126 such a cell 104 is a distance, measured in the axial direction 110, between a point on the first cell opening 124 and a second point on the second cell end 122 of the particular cell 104.

**[0162]** One or more of the cells 104 comprises a second cell opening 128. The second cell opening 128 of a particular cell 104 is an opening of that cell 104. The second cell opening 128 of one or more of the cells 104 is at the second cell end 122 of the respective cell 104. In the illustrated embodiment, each cell 104 comprises a second cell opening 128 at its respective second cell end 122. One or more of the second cell openings 128 are planar. Each cell 104 extends in the axial direction 110 from the respective first cell opening 124 to the respective second cell opening 128. The walls 102 of the formwork 100 are therefore configured such that one or more of the cells 104 is in the form of a channel that extends from a respective first cell opening 124 to a respective second cell opening 128.

**[0163]** The second cell opening 128 of a number of the cells 104 is smaller than the first cell opening 124 of the respective cell(s) 104. That is, in some embodiments, an area of the second cell opening 128 of one or more of the cells 104 is less than an area of the first cell opening 124 of that cell 104. It will be appreciated; however, that in some embodiments, the first cell opening 124 and the second cell opening 128 of one or more of the cells 104 may be the same size. That is, the area of the first cell opening 124 and the second cell opening 128 of one or more of the cells 104 may be the same. Alternatively, the second cell opening 128 of one or more cells 104 may be larger than the corresponding first cell opening 124. In other words, the area of the second cell opening 128 of one or more of the cells 104 may be greater than the area of the first cell opening 124 of that cell 104. Thus, in some embodiments, the area of the first cell opening 124 of one or more of the cells 104 is different to the area of the second cell opening 128 of the respective cell 104.

**[0164]** The formwork 100 comprises a plurality of peripheral cells 130. In particular, the plurality of cells 104 comprises the plurality of peripheral cells 130. Each peripheral cell 130 is defined, at least in part, by a number of the walls 102. The walls 102 defining one or more peripheral cells 130 form a closed loop. That is, the walls 102 may be traced around a perimeter of the relevant peripheral cell 130 without a break in the walls 102. In some embodiments, the walls 102 are traced along a plane to form the closed loop. The walls 102 that form the closed loop may define an annular shape. The formwork 100 comprises a peripheral portion 132. The peripheral cells 130 define at least part of the peripheral portion 132 (see Figure 6). In the illustrated embodiment, the peripheral cells 130 define the peripheral portion 132 of the formwork 100. The peripheral portion 132 extends around a periphery of the formwork 100. The peripheral portion 132 may be said to define a periphery of the formwork 100. The peripheral portion 132 may be considered the periphery of the formwork 100. Alternatively, the outer-most wall 102 of each peripheral cell 130 may define at least part of the periphery of the formwork 100. A gap between one or more walls 102 may define another part of, or the rest of, the periphery of the formwork 100.

**[0165]** The peripheral portion 132 is shown in Figure 6 to be a portion of the formwork 100 that lies between a notional inner boundary 134 and a notional outer boundary 136. The notional inner boundary 134 extends along a number of inner walls 102 of the peripheral cells 130. The notional outer boundary 136 extends along a number of outer walls 102 of the peripheral cells 130. In other words, the space occupied by the peripheral cells 130, and at least part of the walls 102 defining the peripheral cells 130, may be considered to be the peripheral portion 132 of the formwork 100.

**[0166]** The peripheral cells 130 are hexagonal. Specifically, the shape of one or more of the peripheral cells 130 is at least partially a hexagonal prism. The hexagonal prism may have rounded corners. The hexagonal prism may be a tapered hexagonal prism. The hexagonal prism may have a curved side or a recess. The shape of one or more of the peripheral cells 130 may be in the form of two connected hexagonal prisms, one being larger than the other. A number of the walls 102 may define a volume in the shape of, or resembling, a first hexagonal prism. These walls 102 may be axial walls 102. A number of the walls 102 may define a second volume in the shape of, or resembling, a second hexagonal prism. These walls 102 may be cantilever walls 103. Alternatively, these walls 102 may be the same walls that define the volume in the shape of the first hexagonal prism. The second hexagonal prism may be a tapered hexagonal prism. The second hexagonal prism is smaller than the first hexagonal prism.

**[0167]** The formwork 100 comprises a plurality of internal cells 140. The internal cells 140 are internal with respect to the peripheral cells 130. The walls 102 defining one or more internal cells 140 form a closed loop. That is, the walls 102 may be traced around a perimeter of the relevant internal cell 140 without a break in the walls 102. In some embodiments, the walls 102 are traced along a plane to form the closed loop. The walls 102 that form the closed loop may define an annular shape. The formwork comprises an internal portion 142. The internal cells 140 define at least part of an internal portion 142 of the formwork 100. In the illustrated embodiment, the internal cells 140 define the internal portion 142 of the formwork 100. The internal portion 142 of the formwork 100 is the portion of the formwork 100 that is internal to the notional inner boundary 134 of the peripheral portion 130.

**[0168]** The peripheral portion 132 at least partially encircles the internal cells 140. While it will be appreciated that there may be gaps or discontinuities along a length of peripheral cells 130, the peripheral portion 132 may be considered to span these gaps or discontinuities. Thus, in the illustrated embodiment, the peripheral portion 132 encircles the internal cells 140. Similarly, the peripheral portion 132 at least partially encircles the internal portion 142. In the illustrated embodiment, the peripheral portion 132 encircles the internal portion 142.

**[0169]** As described herein, a number of the cells 104 extend between a first cell opening 124 and a second cell end 122, with a distance between the first cell opening 124 and the second cell end 122 of the cell 104, measured in the axial direction 110, being the axial dimension 126 of the cell 104. One or more of the internal cells 140 comprises a first cell opening 124. In the illustrated embodiment, each internal cell 140 comprises a first cell opening 124. One or more of the internal cells 140 comprises a second cell end 122. In the illustrated embodiment, each internal cell 140 comprises a second cell end 122. Each internal cell 140 comprises a second cell opening 128 at its second cell end 122. The axial dimension 126 of an internal cell 140 is the distance, measured in the axial direction 110, between a point on the first cell opening 124 and a corresponding point on the second cell opening 128 of that internal cell 140, measured in the axial direction 110.

**[0170]** The first cell openings 124 of a number of the internal cells 140 are coplanar. In the illustrates embodiment, the first cell openings 124 of each of the internal cells 140 are coplanar. The second cell openings 128 of a number of the internal cells 140 are coplanar. In the illustrated embodiment, the second cell openings 128 of each of the internal cells 140 are coplanar.

**[0171]** While the first cell openings 124 of the internal cells 140 are coplanar, as are the second cell openings

128, in some embodiments, this may not be the case. For example, in some embodiments, one or more of the first cell openings 124 of the internal cells 140 may be angled with respect to one or more other first cell openings 124 of the internal cells 140. In other words, one or more of the first cell openings 124 of the internal cells 140 may be transverse to one or more other first cell openings 124 of the internal cells 140. That is, the walls 102 that form one or more of the internal cells 140 may be different axial lengths and/or their axial lengths may change along the walls 102, such that the first cell opening 124 is angled. Similarly, one or more of the second cell openings 128 of the internal cells 140 may be angled with respect to one or more other second cell openings 128 of the internal cells 140.

**[0172]** A number of the internal cells 140 are hexagonal. Specifically, the shape of one or more of the internal cells 140 is at least partially a hexagonal prism. The hexagonal prism may have rounded corners. The hexagonal prism may be a tapered hexagonal prism. The shape of one or more of the internal cells 140 may be in the form of two connected hexagonal prisms, one being larger than the other. A number of the walls 102 defining one of the internal cells 140 may define a volume in the shape of a first hexagonal prism. These walls 102 may be axial walls 102. A number of the walls 102 defining one of the internal cells 140 may define a second volume in the shape of a second hexagonal prism. These walls 102 may be cantilever walls 103. Alternatively, these walls 102 may be the same walls that define the volume in the shape of the first hexagonal prism. The second hexagonal prism may be a tapered hexagonal prism. The second hexagonal prism is smaller than the first hexagonal prism. The respective internal cell 140 may be the combination of these two volumes.

**[0173]** A number of the internal cells 140 are rectangular. Specifically, the shape of one or more of the internal cells 140 is at least partially a rectangular prism. The rectangular prism may have rounded corners. The rectangular prism may be a tapered rectangular prism. The shape of one or more of the internal cells 140 may be in the form of two connected rectangular prisms, one being larger than the other. A number of the walls 102 defining one of the internal cells 140 may define a volume in the shape of a first rectangular prism. These walls 102 may be axial walls 102. A number of the walls 102 defining one of the internal cells 140 may define a second volume in the shape of a second rectangular prism. These walls 102 may be cantilever walls 103. Alternatively, these walls 102 may be the same walls 102 that define the volume in the shape of the first rectangular prism. The second rectangular prism may be a tapered rectangular prism. The second rectangular prism is smaller than the first rectangular prism. The respective internal cell 140 may be the combination of these two volumes.

**[0174]** One or more of the peripheral cells 130 comprises a first cell opening 124. In the illustrated embodiment, each peripheral cell 130 comprises a first cell opening 124. The first cell openings 124 of the peripheral cells 130 are planar. A number of the first cell openings 124 of the peripheral cells 130 are coplanar. One or more of the peripheral cells 130 comprises a second cell end 122. In the illustrated embodiment, each peripheral cell 130 comprises a second cell end 122. Each peripheral cell 130 comprises a second cell opening 128 at its second cell end 122. The second cell openings 128 of the peripheral cells 130 are planar. One or more of the second cell openings 128 of the peripheral cells 130 are coplanar. The axial dimension 126 of a peripheral cell 130 is the distance, measured in the axial direction 110, between a point on the first cell opening 124 and a corresponding point on the second cell opening 128 of that peripheral cell 130.

**[0175]** The axial dimension 126 of one or more of the peripheral cells 130 is less than the axial dimension 126 of one or more of the internal cells 140. In the illustrated embodiment, the axial dimension 126 of each of the peripheral cells 130 is constant across the second cell opening 128 of the respective peripheral cell 130. Similarly, the axial dimension 126 of the internal cells 140 is constant across the second cell opening 128 of the respective internal cell 140. It will be appreciated that if the first cell opening 124 and/or the second cell opening 128 of a respective peripheral cell 130 are angled with respect to the normal plane, the distance between a first point on the first cell opening 124 and a corresponding second point (i.e. a point that lies on the second opening, that is intersected by a line parallel to the axial direction 110, that also intersects the first point) may change across at least part of the cell 130. This will occur if the angle of the first cell opening 124 and the second cell opening 128 with respect to the normal plane are not identical. In such a case, one may define a minimum axial dimension of the peripheral cell 130 (or, in fact, the cell 104 generally, if this occurs with another cell 104 of the formwork 100), being the minimum distance, measured in the axial direction 110, between the first cell opening 124 and the second cell opening 128 of the respective cell 104. Similarly, one may define a maximum axial dimension of the peripheral cell 130, being the maximum distance, measured in the axial direction 110, between the first cell opening 124 and the second cell opening 128. The minimum axial dimension of the one or more of the peripheral cells 130 is less than the axial dimension 126 of one or more of the internal cells 140.

**[0176]** The first cell end 120 and the second cell end 122 of one or more of the peripheral cells 130 are closer together than the first cell end 120 and the second cell end 122 of one or more of the internal cells 140. In the illustrated embodiment, the first cell end 120 and the second cell end 122 of each of the peripheral cells 130 are closer together than the first cell end 120 and the second cell end 122 of each of the internal cells 140. Similarly, the first cell opening 124 and the second cell opening 128 of one or more of the peripheral cells 130 are closer together than the first cell opening 124 and the second cell opening of one or more of the internal cells 140. In the illustrated embodiment, the first cell opening 124 and the second cell opening 128 of each of the peripheral cells 130 are closer together than the first cell opening 124 and the second cell opening of each of the internal cells 140.

**[0177]** The formwork 100 comprises a cantilever wall 103 (see Figures 7, 8 and 9). The cantilever wall 103 extends inwardly into a respective cell 104. It may be said that the cantilever wall 103 defines a part of a cell 104. In particular, the cantilever wall 103 may define part of a corner of the cell 104. The other part of the corner may be formed by the axial wall 102 that meets the cantilever wall at a junction 105.

**[0178]** The illustrated formwork 100 comprises a plurality of cantilever walls 103. A plurality of the cantilever walls 103 extend inwardly, each into a respective cell 104. Rather than extending inwardly into a respective cell 104, the cantilever walls 103 may be considered to extend inwardly to define a part of a respective peripheral cell 130. A number of the cantilever walls 103 extend outwardly from the cells 104. The cantilever walls 103 extend outwardly from the axial walls 102. One or more of the cantilever walls 103 meets one or more other cantilever wall 103 at one or more junctions 105. The cantilever walls 103 each meet one or more axial walls 102 at a respective junction 105.

**[0179]** The cantilever walls 103 are parallel. A number of the cantilever walls 103 are coplanar. The cantilever walls 103 are transverse to the axial walls 102. In the illustrated embodiment, the cantilever walls 103 are generally perpendicular to the axial walls 102.

**[0180]** A number of the cantilever walls 103 extend inwardly into a respective peripheral cell 130. That is, one or more of the cantilever walls 103 extend inwardly into a respective peripheral cell 130. Rather than being considered to extend inwardly into a peripheral cell 130, the respective cantilever walls 103 may be considered to extend inwardly to define a part of a respective peripheral cell 130. In particular, one or more cantilever walls 103 may define a corner of the peripheral cell 130. The corner may be a rounded corner. The corner may comprise a chamfer.

**[0181]** At least one of the cantilever walls 103 extending inwardly into a respective peripheral cell 130 is parallel to at least one other cantilever wall 103 extending inwardly into that peripheral cell 130. Further, at least one of the cantilever walls 103 extending inwardly into a respective peripheral cell 130 is parallel to at least one other cantilever wall 103 extending inwardly into another peripheral cell 130. In other words, at least one of the cantilever walls 103 that defines part of a respective peripheral cell 130 is parallel to at least one other cantilever wall 103 that defines part of the respective peripheral cell 130. Further, at least one of the cantilever walls 103 that defines part of a respective peripheral cell 130 is parallel to at least one other cantilever wall 103 that defines part of another peripheral cell 130.

**[0182]** A number of the cantilever walls 103 extend inwardly into a respective internal cell 140. That is, one or more of the cantilever walls 103 extend inwardly into a respective internal cell 140. Rather than being considered to extend inwardly into an internal cell 140, the cantilever walls 103 may be considered to extend inwardly to define a corner of the internal cell 140. The corner may be a rounded corner. The corner may comprise a chamfer.

**[0183]** At least one of the cantilever walls 103 extending inwardly into a respective internal cell 140 is parallel to at least one other cantilever wall 103 extending inwardly into that internal cell 140. Further, at least one of the cantilever walls 103 extending inwardly into a respective internal cell 140 is parallel to at least one other cantilever wall 103 extending inwardly into another internal cell 140. In other words, at least one of the cantilever walls 103 that defines part of a respective internal cell 140 is parallel to at least one other cantilever wall 103 that defines part of the respective internal cell 140. Further, at least one of the cantilever walls 103 that defines part of a respective internal cell 140 is parallel to at least one other cantilever wall 103 that defines part of another internal cell 140.

**[0184]** The cantilever walls 103 of a cell 104 are disposed at the second end of that cell 104. The cantilever walls 103 define at least part of the second cell openings 128 of one or more of the cells 104. The second cell openings 128 of some cells 104 are defined entirely by the cantilever walls 103 that define part of the boundary of those cells 104. The second cell openings 128 of some of the cells 104 are defined in part by the cantilever walls 103 that define part of the boundary of those cells 104. Other parts of the second cell openings 128 of those cells 104 may be defined by one or more other walls 102 (e.g. axial walls 102).

**[0185]** In the illustrated embodiment, the cantilever walls 103 define part of the second cell openings 128 of one or more of the internal cells 140 and one or more of the peripheral cells 130. In particular, the cantilever walls 103 define the second cell openings 128 of each of the internal cells 140.

**[0186]** One or more of the cantilever walls 103 that extend inwardly into a peripheral cell 130 is axially offset with respect to one or more of the cantilever walls that extends inwardly into an internal cell 140 (see, for example, Figure 21 and Figure 25). The cantilever wall 130 may be in the form of a protrusion from another wall 102. For example, the cantilever wall 130 may be in the form of a protrusion from an axial wall 102 that defines part of that cell 104. As shown in Figure 21, the cantilever wall 103 of the peripheral cell 130 shown in the cross-section 177 is axially offset from the cantilever wall 103 of the adjacent cell 104, which may be considered an internal cell 140. Similarly, the cantilever wall 103 of the peripheral cell 130 shown in the cross-section is axially offset from each of the cantilever wall portions 103 of each of the other internal cells 140.

**[0187]** This may be expressed differently by comparing the distances between the first cell opening 124 and the cantilever walls 103 of the peripheral cells 130. Specifically, a distance, measured in the axial direction 110, between one or more of the cantilever walls 103 that define part of a peripheral cell 130 and the first cell opening 124 of the respective peripheral cell 130 is less than a distance, measured in the axial direction, between one or more of the cantilever walls 103 that define part of an internal cell 140 and the first cell opening 124 of the respective internal cell 140.

**[0188]** The axial dimension 126 of one or more of the peripheral cells 130 is less than the axial dimension 126 of one or more of the internal cells 140. In the illustrated embodiment, the axial dimension 126 of each of the peripheral cells 130 is less than the axial dimension of each of the internal cells 140. The first cell openings 124 of a number of the peripheral cells 130 are axially offset from the first cell opening 124 of one or more of the internal cells 140. This is shown, for example, in Figures 25 to 37. Similarly, the second cell openings 128 of a number of the peripheral cells 130 are axially offset from the second cell openings 128 of one or more of the internal cells 140. Again, this is shown, for example, in Figure 21 and Figures 26 to 37.

**[0189]** The plurality of peripheral cells 130 comprises a first subset 144 of peripheral cells 130. The first subset 144 of peripheral cells 130 comprises a first row 146 of cells 104. The first subset 144 of peripheral cells 130 comprises a first column 148 of cells 104. The first row 146 of cells 104 and the first column 148 of cells 104 comprise one cell 104 in common. One or more of the peripheral cells 130 of the first subset 144 of peripheral cells 130 comprises a respective first cell opening 124. In the illustrated embodiment, each peripheral cell 130 of the first subset 144 of peripheral cells 130 comprises a respective first cell opening 124 at its first cell end 120. One or more of the peripheral cells 130 of the first subset 144 of peripheral cells 130 comprises a respective second cell opening 128. In the illustrated embodiment, each peripheral cell 130 of the first subset 144 of peripheral cells 130 comprises a respective second cell opening 128 at its second cell end 122.

**[0190]** The first cell ends 120 of the peripheral cells 130 of the first subset 144 of peripheral cells 130 are axially offset from the first cell ends 120 of one or more of the internal cells 140. In the illustrated embodiment, the first cell ends 120 of the peripheral cells 130 of the first subset 144 of peripheral cells 130 are axially offset from the first cell ends 120 of each of the internal cells 140. The first cell openings 124 of the peripheral cells 130 of the first subset 144 of peripheral cells 130 are axially offset from the first cell openings 124 of one or more of the internal cells 140. In the illustrated embodiment, the first cell openings 124 of the peripheral cells 130 of the first subset 144 of peripheral cells 130 are axially offset from the first cell openings 124 of each of the internal cells 140. The first cell openings 124 of at least some of the peripheral cells 130 of the first subset 144 are coplanar. In the illustrated embodiment, the first cell openings 124 of each of the peripheral cells 130 of the first subset 144 are coplanar.

**[0191]** A number of the peripheral cells 130 of the first subset 144 of peripheral cells 130 comprise a respective second cell opening 128. In the illustrated embodiment, each peripheral cell 130 of the first subset 144 of peripheral cells 130 comprises a second cell opening 128. The second cell openings 128 are at the second cell end 122 of the respective peripheral cells 130. The second cell openings 128 of the peripheral cells 130 of the first subset 144 of peripheral cells 130 are coplanar. The second cell openings 128 of the peripheral cells 130 of the first subset 144 of peripheral cells 130 are coplanar with the second cell openings 128 of one or more of the internal cells 140. In the illustrated embodiment, the second cell openings 128 of the peripheral cells 130 of the first subset 144 of peripheral cells 130 are coplanar with the second cell openings 128 of each of the internal cells 140.

**[0192]** Alternative configurations are possible however. For example, as described herein, one or more of the first cell openings 124 of the cells 104 may be angled (e.g. with respect to the normal plane of the formwork 100). For example, the first cell opening 124 of one or more of the peripheral cells 130 of the first subset 144 of peripheral cells 130 may be angled with respect to the normal plane. Similarly, the first cell opening 124 of one or more of the internal cells 140 may be angled with respect to the normal plane. Where their angles with respect to the normal plane are different, the first cell opening 124 of one or more of the peripheral cells 130 of the first subset 144 of peripheral cells 130 may be transverse to the first cell opening 124 of one or more of the internal cells 140. Similarly, the first cell opening 124 of one or more of the peripheral cells 130 of the first subset 144 of peripheral cells 130 may be transverse to the second cell opening 128 of the respective peripheral cell 130. In other words, the first cell opening 124 and the second cell opening 128 of one of the peripheral cells 130 of the first subset 144 of peripheral cells 130 may be non-parallel.

