US009284693B2

(12) **United States Patent**
Tabibnia

(10) **Patent No.: US 9,284,693 B2**
(45) **Date of Patent: Mar. 15, 2016**

(54) **APPARATUS AND RELATED METHODS OF PAVING A SUBSURFACE**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 19 days.

(21) Appl. No.: **14/253,818**

(22) Filed: **Apr. 15, 2014**

(65) **Prior Publication Data**

US 2014/0308076 A1 Oct. 16, 2014

Related U.S. Application Data

(63) Continuation-in-part of application No. 13/564,628, filed on Aug. 1, 2012, now Pat. No. 8,550,753, which is a continuation-in-part of application No. 12/732,755, filed on Mar. 26, 2010, now Pat. No. 8,453,391.

(51) **Int. Cl.**

E01C 9/00	(2006.01)
E01C 5/00	(2006.01)
E04C 1/39	(2006.01)
F24D 3/12	(2006.01)
E04B 5/48	(2006.01)
E04F 15/024	(2006.01)
F24D 3/14	(2006.01)
E04D 11/00	(2006.01)

(52) **U.S. Cl.**
CPC ... ***E01C 5/00*** (2013.01); ***E04B 5/48*** (2013.01); ***E04C 1/392*** (2013.01); ***E04D 11/007*** (2013.01); ***E04F 15/02447*** (2013.01); ***E04F 15/02452*** (2013.01); ***E04F 15/02464*** (2013.01); ***E04F 15/02482*** (2013.01); ***F24D 3/122*** (2013.01); ***F24D 3/127*** (2013.01); ***F24D 3/142*** (2013.01)

(58) **Field of Classification Search**
CPC F24D 3/12; F24D 3/122; F24D 3/127; F24D 3/141; F24D 3/142; E04B 5/48; E04C 1/39; E04C 2/52; E04C 1/392
USPC 52/126.6, 263, 220.2, 220.3, 799.12, 52/660, 673, 177, 630; 404/34, 43; 47/66.5, 86; 165/56, 168; 237/69
See application file for complete search history.

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Primary Examiner — Robert Canfield
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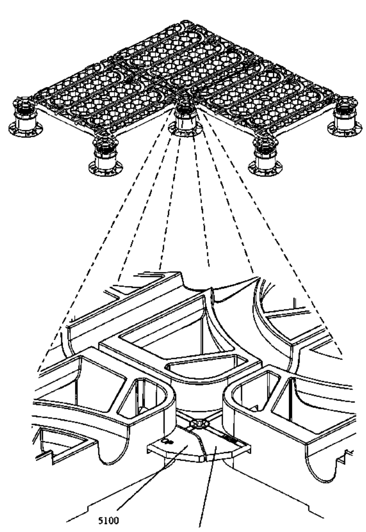
(57) **ABSTRACT**

Disclosed may be an intermediate surface for supporting a small paver, wherein the surface can also be used to exchange heat with the pavers. In one embodiment, the apparatus may be a hextray defined by a frame with a hexagonal lattice for supporting pavers. The hextray preferably features a tubing track throughout the lattice to accommodate heat exchange tubing. In operation the hextray may be positioned above a pedestal or directly on a subsurface. In embodiment, the hex tray may be outfitted with insulation and a metal plate so that heat may be exchanged with pedestals via fluid passing through tubing installed throughout the hexagonal lattice. In a preferred embodiment, the hextray features a slot in its corners for receiving a locking disk or locking slider.

16 Claims, 17 Drawing Sheets



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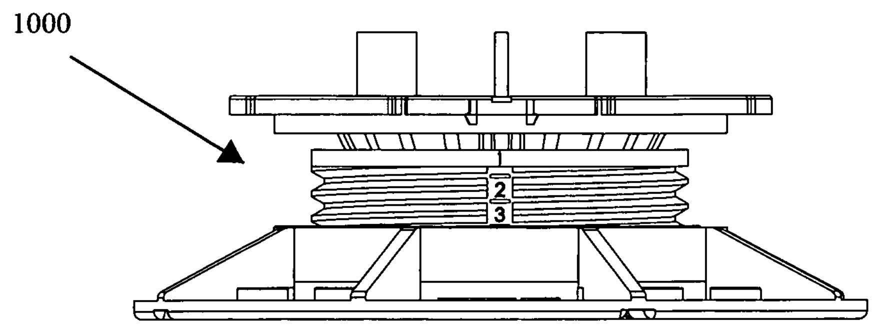


