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(54) Title: FASTENING SYSTEM

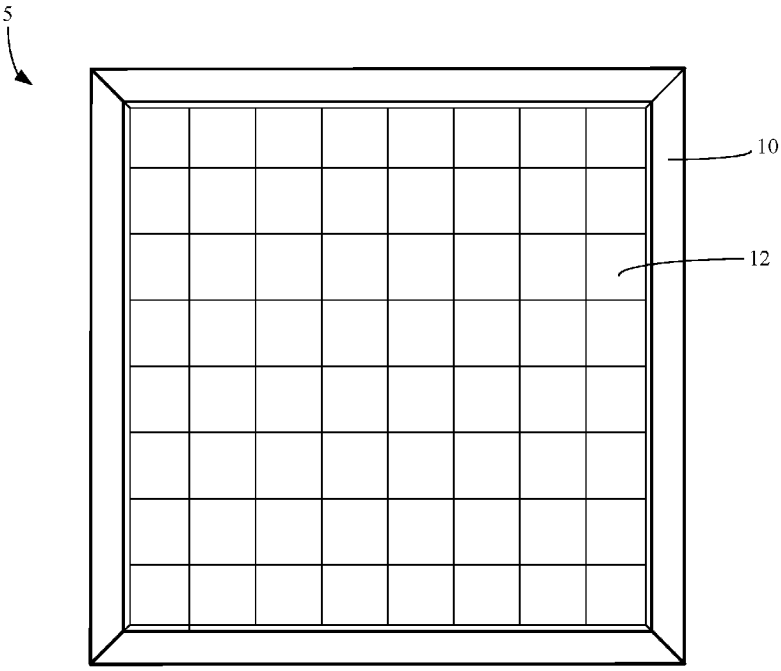

FIG. 1

(57) Abstract: A fastening system comprises a fastening mechanism having a transition member and a ramp member. The transition member has a lower planar element, and an upper planar element, and a central portion disposed therebetween. The ramp member has a lower planar component, a first upper planar component, a forwardly angled component disposed between the lower planar component and the first upper planar component, and a backwardly angled component extending outwardly from the first upper planar component. The ramp member upper planar component is disposed above the transition member upper planar element, and the transition member lower planar element is at least partially disposed above the ramp member lower planar member.

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FASTENING SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Patent Application No. 62/312,604, filed March 24, 2016, titled Tile Fastening System, the entire contents of which are incorporated herein by reference.

BACKGROUND

[0002] Recreational tiles are frequently used as flooring in a number applications ranging from athletic flooring to playground surfaces and beyond. Among other uses, tiles may be used as a court surface, for example, or as a sub-surface to which synthetic turf may be attached. Recreational tiles are often made of plastic, but may also be manufactured from other materials. One such tile is illustrated in U.S. Patent No. 5,628,160 to Küng. Recreational tiles have many advantages over hard surfaces such as concrete, including the ability of the tiles to provide a more forgiving surface which may help to prevent player injuries.

[0003] Typically, a plurality of tiles is connected together via a tile fastening mechanism in order to form the desired surface. To prevent the surface from shifting from its intended position, several of the tiles may be secured to the ground surface (e.g., concrete, rock, etc.) using pins. However, the tiles naturally expand and contract as the temperature fluctuates, e.g., due to the freeze/thaw cycle, or as a result of pressure changes on the tiles (e.g., movement across the tiles). As the tiles expand and contract, the surface naturally shifts, if only slightly. The pins, which are intended to prevent the shifting, cause the tiles to buckle. Occasionally, the pin will rip through the tile to which it is secured. Tiles may be damaged as a result. If a damaged tile is in the middle of the surface, it can take significant effort and cost to remove the old tile and replace it with a new one.

[0004] In addition to the broken tiles due to flawed tile-to-surface fastening mechanisms, tile systems are prone to thievery. Tile systems are not inexpensive to install. The tiles themselves require expensive molding and superior materials, making the tiles costly to produce, and therefore, buy. Moreover, the surface upon which the tiles are installed must be properly prepared, requiring earth movers to ensure a flat surface, and laying rock and/or concrete so that the tiles are laid upon a hard surface. Due to the expense of putting in a tile system, many people who would otherwise like to have such a system cannot afford one. Unfortunately, due to the fastening mechanisms currently employed, stealing tiles from existing systems is quite easy. Thieves may simply walk up to a tile system and unsnap one or more tiles from the system.

[0005] It would therefore be desirable to have a tile fastening system that allows the tiles to flex and shift naturally without causing damage to the tiles, and to prevent thieves from being able to steal tiles from existing systems.

SUMMARY

[0006] The following presents a simplified summary of the invention in order to provide a basic understanding of some aspects of the invention. This summary is not an extensive overview of the invention. It is not intended to identify critical elements of the invention or to delineate the scope of the invention. Its sole purpose is to present some concepts of the invention in a simplified form as a prelude to the more detailed description that is presented elsewhere herein.

[0007] In one embodiment, a tile fastening system includes a tile fastening system comprises a fastening mechanism having a transition member and a ramp member. The transition member has a lower planar element, and an upper planar element, and a central portion disposed therebetween. The ramp member has a lower planar component, a first upper planar component,

a forwardly angled component disposed between the lower planar component and the first upper planar component, and a backwardly angled component extending outwardly from the first upper planar component. The ramp member upper planar component is disposed above the transition member upper planar element, and the transition member lower planar element is at least partially disposed above the ramp member lower planar member.