**[0193]** The plurality of peripheral cells 130 comprises a second subset 145 of peripheral cells 130. The second subset 145 of peripheral cells 130 comprises a second row 146 of cells 104. The second subset 145 of peripheral cells 130 comprises a second column 148 of cells 104. The second row 146 of cells 104 and the second column 148 of cells 104 comprise one cell 104 in common. The first subset 144 of peripheral cells 130 and the second subset 145 of peripheral cells 130 are mutually exclusive. That is, the first subset 144 of peripheral cells 130 and the second subset 145 of peripheral cells 130 comprise no cells 104 in common. The first subset 144 of peripheral cells 130 defines two edge portions of the formwork 100. The second subset 145 of peripheral cells 130 defines two edge portions of the formwork 100.

**[0194]** One or more of the peripheral cells 130 of the second subset 145 of peripheral cells 130 comprises a respective first cell opening 124. In the illustrated embodiment, each peripheral cell 130 of the second subset 145 of peripheral cells 130 comprises a respective first cell opening 124 at its first cell end 120. One or more of the peripheral cells 130 of the second subset 145 of peripheral cells 130 comprises a respective second cell opening 128. In the illustrated embodiment, each peripheral cell 130 of the second subset 145 of peripheral cells 130 comprises a respective second cell opening 128 at its second cell end 122.

**[0195]** The second cell ends 122 of the peripheral cells 130 of the second subset 145 of peripheral cells 130 are axially offset from the second cell ends 122 of one or more of the internal cells 140. In the illustrated embodiment, the second cell ends 122 of the peripheral cells 130 of the second subset 145 of peripheral cells 130 are axially offset from the second cell ends 122 of each of the internal cells 140. The second cell openings 128 of the peripheral cells 130 of the second subset 145 of peripheral cells 130 are axially offset from the second cell openings 128 of one or more of the internal cells 140. In the illustrated embodiment, the second cell openings 128 of the peripheral cells 130 of the second subset 145 of peripheral cells 130 are axially offset from the second cell openings 128 of each of the internal cells 140. The second cell openings 128 of at least some of the peripheral cells 130 of the second subset 145 of peripheral cells 130 are coplanar. In the illustrated embodiment, the second cell openings 128 of each of the peripheral cells 130 of the second subset 145 of peripheral cells 130 are coplanar.

**[0196]** The first cell openings 124 of at least some of the peripheral cells 130 of the second subset 145 of peripheral cells 130 are coplanar. In the illustrated embodiment, the first cell openings 124 of each of the peripheral cells 130 of the second subset 145 of peripheral cells 130 are coplanar. The first cell opening 124 of one or more of the peripheral cells 130 is parallel to the first cell opening 124 of one or more of the internal cells 130. In particular, in the illustrated embodiment, the first cell opening 124 of each of the peripheral cells 130 of the second subset 145 of peripheral cells 130 is parallel with the first cell opening 124 of one or more of the internal cells 140.

**[0197]** The first cell openings 124 of at least some of the peripheral cells 130 of the second subset 145 of peripheral cells 130 are coplanar with the first cell opening 124 of one or more of the internal cells 140. In the illustrated embodiment, the first cell openings 124 of each of the peripheral cells 130 of the second subset 145 of peripheral cells 130 are coplanar with the first cell openings 124 of each of the internal cells 140.

**[0198]** The second cell openings 128 of the peripheral cells 130 of the second subset 145 of peripheral cells 130 are axially offset from the second cell opening 128 of one or more of the peripheral cells 130 of the first subset 144 of peripheral cells 130. In the illustrated embodiment, the second cell openings 128 of the peripheral cells 130 of the second subset 145 of peripheral cells 130 are axially offset from the second cell opening 128 of each of the peripheral cells 130 of the first subset 144 of peripheral cells 130.

**[0199]** Alternative configurations are possible however. For example, as described herein, one or more of the first cell openings 124 may be angled (e.g. with respect to the normal plane of the formwork 100). For example, the first cell opening 124 of one or more of the peripheral cells 130 of the second subset 145 of peripheral cells 130 may be angled with respect to the normal plane. Similarly, the first cell opening 124 of one or more of the internal cells 140 may be angled with respect to the normal plane. Where their angles with respect to the normal plane are different, the first cell opening 124 of one or more of the peripheral cells 130 of the second subset 145 of peripheral cells 130 may be transverse to the first cell opening 124 of one or more of the internal cells 140. Similarly, the first cell opening 124 of one or more of the peripheral cells 130 of the second subset 145 of peripheral cells may be transverse to the second cell opening 128 of the respective peripheral cell 130. In other words, the first cell opening 124 and the second cell opening 128 of one of the peripheral cells 130 of the second subset 145 of peripheral cells 130 may be non-parallel.

**[0200]** The second cell opening 128 of one or more of the peripheral cells 130 is smaller than the first cell opening 124 of that peripheral cell 130. The second cell opening 128 of one or more of the peripheral cells 130 of the first subset 144 of peripheral cells 130 is smaller than the first cell opening 124 of that peripheral cell 130. In the illustrated embodiment, the second cell opening 128 of each of the peripheral cells 130 of the first subset 144 of peripheral cells 130 is smaller than the first cell opening 124 of that peripheral cell 130. The second cell opening 128 of one or more of the peripheral cells 130 of the second subset 145 of peripheral cells 130 is smaller than the first cell opening 124 of that peripheral cell 130. In the illustrated embodiment, the second cell opening 128 of each of the peripheral cells 130 of the second subset 145 of peripheral cells 130 is smaller than the first cell opening 124 of that peripheral cell 130.

**[0201]** A cantilever wall 130 is provided at the second cell end 122 of the peripheral cells 130 of the second subset 145 of peripheral cells 130.

**[0202]** The second cell opening 128 of one or more of the internal cells 140 is smaller than the first cell opening 124 of that internal cell 140. In the illustrated embodiment, the second cell opening 128 of each of the internal cells 140 is smaller than the first cell opening 124 of the respective internal cell 140.

**[0203]** The difference in dimensions between the peripheral cells 130 and the inner cells 140 results in these cells having different volumes. Specifically, a volume of one or more of the peripheral cells 130 is less than a volume of one or more of the internal cells 140. In the illustrated embodiment, the volume of each of the peripheral cells 130 is less than the volume of each of the hexagonal internal cells 140. Further, the volume of one or more of the peripheral cells 130 may be greater than the volume of one or more of the internal cells 140. Specifically, the volume of each of the peripheral cells 130 may be greater than the volume of each of the rectangular internal cells 140.

## Connecting Cells 150

**[0204]** The formwork 100 comprises one or more connecting cells 150. The illustrated formwork 100 comprises a plurality of connecting cells 150. In particular, the plurality of cells 104 comprises the plurality of connecting cells 150. Each connecting cell 150 is configured to receive part of a second formwork. When the connecting cells 150 have received the respective parts of the second formwork, movement between the formwork 100 and the second formwork is inhibited.

**[0205]** The connecting cells 150 are circular. In the illustrated embodiment, each connecting cell 150 is cylindrical. Each connecting cell 150 is defined by curved walls 102. One or more of the connecting cells 150 are defined, at least in part, by walls 102 that also define at least part of one or more peripheral cells 130. In the illustrated embodiment, each connecting cell 150 is formed by a number of walls 102, each wall 102 forming part of another cell 104. Some of these other cells 104 are peripheral cells 130. Specifically, two of these other cells 104 are peripheral cells 130. One of these other cells is an internal cell 140. The connecting cells 150 are formed, in part, by walls 102 that also define part of a number of peripheral cells 130 of the first subset 144 of peripheral cells 130. It will be appreciated however, that in some embodiments, one or more of the connecting cells 150 may be formed only by walls 102 that also form part of a peripheral cell 130.

**[0206]** The connecting cells 150 each comprise a first cell opening 124. The first cell opening 124 of a particular connecting cell 150 is an opening of that connecting cell 150. The first cell opening 124 of one or more of the connecting cells 150 is at the first cell end 120 of the respective connecting cell 150. In the illustrated embodiment, each connecting cell 150 comprises a first cell opening 124 at its respective first cell end 120. Each connecting cell 150 extends in the axial direction 110 from the respective first cell opening 124 to the respective second cell end 122. The second cell end 122 of each connecting cell 150 comprises a second cell opening 128.

**[0207]** The first cell openings 124 of one or more of the connecting cells 150 are coplanar with the first cell openings 124 of one or more of the peripheral cells 130 of the first subset 144 of peripheral cells 130. In the illustrated embodiment, the first cell openings 124 of each of the connecting cells 150 are coplanar with the first cell openings 124 of each of the peripheral cells 130 of the first subset 144 of peripheral cells 130.

**[0208]** The second cell openings 128 of one or more of the connecting cells 150 are coplanar with the second cell openings 128 of one or more of the peripheral cells 130 of the first subset 144 of peripheral cells 130. In the illustrated embodiment, the second cell openings 128 of each of the connecting cells 150 are coplanar with the second cell openings 128 of each of the peripheral cells 130 of the first subset 144 of peripheral cells 130.

**[0209]** The formwork 100 comprises a projection 152. The projection 152 is cylindrical. The projection 152 is configured to cooperate with another formwork to inhibit relative movement between the formwork 100 and the other formwork. The formwork 100 comprises a plurality of projections 152. Each projection 152 is configured to cooperate with another formwork to inhibit relative movement between the formwork 100 and the other formwork.

**[0210]** In particular, each of the projections 152 is configured to fit within a corresponding connecting cell of the other formwork(s). The shape of one or more of the projections 152 is such that they can be received within a volume that has the same or similar dimensions as one or more of the connecting cells 150.

**[0211]** The projections 152 project outwardly from one or more of the walls 102 defining the peripheral cells 130 of the second subset 145 of peripheral cells 130. In particular, the projections 152 project outwardly from a junction 105 between a plurality of walls 102, the walls 102 forming part of a number of peripheral cells 130 of the second subset 145 of peripheral cells 130. The projections 152 project in the axial direction 110. The projections 152 project parallel to the axial direction 110. The projections 152 project towards a base of the formwork 100. The projections 152 project downwardly. One or more of the projections 152 are closer to the second cell openings 128 of the peripheral cells 130 of the second subset 145 of peripheral cells 130 than the first cell openings 124 of those peripheral cells 130. In the illustrated embodiment, each of the projections 152 is closer to the second cell opening 128 of at least one of the peripheral cells 130 of the second subset 145 of peripheral cells 130 than the first cell openings 124 of those peripheral cells 130.

## Cell Connection Channels 154

**[0212]** The formwork 100 comprises a number of cell connection channels 154. The illustrated formwork 100 comprises a plurality of cell connection channels 154. One or more of the walls 102 defines at least part of a respective cell connection channel 154. Each cell connection channel 154 fluidly connects two or more cells 104. A number of the cell connection channels 154 fluidly connect three cells 104. Each cell connection channel 154 extends between a number of cell connection openings 156. In the illustrated embodiment, each cell connection channel 154 extends between three cell connection openings 156. One or more of the cell connection openings 156 is an opening into a respective cell 104. Some of the cell connection openings are external openings, that open to a volume external to the cells 104. The cell connection channels 154 are located at the junctions

105 between the walls 102. In particular, the junction 105 between the axial walls 102 of each internal cell 140 comprises a respective cell connection channel 154. Similarly, the junction 105 between a number of the axial walls 104 of the peripheral cells 130 comprises a respective cell connection channel 154. The cell connection channels 154 are configured to enable a fill material that is provided into one of the cells 104 to move to an adjacent cell 104. The fill material may move to the adjacent cell 104 by passing through one or more of the cell connection channels 154 in the walls 102 that define the respective cell 104.

**[0213]** The formwork 100 comprises a polymer. The formwork 100 may be constructed of polymer. The formwork may be constructed of a composite material comprising a polymer.

**[0214]** The formwork 100 may be injection moulded. One or more of the walls 102 may have a draft angle applied to it. For example, a draft angle may be applied to one or more of the axial walls 102. The draft angle may take a value between 1° and 5°.

Method of Constructing a Path

**[0215]** The formwork 100 is configured to be used in the construction of a path. Specifically, a plurality of formworks like the formwork 100 described with reference to Figures 5 to 38 can be used in the construction of a path. The formwork 100 is configured to receive a fill material. In particular, one or more of the cells 104 is configured to receive the fill material. In the illustrated embodiment, each cell 104 is configured to receive the fill material.

**[0216]** To construct a path, a number of appropriately sized formworks manufactured in accordance with the present description are provided. The illustrated formwork 100 comprises 14 cells 104 in each row 146 and column 148 of peripheral cells 130. It will be understood that in some embodiments, this number may be different. For example, the rows 146 of peripheral cells 130 may comprise 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 or 20 cells 104. The columns 148 of peripheral cells 130 may comprise 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 or 20 cells 104. The number of cells 104 in a row 126 of the peripheral cells 130 may be different to the number of cells 104 in a column 148 of the peripheral cells 130.

**[0217]** Initially, a base layer of the path is provided on the ground. The base layer may be in the form of a polymer layer. The polymer layer may comprise one or more polymer sheets.

**[0218]** The formworks 100 are connected together, on top of the base layer, using the respective connecting cells 150 and projections 152. Referring to Figure 39, one formwork 100 may be placed on the base layer. An additional formwork 100, itself comprising peripheral cells 130, connecting cells 150 and projections 152 like those described herein, is connected to the formwork 100 on the base layer by lifting the additional formwork 100, aligning the projections 152 along one side of the additional formwork 100 with the connecting cells 150 of the formwork 100 placed on the base layer, and inserting the projections 152 of the additional formwork in to the connecting cells 150. This can be repeated for any number of formworks 100 over any area on which a path is desired to be constructed. Four formworks 100 are shown in Figure 39.

**[0219]** Following connection of the formworks 100, the fill material can be provided into the cells 104 of each formwork 100. The fill material may comprise one or more of a cementitious material, a bituminous material and a granular fill material. The fill material may comprise cement. The fill material may be poured over the formworks 100 such that it enters the cells 104 of the formworks 100. The cell connection channels 154 enable the fill material to flow between the cells 104 even if it is not poured directly over each individual cell 104. This enables each of the cells 104 of each of the formworks 100 to be filled with the fill material without requiring the fill material to be explicitly poured over each cell 104. The fill material can be added until one or more of the cells 104 is filled with it. In some cases, the fill material can overflow over the top of a number of the cells 104, if a top layer of the fill material is desired. If the fill material needs to cure and/or set, it can be allowed to cure and/or set following its application.

**[0220]** Following application of the fill material, and allowing it to set, if necessary, the upper surface of the path can be levelled. The upper surface may be levelled using a vibrating screed. The upper surface of the path may be finished. The upper surface of the path may be finished using a chopper.

**[0221]** In use, the formwork 100 remains as part of the path. The formwork 100 may therefore be referred to as a permanent formwork. Alternatively, the formwork 100 may be referred to as a lost formwork.

**[0222]** A plurality of the formworks 100 described herein can also be used to construct curved paths. Referring to Figure 40, the formworks 100 do not need to be directly aligned. In some cases, the formworks 100 can be connected with offset edge portions to facilitate the construction of a curved path. It will be appreciated that a smaller formwork 100 (i.e. a formwork with a lower number of peripheral cells in each row and column of cells) can be used for sharper curve radii.

Method of Repairing a Path

**[0223]** The path produced using the described method is easily repairable. If, for example, there is a void in the ground underneath the path, the void can be filled and/or any damage caused to the path can be repaired. A hole may be drilled through one of the cells 104 that is located above the void. A filler product can be injected into the void until the void is substantially filled. The filler product may be the fill material described herein. The filler product may also be applied until the cell 104 that was drilled out is re-filled with it. Such a filler product can be allowed to set, after which, the path is repaired.

Advantages

[0224] The formwork 100 described herein provides a number of significant advantages.

[0225] Existing flexible pavements require a significant volume of material and excavated depth. Higher material volumes and excavation depths result in associated increased costs of construction. Damage to flexible pavements is also common.

[0226] Rigid pavements are adversely affected by temperature changes, which can cause expansion and subsequent cracking of the rigid pavements. Rigid pavements can also be relatively expensive to construct and difficult to repair.

[0227] The formwork 100 described herein can enable the construction of a path/pavement for the conveyance of traffic that provides benefits that are typically only provided by one of flexible pavements or rigid pavements.

[0228] The formwork 100 enables the path that is ultimately constructed to flex, as the formwork 100 is generally less rigid than a concrete or steel re-enforced concrete path. As the cells 104 of the formwork 100 are filled with fill material, the compressive strength of the fill material can be utilised in use, whilst the flexibility of the formwork 100 enables the path to flex when under load. A path constructed using the formwork 100 can therefore provide benefits that are traditionally provided by only one of flexible pavements and rigid pavements. That is, a path constructed using the formwork 100 can provide the benefits of a rigid pavement (e.g. where the fill material is concrete), whilst also providing the benefits of a flexible pavement, at least in part due to the flexibility provided by the formwork 100 and the way the formwork divides the path into cells 104 filled with the fill material. Such characteristics can reduce the wear experienced by the path over time and can lead to an increase in the working lifespan of a path constructed using the formwork 100.

[0229] The formwork 100 enables the construction of a path that can support a high load whilst sustaining a reduced amount of damage. For example, a path constructed using an array of connected formworks 100, in combination with concrete as a fill material, can provide sufficient structural integrity for a concrete truck to drive across without disturbing the subjacent base courses.

[0230] The construction of such a path using conventional methods could require a significant volume of concrete. The described formwork 100, and the described method of constructing a path using the formwork 100 therefore remove or reduce the requirement for an expensive concrete pump in some instances, for example on a large expanse of pavement area.

[0231] Further, a composite pavement course constructed as described herein, comprised of formworks 100 filled with a fill material, can achieve a large tensile load bearing capacity, when compared to known conventional flexible and rigid pavement courses.

[0232] The formwork 100 described herein enables the construction of paths with a relatively small vertical profile (i.e. depth, and therefore, corresponding excavation requirements), that are capable of supporting the transport of heavy vehicles. Such paths can be constructed using a reduced amount of materials, which can significantly reduce the cost of producing such a path, and the logistical difficulties associated with constructing such paths.

[0233] The cell connection channels 154 of the formwork 100 advantageously enable fill material to flow between cells 104 during construction. This enables the fill material to settle at a relatively constant height throughout the path that is being constructed.

[0234] No formwork or additional concrete reinforcement is required, saving both time and cost.

[0235] The concrete required to construct a path using the formwork 100 described herein is significantly less than either a conventional rigid pavement or flexible pavement. Further, the reduced thickness of the pavement course requires less excavation and material than conventional pavements. Less excavation means less expensive heavy machinery, lower risk of hitting or disrupting underground services, and reduced schedules.

[0236] The load profile of a pavement course according to the present disclosure is similar to a rigid pavement, as depicted in Figure 4, with the load being spread due to the tensile stress being carried through the formwork 100 filled with fill material. As such, any defects or voids beneath the path are shallower than would be experienced by flexible pavements.

[0237] In addition, due to higher tensile strength, the path has a greater loading capacity and may continue to operate with a defect below the path, for a longer period without failure which requires repair, than conventional pavements.

[0238] In the event of a void appearing under the path, access beneath the path can be provided by removing a single cell of fill material and injecting a suitable filler product to fill the void. Further, prior to repair, the flexibility of the formwork 100 enables the path to flex to partially accommodate the void. This can reduce damage to the composite path (i.e. the formwork 100 filled with fill material) caused by damage underneath the path.

[0239] As described herein, the formwork 100 comprises a plurality of peripheral cells 130. The peripheral cells 130 are configured to overlap with peripheral cells 130 of adjacent formworks 100, during installation. When the fill material is poured into the formworks 100 during construction of the path, the overlapping peripheral cells 130 of adjacent formworks 100 form a composite cell which receives the fill material. The composite cell is formed from walls 102 of two different formworks 100. Such a configuration enables the structural characteristics of particular fill materials to be better utilised. For example, where the fill material is concrete, the compressive strength of concrete is better utilised by formworks 100 of the present design, compared to other designs. This is particularly the case where loads are applied to the path that act to move one formwork 100 away from the adjacent formwork 100. In this case, a force is applied by the walls 102 of the peripheral cells 130 of one of the formworks 100 in a first direction, and a second force is applied by the walls of the peripheral cells of the adjacent formwork 100 in another direction that is different to (e. g. opposite to) the first direction. In this case, the fill material in the composite cell is compressed by the walls 102 of the formworks 100. Where the fill material is concrete, the compressive strength of the concrete can be utilised in this case to inhibit separation of the formworks 100. This characteristic of paths formed using the formwork 100 described herein can significantly increase the operating life of a path.

**[0240]** The walls 102 of the formwork 100 are also configured to accommodate expansion and contraction of the fill material. As described herein, the formwork 100 may comprise a polymer. The walls 102 may therefore be formed from a polymer. Alternatively, the walls 102 may be formed from another material that is capable of accommodating expansion and contraction of the fill material. The walls 102 of the formwork 100 are of a thickness that reduces or eliminates the need for expansion gaps to be provided in the path. This is because the walls 102 each act as independent expansion gaps, with each accommodating a portion of the expansion of the fill material. Thus, the formwork 100 enables the construction of a path with no, or with a reduced number of expansion gaps. This reduces the complexity of construction of the path, can reduce the construction cost and can increase the longevity of the path.

**[0241]** The formwork 100 therefore enables the construction of a path that has improved structural integrity compared to paths constructed using existing methods, with the structural integrity characteristics of a path constructed using the formwork 100 significantly exceeding conventional pavements at lower thickness.