FIG. 1

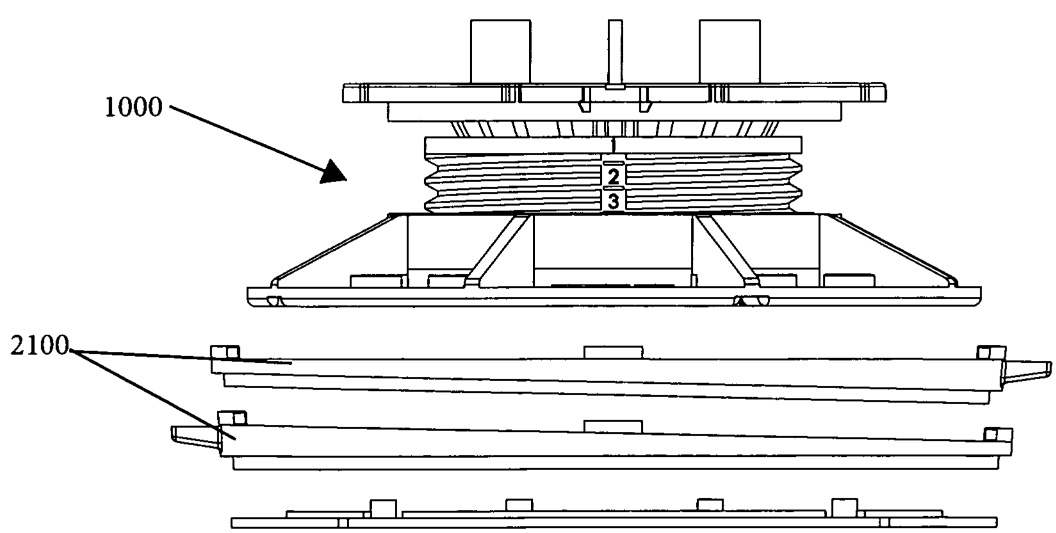


FIG. 2

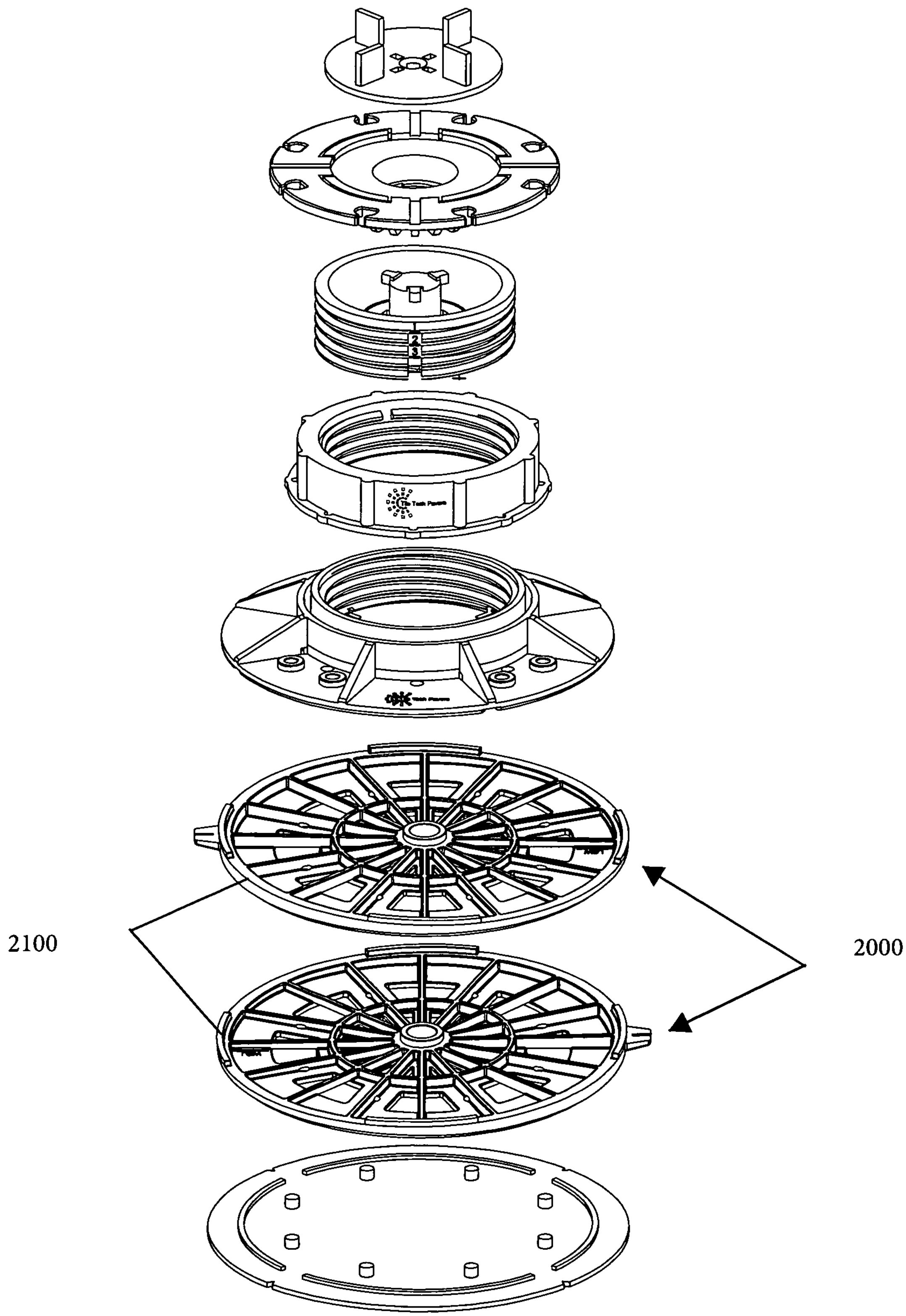


FIG. 3

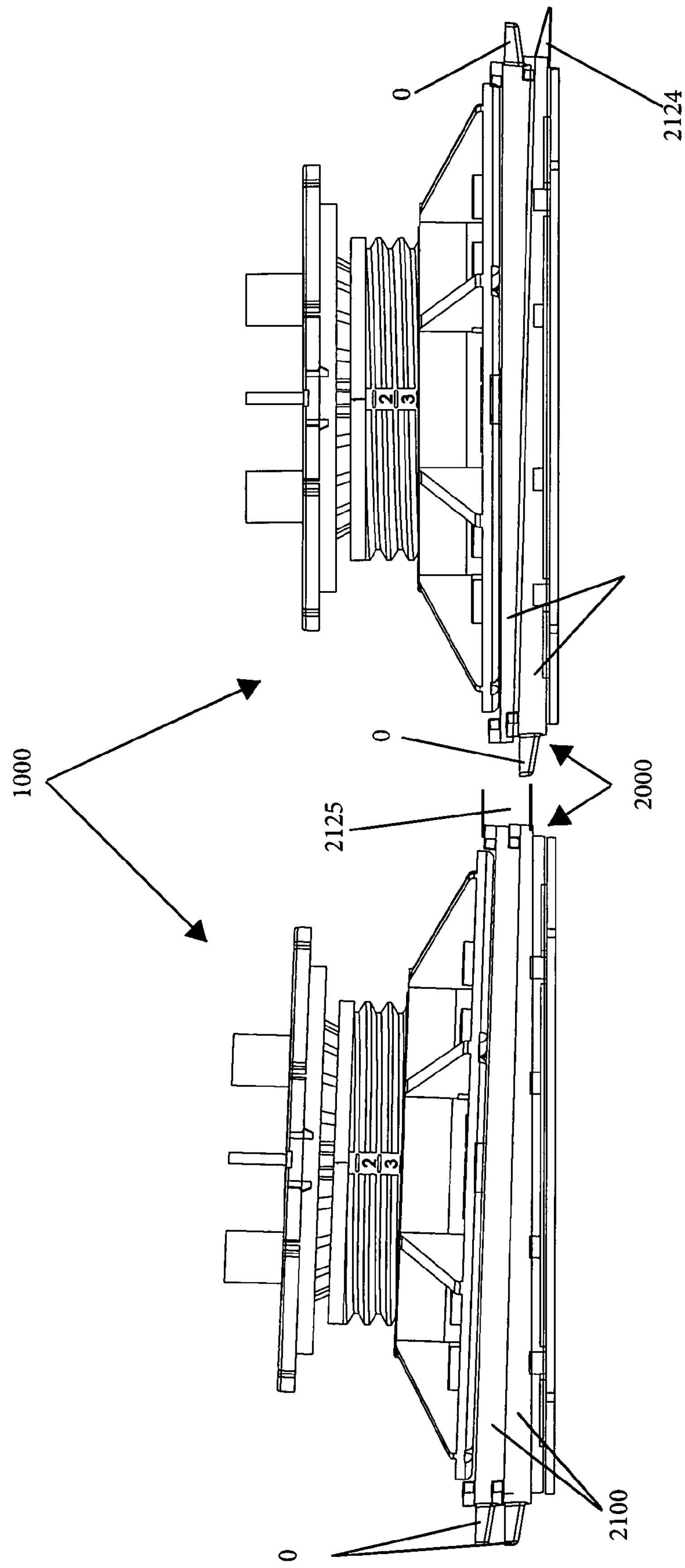
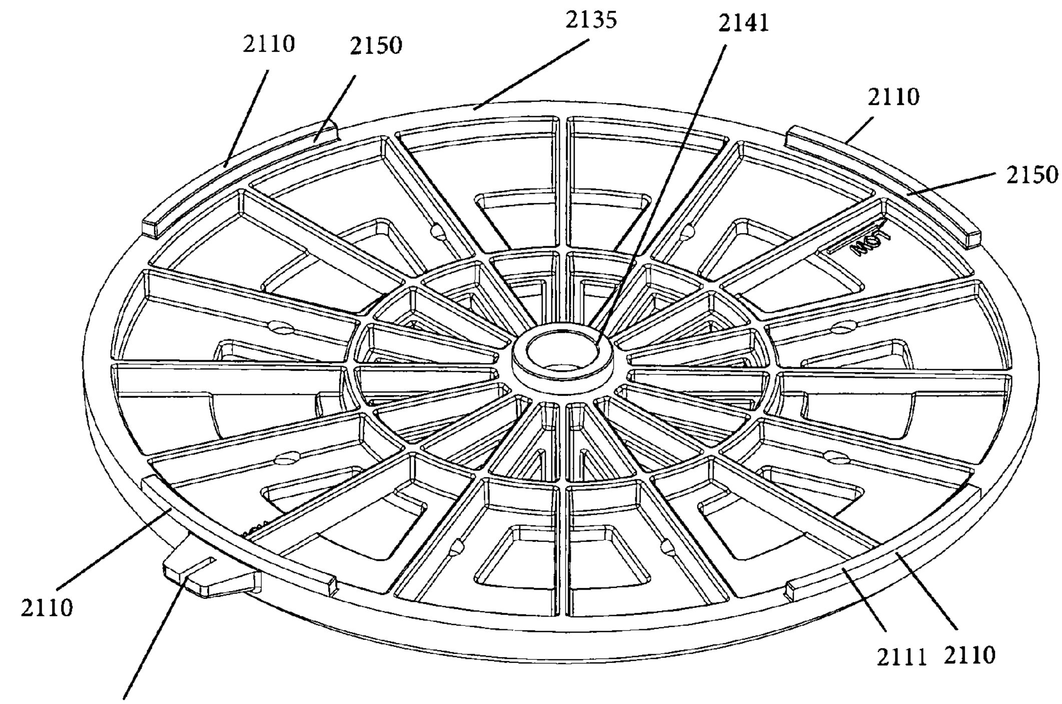


FIG. 4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2150
2135
2141
2110
2150
2110
0
2111
2110

FIG. 5

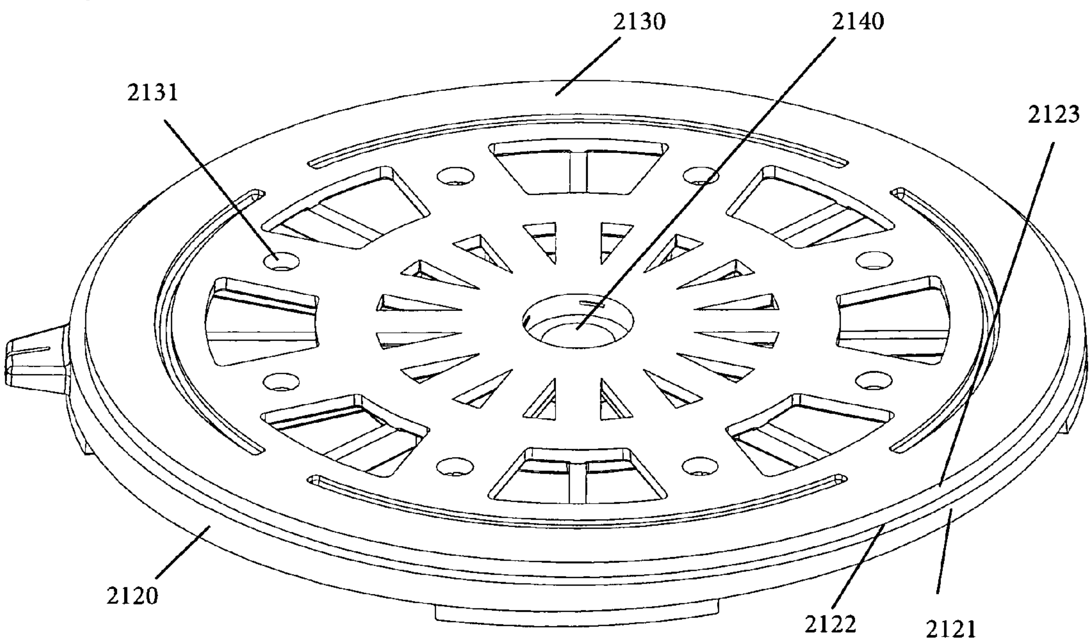
2130
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FIG. 6