[0008] In another embodiment, a fastening system comprises a tile having a tile surface and disposed above a subsurface, and a fastening mechanism. The fastening mechanism includes a transition member and a ramp member. The transition member includes a lower planar element, and an upper planar element, and a central portion disposed between the lower planar element and the upper planar element. The ramp member has a lower planar component, a first upper planar component, a forwardly angled component disposed between the lower planar component and the first upper planar component, and a backwardly angled component extending outwardly from the first upper planar component. The ramp member lower planar member is disposed above the subsurface. The transition member upper planar element is substantially adjacent the tile surface. The ramp member upper planar member is disposed above the transition member upper planar element. And, the transition member lower planar element is at least partially disposed above the ramp member lower planar member. A fastener inserted through corresponding apertures in the transition member lower planar element and the ramp member lower planar component secures the fastening mechanism to the subsurface.

[0009] In still another embodiment, a fastening system includes a tile having a tile surface, the tile being disposed above a subsurface; and a fastening mechanism. The fastening mechanism includes a transition member and a ramp member. The transition member has a lower planar element, and an upper planar element, and an angled central portion disposed

between the lower planar element and the upper planar element. The ramp member has a lower planar component, a first upper planar component, a forwardly angled component disposed between the lower planar component and the first upper planar component, a backwardly angled component extending outwardly from the first upper planar component, and a second upper planar component extending inwardly from the backwardly angled component, a first space being formed between the first upper planar component and the second upper planar component. The ramp member lower planar component is disposed above the subsurface, the transition member upper planar element is disposed in the first space; and the transition member lower planar element is at least partially disposed above the ramp member lower planar member.

[0010] In still yet another embodiment, a fastening system includes a fastening mechanism having a top surface; a forwardly angled portion extending from a back side of the top surface; a backwardly angled portion extending from a front side of the top surface; and respective bottom surfaces being formed beneath the forwardly and backwardly angled portions. A tongue extends from a first side of the top surface, and the tongue is offset from the top surface, and a groove is formed under a second side of the top surface. A fastener mount extends from a first side of the bottom surface of the forwardly angled portion; and a channel is formed in a second side of the bottom surface of the forwardly angled portion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The drawings illustrate exemplary embodiments of the invention and various objects and features thereof. Reference to the drawings may, as a part of the specification, aid in a complete understanding of the invention.

[0012] FIG. 1 is a top view of a tile system incorporating a tile fastening mechanism according to an embodiment of the invention.

[0013] FIG. 1A is a top view of a tile system incorporating a tile fastening mechanism according to another embodiment of the invention

[0014] FIG. 2 is a side cross-section view of a tile fastening mechanism according to one embodiment of the invention.

[0015] FIG. 3 is a top view of the tile fastening mechanism of FIG. 2.

[0016] FIG. 4 is a side cross-section view of a tile fastening mechanism according to another embodiment of the invention.

[0017] FIG. 5 is a perspective view of a tile fastening mechanism according to still another embodiment of the invention.

[0018] FIG. 6 is a top view of the tile fastening mechanism of FIG. 5.

[0019] FIG. 7a is a left side view of the tile fastening mechanism of FIG. 5.

[0020] FIG. 7b is a right side view of the tile fastening mechanism of FIG. 5.

[0021] FIG. 7c is a section view along Section B-B of the tile fastening mechanism of FIG. 6.

[0022] FIG. 7d is a section view along Section A-A of the tile fastening mechanism of FIG. 6.

[0023] FIG. 7e is a front view of the tile fastening mechanism of FIG. 5.

DETAILED DESCRIPTION

[0024] FIGs. 1-4 illustrate various embodiments of the tile fastening system 100. Beginning with FIG. 1, a tile system 5 includes a plurality of tiles 12 and a fastening mechanism 10. The tile system 5 illustrated in FIG. 1 includes a square 8x8 grid of tiles 12 arranged in a

simple square. Those of skill in the art shall understand that tile systems 5 often come in a variety of shapes and sizes, and are not always (and in fact, are often not) a square surface. The fastening mechanism 10 may thus be adapted as necessary according to the various shape and size of the tile grid. FIG. 1A roughly illustrates a system 5' that incorporates a non-square grid of tiles 12 with a fastening mechanism 10 arranged there-around.

[0025] Moving on to FIGs. 2 and 3, an embodiment of a tile system 5 having a fastening mechanism 10 engaged with one or more tiles 12. The fastening mechanism 10 and the tiles 12 are disposed on a prepared subsurface 11, such as concrete. The fastening mechanism 10 includes an inner transition member 13 and an outer ramp member 16.

[0026] The inner transition member 13 include a lower planar element 13A, an upper planar element 13B, and a central portion 13C disposed between the upper and lower planar elements 13B and 13A, respectively. The central portal 13C may be angled between the lower planar element 13A and the upper planar element 13B to form a space 22, which, as described in greater detail below, allows for expansion and contraction of the tile members 12. The upper and lower planar elements 13A and 13B may be substantially parallel to the top face of the subsurface 11.

[0027] The lower planar element 13A may have a length sufficient to receive a fastener 15, such as a tapcon or concrete nail. Other types of fasteners for anchoring the fastening mechanism 10 to the subsurface 11 may be used as shall be understood by those of skill in the art. The fastener 15 may be inserted through an aperture in the lower planar element 13A (and a respective aperture in a lower planar portion 17 of the ramp member 16) to secure the fastening mechanism 10 to the subsurface 11.

[0028] The upper planar element 13B extends a distance D sufficient to engage with the

outer ramp member 16 and the edge or the tile 12 as described below.

[0029] The outer ramp member 16 includes a lower planar member 17, a first upper planar member 19, a second upper planar member 21, a forwardly angled member 18 disposed between the lower planar member 17 and the first upper planar member 19, and a backwardly angled member 20 disposed between the first upper planar member 19 and the second upper planar member 21. The lower planar member 17 sits atop the subsurface 11, and extends inwardly in a direction of the tile 12. An inside end 17A of the lower planar member 17 extends inwardly such that it engaged with the lower planar element 13A of the transition member 13. As noted above, a fastening mechanism 15 may be inserted through corresponding apertures in the lower planar element 13A of the transition member 13 and the lower planar member 17 of the ramp member 16 to secure the fastening mechanism 10 to the subsurface 11.