**[0242]** Many modifications may be made to the embodiments described herein without departing from the spirit and scope of the disclosure. For example, while the description of the present application is in the context of a drill rig, it will be understood that one or more of the features described herein may be applicable to another mining vehicle, such as a loader or a haulage truck.

**[0243]** In the claims which follow and in the preceding description, except where the context requires otherwise due to express language or necessary implication, the word "comprise" or variations such as "comprises" or "comprising" is used in an inclusive sense, i.e. to specify the presence of the stated features but not to preclude the presence or addition of further features in various embodiments of the disclosure.

**Claims**

1. A formwork (100) comprising:

   a plurality of walls (102), the walls (102) defining a plurality of cells (104), each cell (104) extending in an axial direction (110) from a first cell opening (124) to a second cell end (122);
   wherein the plurality of cells (104) comprises:

      a plurality of peripheral cells (130); and
      a plurality of internal cells (140).

2. The formwork (100) of claim 1, wherein an axial dimension (126) of one or more of the peripheral cells (130) is less than an axial dimension (126) of one or more of the internal cells (140).

3. The formwork (100) of claim 1 or claim 2, wherein the first cell openings (124) of a first subset (144) of the peripheral cells (130) are axially offset from the first cell opening (124) of one or more of the internal cells (140).

4. The formwork (100) of any one of claims 1 to 3, wherein:

   the peripheral cells (130) define at least part of a peripheral portion (132) of the formwork (100);
   the internal cells (140) define at least part of an internal portion (142) of the formwork (100); and
   the peripheral portion (132) at least partially encircles the internal portion (142).

5. The formwork (100) of claim 2, or claim 3 or claim 4 when dependent on claim 2, wherein the axial dimension (126) of a particular cell (104) of the plurality of cells (104) is a shortest distance, measured in the axial direction (110), between the first cell opening (124) and the second cell end (122) of the particular cell (104).

6. The formwork (100) of any one of claims 1 to 5, wherein the first cell opening (124) and the second cell end (122) of one or more of the peripheral cells (130) are closer together than the first cell opening (124) and the second cell end (122) of one or more of the internal cells (140).

7. The formwork (100) of any one of claims 1 to 6, wherein each cell (104) comprises a second cell opening (128), the second cell opening (128) being at the second cell end (122) of the respective cell (104).

8. The formwork (100) of claim 7, wherein:

   the second cell openings (128) of the peripheral

cells (130) of the first subset (144) of peripheral cells (130) are coplanar; and
the second cell openings (128) of the peripheral cells (130) of the first subset (144) of peripheral cells (130) are coplanar with the second cell openings (128) of the internal cells (140).

**9.** The formwork (100) of claim 7 or claim 8, wherein:

the plurality of peripheral cells (130) comprises a second subset (145) of peripheral cells (130); and
the second cell openings (128) of the peripheral cells (130) of the second subset (145) of peripheral cells (130) are axially offset from:

the second cell opening (128) of one or more of the internal cells (140); and
the second cell opening (128) of one or more of the peripheral cells (130) of the first subset (144) of peripheral cells (130).

**10.** The formwork (100) of claim 9, wherein:

the first cell openings (124) of the peripheral cells (130) of the second subset (145) of peripheral cells (130) are coplanar; and
the first cell openings (124) of the peripheral cells (130) of the second subset (145) of peripheral cells (130) are coplanar with the first cell openings (124) of the internal cells (140).

**11.** The formwork (100) of any one of claims 1 to 10, wherein:

the formwork (100) comprises a plurality of cantilever walls (103); and
one or more of the cantilever walls (103) defines at least part of a cell (104) of the plurality of cells (104).

**12.** The formwork (100) of claim 11, wherein the cantilever walls (103) define at least part of the second cell opening (128) of the respective cell (104).

**13.** The formwork (100) of any one of claims 1 to 12, wherein the plurality of cells (104) comprises one or more connecting cells (150), the connecting cells (150) being configured to receive part of a second formwork, thereby inhibiting movement between the formwork (100) and the second formwork in at least one direction.

**14.** The formwork (100) of any one of claims 1 to 13, further comprising one or more projections (152), the one or more projections (152) being configured to fit within a corresponding connecting cell of another formwork to inhibit relative movement between the formwork (100) and the other formwork.

**15.** The formwork (100) of any one of claims 1 to 14, wherein the walls (102) defining one or more of the peripheral cells (130) form a closed loop.

**Amended claims in accordance with Rule 137(2) EPC.**

**1.** A formwork (100) for use in the construction of a pavement, the formwork (100) comprising:

a plurality of walls (102), the walls (102) defining a plurality of cells (104), each cell (104) extending in an axial direction (110) from a first cell opening (124) to a second cell end (122); wherein:

the plurality of cells (104) comprises:

a plurality of peripheral cells (130); and
a plurality of internal cells (140);

the peripheral cells (130) define at least part of a peripheral portion (132) of the formwork (100);
the internal cells (140) define at least part of an internal portion (142) of the formwork (100);
the peripheral portion (132) of the formwork (100) at least partially encircles the internal portion (142) of the formwork (100);
the first cell opening (124) and the second cell end (122) of each of the peripheral cells (130) are closer together than the first cell opening (124) and the second cell end (122) of one or more of the internal cells (140);
the plurality of peripheral cells (130) comprises:

a first subset (144) of peripheral cells (130); and
a second subset (145) of peripheral cells (130);

the second subset (145) of peripheral cells (130) comprises:

a second row (146) of cells (104); and
a second column (148) of cells (104); and

the second row (146) of cells (104) of the second subset (145) of peripheral cells (130) and the second column (148) of cells (104) of the second subset (145) of peripheral cells (130) comprise at least one cell

(104) in common.

**2.** The formwork (100) of claim 1, wherein:

the first subset (144) of peripheral cells (130) comprises:

a first row (146) of cells (104); and
a first column (148) of cells (104); and

the first row (146) of cells (104) of the first subset (144) of peripheral cells (130) and the first column (148) of cells (104) of the first subset (144) of peripheral cells (130) comprise one cell (104) in common.

**3.** The formwork (100) of claim 1 or claim 2, wherein each cell (104) comprises a second cell opening (128), the second cell opening (128) being at the second cell end (122) of the respective cell (104).

**4.** The formwork (100) of claim 3, wherein:

the first cell openings (124) of the peripheral cells (130) of the first subset (144) of peripheral cells (130) are coplanar;
the first cell openings (124) of the peripheral cells (130) of the first subset (144) of peripheral cells (130) are axially offset from the first cell opening (124) of one or more of the internal cells (140);
the second cell openings (128) of the peripheral cells (130) of the first subset (144) of peripheral cells (130) are coplanar; and
the second cell openings (128) of the peripheral cells (130) of the first subset (144) of peripheral cells (130) are coplanar with the second cell openings (128) of the internal cells (140).

**5.** The formwork (100) of any one of claim 3 or claim 4, when dependent on claim 2, wherein:

the first cell openings (124) of the peripheral cells (130) of the second subset (145) of peripheral cells (130) are coplanar;
the first cell openings (124) of the peripheral cells (130) of the second subset (145) of peripheral cells (130) are coplanar with the first cell openings (124) of the internal cells (140); and
the second cell openings (128) of the peripheral cells (130) of the second subset (145) of peripheral cells (130) are axially offset from:

the second cell opening (128) of one or more of the internal cells (140); and
the second cell opening (128) of one or more of the peripheral cells (130) of the first subset (144) of peripheral cells (130).

**6.** The formwork (100) of any one of claims 1 to 5, wherein a volume of one or more of the peripheral cells (130) is greater than a volume of one or more of the internal cells (140).

**7.** The formwork (100) of any one of claims 1 to 6, wherein:

a number of the internal cells (140) are hexagonal; and
a number of the internal cells (140) are rectangular.

**8.** The formwork (100) of any one of claims 1 to 7, wherein the peripheral cells (130) are hexagonal.

**9.** The formwork (100) of any one of claims 1 to 8, wherein:

the formwork (100) comprises a plurality of cantilever walls (103); and
one or more of the cantilever walls (103) defines at least part of a cell (104) of the plurality of cells (104).

**10.** The formwork (100) of claim 9, wherein the cantilever walls (103) define at least part of the second cell opening (128) of the respective cell (104).

**11.** The formwork (100) of any one of claims 1 to 10, wherein the plurality of cells (104) comprises one or more connecting cells (150), the connecting cells (150) being configured to receive part of a second formwork, thereby inhibiting movement between the formwork (100) and the second formwork in at least one direction.

**12.** The formwork (100) of claim 11, wherein one or more of the one or more connecting cells (150) are defined, at least in part, by walls (102) that also define at least part of one or more peripheral cells (130) of the first subset (144) of peripheral cells (130).

**13.** The formwork (100) of any one of claims 1 to 12, further comprising one or more projections (152), the one or more projections (152) being configured to fit within a corresponding connecting cell of another formwork to inhibit relative movement between the formwork (100) and the other formwork.

**14.** The formwork (100) of claim 13, wherein the one or more projections (152) project outwardly from one or more of the walls (102) defining the peripheral cells (130) of the second subset (145) of peripheral cells (130).

**15.** The formwork (100) of any one of claims 1 to 14, wherein the walls (102) defining one or more of the peripheral cells (130) form a closed loop.

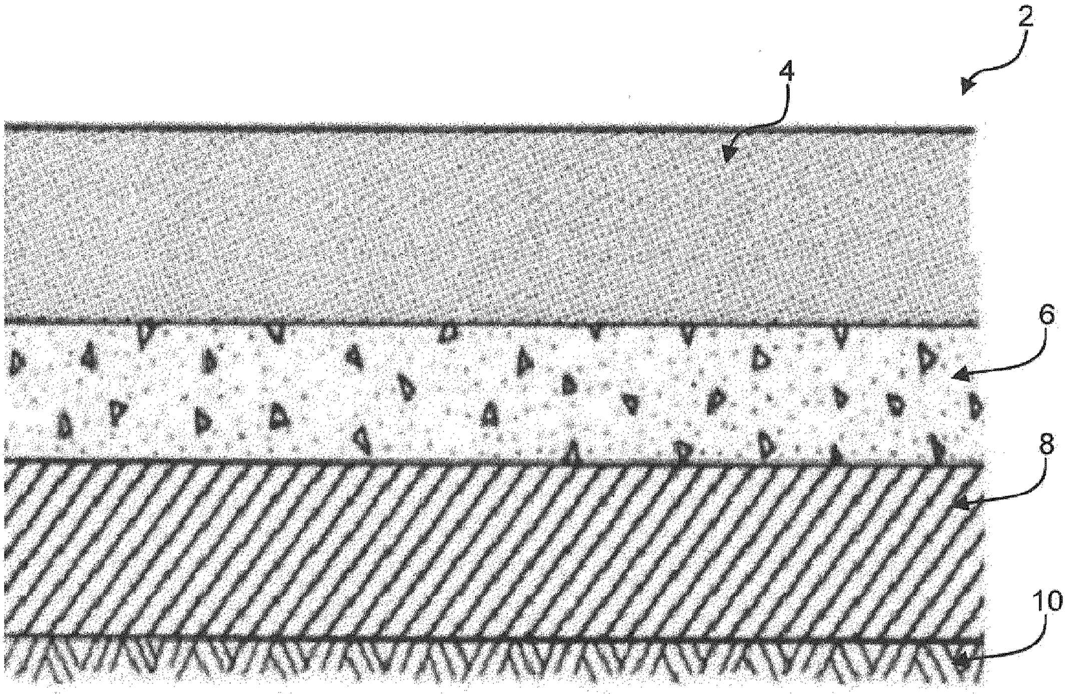



Figure 1

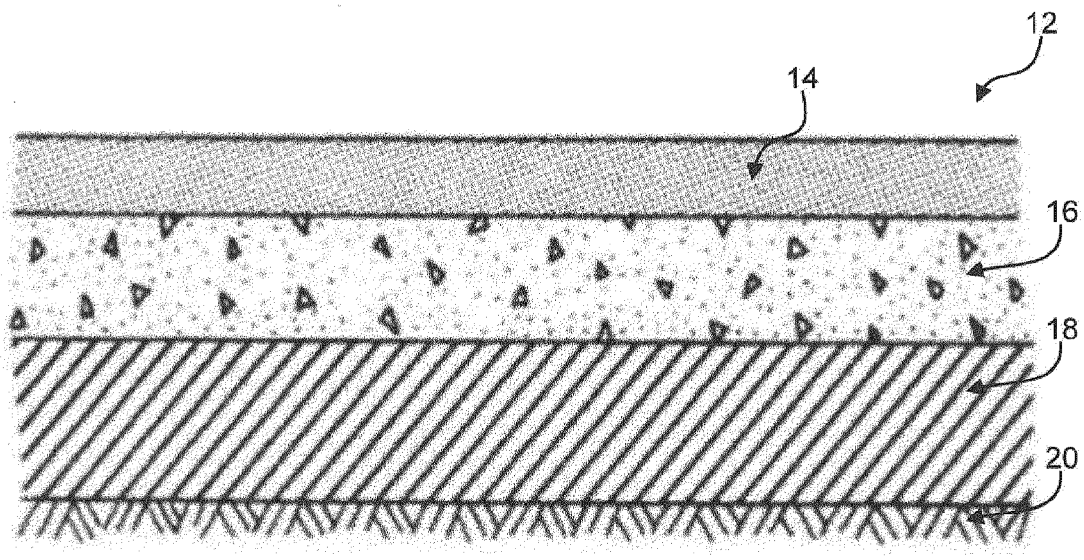



Figure 2

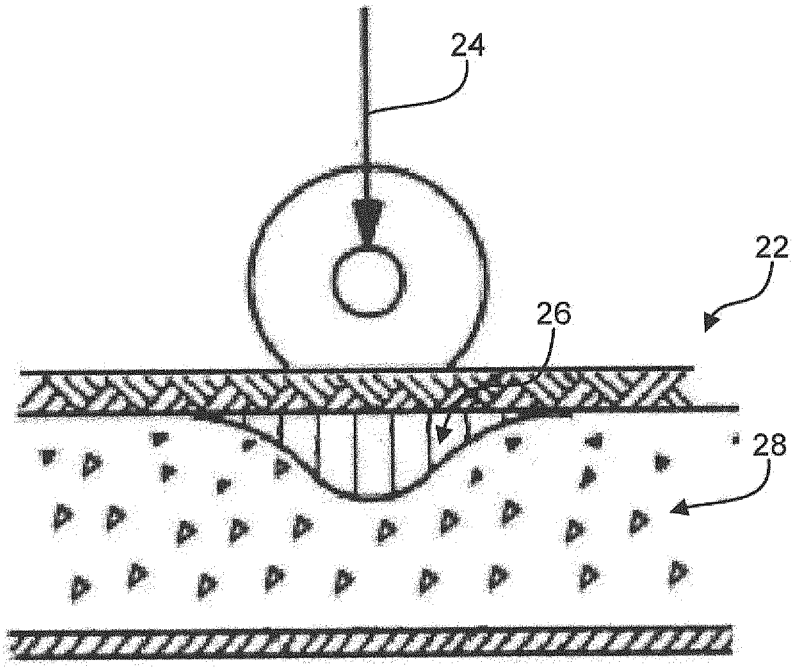
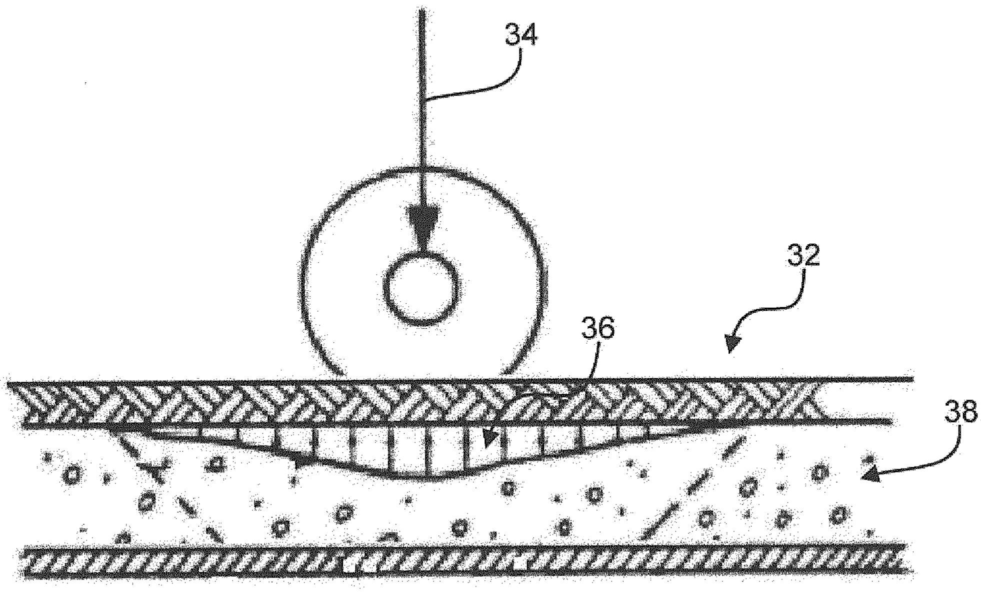



Figure 3

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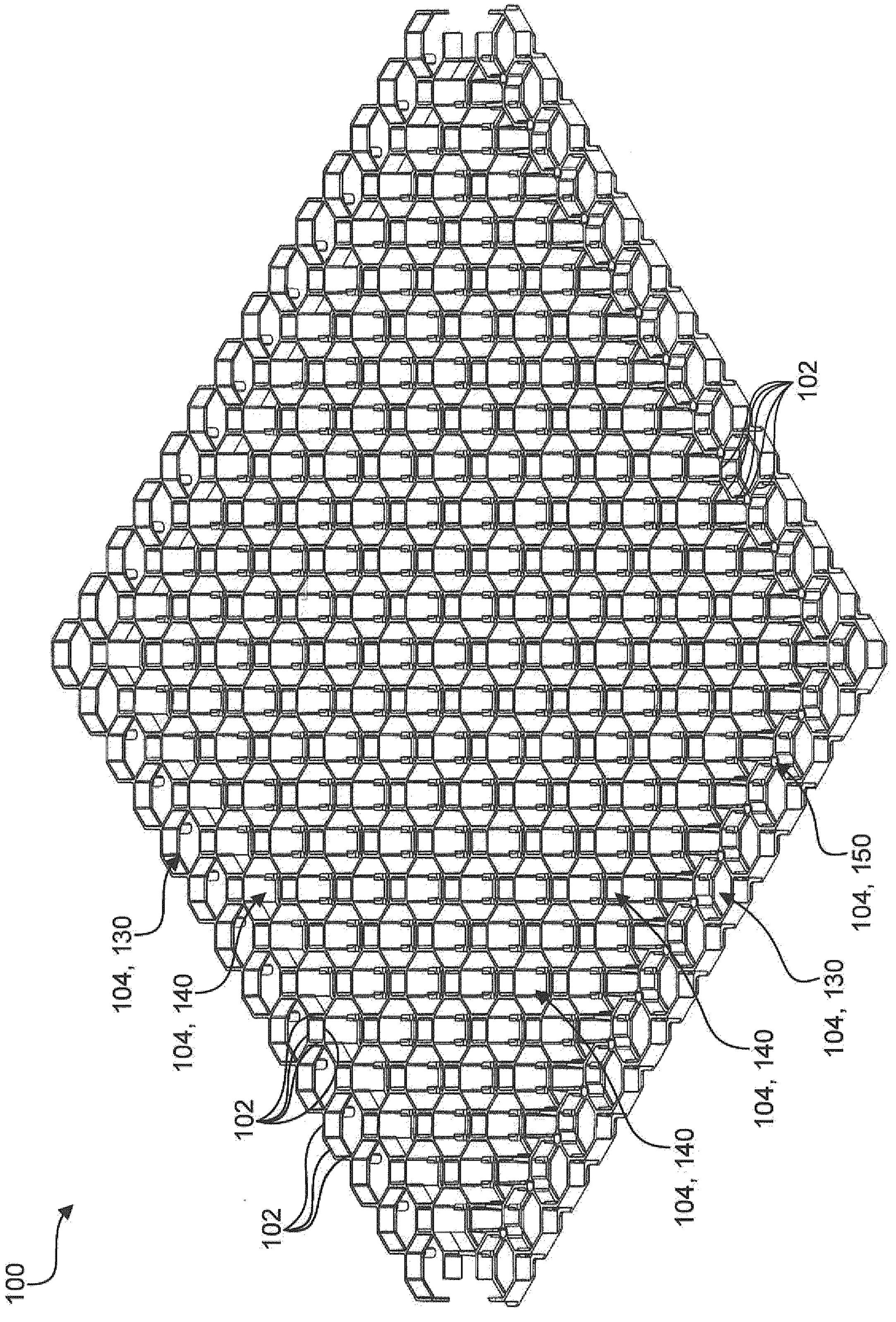