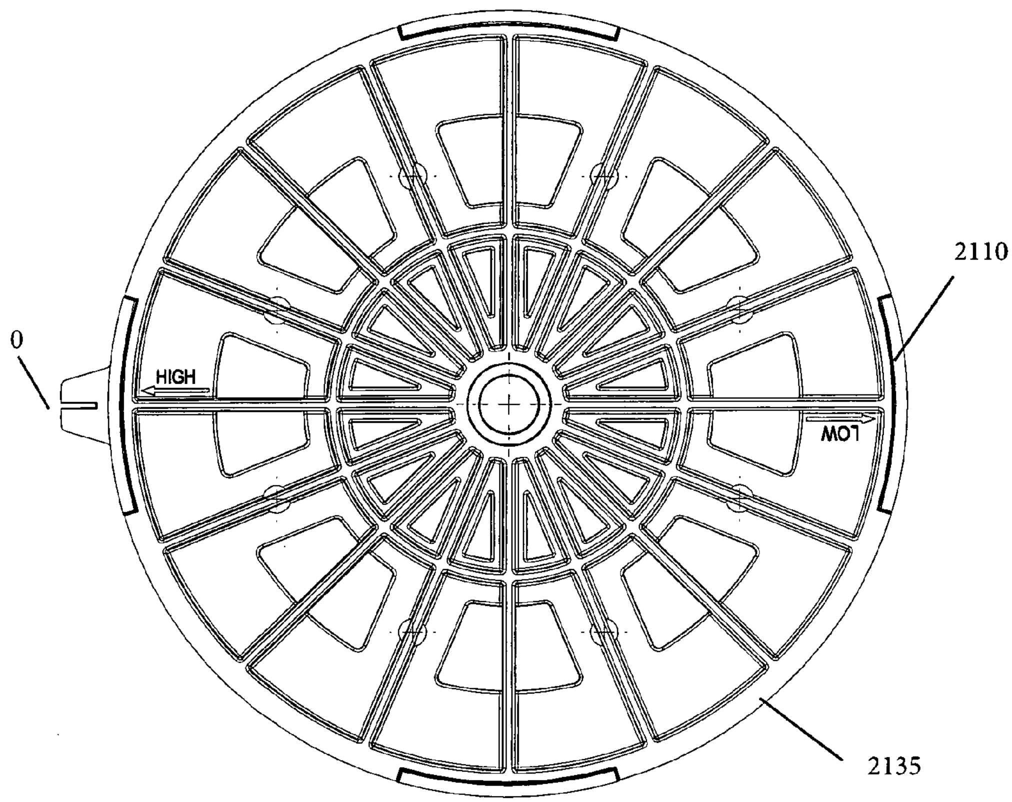

FIG. 7

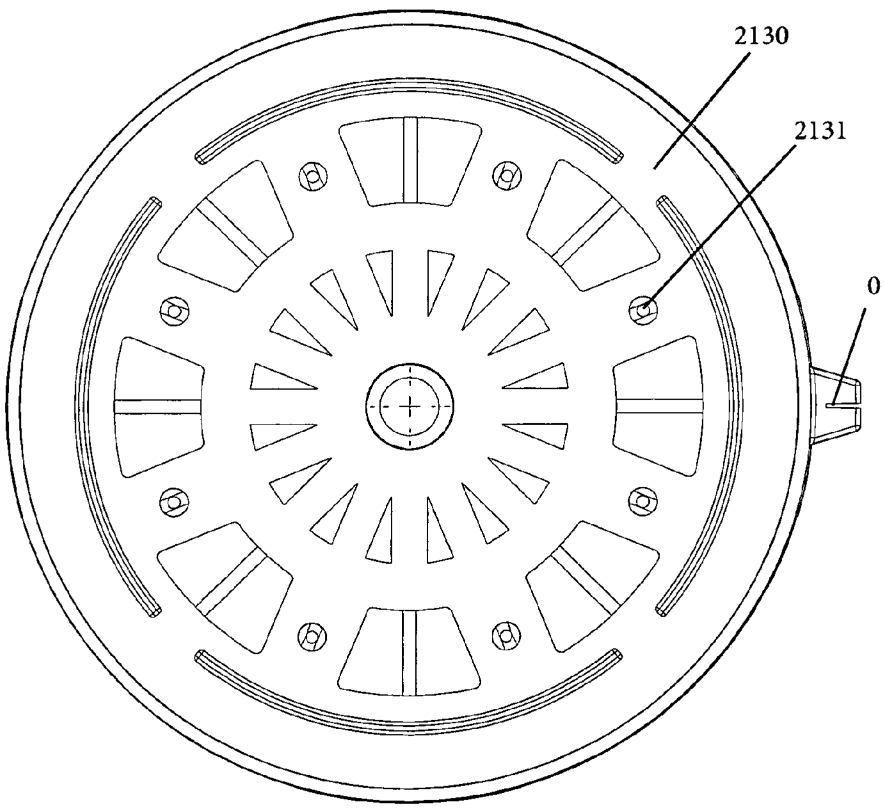

FIG. 8

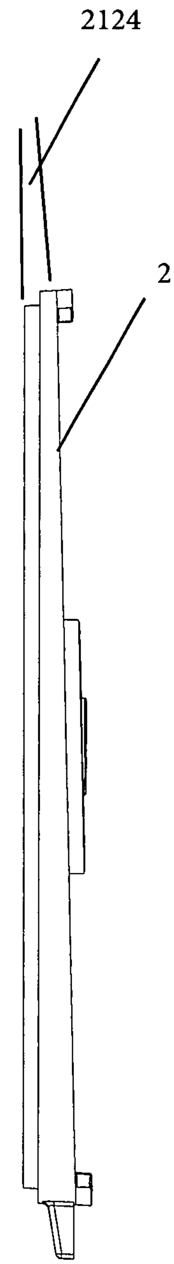

FIG. 9

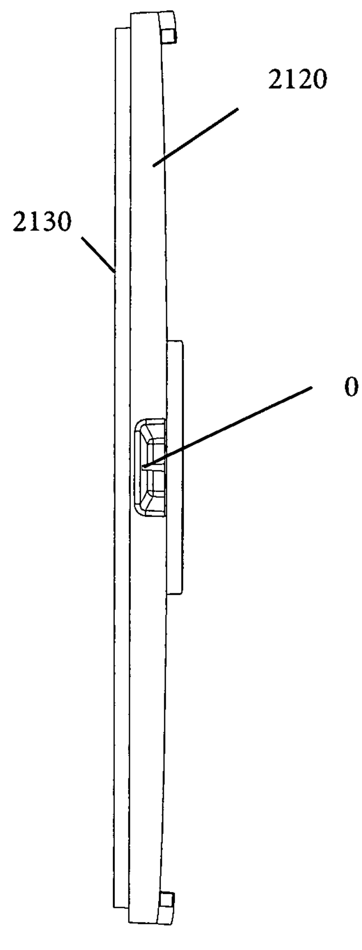

FIG. 10

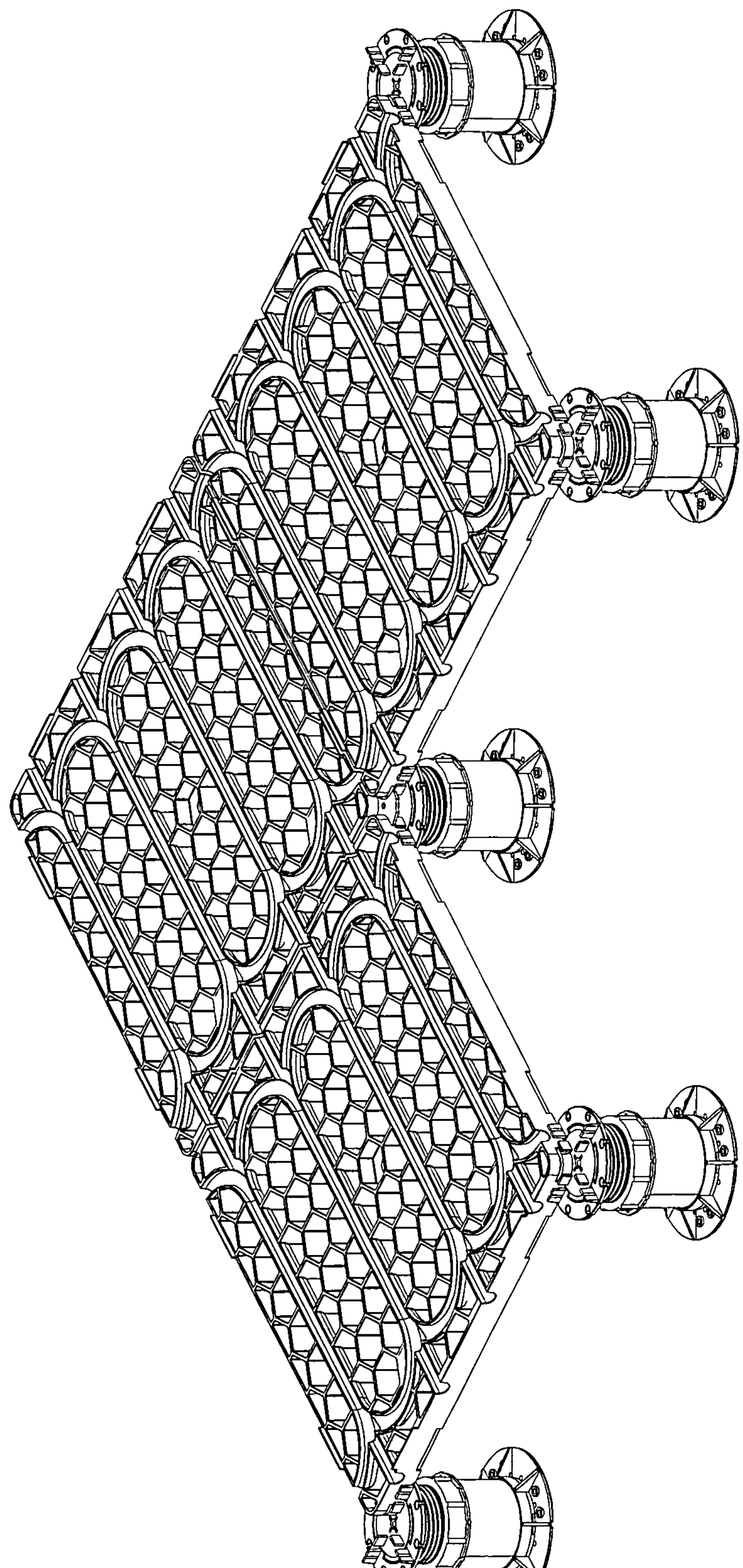

FIG. 11

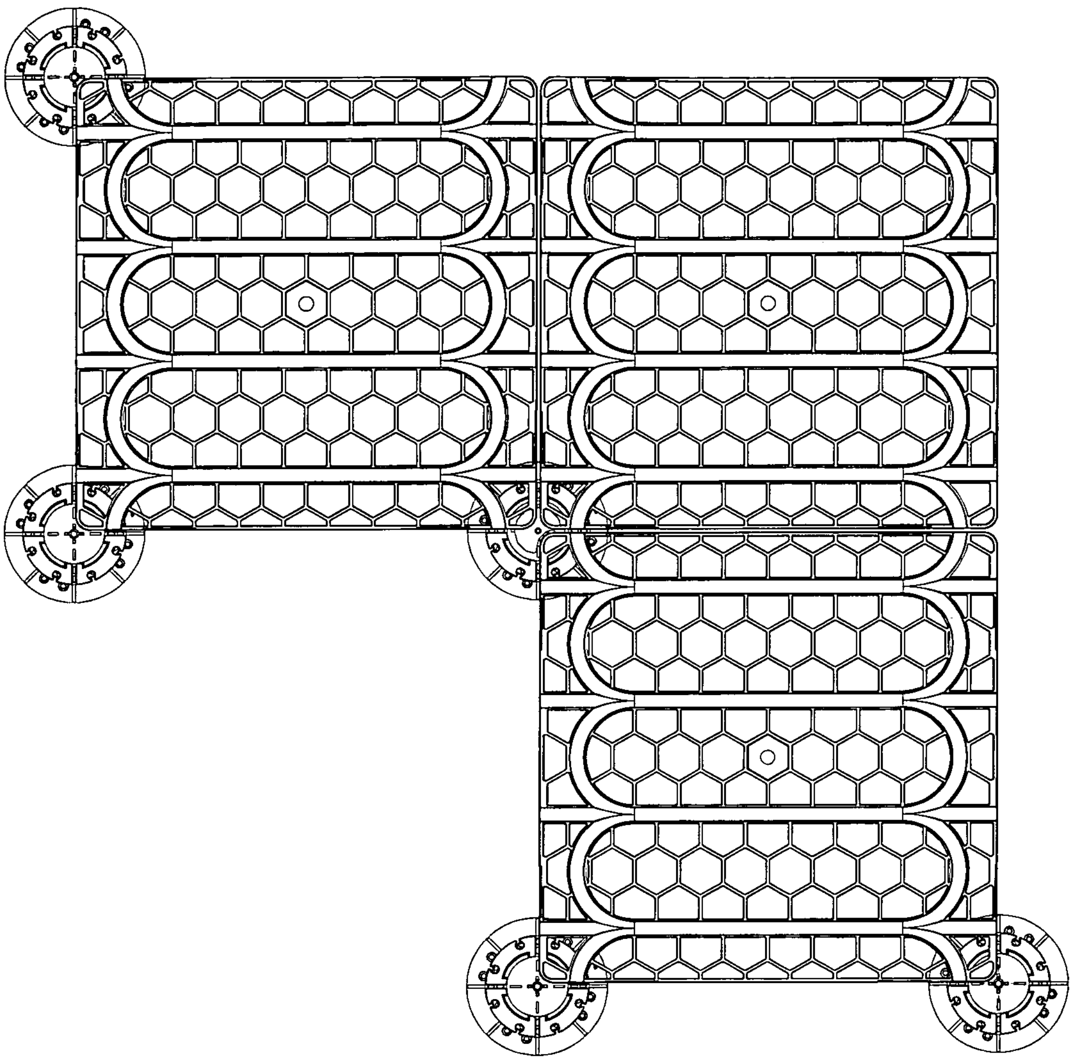

FIG. 12

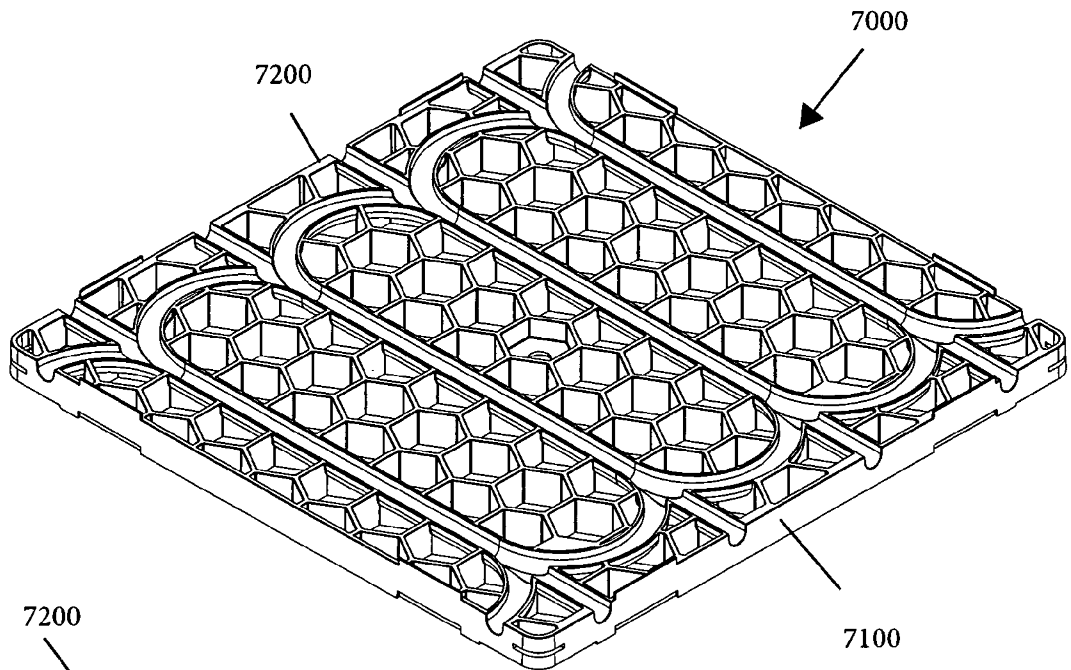

FIG. 13

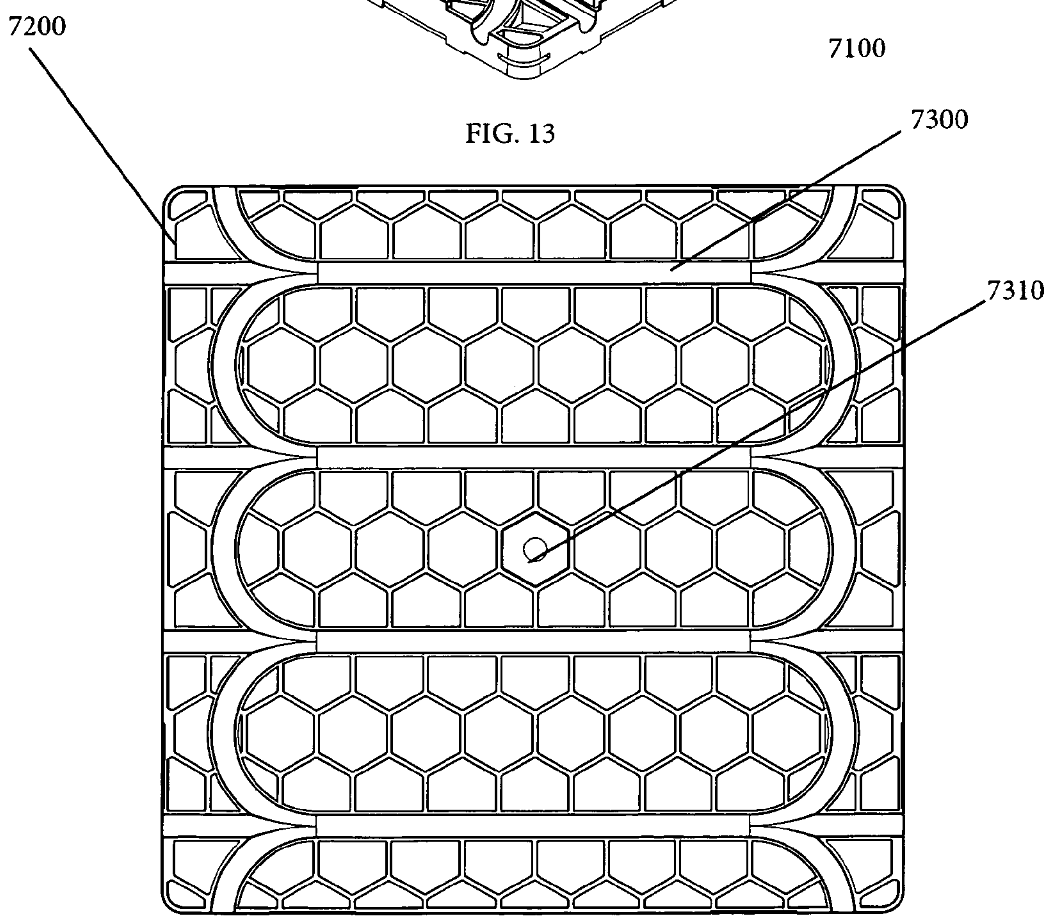

FIG. 14

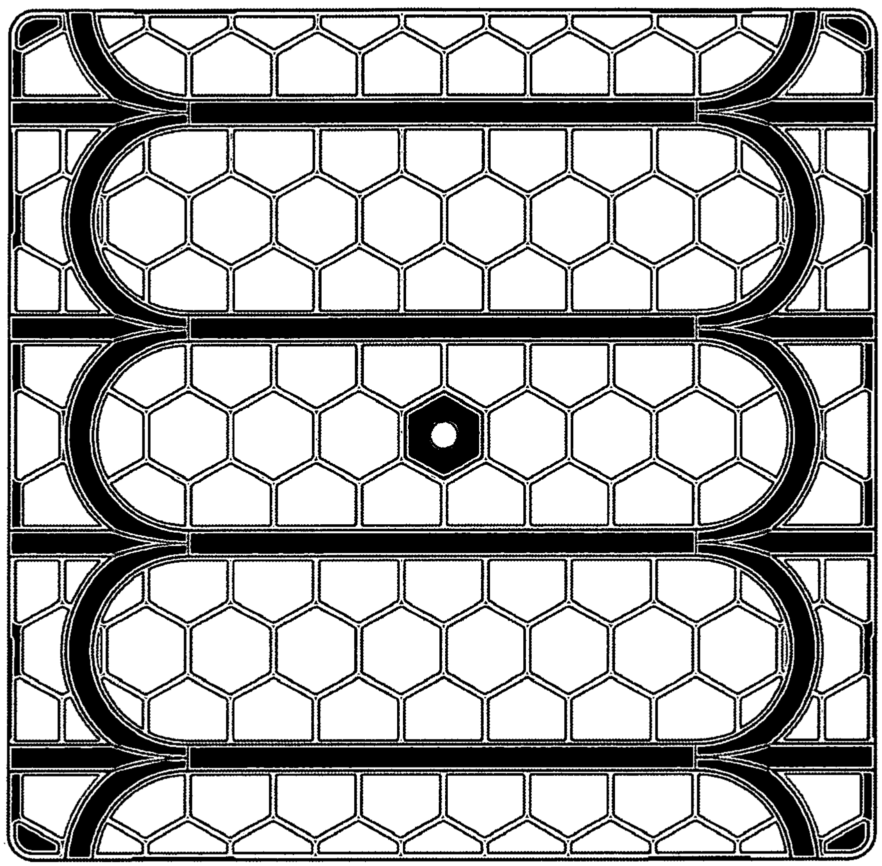

FIG. 14A

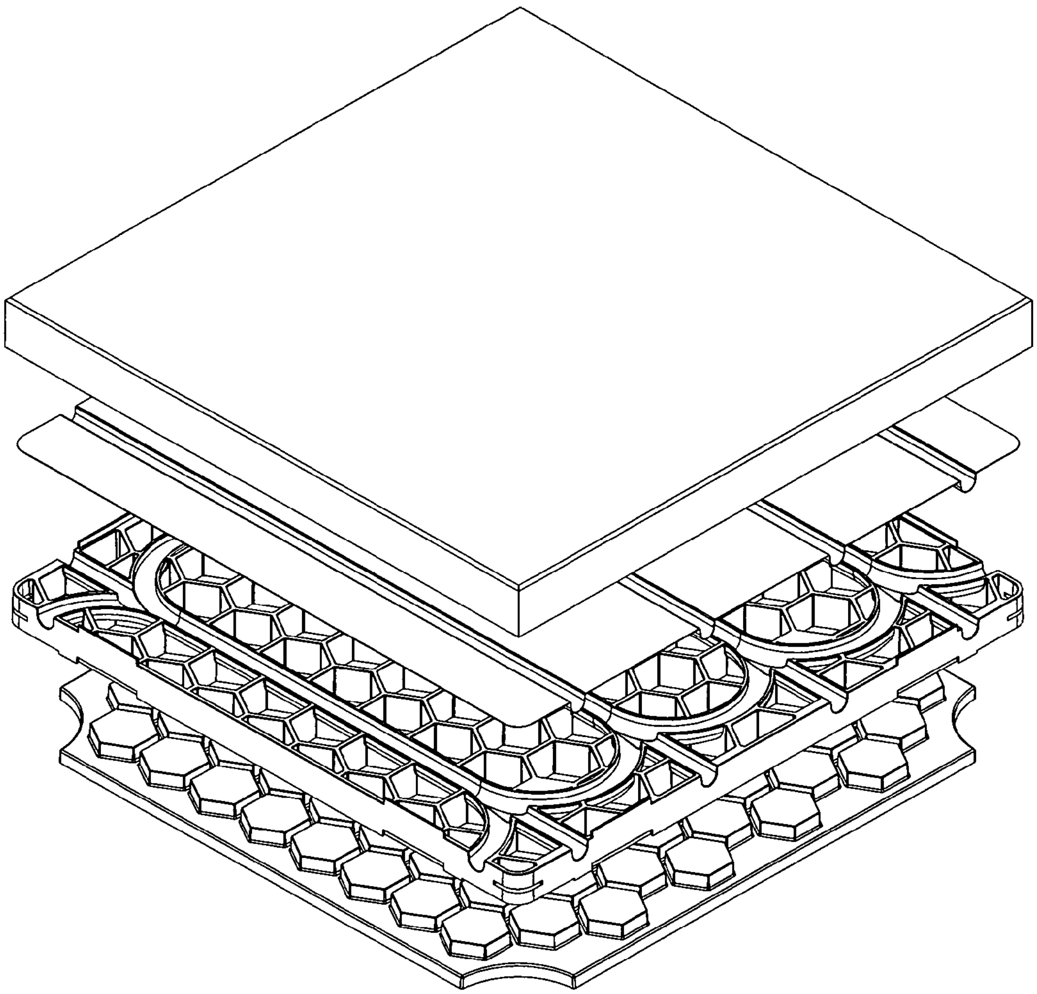

FIG. 15

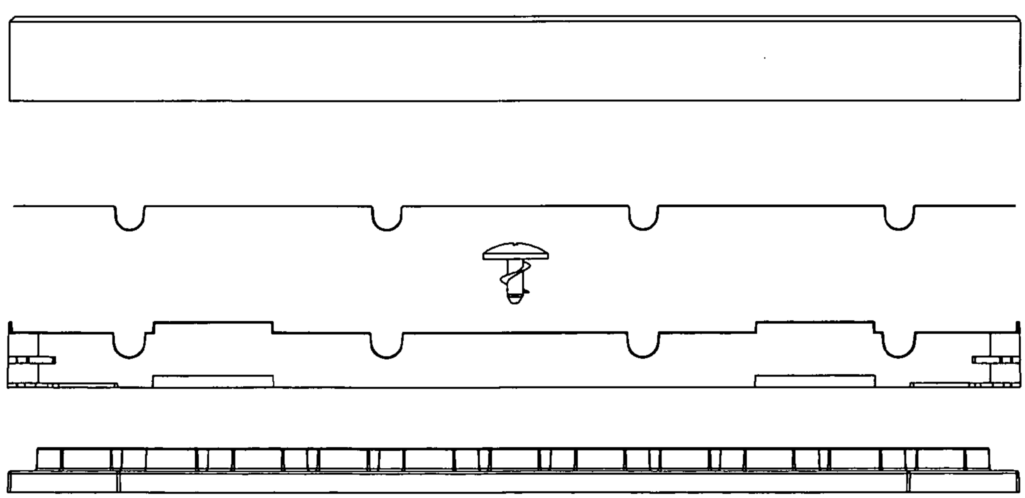

FIG. 16

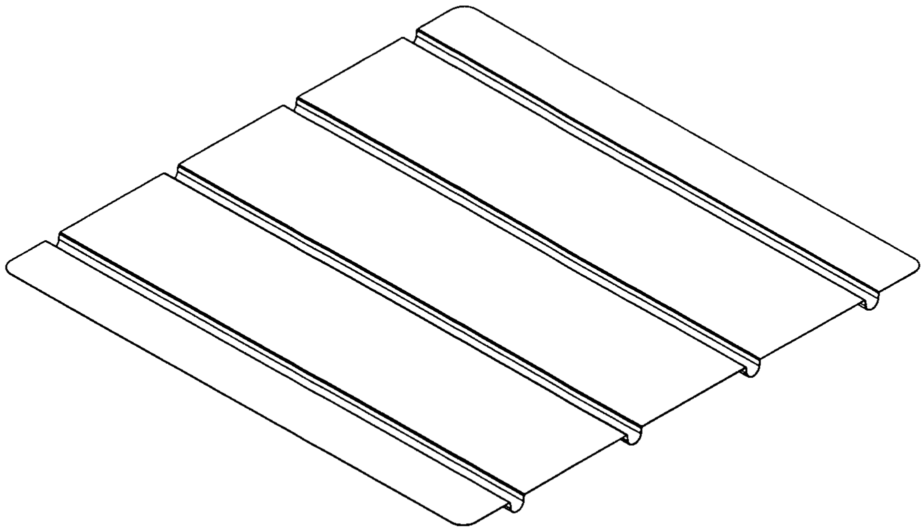

FIG. 17

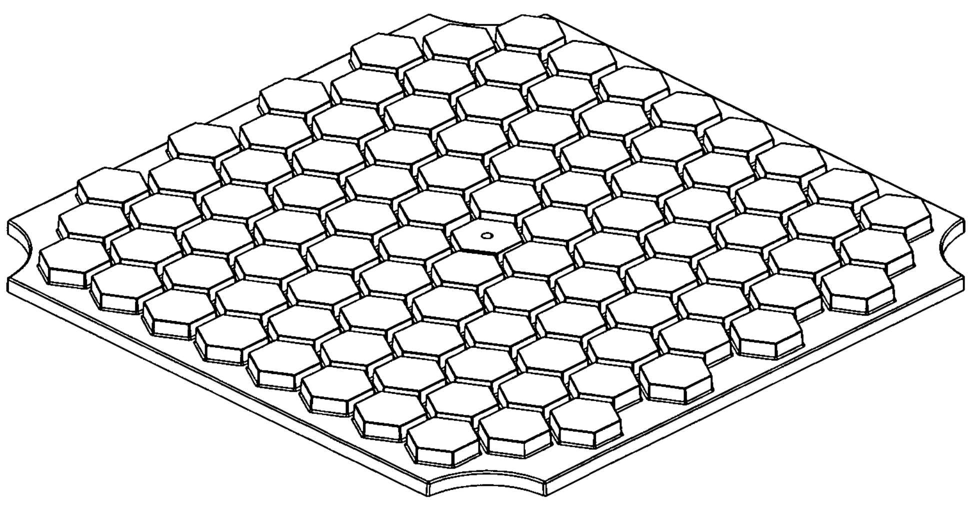

FIG. 18

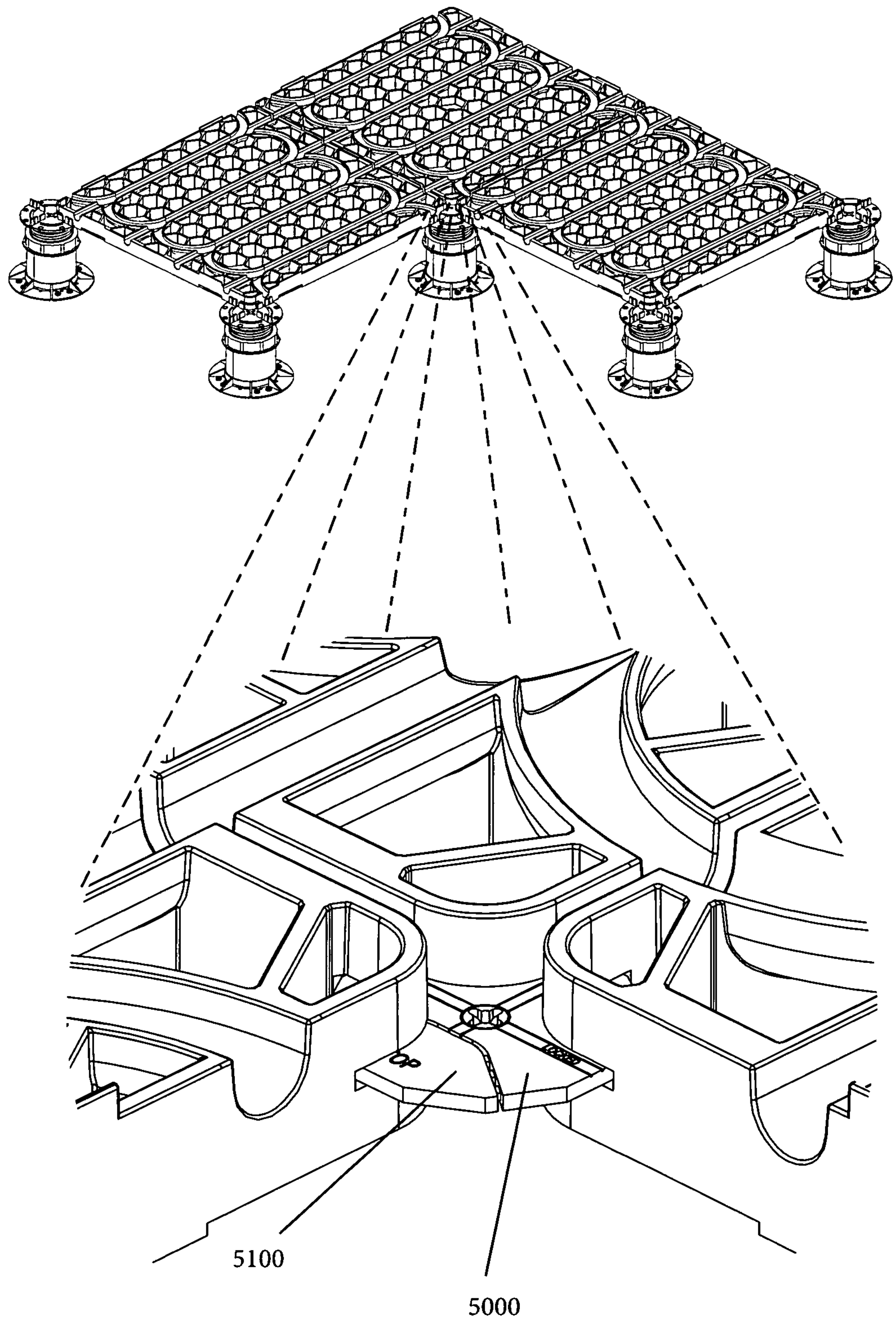

FIG. 19

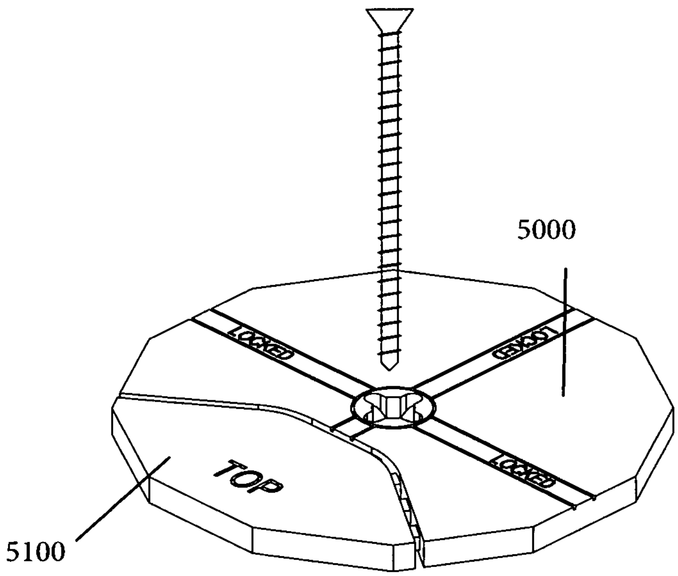

FIG. 20

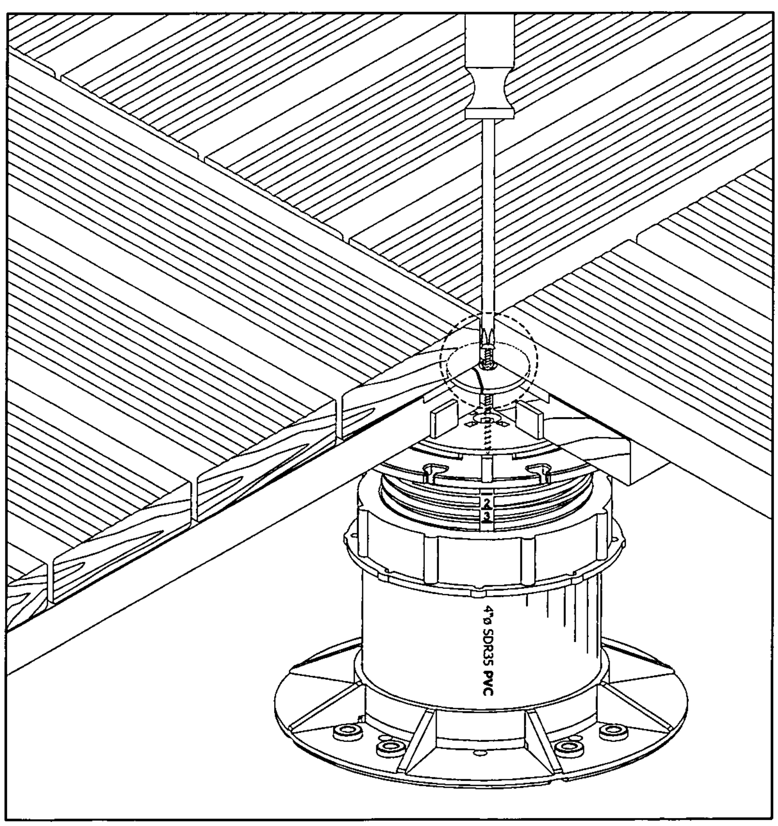

FIG. 21

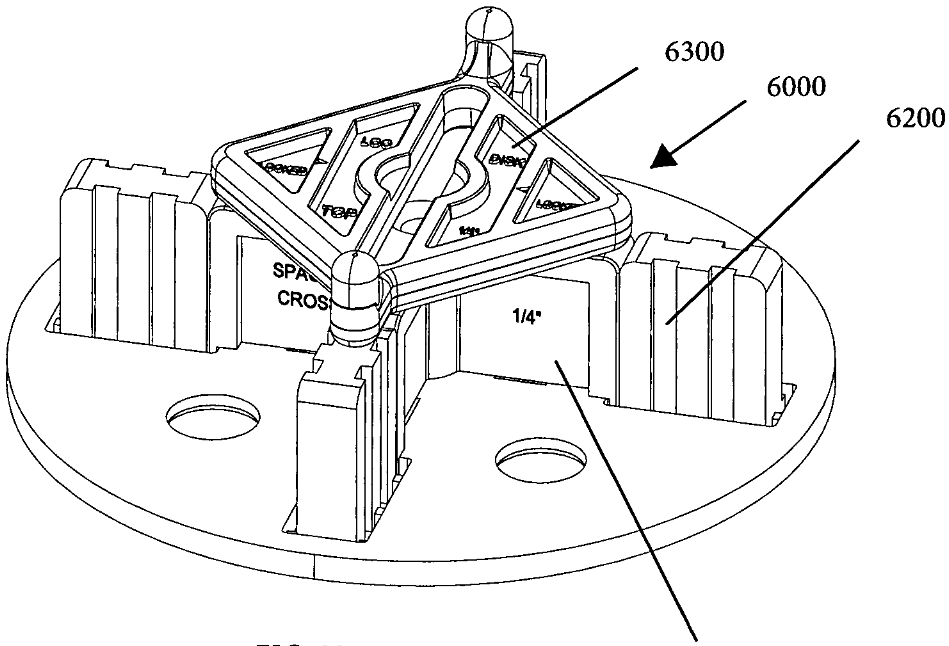

FIG. 22

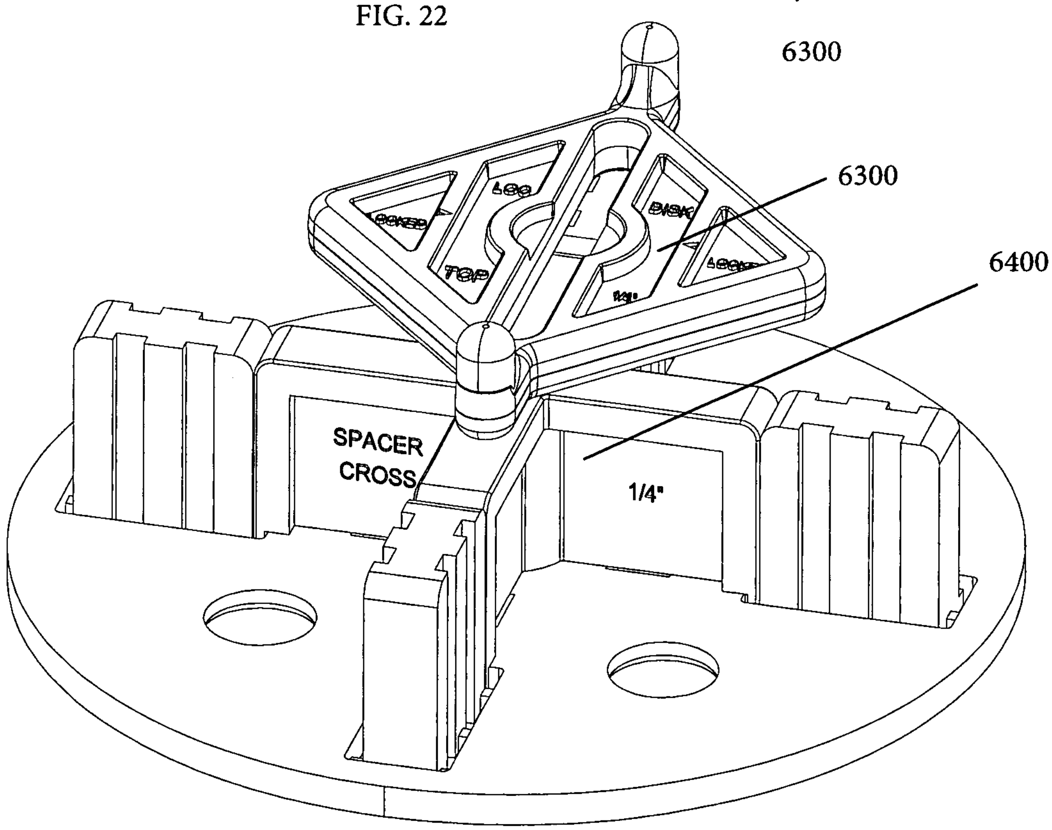

FIG. 23

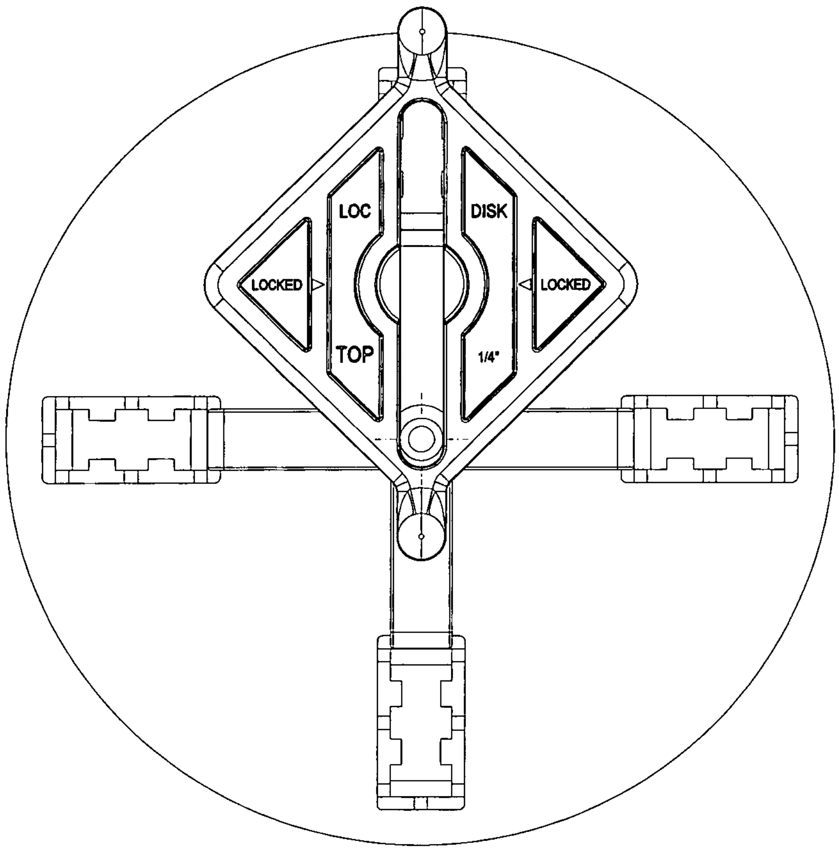

FIG. 24

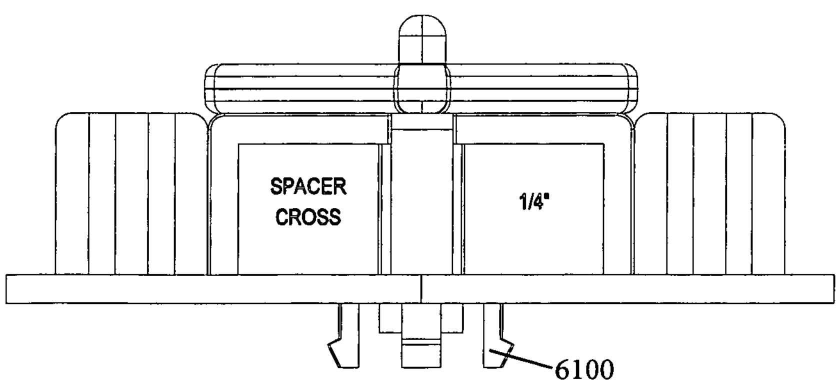

FIG. 25

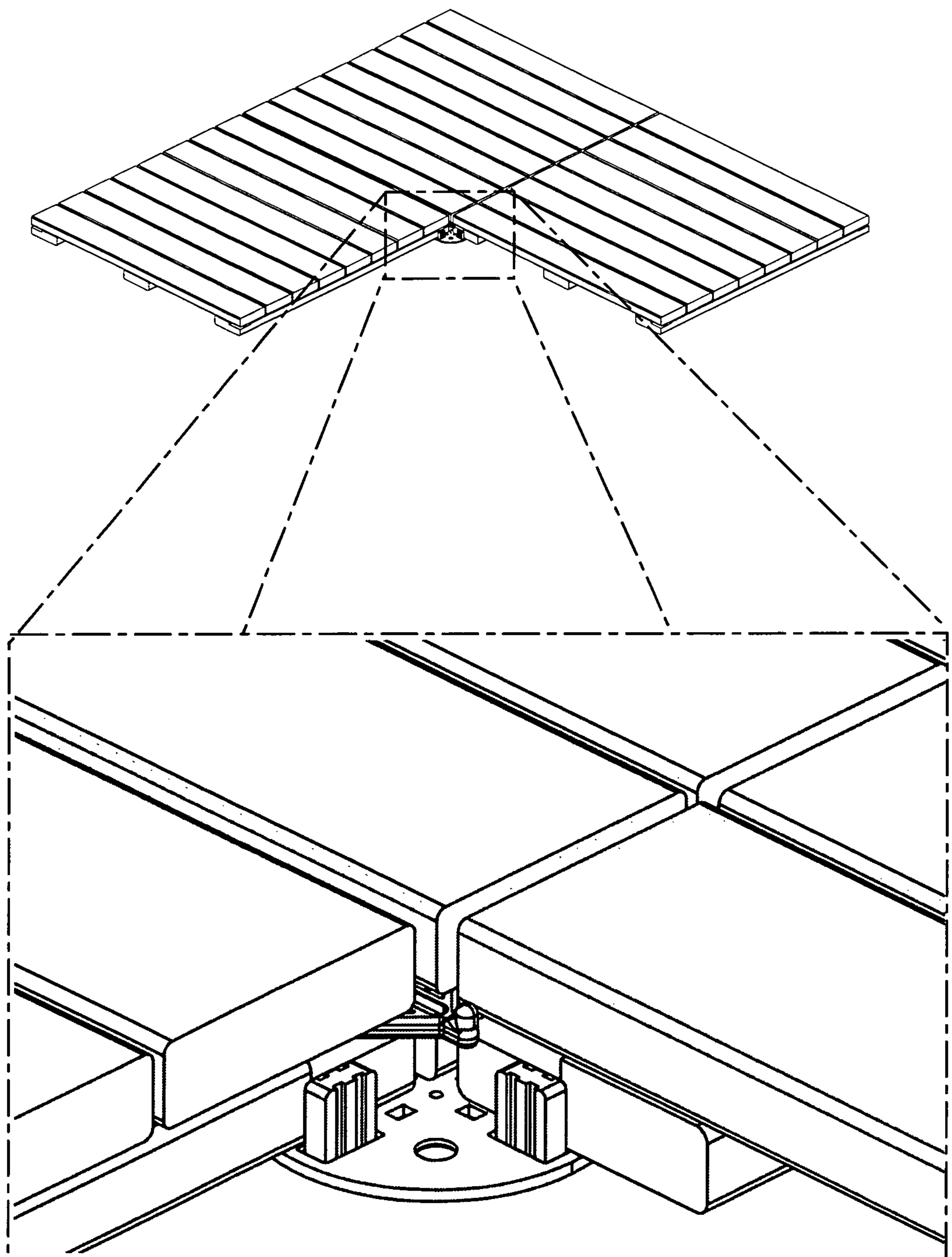

FIG. 26

APPARATUS AND RELATED METHODS OF PAVING A SUBSURFACE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation in part of U.S. patent application Ser. No. 12/732,755 (filed Mar. 26, 2010) and U.S. patent application Ser. No. 13/564,628 (filed Aug. 1, 2012). Both applications are entitled "Apparatus for establishing a paver over a subsurface" and are incorporated by reference as if fully set forth herein.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable.

BACKGROUND OF THE INVENTION

1. Field of Invention

The present application is in the field of methods and apparatus for establishing a level paver surface with heat-exchange functionality.

2. Background of the Invention

Subsurfaces are frequently paved to adjust the aesthetic and/or physical properties of the subsurface. Sometimes, paving is accomplished via placing an array of pavers onto the subsurface. Therefore, a need exists for an apparatus and related methods that facilitate the paving of a subsurface with a paver.