[0030] The first upper planar member 19 extends substantially horizontally along the transition member upper planar element 13B. A first edge 19A of the first upper planar member may extend beyond an outer edge of the transition member upper planar element 13B such that the forwardly angled member 18 has a slope of approximately 1:12, although other slopes may be acceptable or appropriate.

[0031] The backwardly angled member 20 extends downwardly at an angle to meet up with the second upper planar member 21, which extends inwardly to form a space between the first upper planar member 19 and the second upper planar member 21. The second upper planar member 21 is disposed substantially atop the tile 12. The transition member upper planar element 13B is disposed in the space between the first upper planar member 19 and the second upper planar member 21.

[0032] Thus, as shown in FIG. 2, the tile 12 sits atop the subsurface 11. The fastening

mechanism 10 is fastened to the subsurface 11 and engages with the tile 12 via the transition member 13 and the ramp member 16. The tile 12, however, is not fastened directly to the subsystem 12. The tile 12 may therefore expand and contract within the space 22 without buckling.

[0033] A probe gauge 14 may be inserted horizontally though an aperture in the angled element 13C. The probe gauge 14 may evaluate the position of the plastic tile 14. The probe gauge 14 may be configured to communicate (e.g., wirelessly) over a network to provide alerts, for example, when the tile(s) 12 have shifted a predetermined distance.

[0034] The forwardly and backwardly angled members 18 and 20, respectively, allow for a smooth transition from the tile surface 12 to the subsurface 11. In embodiments, the backwardly angled member 20 may be nearly imperceptible to a person walking atop the tile surface 12. Further, the ramp member 16 may thus be configured for compliance with the Americans with Disabilities Act of 1990 (ADA), as it will not be required to step up to access the tile surface 12.

[0035] FIG. 4 illustrates an alternative embodiment 5' of a fastening mechanism 10' which is substantially similar to fastening mechanism 10 except as shown as described. Corresponding numbers from FIG. 2 are given to similar elements in FIG. 4 (e.g., element 18 in FIG. 2 corresponds to element 18' in FIG. 4). As can be seen in FIG. 4, the ramp member 16' is nearly identical to the ramp member 16. Here, however, the ramp member 16' does not include a second upper planar member 21. The upper planar element 13B' is disposed directly on the top surface of the tile 12. The upper planar member 19' runs adjacent the upper planar element 13B', and the backwardly angled member 20' directly abuts the top surface of the tile 12.

[0036] In use, multiple transition members 13 and ramp members 16 may be provided

around the entire edge of a tile surface 12 to keep the tiles in the desired location. The tiles 12 may snugly fit into the space 22 formed between the fastening mechanism 10 and the subsurface 11. The fastening mechanism 10 may impart an elastic force on the tile, which causes backwardly shaped component to press against the tile 12, as shown in the figures. However, the tiles 12 are allowed to expand and contract due to the opening 22 between the transition member 13, the subsurface 11, and the tile 12. As the upper planar element 13B of the transition member 13 extends beyond the edge of the tile 12 towards the center of the tile 12, the transition member 13 and the ramp member 16 remain in constant contact with the tile 12. However, the tiles cannot move away from the desired position due to the transition members 13 and the ramp members 16 being secured to the subsurface 11. Those of skill in the art will recognize that the flexibility that the disclosed fastening mechanism 10 gives to the tiles 12 is especially useful in areas where the freeze/thaw cycle may otherwise cause the tiles 12 to be in a constant shift away from the desired position.

[0037] Additionally, the fastening member 15 may be completely inaccessible once the system 5 is fully installed. Because the transition members 13 extend over the edge of the tile 12, the and the transition member 13 is secured to the subsurface 11 via an inaccessible fastening member 15, thieves will have difficulty reaching the edges of the tiles 12 in order to dismantle them from the outer edges. Therefore, once installed, it will be increasingly difficult to break apart the tiles 12. Thieves may thus be dissuaded from attempting to remove the tiles 12 from a system 5 incorporating the fastening mechanism 10 described herein.

[0038] The various components of the fastening mechanism 10 may be manufactured from any material. Particular materials, such as hard plastics or aluminum, may be preferable as understood by those of skill in the art. However, the materials are not limited to plastics.

[0039] FIGs. 5-7e illustrate still another embodiment 105 of the invention. Here, the fastening mechanism is a locking piece 110 configured to interact with other locking pieces 110 and tiles 12. Components of the locking piece 110 correspond with components of the fastening mechanism 10. For uniformity and brevity, reference numbers between 100 and 199 may be used to indicate parts generally corresponding to those discussed above numbered between 0 and 100 (e.g., surface 119 generally corresponds to surface 19), though with any noted or shown deviations.

[0040] The locking piece 110 may be manufactured as a single piece. Although many methods may be used as known to those of skill in the art, in one embodiment, the piece 110 may be molded (e.g., injection molded) using one or more materials such as a hard plastic. The locking piece 110 includes a top surface 119 extending substantially parallel to a subsurface. A forwardly angled portion 118 extends outwardly from the top surface 119 in a first direction, and a backwardly angled portion 120 extends outwardly from the top surface 119 in an opposing direction. The forwardly angled portion 118 includes a bottom surface 117 which extends inwardly under the forwardly angled portion 118 and abuts the subsurface. Likewise, the backwardly angled portion 120 includes a bottom surface 121 which extends inwardly under the backwardly angled portion 120 and abuts the surface of the tile 12. It shall be understood that the respective bottom surfaces 117 and 121 may be solid or hollowed out.