Figure 5

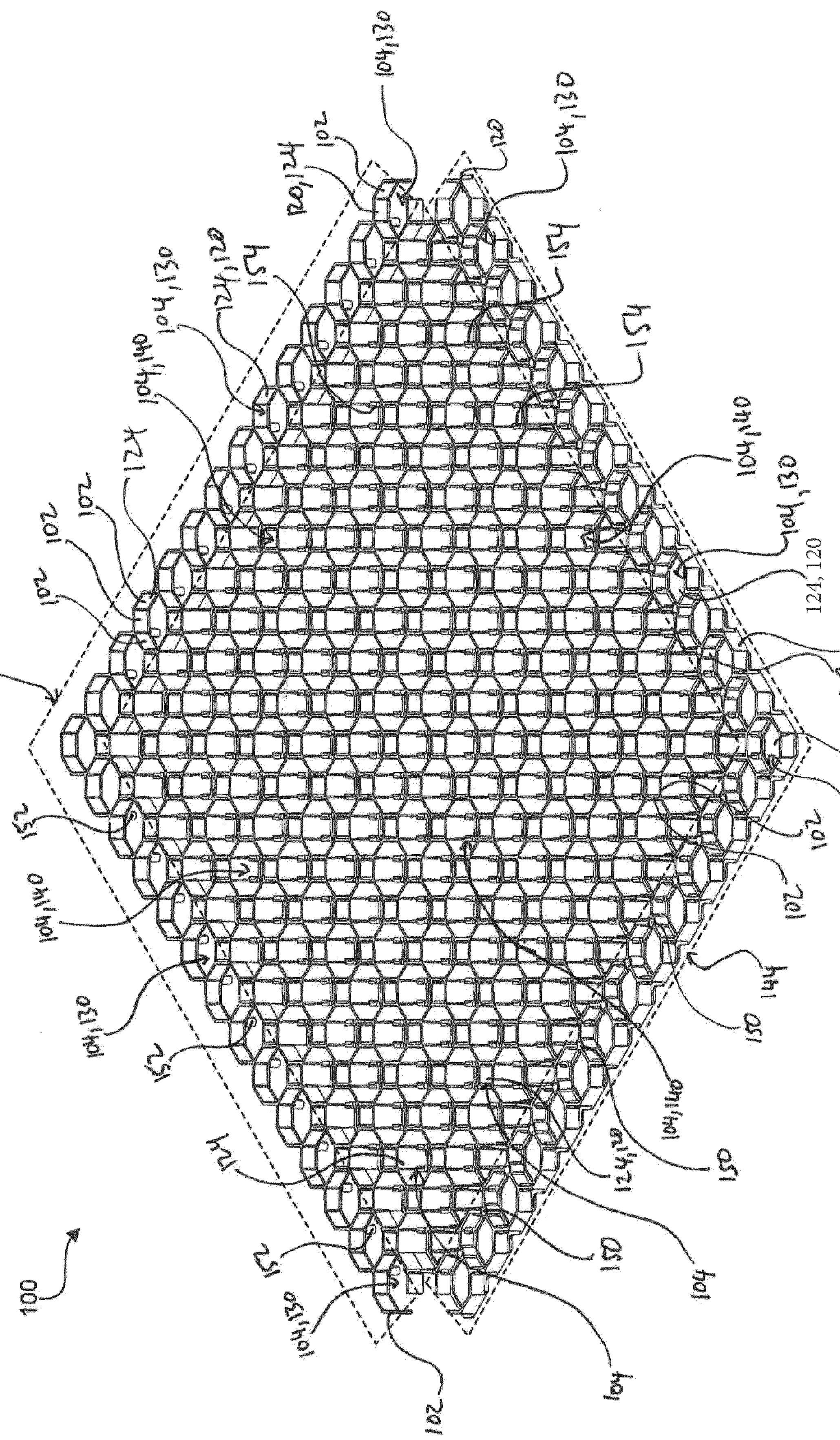
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Figure 5A

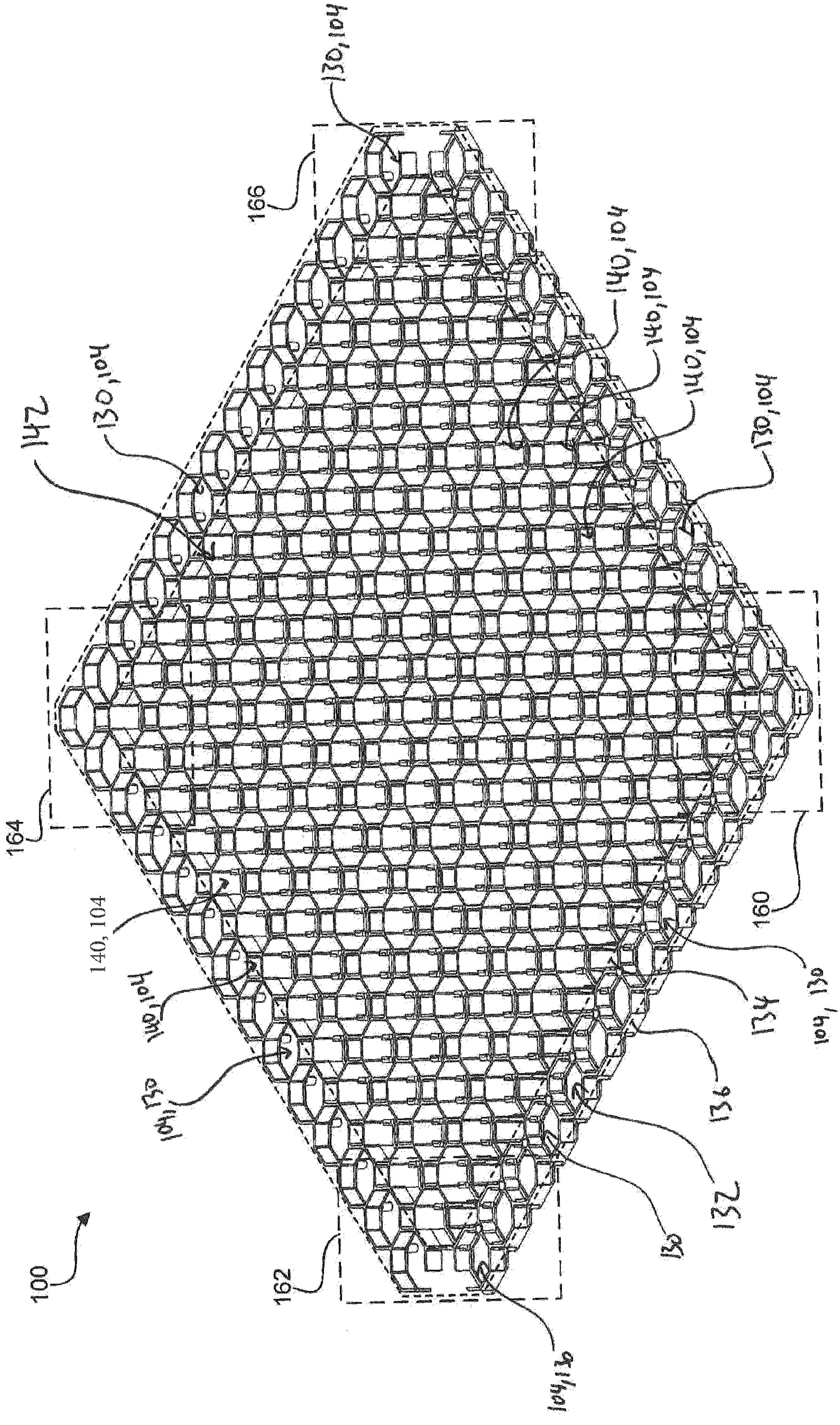
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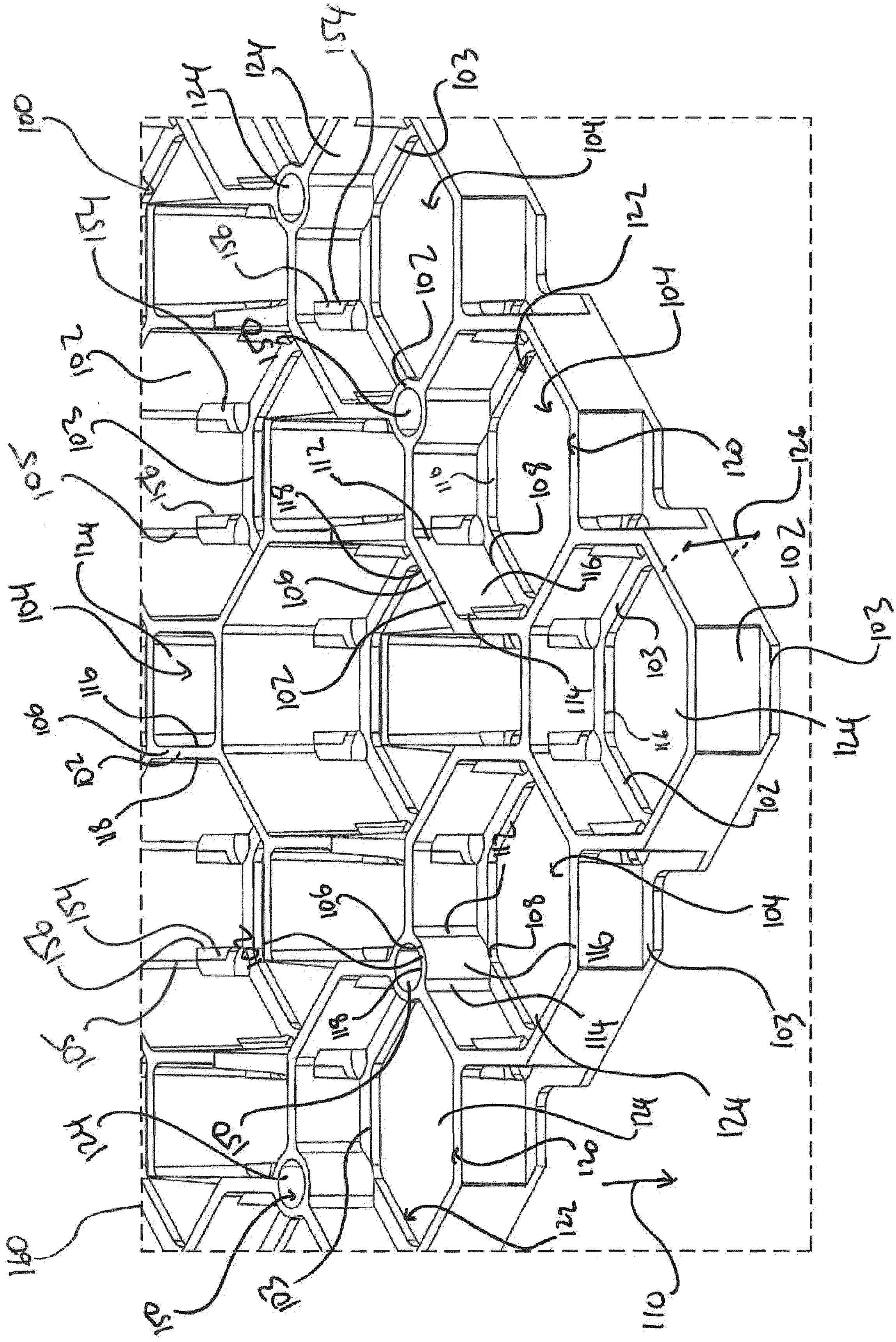
Figure 6



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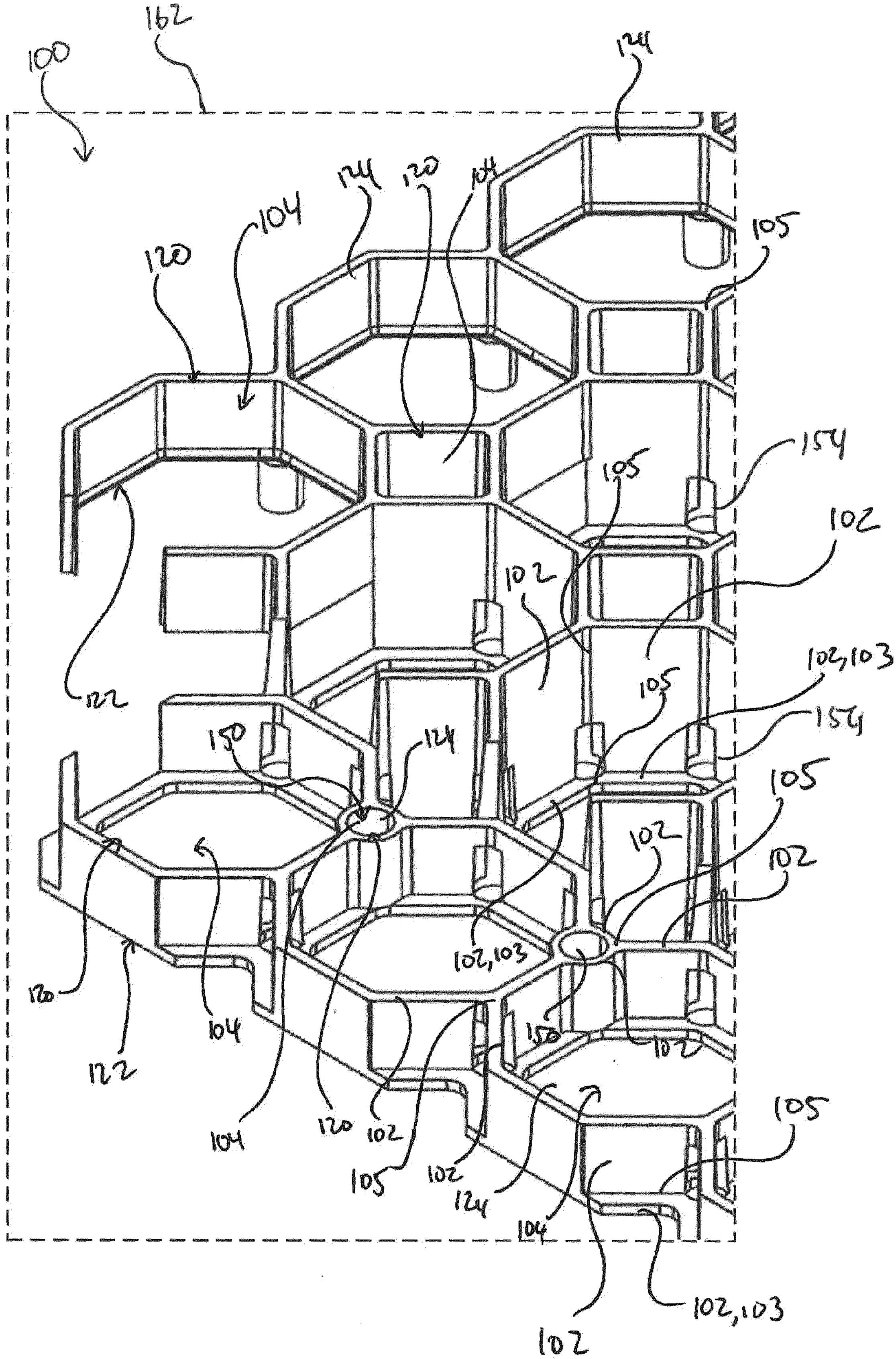
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Figure 8

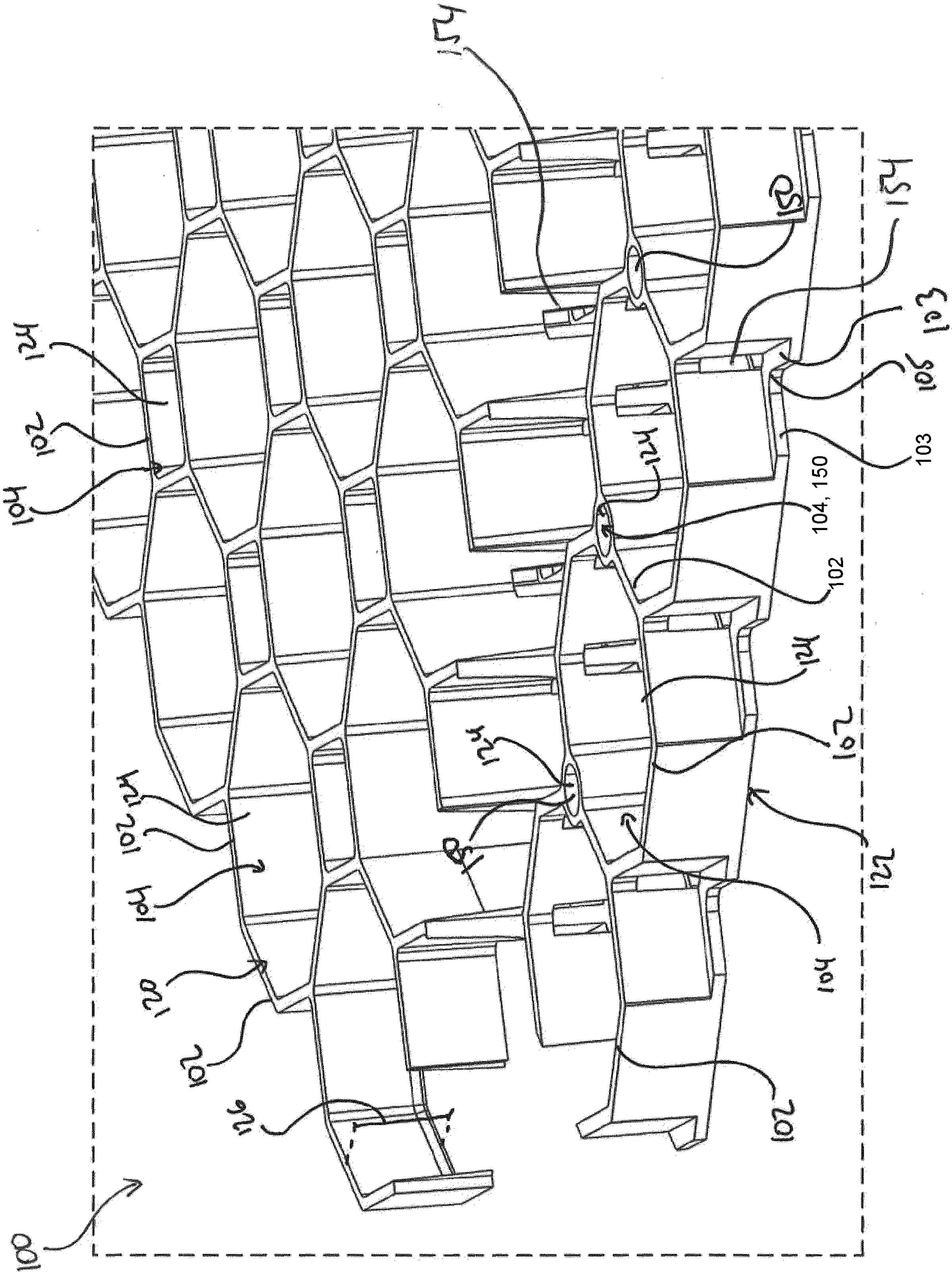


Figure 9

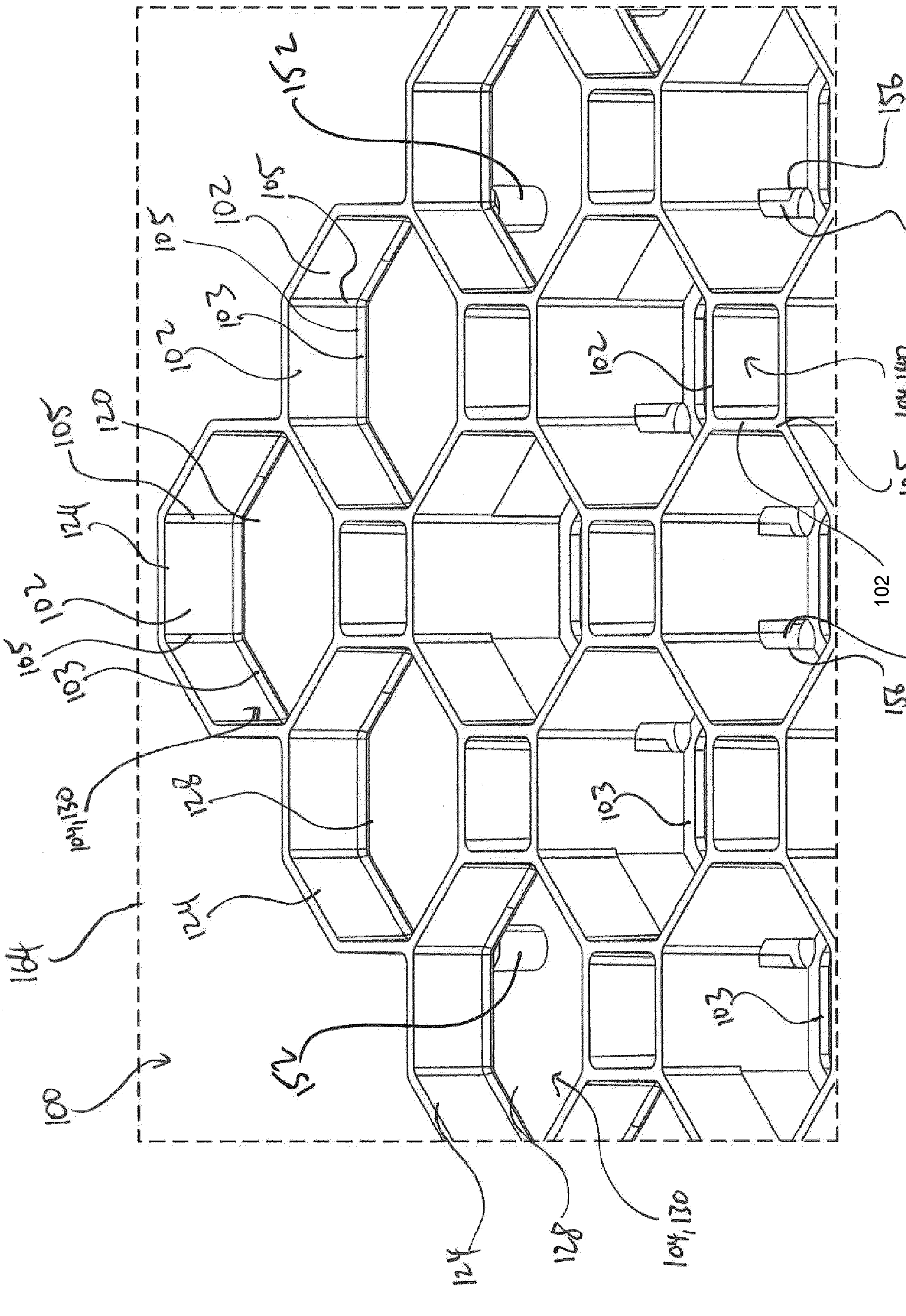
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Figure 10