Often, leveling and/or elevation of the paved surface relative to the subsurface are necessary. For instance, raising or elevating the paved surface relative to the subsurface can facilitate drainage of the paved surface or provide for air circulation between the paved surface and the subsurface (e.g., to prevent the buildup or mold or other residue). Furthermore, leveling the paved surface can correct an undesirably irregular or sloped undersurface. As a result, there is a need for an apparatus and related methods which facilitate the elevated and leveled placement of a paved surface onto a subsurface.

Pedestals can be used to elevate a paved surface relative to a subsurface. For instance, in U.S. Pub. App. No. 2013/0219809, we disclosed a pedestal that supports the corners of an elevated paver. Pedestals frequently feature slope compensating mechanisms for leveling the elevated paver surface relative to the subsurface. Two common slope compensating mechanisms are: cooperating twist slope adjustment (see U.S. Pat. Nos. 6,332,292 and 5,442,882); concave/convex interacting surfaces (see e.g., U.S. Pat. No. 3,318,057). Twist slope manipulation only allows for slope adjustment at the paver support surface instead of at the pedestal base whereby the pedestal can become unbalanced. Concave/convex surface slope compensation is not adequate since the concave/convex surface interactions are relatively frictionless and unstable so that additional components are needed to keep the paver support surface from shifting orientation. See U.S. Pat. No. 3,318,057, FIG. 2, element 70; see also U.S. Pub. Pat. App. No. US2008/0222973, FIGS. 4 and 5, element 132, 134 and 72. Accordingly, a need still exists for a pedestal and related methods which facilitate the elevated and leveled placement of a paved surface onto a subsurface.

When pedestals are used for elevation or slope compensation of a paved surface, problems can arise when the pavers are not coupled to the pedestal. For example, a paver can fall or otherwise shift position to increase paver installation time or ruin the paver pattern. Thus, many have designed mechanisms for coupling the paver to a pedestal. In the pedestal disclosed by Knight, III et al. (U.S. Pat. No. 8,302,356), the corners of four wooden pavers are anchored to a support pedestal via a washer