[0041] A space 122 (FIG. 7b) may be formed between the subsurface 11 and the bottom surface 121. The tile 12 is configured to fit within the space 122. The tile 12 may abut a front surface 123 of the bottom surface 117. Alternately, in order that the tile 12 may expand and contract due to changes in the environment (e.g., temperature, pressure, etc.), when installed, a gap (e.g., 1", 2", 3", etc.) may be formed between the wall 123 and the tile 12.

[0042] As noted above, each locking piece 110 is configured to interact with locking pieces 110 on both the right and left sides. To achieve such interact, each locking piece 110 has a tongue 130 extending from a side of the top surface 119 (e.g., the right side) and a corresponding groove 135 formed beneath the top surface 119 on the opposite side (e.g., the left side). The tongue 130 may be slightly offset from the top surface 119 such that it snugly fits into the groove 135 of a corresponding locking piece 110.

[0043] Each locking piece 110 is further configured to be secured to the subsurface 11. A fastening mount 140 may extend from one side (e.g., the left side) of the bottom surface 117 and may be configured so as to lay substantially flat against the subsurface. An aperture 145 may be formed in the mount 140 to receive a fastener (e.g., concrete screw, anchor, etc.). The locking piece 110 is thus secured to the subsurface by inserting a fastener through the aperture 145 and fastening as appropriate. A corresponding channel 150 may be formed into the other side (e.g., the right side) of the bottom surface 117 for receiving a fastening mount 140 of a corresponding locking piece 110. Therefore, the fasteners are covered up and inaccessible due to the installation of corresponding locking pieces 110. As understood by those of skill in the art, it may be beneficial to install locking pieces 110 in a clockwise direction around a grid of tiles 12.

[0044] The groove 135 and the channel 150 may allow for expansion and contraction of the locking pieces 110 due to, for example, changes in the environment. The tongue 130 and fastening mount 140 may be sufficiently sized such that even in extreme instances of expansion and contract, the various locking pieces 110 remain connected.

[0045] It shall be understood by those of skill in the art that additional pieces 110, such as corner pieces, may be similarly formed in order to connect two sides of locking pieces 110. Further, it shall be understood that in embodiments, it may be desirable for components to be

joined together at the point of installation rather than formed as a single piece. For example, in embodiments, a tile 12 may need to be cut to length, which would require that the locking piece 110 is also cut to length. Here, it may be desirable for the channel 130 to run the entire length of a locking piece 110. A furrow may run along the bottom surface 117 which may generally correspond to the width of the mount 140. Once the locking piece 110 is cut to the appropriate length, the mount 140 may be secured (e.g., using an adhesive) in the furrow such that it extends outwardly to receive a fastener as described above. The furrow may additionally function as the channel 150.

[0046] Many different arrangements of the various components depicted, as well as components not shown, are possible without departing from the spirit and scope of the present invention. Embodiments of the present invention have been described with the intent to be illustrative rather than restrictive. Alternative embodiments will become apparent to those skilled in the art that do not depart from its scope. A skilled artisan may develop alternative means of implementing the aforementioned improvements without departing from the scope of the present invention. Further, it will be understood that certain features and subcombinations are of utility and may be employed within the scope of the disclosure. Further, various steps set forth herein may be carried out in orders that differ from those set forth herein without depart from the scope of the present methods. This specification shall not be restricted to the above embodiments.

[0047] Any units of measurement provided herein are exemplary in nature only and are not meant to specifically define the dimensions of the system. Other dimensions may be appropriate or desirable.

CLAIMS

1. A fastening system comprising:

a tile having a tile surface, the tile being disposed above a subsurface; and

a fastening mechanism, the fastening mechanism comprising:

a transition member having a lower planar element, and an upper planar element, and a central portion disposed between the lower planar element and the upper planar element; and

a ramp member having a lower planar component, a first upper planar component, a forwardly angled component disposed between the lower planar component and the first upper planar component, and a backwardly angled component extending outwardly from the first upper planar component;

wherein:

the ramp member lower planar member is disposed above the subsurface;

the transition member upper planar element is substantially adjacent the tile surface;

the ramp member upper planar member is disposed above the transition member upper planar element;

the transition member lower planar element is at least partially disposed above the ramp member lower planar member;

a fastener inserted through corresponding apertures in the transition member lower planar element and the ramp member lower planar component to secure the fastening mechanism to the subsurface.

2. The system of claim 1, wherein the tile is not secured to the subsurface; and wherein a

first space formed between the transition member central portion and an edge of the tile permits expansion and contraction of the tile in the first space.

3. The system of claim 2, further comprising a probe gauge, wherein the probe gauge is inserted through an aperture in the transition member central portion.

4. The system of claim 1, wherein the ramp member further comprises a second upper planar component extending inwardly from the backwardly angled component forming a second space between the first upper planar component and the second upper planar component; and wherein the transition member upper planar element is disposed in the second space.

5. The system of claim 4, wherein the slope of the forwardly angled component is approximately 1:12.

6. The system of claim 1, wherein the system comprises a plurality of tiles fastened together to form a network of tiles, and wherein the fastening mechanism is disposed around the perimeter of the plurality of tiles.

7. A fastening system comprising:

a tile having a tile surface, the tile being disposed above a subsurface; and

a fastening mechanism, the fastening mechanism comprising:

a transition member having a lower planar element, and an upper planar element, and an angled central portion disposed between the lower planar element and the upper planar element; and

a ramp member having a lower planar component, a first upper planar component, a forwardly angled component disposed between the lower planar

component and the first upper planar component, a backwardly angled component extending outwardly from the first upper planar component, and a second upper planar component extending inwardly from the backwardly angled component, a first space being formed between the first upper planar component and the second upper planar component;

wherein:

the ramp member lower planar component is disposed above the subsurface;

the transition member upper planar element is disposed in the first space; and

the transition member lower planar element is at least partially disposed above the ramp member lower planar member.