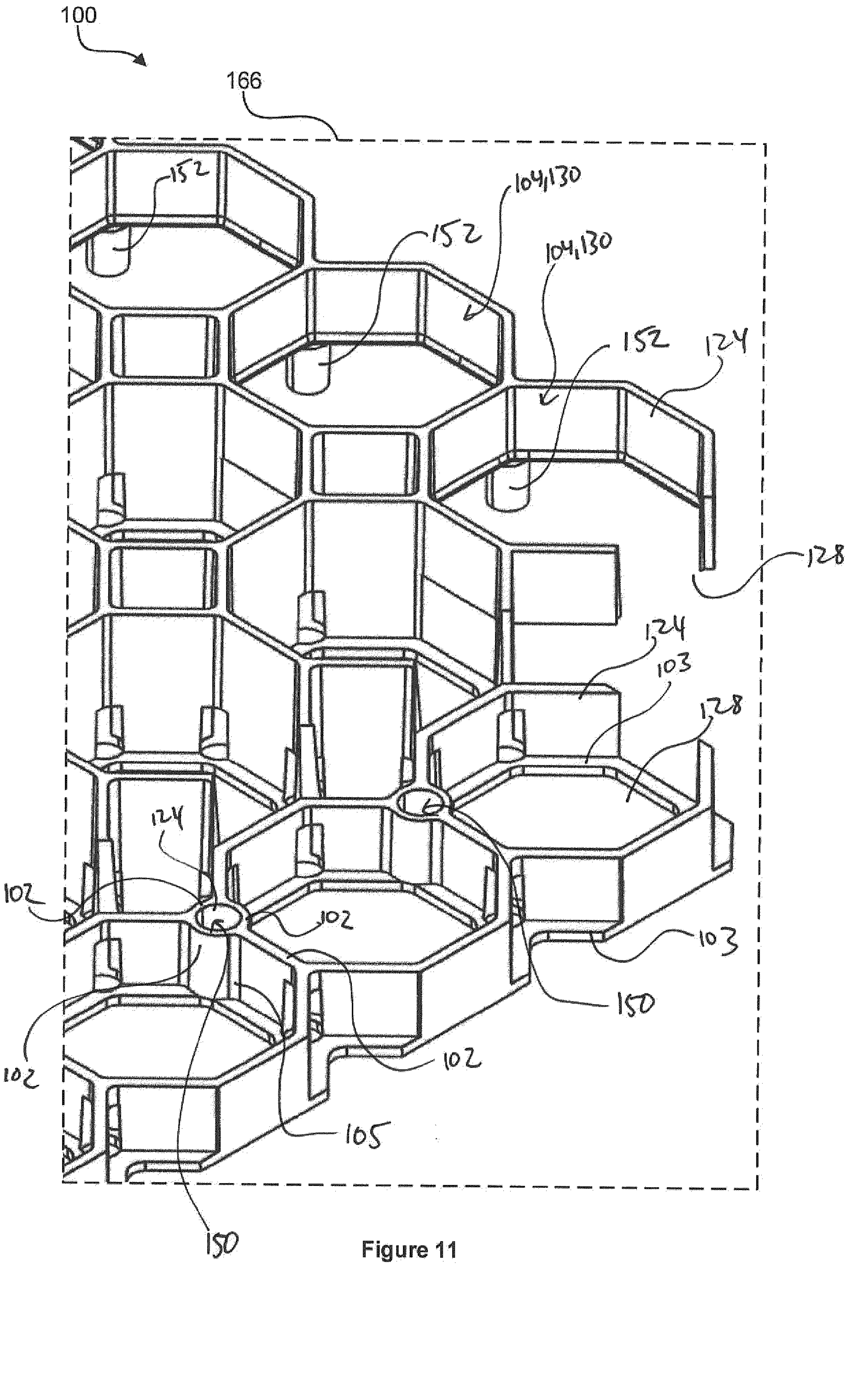
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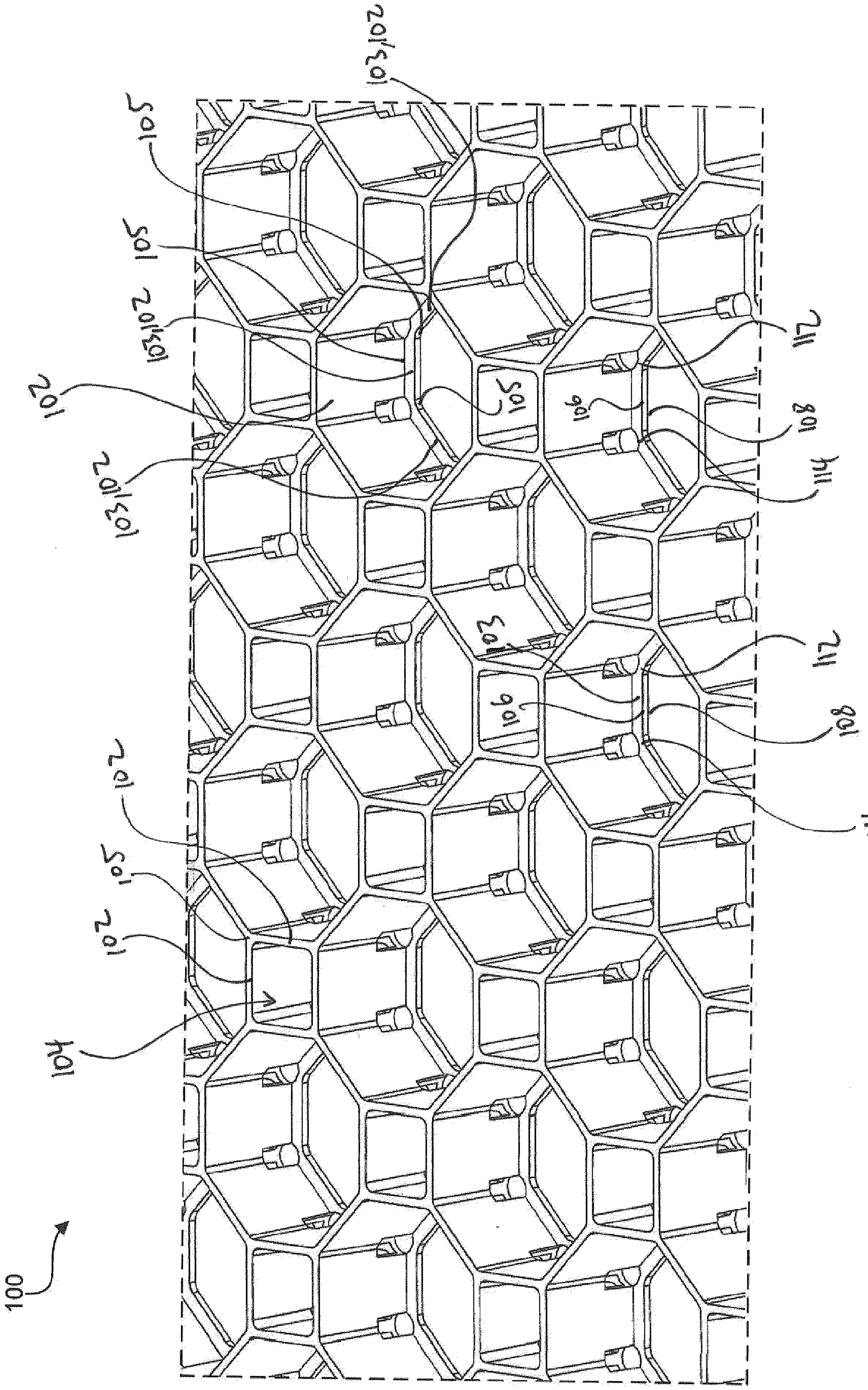
Figure 11

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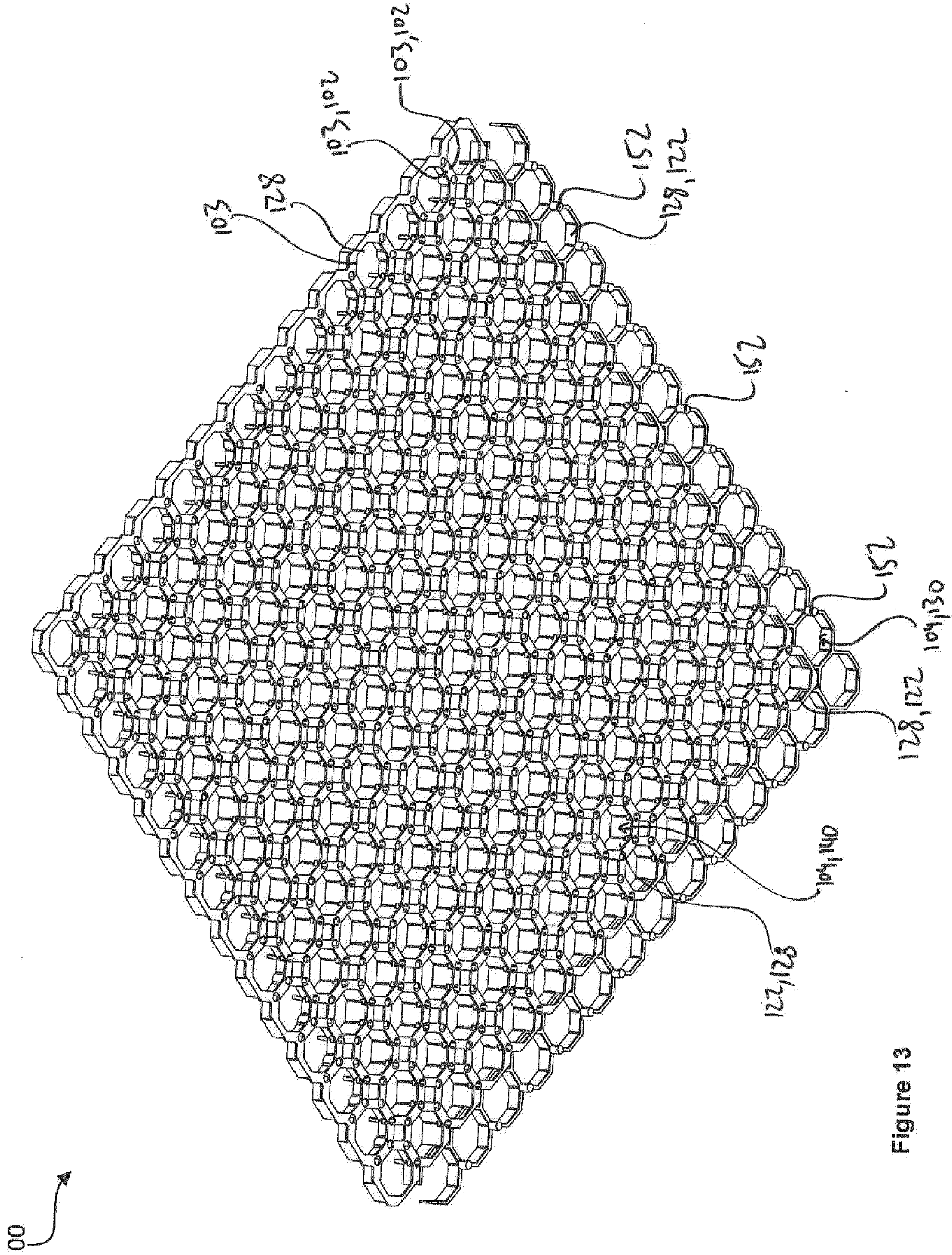
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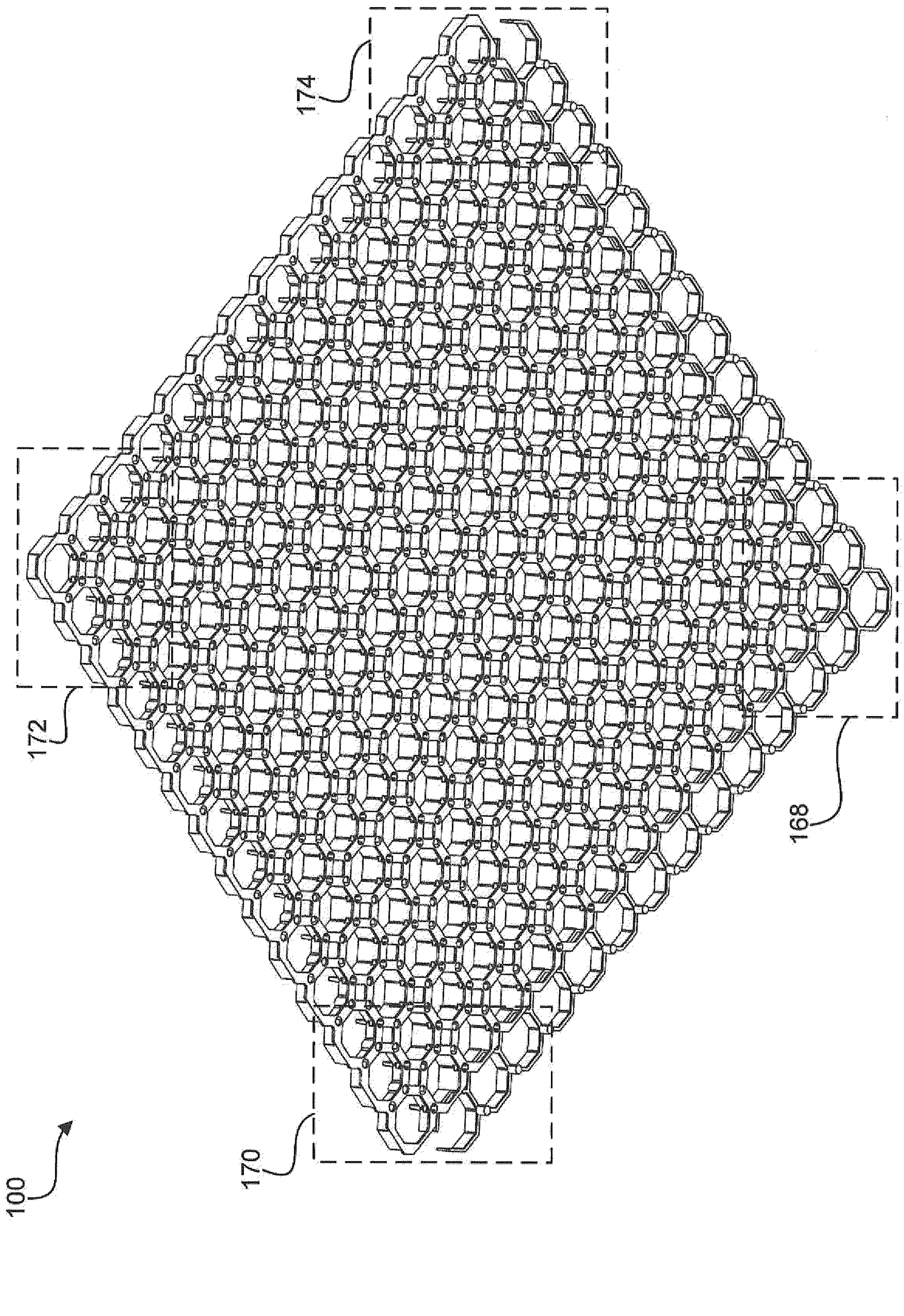
Figure 13

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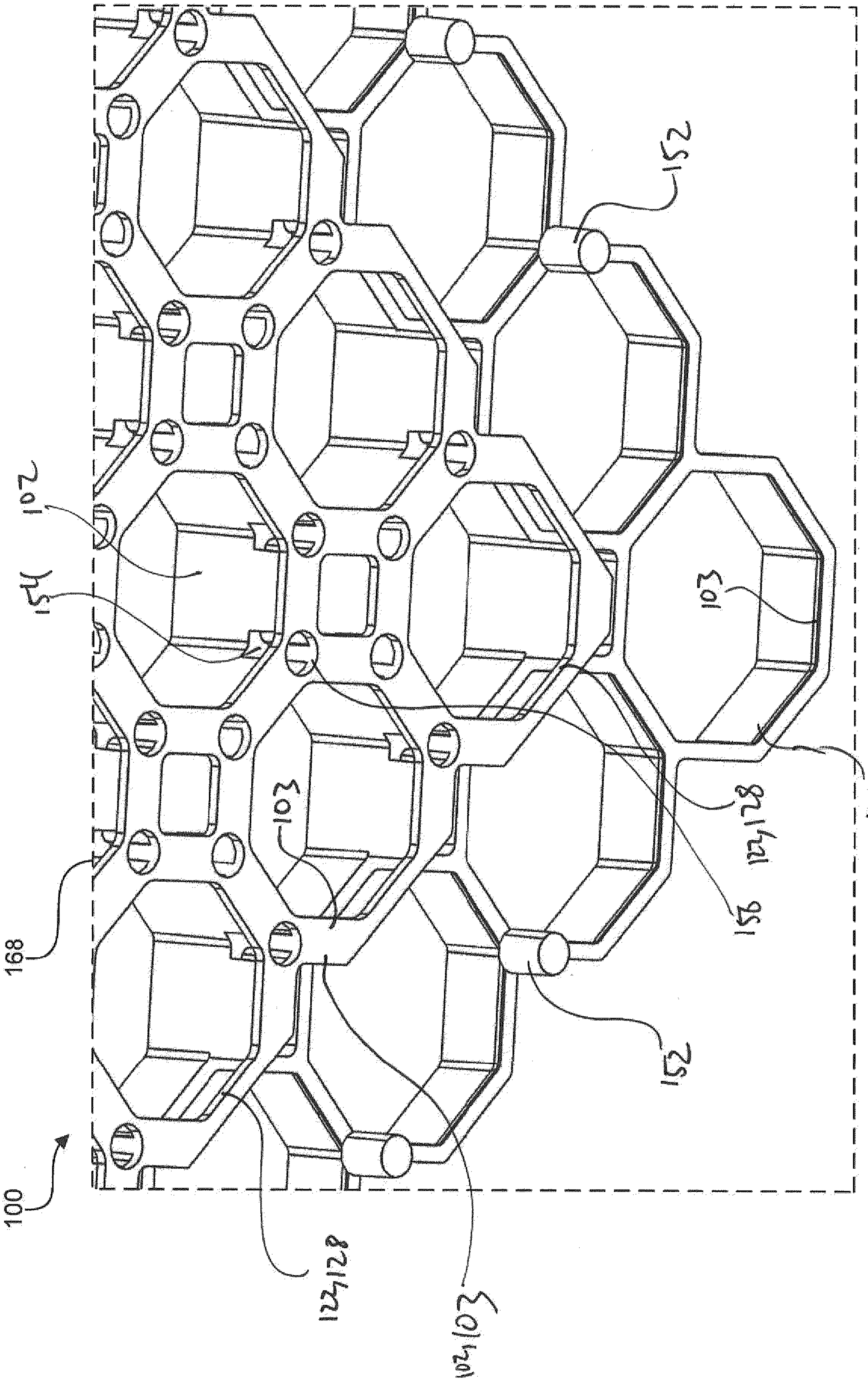