that turns into a notch in the pavers' corner. See FIGS. **9-11**. This washer features a cut-away portion so that the panels can be unanchored to the pedestal via aligning the cut-away portion with one of the four anchored corners. Problems can arise when the cut-away portion accidentally aligns with one of the paver corners wherein the paver may still be allowed to fall out of place or otherwise misalign. Thus, a need exists for apparatus and related methods of anchoring a paver to a pedestal.

Problems also arise in elevated and slope adjusted paved surfaces when small pavers are used because such small pavers cannot span between two pedestals. As a result, support surfaces are provided between the paver and the pedestal. See, e.g., U.S. Pat. No. 8,128,312. However, intermediate surfaces can be problematic for adding or removing heat from the paver surface. Exchanging heat with a paved surface is sometimes desirable. Heat is frequently provided to cold paved surfaces to melt snow on paved surfaces (e.g., a driveway of a home) in cold environments. Similarly, heat may be removed from a paved surface in hot environments to prevent discomfort to those walking bare-foot on the paved surface (e.g., a pool-side paved surface). As a result, there is a need for a pedestals, intermediate paver support surfaces, and related methods which facilitate the elevated, leveled, heated or cooled placement of a paved surface onto a subsurface.

SUMMARY OF THE INVENTION

It is an object of the present application to disclose apparatus and related methods for facilitating the elevated and leveled placement of a paver array onto a subsurface. In one embodiment, such an apparatus may be defined by two cooperating slope compensation panels that are disposed underneath a paver support pedestal. Each panel has a top surface and a bottom surface, wherein the bottom surface of one panel is configured for receiving the top surface of the other panel, and wherein the top surface is configured to be received by the bottom surface of the other panel or by the bottom of the pedestal. Suitably, the bottom surface of one panel features a slope relative to the top surface of the bottom panel so