8. The system of claim 7, wherein the tile is not secured to the subsurface; and wherein a second space formed between the transition member central portion and an edge of the tile permits expansion and contraction of the tile in the second space.

9. The system of claim 8, further comprising a probe gauge, wherein the probe gauge is inserted through an aperture in the transition member central portion.

10. The system of claim 8, wherein the fastening mechanism imparts an elastic force on the tile, the force causing the second upper planar component and an end of the backwardly shaped component to press against the tile surface.

11. The system of claim 7, wherein a fastener is inserted through corresponding apertures in the transition member lower planar element and the ramp member lower planar component to

secure the fastening mechanism to the subsurface, the fastener being covered by the ramp member upper planar component.

12. The system of claim 7, wherein the system comprises a plurality of tiles fastened together to form a network of tiles, and wherein the fastening mechanism is disposed around the perimeter of the plurality of tiles.

13. A fastening system comprising:

a fastening mechanism, comprising:

a top surface;

a forwardly angled portion extending from a back side of the top surface

a backwardly angled portion extending from a front side of the top surface; and

respective bottom surfaces being formed beneath the forwardly and backwardly angled portions;

wherein:

a tongue extends from a first side of the top surface, the tongue being offset from the top surface;

a groove is formed under a second side of the top surface;

a fastener mount extends from a first side of the bottom surface of the forwardly angled portion; and

a channel is formed in a second side of the bottom surface of the forwardly angled portion.

14. The fastening system of claim 13, comprising two fastening mechanisms, wherein the tongue of a first fastening mechanism is received into the groove of a second fastening

mechanism, and the fastener mount of the second fastening mechanism is received into the channel of the first fastening mechanism.

15. The fastening system of claim 13, wherein:

the fastening mechanism is disposed above a subsurface;

the bottom surface of the forwardly angled portion lays substantially flat against the subsurface;

a space is formed between the subsurface and the bottom surface of the backwardly angled portion, the space being configured to receive a tile.

16. The fastening system of claim 15, wherein the system comprises a plurality of tiles fastened together to form a network of tiles, and wherein the fastening mechanism is disposed around the perimeter of the plurality of tiles.

17. The fastening system of claim 16, wherein an aperture is formed in the fastener mount for receiving a fastener to secured the fastening mechanism to the subsurface, the fastener being inaccessible in an installation configuration.