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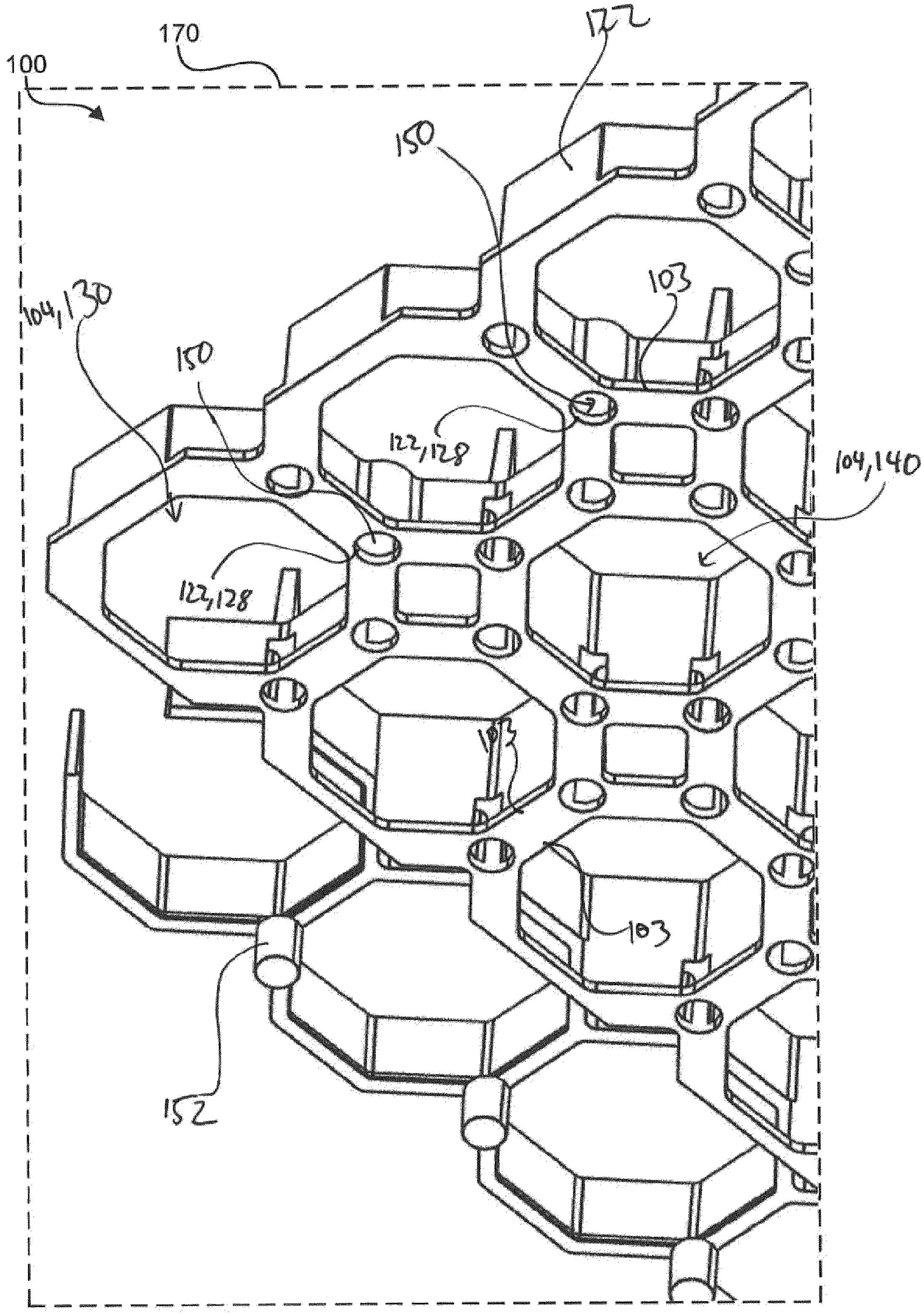
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Figure 16

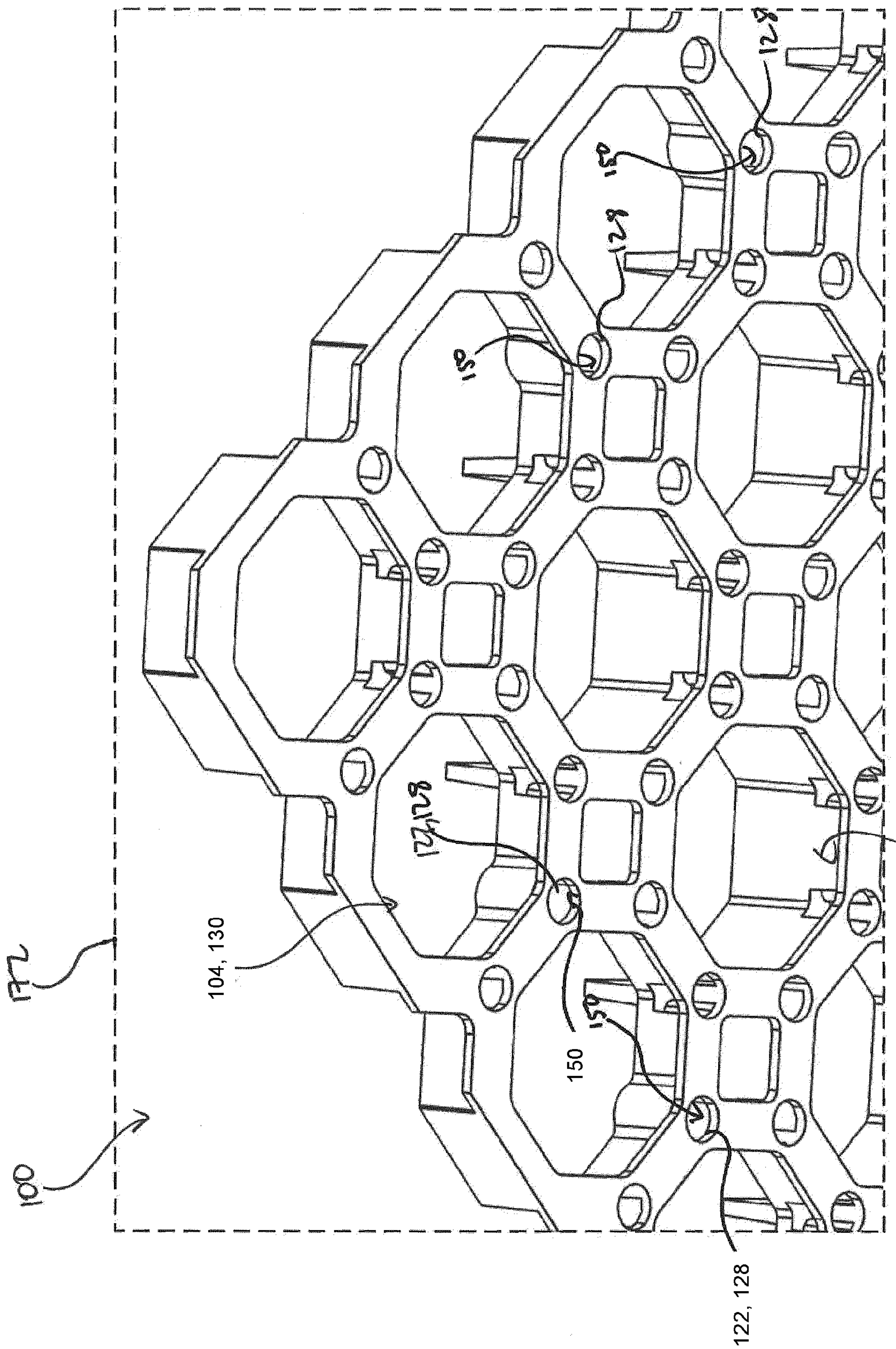
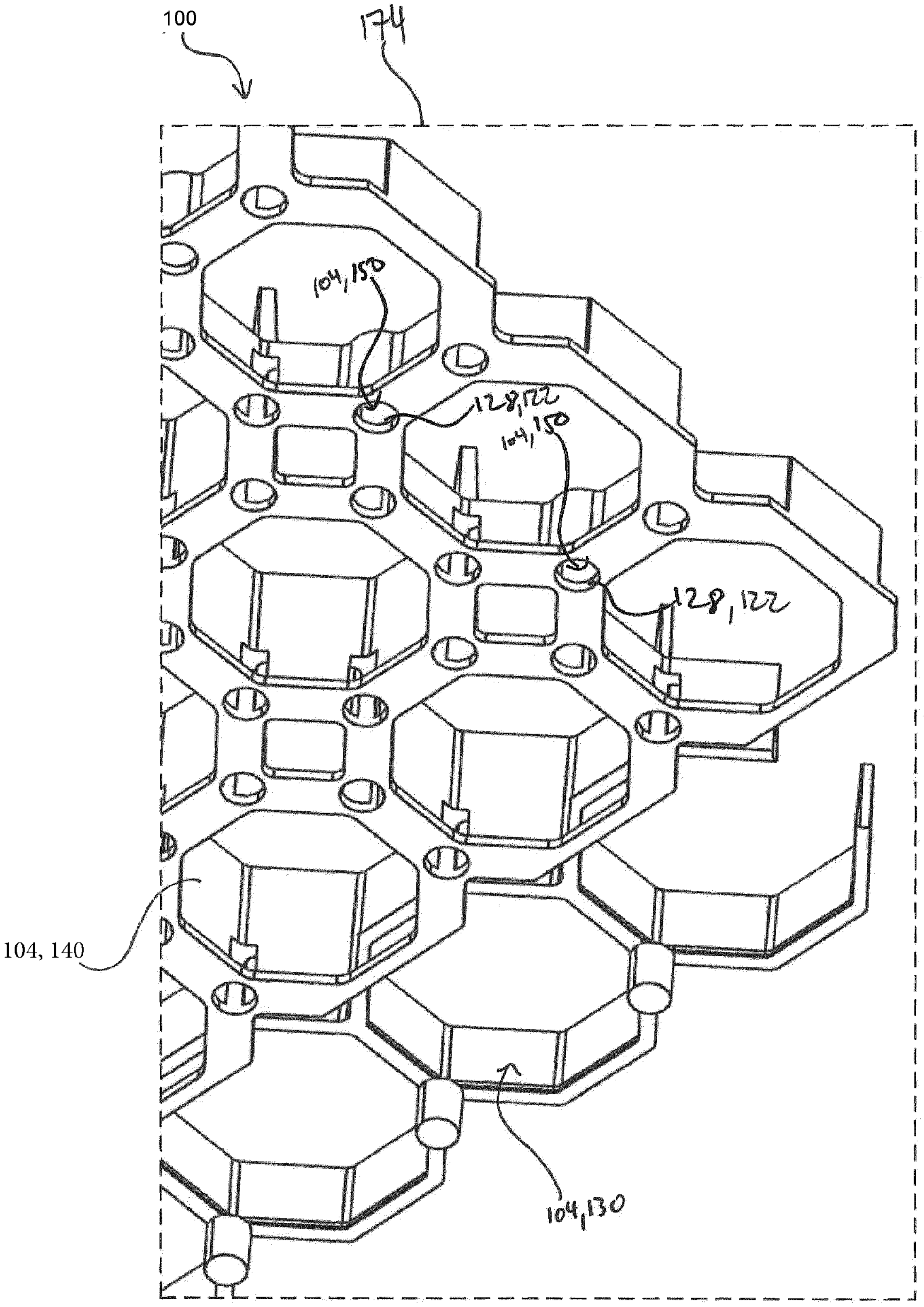



Figure 17

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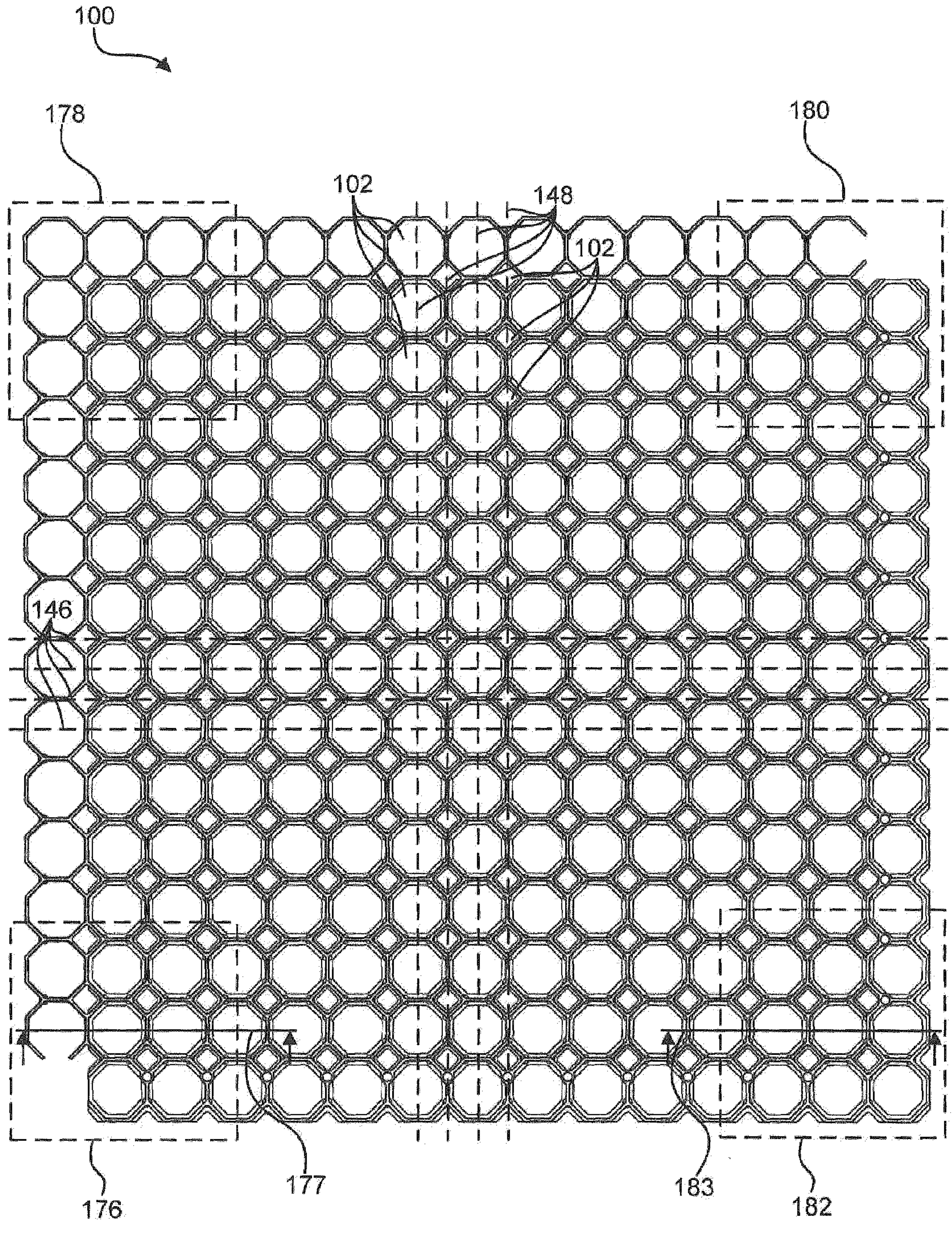


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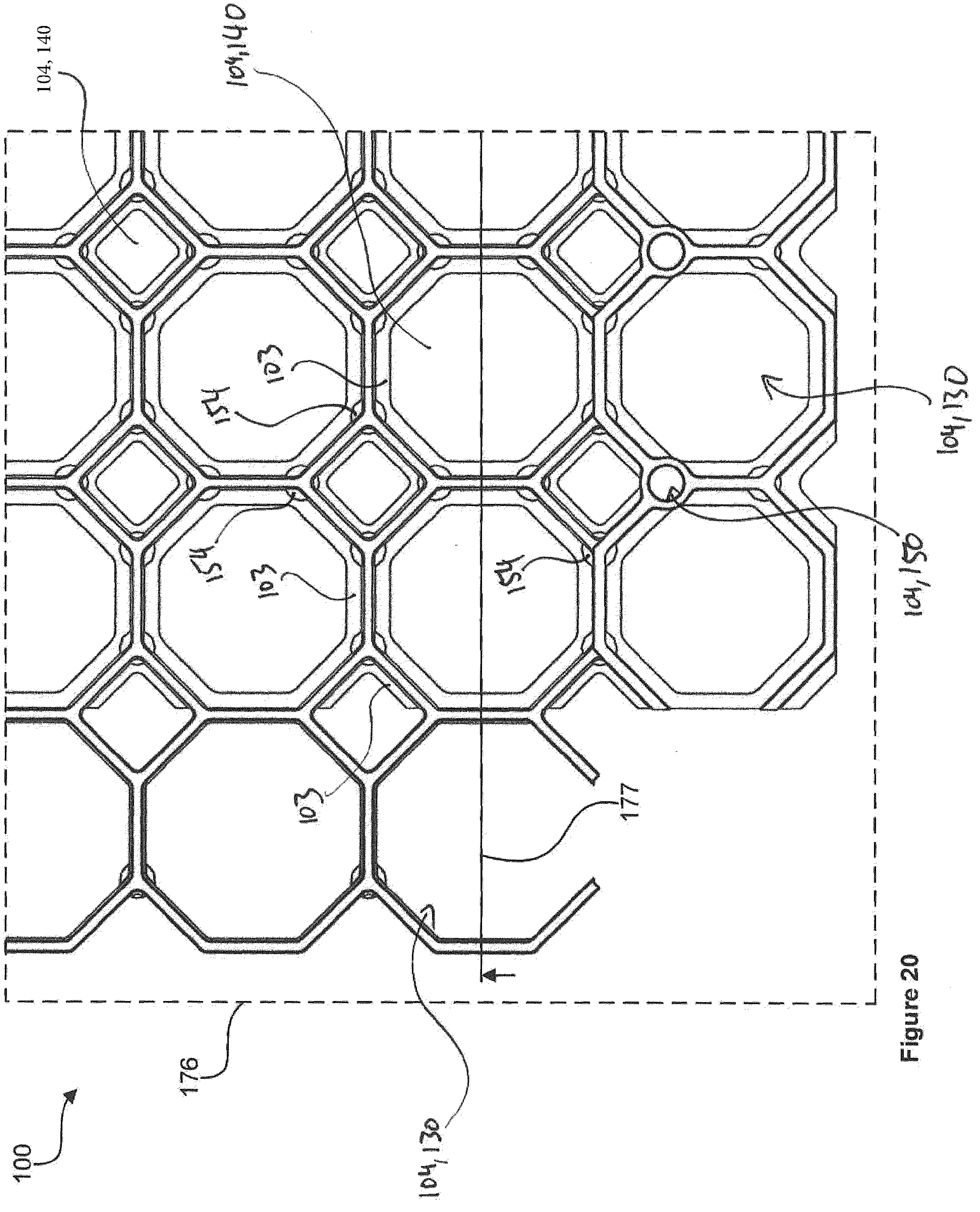
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Figure 20

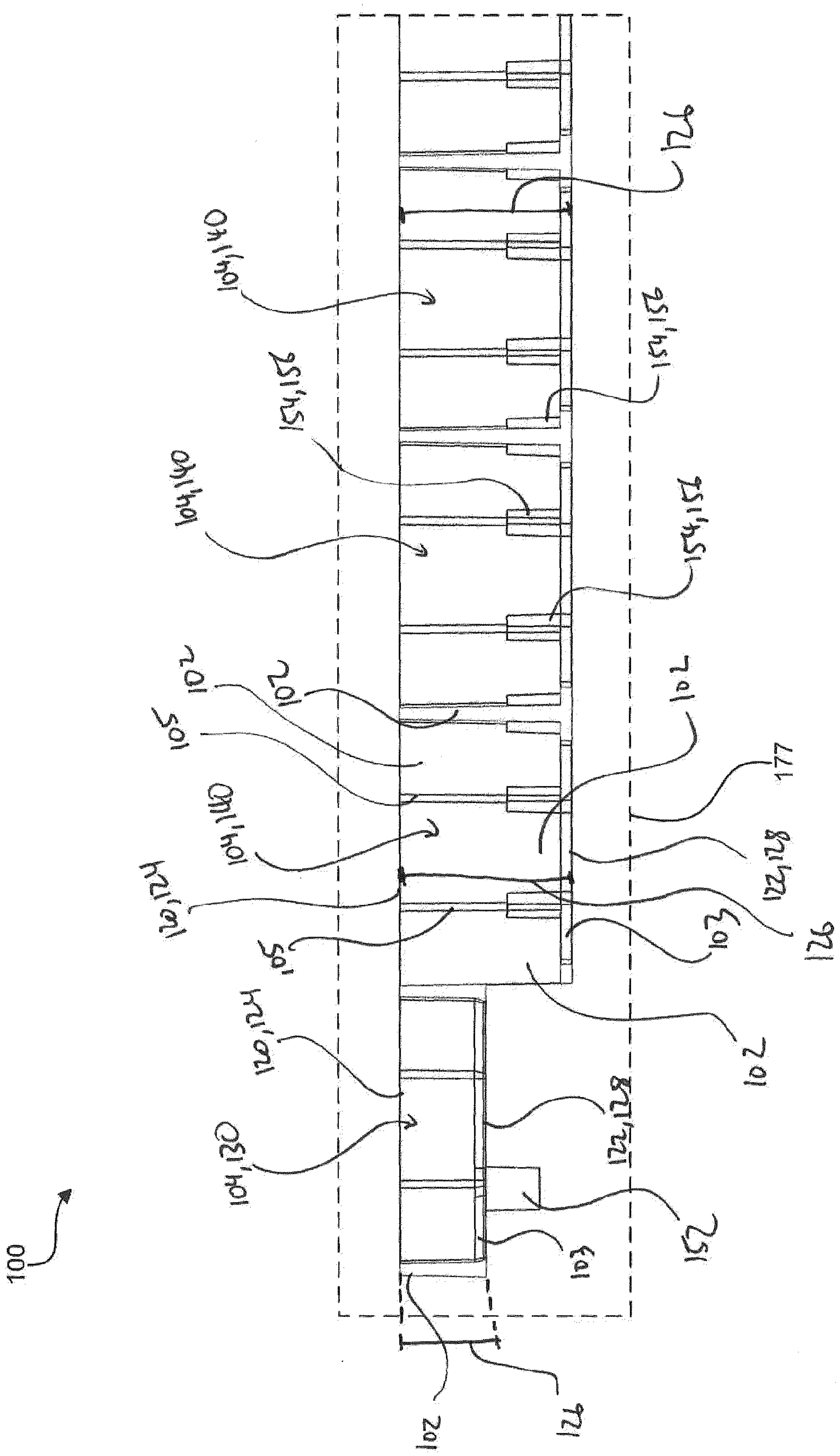
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Figure 21