that the slopes of each panel compound or offset with the relative rotation of each panel with respect to each other. In one mode of operation, (A) the panels may be coupled and rotated relative to each other to compensate for a slope of an undersurface and (B) a pedestal may be positioned on the panels so that the pedestal's paver support surface is level relative to the subsurface.

It is also an object of the present application to disclose an anchoring mechanism for securing a paver to a pedestal. In one embodiment, the apparatus is a locking disk that may be positioned at the corners of a plurality of pedestals and inserted into a disk slot through the corners. In a preferred embodiment, the locking disk is a full circle that features a perforated break-away to assist in the unanchoring of the pavers whenever necessary. In operation, the locking disk works similar to the apparatus disclosed in by Knight, III et al. (U.S. Pat. No. 8,302,356) except the pavers are anchored with a full disk without a cutout. In another embodiment, the apparatus is a locking slider that may be positioned between two pavers and slid into slots in the corners of the two pavers, and then slid backward into so that the slider is positioned in the slot of four paver corners.

Finally, it is an object to provide an intermediate surface for supporting a small paver and that can also be used to exchange heat with the payers. In one embodiment, the apparatus may be a hextray defined by a frame with a hexagonal lattice for supporting pavers. The hextray preferably features a tubing track throughout the lattice to accommodate heat exchange tubing. In operation the hextray may be positioned above a pedestal or directly on a subsurface. In embodiment, the hex tray may be outfitted with insulation and a metal plate so that heat may be exchanged with pedestals via fluid passing through tubing installed throughout the hexagonal lattice. In a preferred embodiment, the hextray features a slot in its corners for receiving a locking disk or locking slider.

Other objectives and desires may become apparent to one of skill in the art after reading the below disclosure and viewing the associated figures.