18. The fastening system of claim 17, wherein the plurality of tiles is not secured to the subsurface.

19. The fastening system of claim 18, wherein the fastening mechanism is formed of a single construction.

20. The fastening mechanism of claim 19, wherein the fastening mechanism is injection molded plastic.

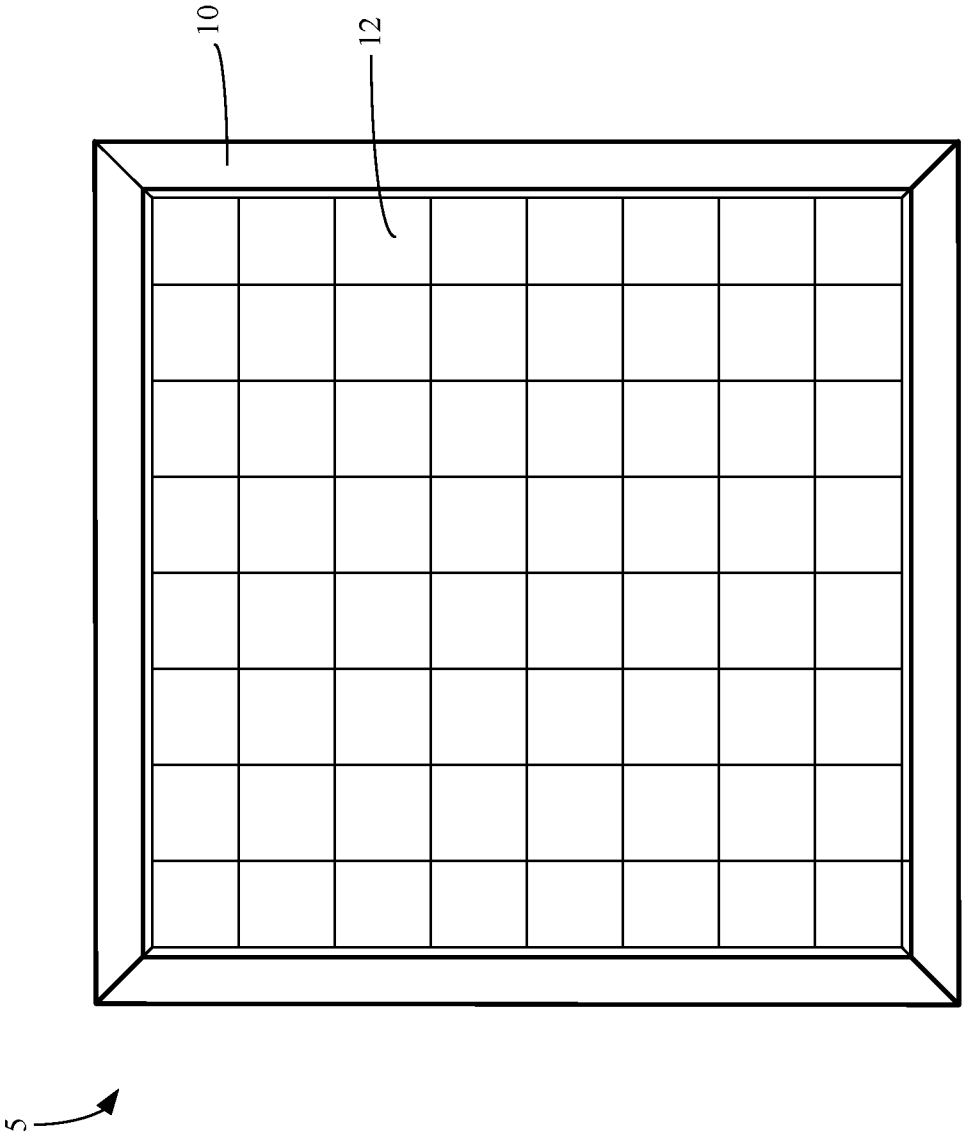

FIG. 1

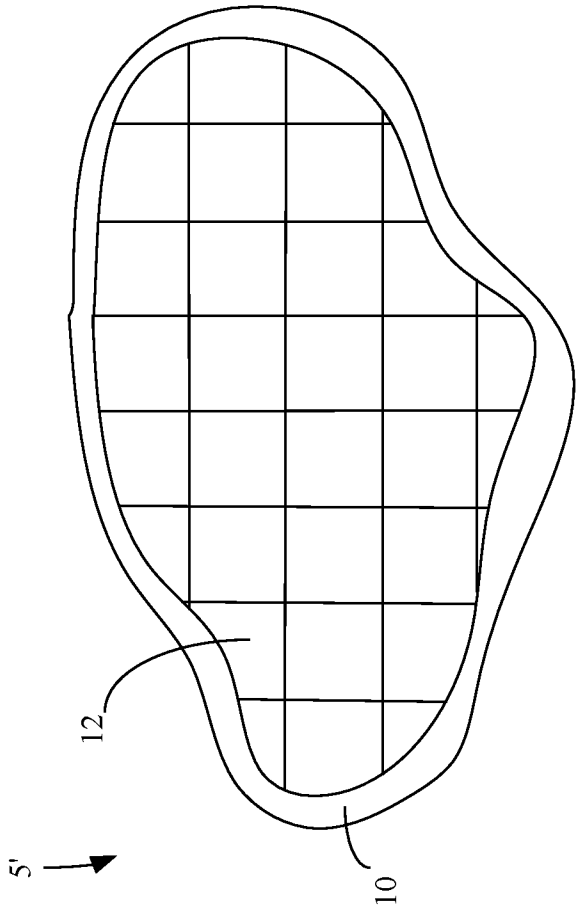