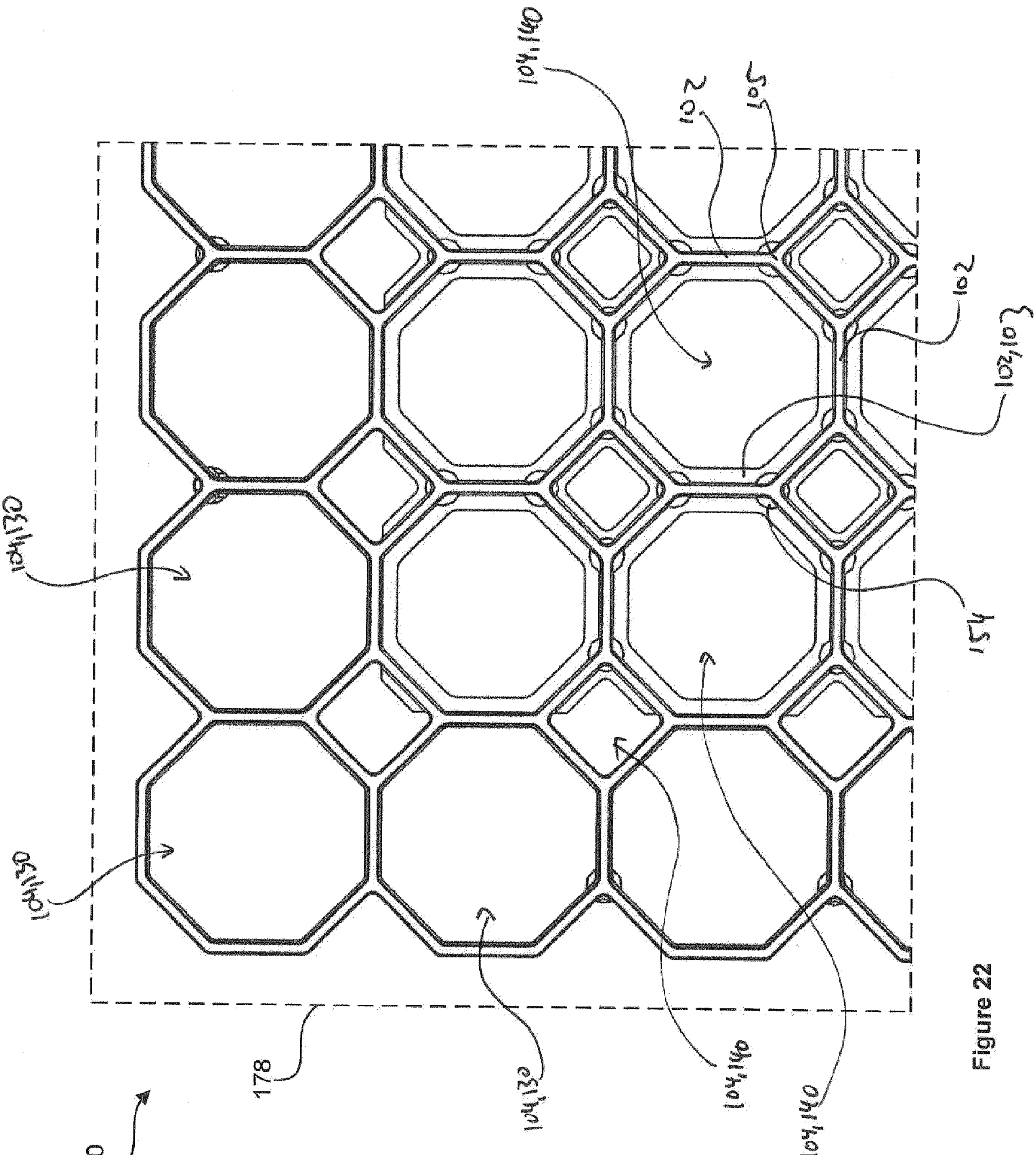
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Figure 22

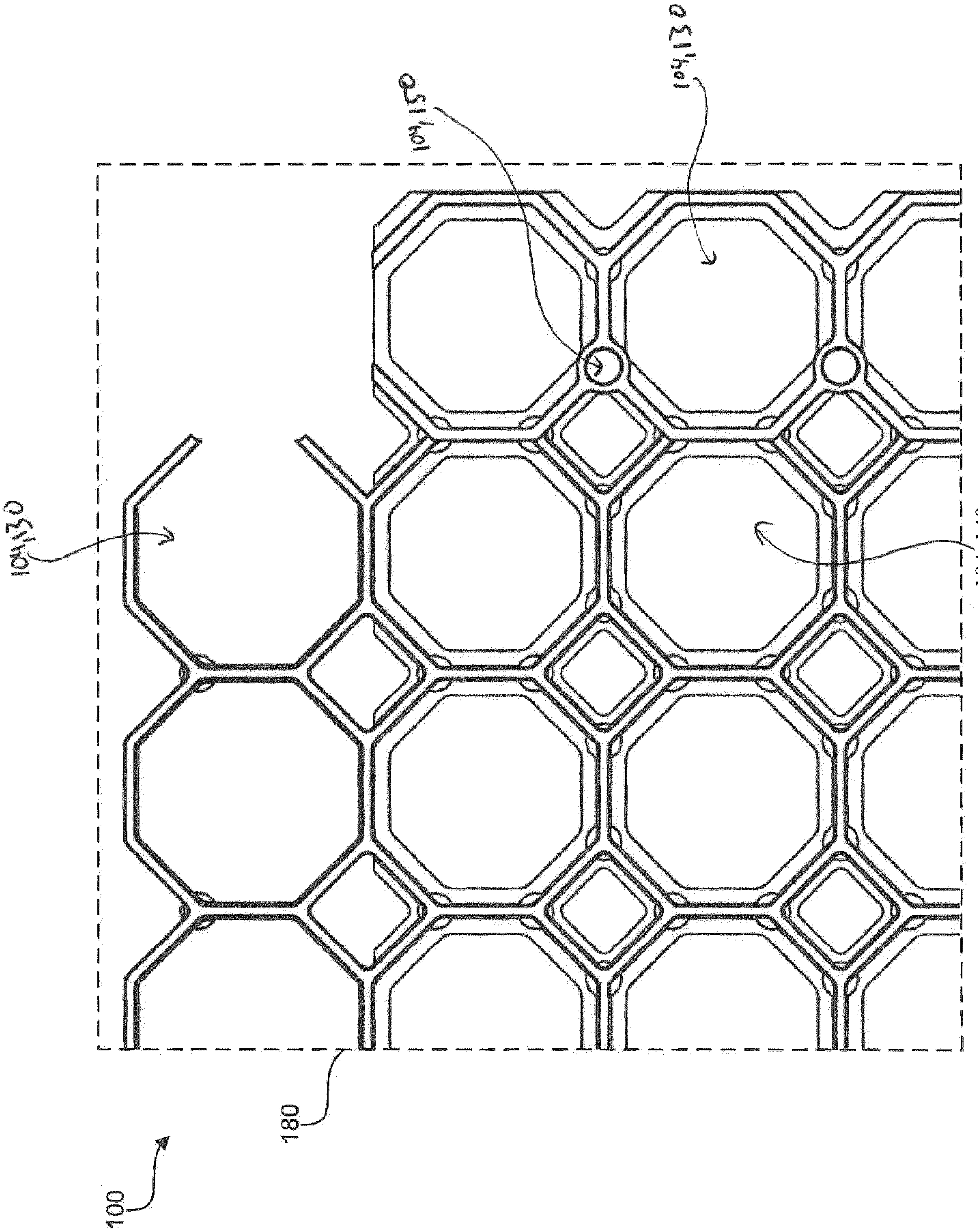
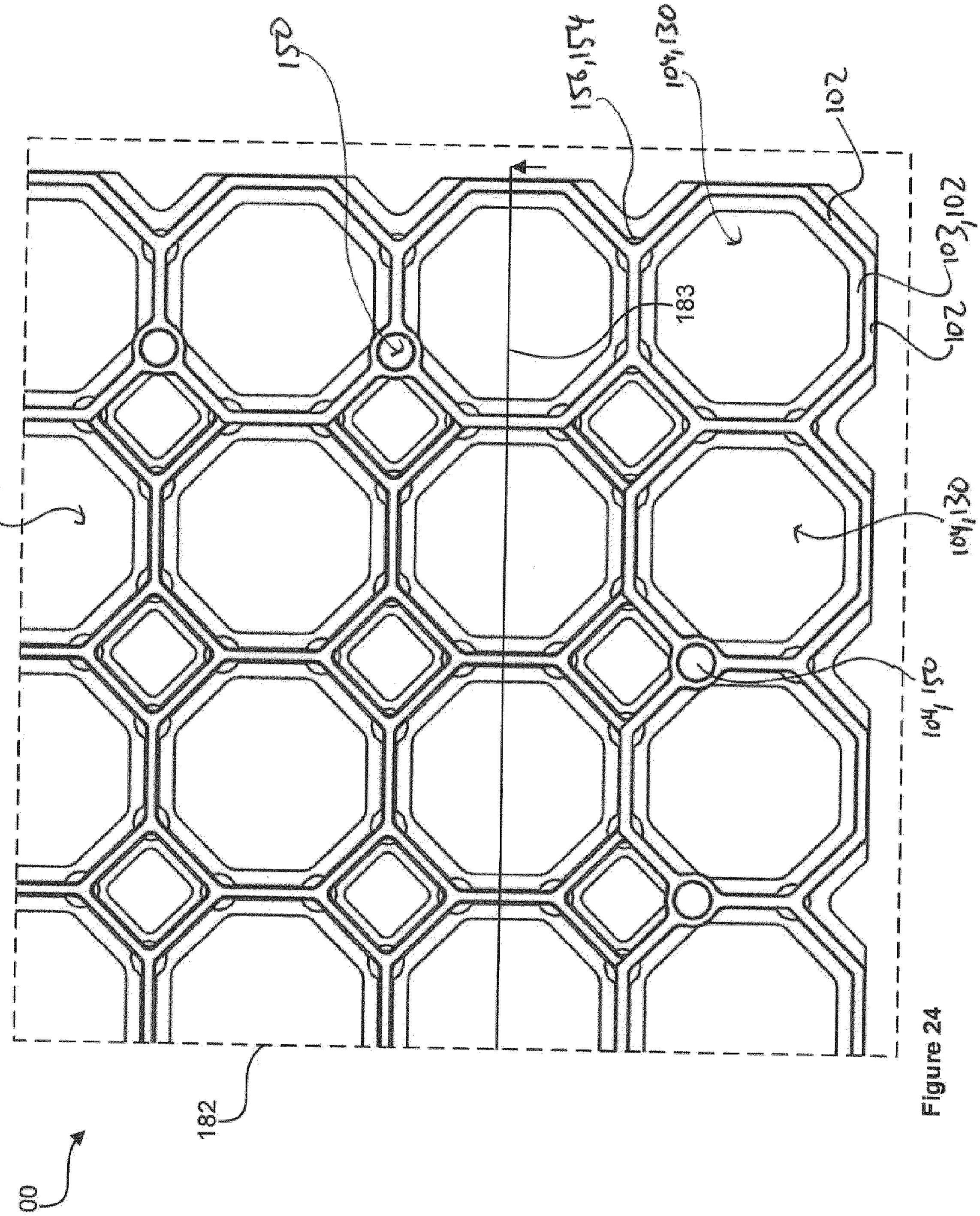



Figure 23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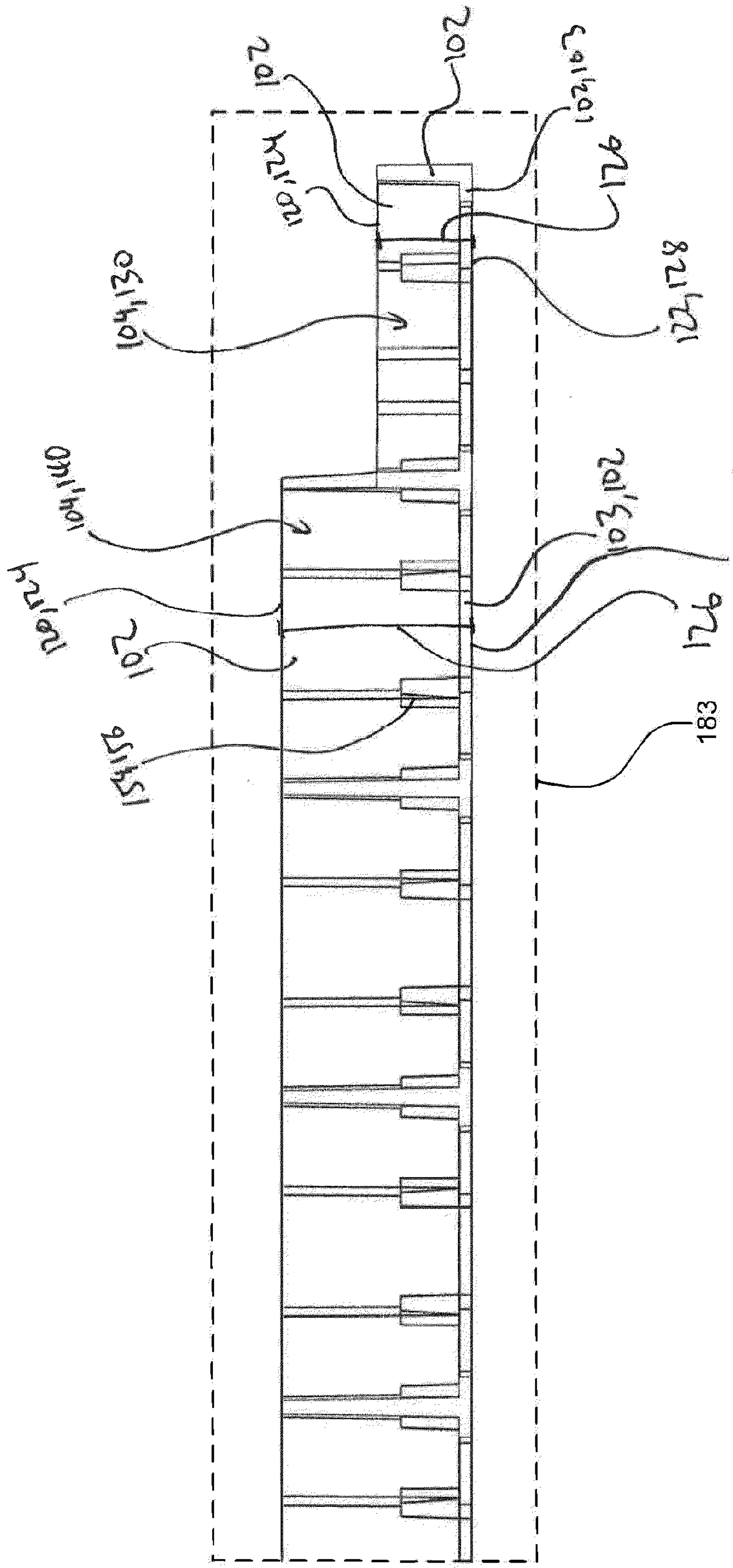
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Figure 25

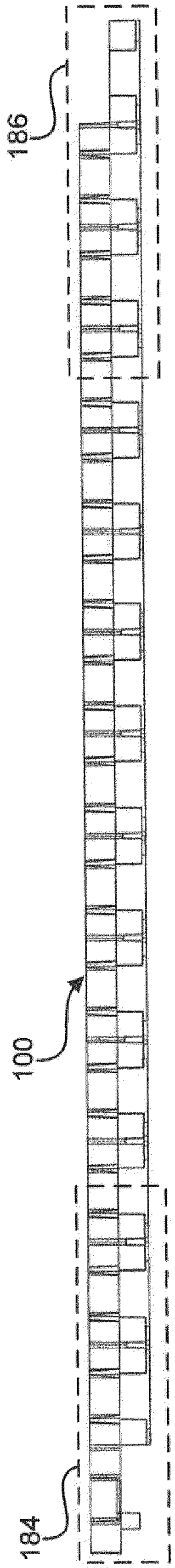



Figure 26

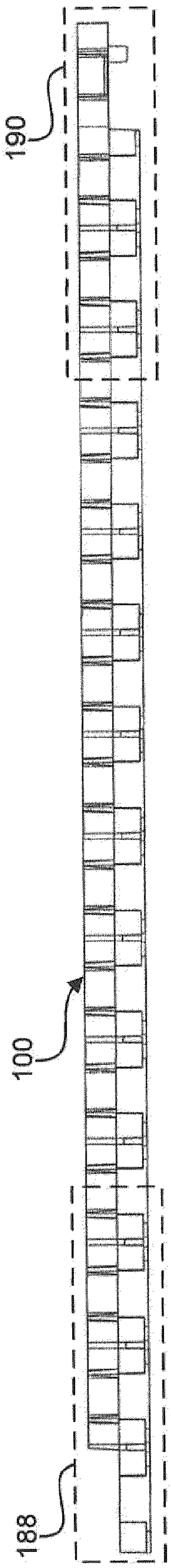
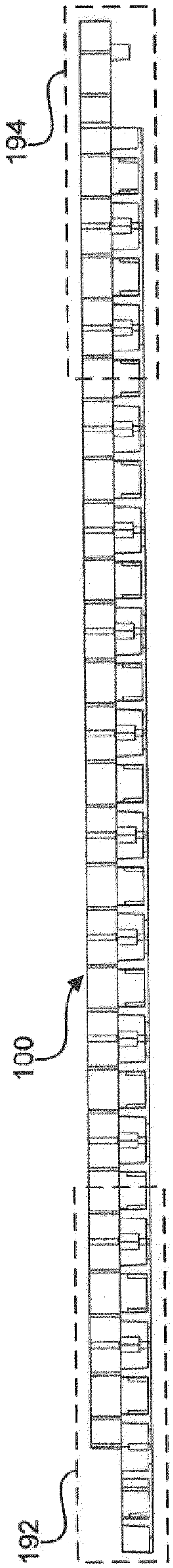



Figure 27

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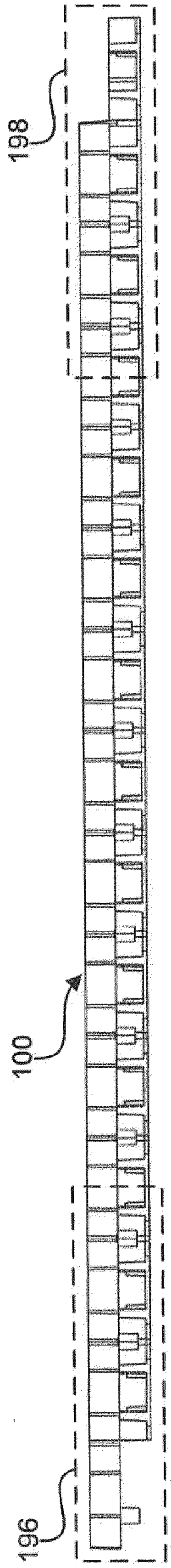



Figure 29

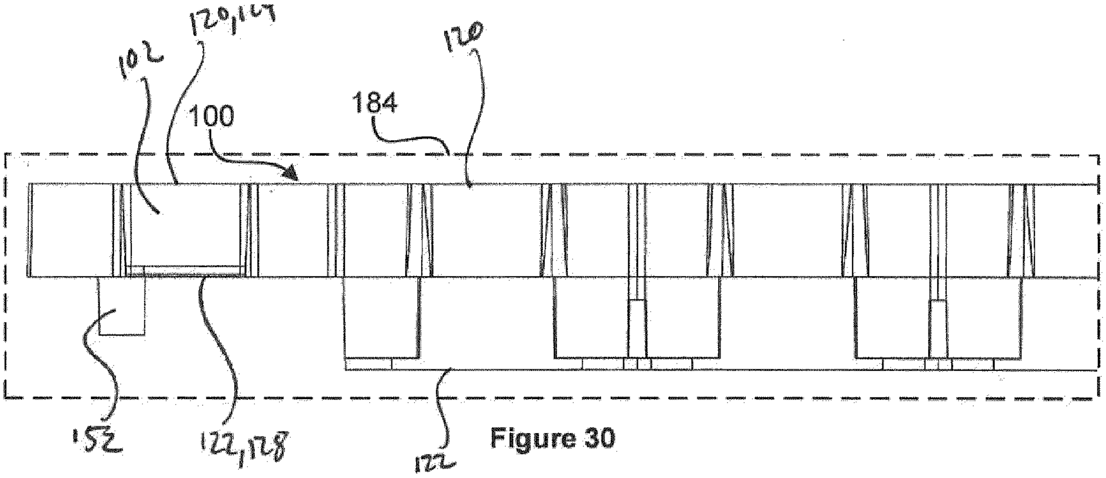
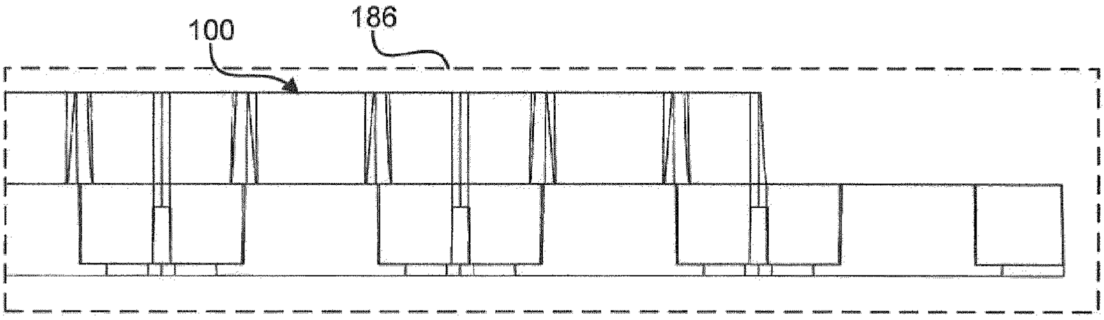