BRIEF DESCRIPTION OF THE FIGURES

The manner in which these objectives and other desirable characteristics can be obtained is explained in the following description and attached figures in which:

FIG. **1** is a pedestal **1000**;

FIG. **2** is an exploded view of the pedestal **1000** over a base and two slope compensation panels **2000**;

FIG. **3** is an exploded view of the pedestal **1000** and the slope compensation panels **2000**;

FIG. **4** is a side-by-side view of a pedestal and a slope compensated pedestal;

FIG. **5** is a top perspective of a slope compensation panel **2000**;

FIG. **6** is a bottom perspective of a slope compensation panel;

FIG. **7** is a top view of the slope compensation panel

FIG. **8** is a bottom view of the slope compensation panel;

FIG. **9** is a side view of the slope compensation panel;

FIG. **10** is a rear-view of the slope compensation panel;

FIG. **11** is an environmental view of a pedestal array supporting a paver support panel;

FIG. **12** is a top view of FIG. **11**;

FIG. **13** is a perspective view of a paver support panel;

FIG. **14** is a top view of the paver support panel;

FIG. **14**A is a top view of the paver support panel;

FIG. **15** is an exploded view of a heat exchanger paver support panel;

FIG. **16** is a side view of FIG. **15**;

FIG. **17** is a perspective view of an aluminum tray;

FIG. **18** is a perspective view of a foam tray;

FIG. **19** is an environmental view of a locking disk;

FIG. **20** is a perspective view of a locking disk;

FIG. **21** is an environmental view of the locking disk;

FIG. **22** is a view of a locking slider;

FIG. **23** is a view of a locking slider;

FIG. **24** is a view of a locking slider;

FIG. **25** is a view of a locking slider; and,

FIG. **26** is a view of a locking slider.

It is to be noted, however, that the appended figures illustrate only typical embodiments of the disclosed assemblies, and therefore, are not to be considered limiting of their scope, for the disclosed assemblies may admit to other equally effective embodiments that will be appreciated by those reasonably skilled in the relevant arts. Also, figures are not necessarily made to scale.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Disclosed may be an apparatus and related methods for facilitating the elevated and leveled placement of a paver array onto a subsurface. In one embodiment, such an apparatus may be defined by two cooperating slope compensation panels that are disposed underneath a paver support pedestal. Each panel has a top surface and a bottom surface. Suitably, the bottom surface of a top panel features a slope relative to the top surface of a bottom panel so that the slopes of each panel compound or offset via the relative rotation of each panel with respect to each other. In one mode of operation, (A) the panels may be coupled and rotated relative to each other to compensate for a slope of an undersurface and (B) a pedestal may be positioned on the panels so that the pedestal's paver support surface is level relative to the subsurface. The details of the preferable panel are best disclosed by reference to FIGS. **1** through **10**.

It should be noted that, now, and throughout the application the terms "top" and "bottom" or "lower" and "upper", or any other orientation defining term should in no way be construed as limiting of the possible orientations of the panel **1000** (i.e., the panel **1000** may be positioned sideways, or in reversed vertical orientations even though the specification refers to a "top" and "bottom" parts).

FIG. **1** is a pedestal **1000** for elevating a paver surface. The pedestal **1000** is disclosed in U.S. Pub, App. No. 2013/0219809, and that document is hereby incorporated in its entirety. As disclosed in that document, the pedestal **100** has a slope compensation mechanism at its paver support surface, but not its base. In one embodiment, the disclosed apparatus is slope compensation disk that, when staked with a like disk, provides a footing for a pedestal that is configured to compensate for the slope of the subsurface.

Referring now to FIG. **4**, the pedestal **1000** may be positioned on a slope compensation pad **2000** defined by two or more slope compensation disks **2100**. FIGS. **2** and **3** illustrate how two panels might be stacked. As alluded to above, the panels **2100** are configured with a top surface plane that is angled relative to the plane of its bottom surface. The top surface plane of a first panel **2100** may interact with a bottom surface plane of a second panel to result in the compounding or offsetting of panels **2100** respective angle. As shown in the figure, the pedestal **1000** on the right is on a pad **2000** that has the angles of its panels **2100** offset while pedestal **1000** on the left is on a pad **2000** that has had the angles of the stacked panels **2100** compounded. FIG. **2** is a side view of the pedestal **1000** being positioned over two slope compensation panels **2000**.

FIGS. **5** and **6** respectively depict bottom and top perspective views of the slope compensation panel **2100**. FIGS. **7** through **10** respectively depict top, bottom, left side, and right side view of the compensation panel **2100**. As can be seen in the referenced drawings, the panel **2100** is generally a truncated tubiform and may comprise: feet **2110**; an outer wall **2120**; an established surface **2130** on at least a part of one end of the truncated tubiform; an established surface **2135** on the underside of the panel **2100**; an attachment receptacle **2140** on the surface **2130**; an inner wall **2150** accessible at the unclosed end of the component's **1** truncated tubiform; and the underside **2160** of the surface **2130**. FIGS. **5** through **10** suitably illustrate the above referenced components of the depicted panel **2100**.

The feet **2110**. The feet **2110** are best depicted in FIGS. **5**, **6**, **7**, **9**, and **10**. As seen in the cited figures, the feet **2110** may generally be a rim or portion thereof or distal projection around the open end of the panels **2100** truncated tubiform. As such, the feet **2110** feature lower **2112** (see FIG. **7**) surfaces. Operably, the feet **2110**, via the lower surface **2112**, may uprightly support a panel **2100** on a subsurface when such is positioned with its open end against the subsurface. In an alternate embodiment (see, e.g., FIG. **4**, the feet **2110** may be positioned on a base plate). Further, as discussed below, because the panel **2100** is configured to receive/retain items within its tubiform, the foot **2100** may further define a gripping means for facilitating the receipt/retention and/or removal of such items.

The outer wall **2120**. The outer wall **2120** is best depicted in FIGS. **5**, **6**, **9** and **10**. As seen in the figures, the outer wall **2120** may suitably be the external portion of the component's tubiform. As such, the outer wall **2120** generally extends between the foot **2110** and the surface **2130**. As is further depicted, the outer wall **2120** is suitably divided at a midpoint by a step **2122** into lower **2121** and upper **2123** sections. As seen in FIGS. **9** and **10**, the upper portion **2123** is offset from the lower portion **2121** in terms of the component's external diameter to generally define the step **2122** (see also FIG. **5**). As further seen in FIGS. **5**, **9**, and **10**, the step **2122** generally defines a plane that is oblique to the plane of the bottom surface **2135**. The oblique angle is generally referenced by angle **2124**. Preferably, the step **202** is disposed on the outer wall **200** at a location that is more toward the surface **2130** end of the panel **2100**, but the plane of the surface **2130** should suitably be above the plane of the step **2122** and the plane of the under surface **2135**.

When a panel is used in isolation, as discussed further below, the top surface **2130**, the step **2122**, and undersurface **2135** suitably serve only aesthetic purposes. However, when used in conjunction with a like panel **2100** (i.e., more than one panel **2100**) the step **2122** and surface serves as a means for altering the slope of the surface **2130** with respect to a subsurface. This functionality is discussed later below.

The to surface **2130** and bottom surface **2135**. The top and bottom surfaces **2130**, **2135** are best seen in FIGS. **5**, **6**, **7**, and **8**. Referring to these figures, the surface **2130** generally encloses one end of the component's **1** tubiform to establish a load bearing surface. The bottom surface, **2135** generally defines a plane on the bottom of the panel **2100**. Operably, the surface **2130** is adapted for receiving a pedestal (see e.g., FIG. **2**) whereby the pedestal is supported above a subsurface by the panel. For example, a panel **2100** used in isolation may, after being placed feet **2110** down on a subsurface or base plate, receive a pedestal, on its surface **2130** whereby the paver is above the subsurface.

The attachment receptacle **2140**. Referring now to FIGS. **5**, **6**, **7** and **8**, the surface **2130** features at least one mortise **211** and an attachment receptacle **2140**. The mortise **2131** is generally an aperture or depression around the periphery of the surface **2130**. The mortise **2131** are generally for receiving a corresponding tennon for securing a pedestal to the top surface **2130**. The attachment receptacle **2140** is generally a larger, central depression or aperture. The attachment receptacle **2140** is generally for receiving a corresponding extension **2141** from the bottom surface **2135** of a panel that has been stacked on the top surface.

The inner wall **2150**. The inner wall **2150** is best viewed in FIG. **6**. As seen in the figures, the inner wall **2150** may suitably be the internal portion of the panel's **2100** tubiform. As such, the inner wall **2150** generally extends internally between the foot **2110** and the underside **2135** of the surface **300**. As further depicted in the figures, the inner wall **2150** ends at the bottom surface **2135**. As further seen in FIGS. **5**, **6**, **7**, and **8** the bottom surface **2135** generally defines a plane that is oblique to the plane of the foot surface **102** and the plane of the top surface **2130**. The oblique angle has generally been identified by angle **2124**. Preferably, the plane of the feet surface **2111** should suitably be below the plane of the bottom surface **2135**.

FIG. **4** depicts two like panels coupled in stacked configurations. The panel **2100**, as best seen in FIG. **6**, features a receptacle which is generally defined by the inner wall **2150** and is adapted to femininely receive the surface **2130** end of a like panel **2100** until the bottom surface of the receiving panel (**2135**) interfaces with the top surface **2135** and the feet **2110** interface with the step **2122** of the inserting panel **2100**. Referring still to FIG. **4** through **10**, the orientation of the interface of the upper and lower surfaces **2130** and **2135** may be manipulated to change the slope of the top surface **2100** of the receiving panel **2100** with respect the feet plane **2111** of the lower panel **2100**. The stated change in slope can be viewed by comparing the rotated pad **2000** of FIG. **4**.

Referring first to FIG. **4**, the upper and lower panels **2100** on the right are oriented with respect to one another whereby the angles **2124** of the panels are approximately alternate interior angles with respect to the panel interface, the surface **2130** of the upper panel **2100**, and the lower surface **2111** of the bottom panel. (i.e., the surface **2130** of the upper panel and the lower surface **2111** of the feet of the bottom panel are parallel and the concentric axes of the panels are aligned). The pedestal on the right of FIG. **4**, can generally be obtained by identifying an origin point 0 on the pedestal of both panels and subsequently stacking the components whereby the origin 0 on the first panel **2100** is diametrically opposite (one-hundred and eighty degrees around the axis of the insertive panel **2100**) to the origin 0 of the second panel. Further, the angle **2125** in this configuration is suitably zero degrees whereby the surface **2130** of the receiving panel is parallel with the feet surface **2111** of the inserting panel **2100**.

Referring now to the left side of FIG. **4**, the receptive and insertive panels **2100** are oriented with respect to one another whereby the angles **2124** of the insertive and receptive components **1**A and **1**B compound (i.e., have the same vortex point and share a common reference plane). The above described second configuration typically occurs when the origin point 0 on the first panel is aligned with the origin point 0 on the second panel as depicted on the left in FIG. **4**. Further, the angle **2125** in this configuration is suitably the sum of angles **2124**.

Preferably, rotating the first panel around the axis of the second panel along the interface of the upper and lower surfaces **2130**, **2135** of the panels and between the above-identified configurations (i.e., rotating the origin of the first panel with respect to the axis of component **1**B) will vary the size of the angle **2125** between the upper surface **2130** of the upper panel and the relative horizontal. Suitably, a maximum degree for the angle **2125** will be obtained in the identified left configuration of FIG. **4**, a zero degree will be obtained as identified in the right configuration of FIG. **4**, and an intermediate angle may be elected via positioning the origin of the first panel between zero or one hundred eighty degrees relative to the origin and axis of the second component. Referring again to FIGS. **9** and **10**, in the present embodiment the angles **2124** are approximately 1 degree whereby the angle **2125** may vary from between 0 and two degrees. Subject thereto, the angles need not be limited to 1 degree, but rather it is preferable that the angles be in a range of about 0 to 5 degrees whereby the resulting angle **2125** may be selected to between a range of about 0 and 10 degrees depending on the circumstances.

The components of the pad **2000** being or composing a paver load bearing apparatus, slipresistant mechanism, noise dampening mechanism, and protective buffering to the substrate, should preferably be fashioned out of materials that are capable of these functions. As the weight of a paver may vary from extraordinarily heavy to very light, the materials which may be acceptable for fabricating the components will typically vary according to the applicable paver to be supported thereon the pads. Depending on the circumstance, such materials will be readily known to one of skill in the art, and may include, without being limited to: plastics, polymers, PVC, polypropylene, polyethylene; metals; woods; ceramics; composites and other synthetic or natural materials whether molded, extruded, stamped or otherwise fabricated.

Similarly, the components of the assemblies being or composing a paver load bearing apparatus should preferably be dimensioned to a size that renders the assemblies capable of retaining a paver. As the size of a paver may vary from big to little, the physical dimensions of the components will typically vary according to the applicable paver to be supported thereon the apparatus. Depending on the circumstance, such dimensions will be readily known to one of skill in the art, and may include, without being limited to a cap having an diameter spanning of 1.36 inches. The dependence of the size and dimensions of the component apply equally well to the other aspects and parts of this disclosure.

A slope compensation pad **2000** comprised of an above disclosed panels may be used to compensate for variations in the slope of the undersurface with regard to the leveling of a paver surface via a pedestal. For example, the method may comprise the following steps: obtaining a plurality of components comprising a structure having an undersurface and a top surface, said under surface configured to interface with the top surface of a like component; insertably coupling two of said components whereby the under surface of the receptive component interfaces with the top surface of the insertive component; manipulating the orientation of the insertive component with respect to the receptive component along the interface; and, providing a pedestal to the support surface.

As alluded to above, the disclosed assembly may used for establishing a level paver surface over a sloped subsurface. FIG. **21**A depicts a side view of the assembly **2000** and illustrates one mode establishing such leveled surface. Referring first to FIGS. **21**A and **21**B, the threaded insert **3200** suitably features a concave surface **3240** and the cap **3200** suitably features a convex surface **3230** whereby the slope of the paver support surface **3230** may be skewed in any direction relative to the plane of the foot **3110** of the base **3100** via sliding the convex surface **3230** of the cap **3200** along the concave surface **3240** of the insert **3200**. In one embodiment, the paver support surfaces **3210** of four assemblies **4000** positioned at the four corners of a square paver will self level with respect to one another under the weight of the pavers installed thereon the assemblies **2000**.

FIGS. **11** and **12** depict a plurality of hextrays **7000** installed on top of a plurality of paver pedestals. FIG. **13** is a perspective view of a hextray **7000**, which is an intermediate paver support surface. FIG. **14** is a top view of the hextray **7000** of FIG. **13**. In operation, a hextray **7000** may be provided to a paver pedestal in the manner of a large paver and as shown in FIGS. **11** and **12** and small pavers deposited thereon in an array. In an alternate embodiment, the hextray **7000** may be placed directly on the subsurface to provide a larger footprint for said small pavers.

Referring to FIG. **13**, the hextray **7000** is generally square and defined by a frame **7100** and a hexagon lattice **7200**. As shown in FIGS. **13** and **14**, the hextray **7000** features a tubing track **7300** and all of the hexagons in the hexagon lattice **7200** define an aperture through the hextray **7000** except the center hexagon **7310** (See the shaded portion of FIG. **14**A). In one embodiment, the frame **7100** has holes or other apertures in its corner for securement to a pedestal as described in U.S. Pat. No. 7,140,156 (issued Nov. 28, 2006). As discussed later, each corner of the hextray **7000** features a slot for receiving a locking disk or a locking slider (see FIG. **19**).

It should be noted: although the locking hextray **7000** is depicted as a square, any number of suitable shapes may be used. Such shapes will be known by those of skill in the art, and may include, but should not be limited to, squares, rectangles and other quadrilaterals. Also, the hextray should be constructed of suitable material. Such materials will be readily known to one of skill in the art, and may include, without being limited to: plastics, polymers, PVC, polypropylene, polyethylene; metals; woods; ceramics; composites and other synthetic or natural materials whether molded, extruded, stamped or otherwise fabricated. Finally, it should further be noted that, the dimensions of the hextray **7000** will vary with the size of the paver to be retained by the pedestal. In particular, the height of the projections may vary depending on the thickness of a paver, e.g. in a range of about 0 to 100 inches.

In a preferred embodiment, the hextray **7000** may be used to provide a heat exchanger to a paver for heating or cooling a paver surface. FIG. **15** is an exploded view of a hextray with a heat exchange configuration. FIG. **16** is a side view of the exploded hextray **7000** configuration. As shown, insulation (shown in FIG. **18**) may be provided to the bottom of the hex board and secured to the hextray **7000** via a screw with large threads for gripping the insulation and retaining the insulation against the hextray **7000**. Referring to FIG. **18**, the insulation is a pad with hexagonal protrusions that insert into the hexagonal apertures of the hexagon lattice. An aluminum or other heat conducting metal plate with tubing lanes may suitably be positioned on top of the hextray so that the tubing lanes are disposed within the tubing track of the hextray **7000** (see FIG. **19**). Tubing (not shown) may be provided through the tubing lanes and connected to a hot or cold water source and discharge. Finally a paver may be positioned above the tubing and aluminum plate.

When constructed as shown in FIGS. **15** and **16**, the hextray operates as a heat exchanger for the paver. For cooling a paver surface, cool water may be provided to the tubing so that heat may be conducted through the paver surface, along the heat conducting plate and into the water. For heating a paver surface, hot water may be provided to the tubing for the opposite heat flow. Suitably, the insulation keeps heat from being lost below the hextray **7000**.

Although water through tubing is described as the heat transfer mechanism, in an alternate embodiment, a refrigeration unit may be applied to the hextray. In a preferred embodiment, the refrigeration unit is similar to the one disclosed in U.S. Pub. Pat. App. No. 2012/0298331 (published Nov. 29, 2012). In a preferred embodiment, the refrigeration will comprise an aluminum plate with capillary heat exchangers, wherein the plate features hexagonal male inserts that will register in the hexagonal holes of hextray. In other words, the system may be outfitted with a heat exchanging aluminum plate or heat exchanging panel that will fit and align with the hexagonal structures of the tray.

FIGS. **20** and **21** are respectively a view of a locking disk **5000** for securing tiles and an environmental view of the same. As shown in FIG. **20**, the disk is circular and features a screw for anchoring the disk **5000** to a pedestal. As shown, the disk **5000** suitably features a break-away portion **5100**, with perforation so that said portion **5100** may be broken off or folded away. In general, the disk **5000** may be inserted into corner slots of four adjacent tiles and secured to a pedestal, as shown in FIG. **21**. Suitably, the disk **5000** feature indicia so that a user may, by looking between two adjacent tiles, identify when the disk is properly positioned. In one embodiment, the disk may feature teeth for a screwdriver (Phillips or flat head) so that the disk **5000** can be turned when in installed between pavers. A screw may be provided through the center of the disk for anchoring the disk to the pedestal. When the break-away portion of the disk is broken, bent or folded along the perforations, the locking disk suitably operates like the anchoring washer disclosed by U.S. Pat. No. 8,302,356 (issued Nov. 6, 2012), and that patent is hereby incorporated by reference. In a preferred embodiment, the disk **5000** is constructed of plastic.

Instead of a locking disk or anchoring pavers or tiles to the support surface of a pedestal, sliding attachment may be used for that purpose. FIGS. **22** through **25** respectively illustrate perspective, alternate perspective, top, and side views of an attachment for a paver support surface of a pedestal **6000**. Referring to these figures, the attachment **6000** is generally a disc adapted for placement within an attachment receptacle of a pedestal's paver support surface whereby the disc and pedestal surface establish a paver support plane. The attachment **6000** is preferably retained within the receptacle via the locking means **6100** deflectively inserting into an aperture until its nibs snap into restrictive interface with the rim of the aperture for restricting the removal of the attachment **6000**. As seen in FIGS. **22** through **25** the attachment features projections **6200** that operate to divide the surface **300** into evenly spaced paver receptacles whereby pavers provided to the pedestal may be uniformly oriented and spaced. For example, a paver may be supported above a subsurface via: positioning a pedestal on a subsurface; installing the attachment **6000** on the pedestal's support surface in the manner disclosed above, rotating the attachment **6000** until the orientation of the projections **6200** align with planned paver surface, and providing a corner of the paver to the surface support surface whereby the sides of the paver abut the projections **6200**. See also FIG. **26** wherein the depicted pavers **10** are supported, spaced, and oriented by a component fitted with the attachment **6000**. In a preferred embodiment, the spacers **6200** define a spacer cross **6400** for dividing the paver support surface of a pedestal into quadrants.

Referring now to FIG. **26**, a slider **6300** may suitably be positioned on the projections **6200** so that the slider may suitably be provided to a slot in a paver corner whereby the paver is anchored to the pedestal. Wither reference to FIGS. **22** and **23**, the slider **6300** may be slidable between three locations: (1) a first side of the spacer cross **6400** (FIG. **23**); (2) the center of the spacer cross **6400** (FIG. **22**); and (3) the opposite side of the spacer cross **6400** (opposite of FIG. **23**). Referring again to FIG. **26**, two pavers may be provided to the first side of the paver cross **6400**, the slider slid into the first position, two pavers may be placed on the other side of the paver cross **6400** and the slider **6300** slid to the center position whereby the pavers are anchored to the pedestal (FIG. **26**).

It should be noted that the dimensions of the projections **6200**, slider **6300** and spacer cross **6400** will vary depending on the desired paver spacing for the planned paver surface. It should be noted: although the locking means is depicted as a projection with a nib for restrictive interaction with an aperture rim, any number of suitable locking means may be used. Such locking means will be known by those of skill in the art, and may include, but should not be limited to, snaps, buttons, bolts, screw and nut mechanisms, and the like (e.g., a screw projecting downward for threaded entry into the aperture **117**). Such materials will be readily known to one of skill in the art, and may include, without being limited to: plastics, polymers, PVC, polypropylene, polyethylene; metals; woods; ceramics; composites and other synthetic or natural materials whether molded, extruded, stamped or otherwise fabricated. Finally, it should further be noted that, the dimensions of the attachment **6000** will vary with the size of the paver to be retained by the pedestal. In particular, the height of the projections may vary depending on the thickness of a paver, e.g. in a range of about 0 to 20 inches.

An apparatus comprised of an above disclosed component may be used to compensate for variations in the slope of the undersurface with regard to the leveling of a paver surface. It should be noted that FIGS. **1** through **26** and the associated description are of illustrative importance only. In other words, the depiction and descriptions of the present invention should not be construed as limiting of the subject matter in this application. Additional modifications may become apparent to one skilled in the art after reading this disclosure.

I claim:

1. A paver tray comprising:

a frame with at least one corner;

a hexagon lattice within the frame, said lattice defining a paver support surface on one side and an underside, wherein all of the hexagons in the hexagon lattice define hexagonal apertures except one center hexagon that is substantially solid;

a tubing track in the hexagon lattice; and,

a slot in the at least one corner for receiving a locking means.

2. The paver tray of claim **1** further comprising a locking disk installed in said slot.

3. The paver tray of claim **1** further comprising a locking slider installed in said slot.

4. The paver tray of claim **1** further configured to exchange heat with a paver.

5. The paver tray of claim **4** wherein:

insulation is attached to said underside of the hexagonal lattice via securement to said center hexagon.

6. The paver tray of claim **5** further comprising a heat conducting plate with at least one tubing lane deposited into said tubing track.

7. The paver tray of claim **6** wherein a paver is positioned on said heat conducting plate.

8. The paver tray of claim **1** installed on a pedestal.

9. The paver tray of claim **2** wherein the locking disk is defined by a disk with a break away portion.

10. The paver tray of claim **9** wherein the breakaway portion is defined by a perforated seam.

11. The paver tray of claim **1** wherein the locking means comprises:

a disk adapted for placement within an attachment receptacle of a paver support pedestal;

a spacer cross on said disk; and,

a slider that is slidably attached to said spacer cross.

12. The paver tray of claim **8** wherein said pedestal features a slope compensation pad defined by at least two slope compensation panels, each of said panels comprising:

a top surface that defines a first plane;

an underside surface that defines a second plane; and,

wherein said first plane and second plane are oblique relative to each other.

13. The paver tray of claim **12** wherein a first and second panel are stacked so that the top surface of the first panel interfaces with the bottom surface of the second panel.

14. The paver tray of claim **13**, wherein the plane of the top surface of the second panel and the plane of the bottom surface of the first panel are parallel.

15. The paver tray of claim **13**, wherein the plane of the top surface of the second panel and the plane of the bottom surface of the first panel are not parallel.

16. The paver tray of claim **13** wherein the first and second panel are rotatable relative to one another.

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