Figure 30

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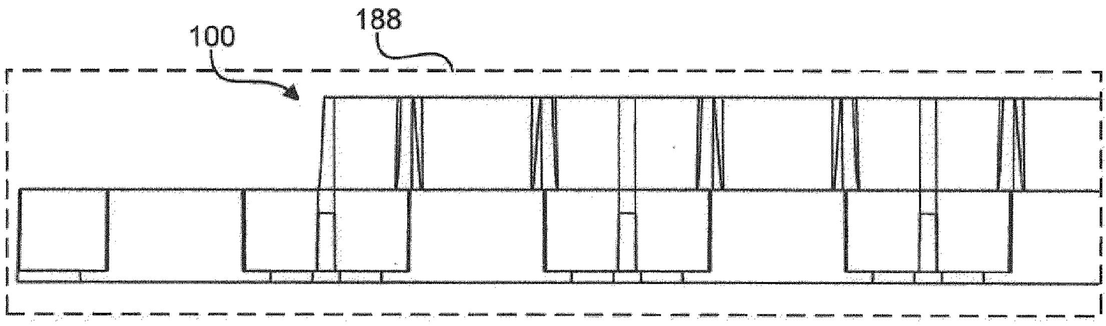



Figure 32

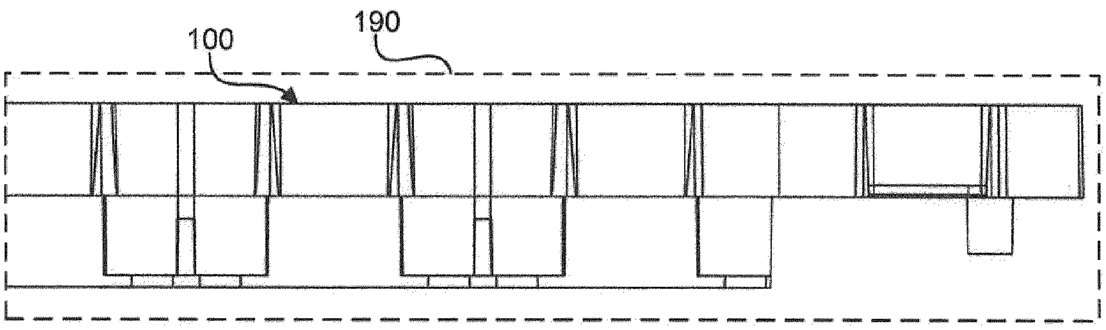



Figure 33

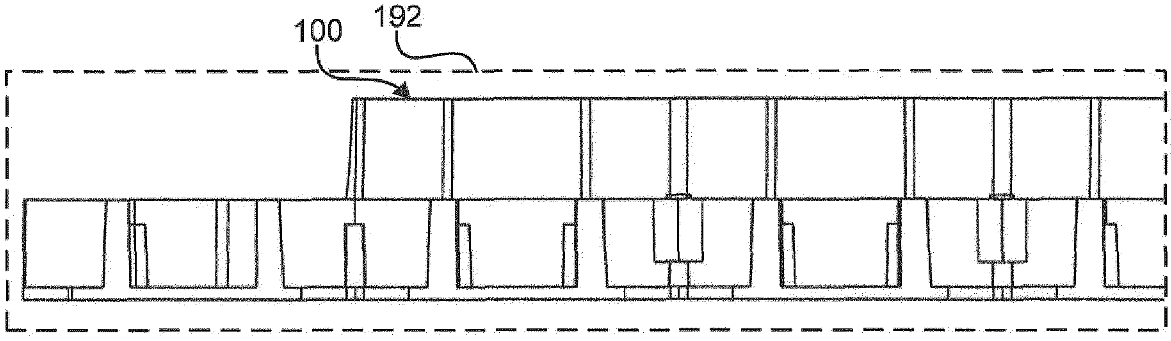
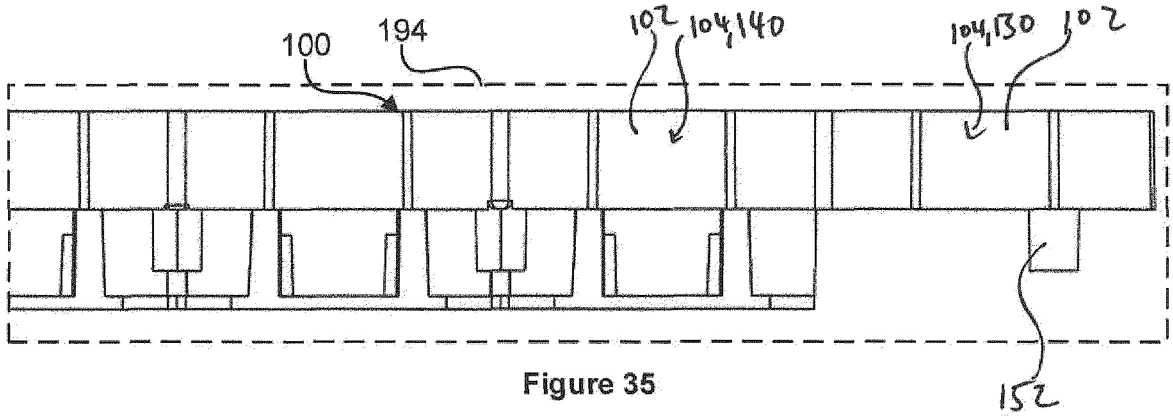



Figure 34

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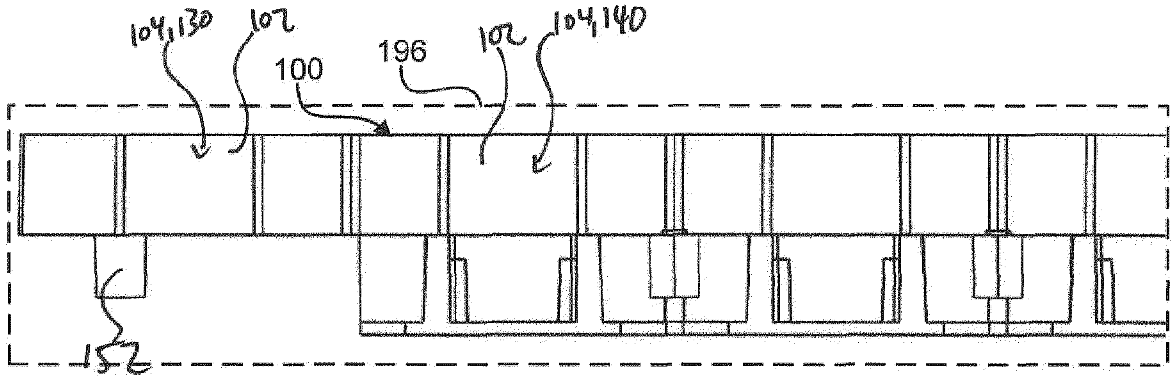
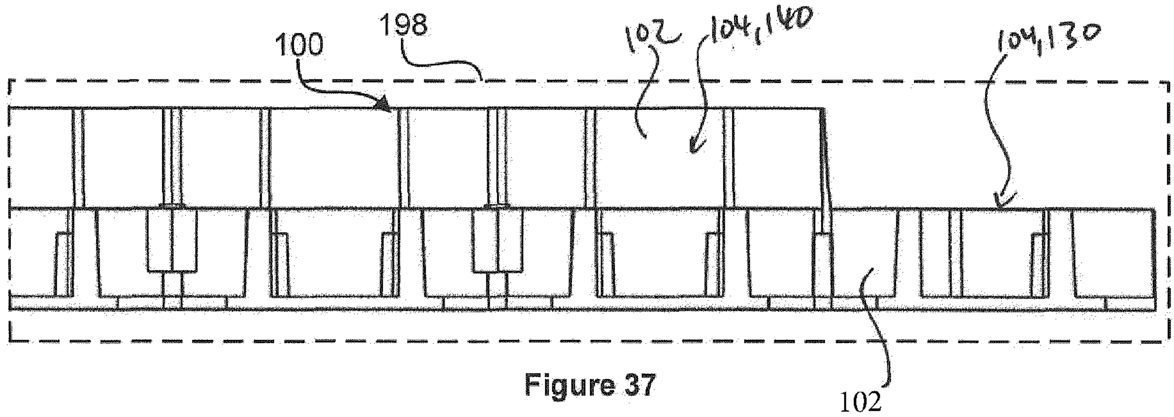



Figure 36

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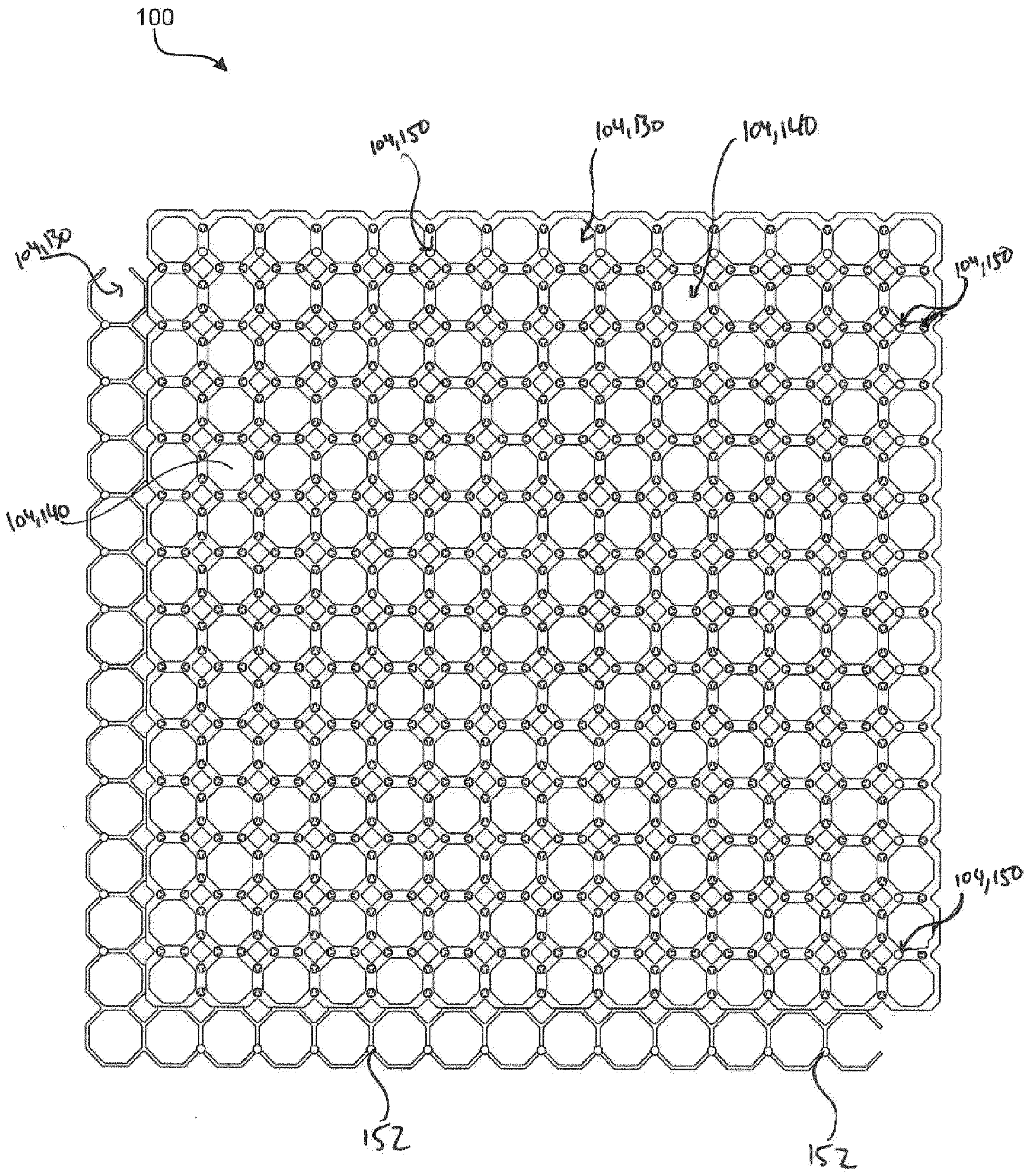
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Figure 38

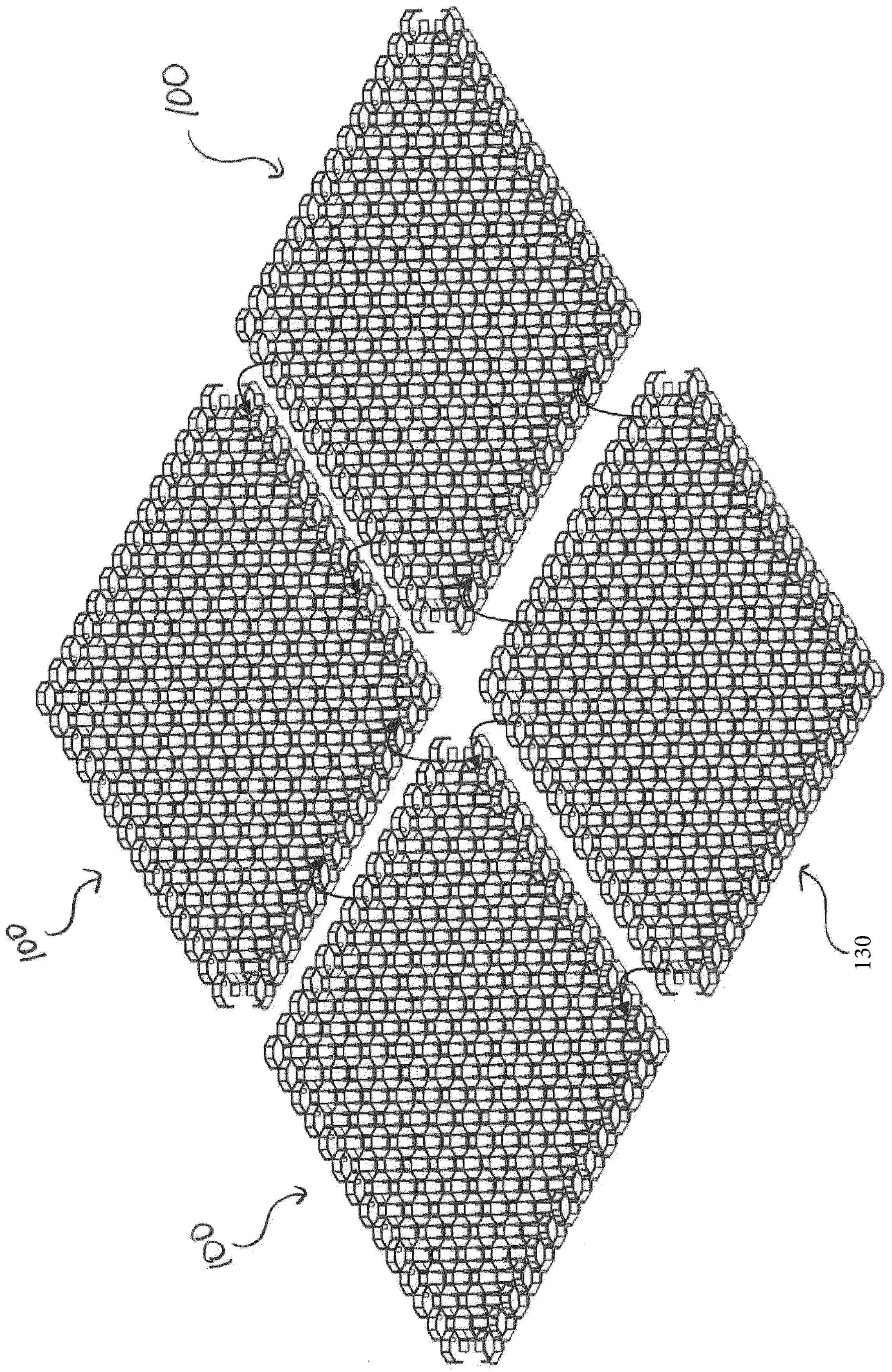


Figure 39

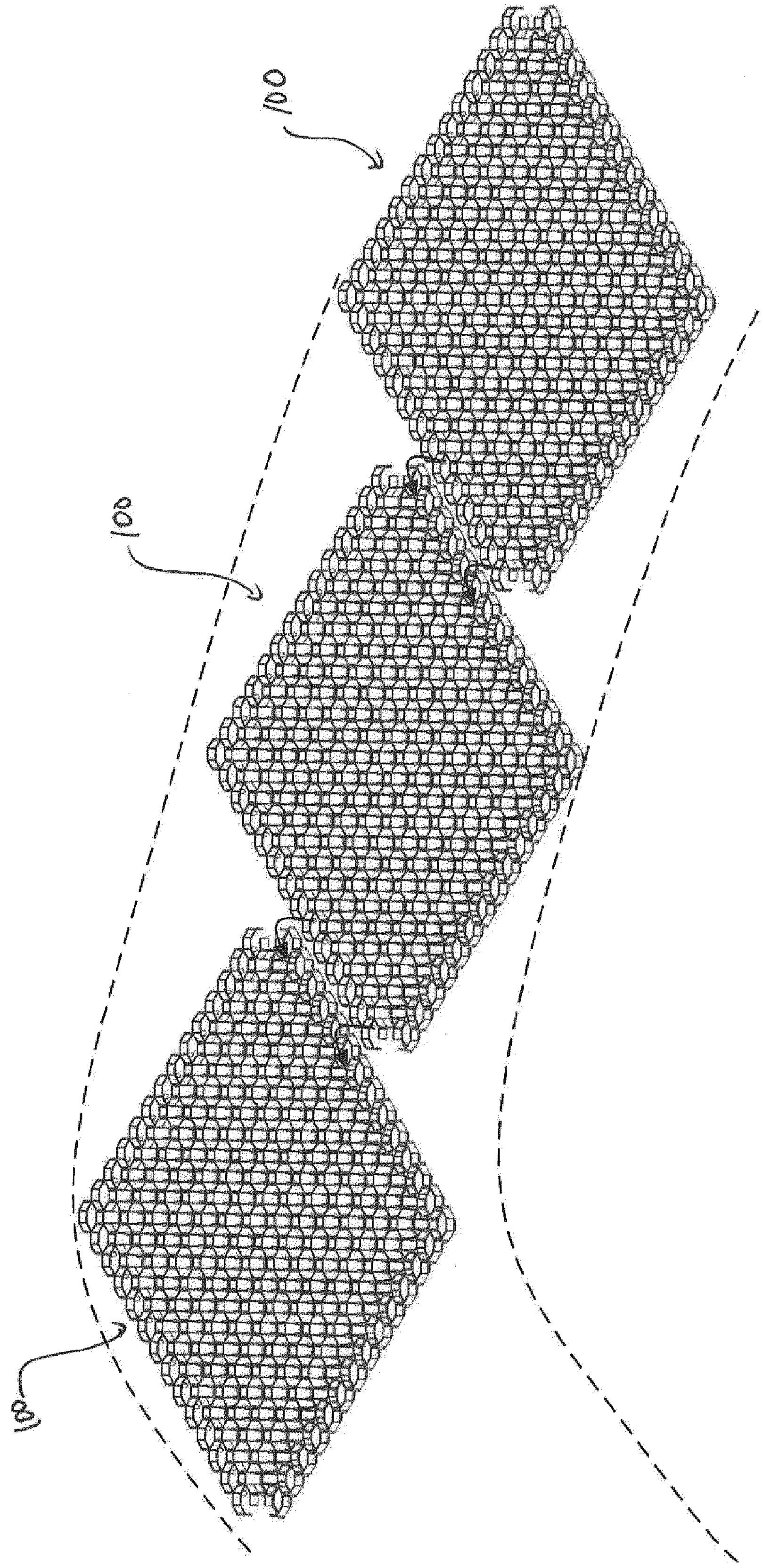


Figure 40

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European Patent Office
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# EUROPEAN SEARCH REPORT

Application Number
EP 23 17 8254

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| X | US 2014/270945 A1 (BACH GARY MICHAEL [US] ET AL) 18 September 2014 (2014-09-18)<br>* the whole document *<br>----- | 1-15 | INV.<br>E01C3/00<br>E01C9/00<br>E01C9/10<br>E01C11/16 |
| X | US 2012/057932 A1 (MARSHALL ALLEN PHILIP [GB]) 8 March 2012 (2012-03-08)<br>* the whole document *<br>----- | 1-15 | |
| X | US 10 731 303 B2 (BRENTWOOD IND INC [US]) 4 August 2020 (2020-08-04)<br>* the whole document *<br>----- | 1-15 | |
| X | DE 100 45 814 C1 (LANDGRAF RAINER [DE]; BEINER GUENTER [DE])<br>7 February 2002 (2002-02-07)<br>* the whole document *<br>----- | 1-15 | |
| | | | TECHNICAL FIELDS SEARCHED (IPC) |
| | | | E01C |

The present search report has been drawn up for all claims

4

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 17 November 2023 | Kerouach, May |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 17 8254

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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17-11-2023

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| | | AR 114760 A2 | 14-10-2020 |
| | | AU 2014249675 A1 | 10-09-2015 |
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| | | CA 2902331 A1 | 09-10-2014 |
| | | CL 2015002544 A1 | 29-07-2016 |
| | | CN 105074090 A | 18-11-2015 |
| | | DK 2971359 T3 | 25-06-2018 |
| | | EP 2971359 A2 | 20-01-2016 |
| | | JP 6367909 B2 | 01-08-2018 |
| | | JP 2016516924 A | 09-06-2016 |
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