FIG. 1A

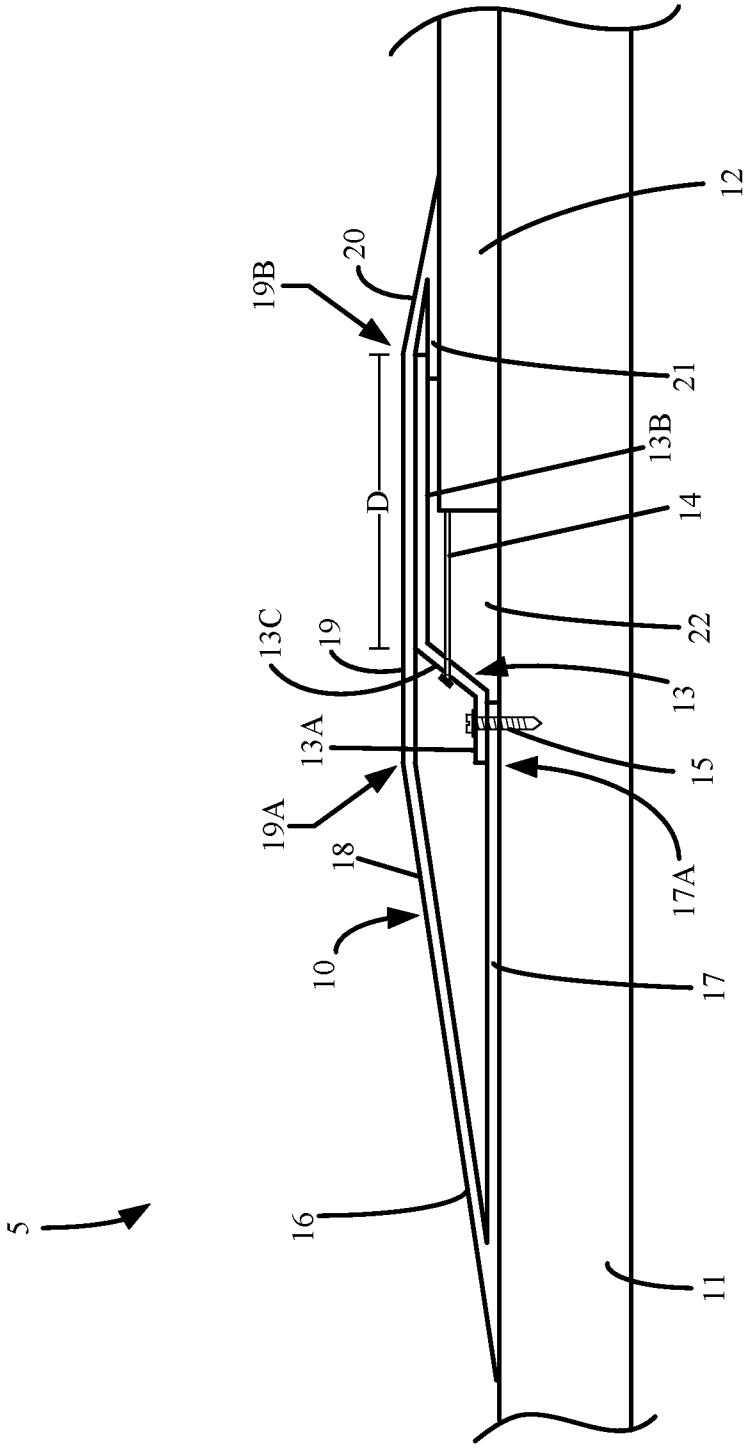

FIG. 2

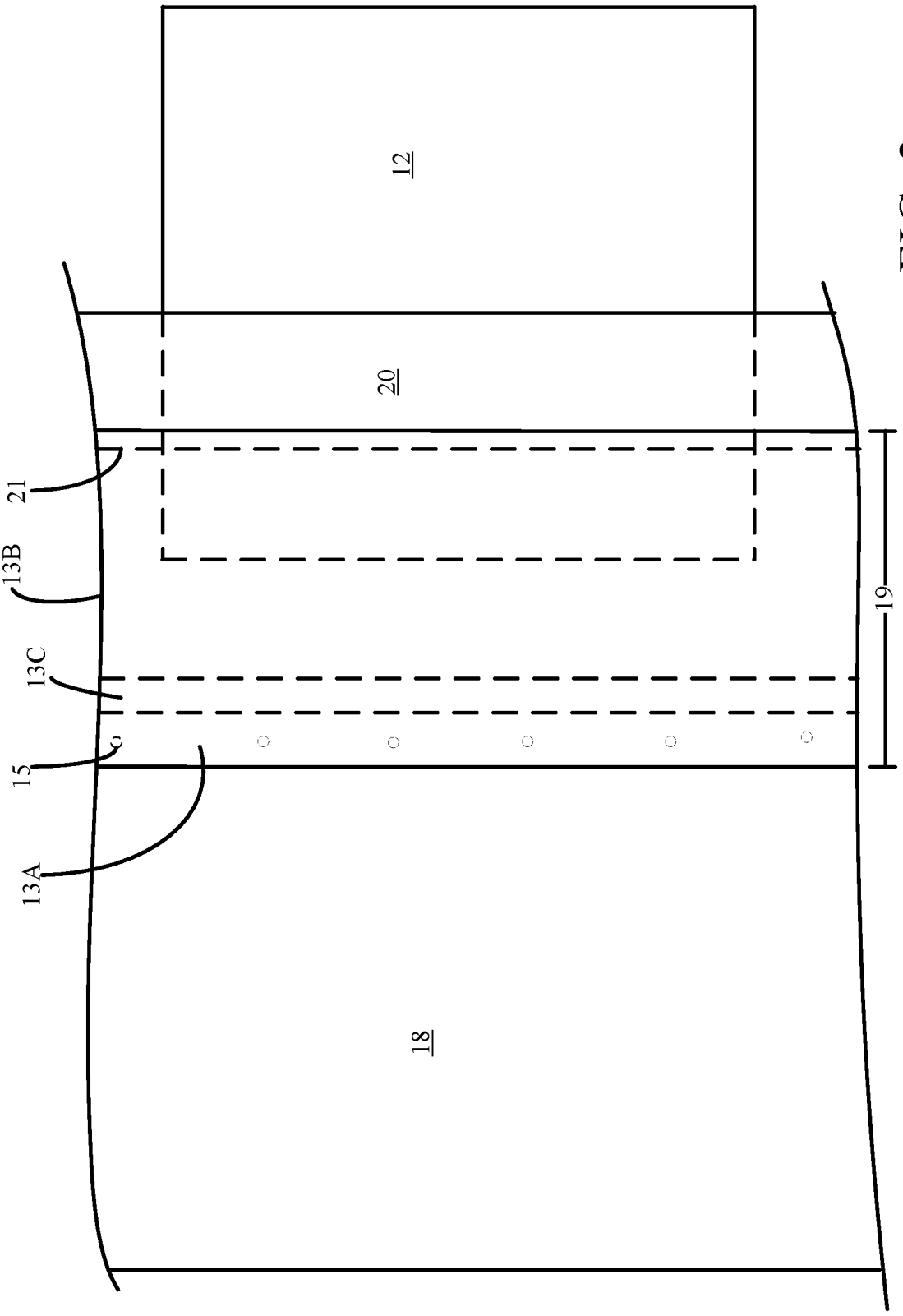

FIG. 3

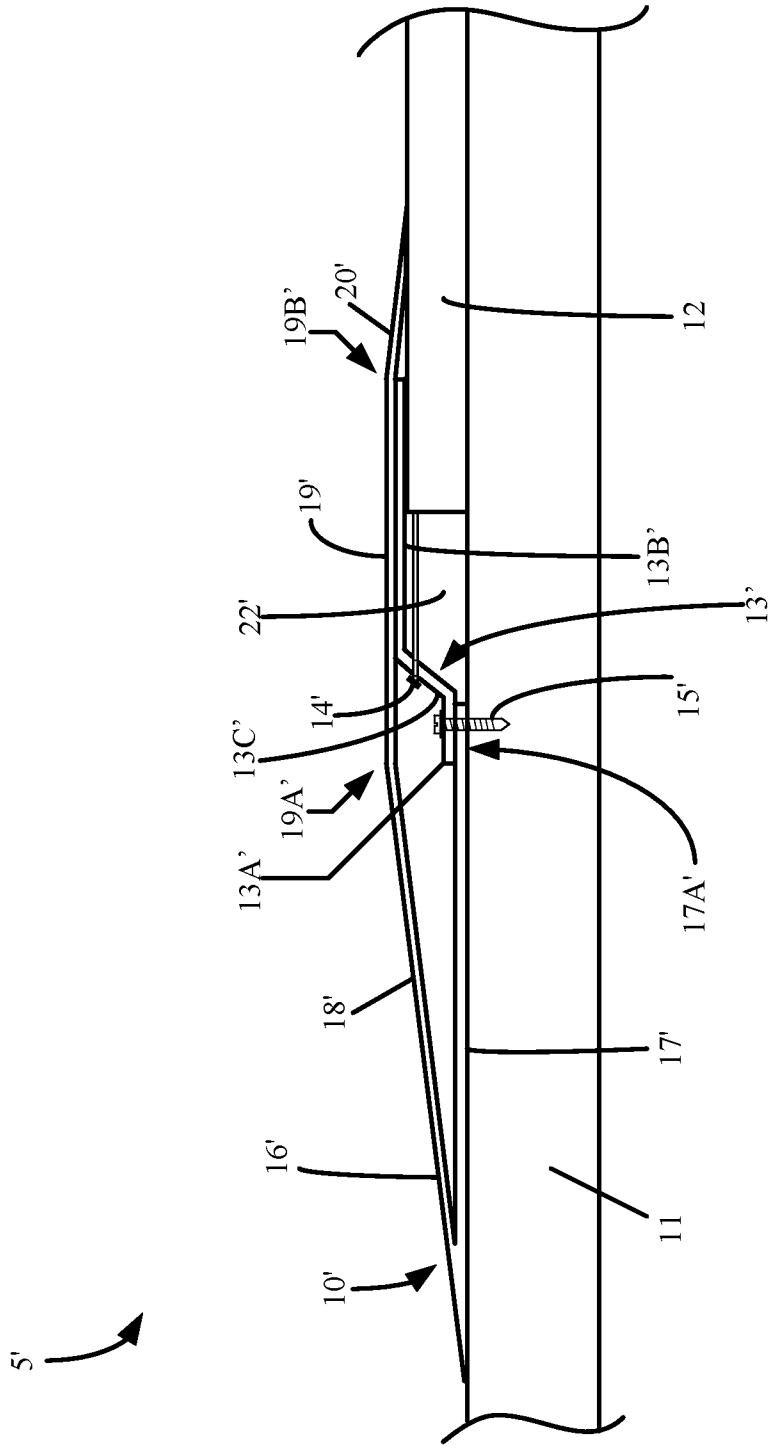

FIG. 4

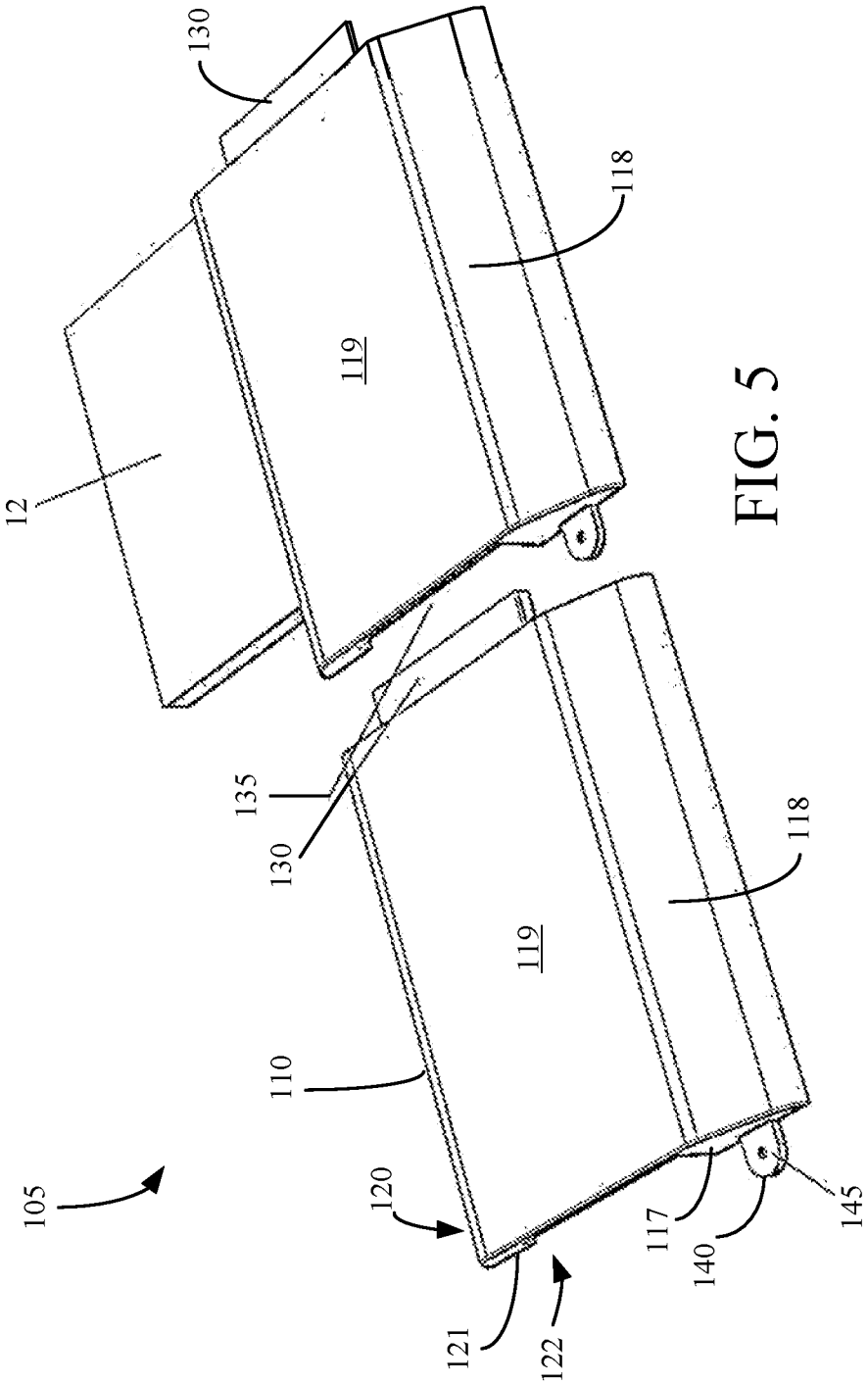

FIG. 5

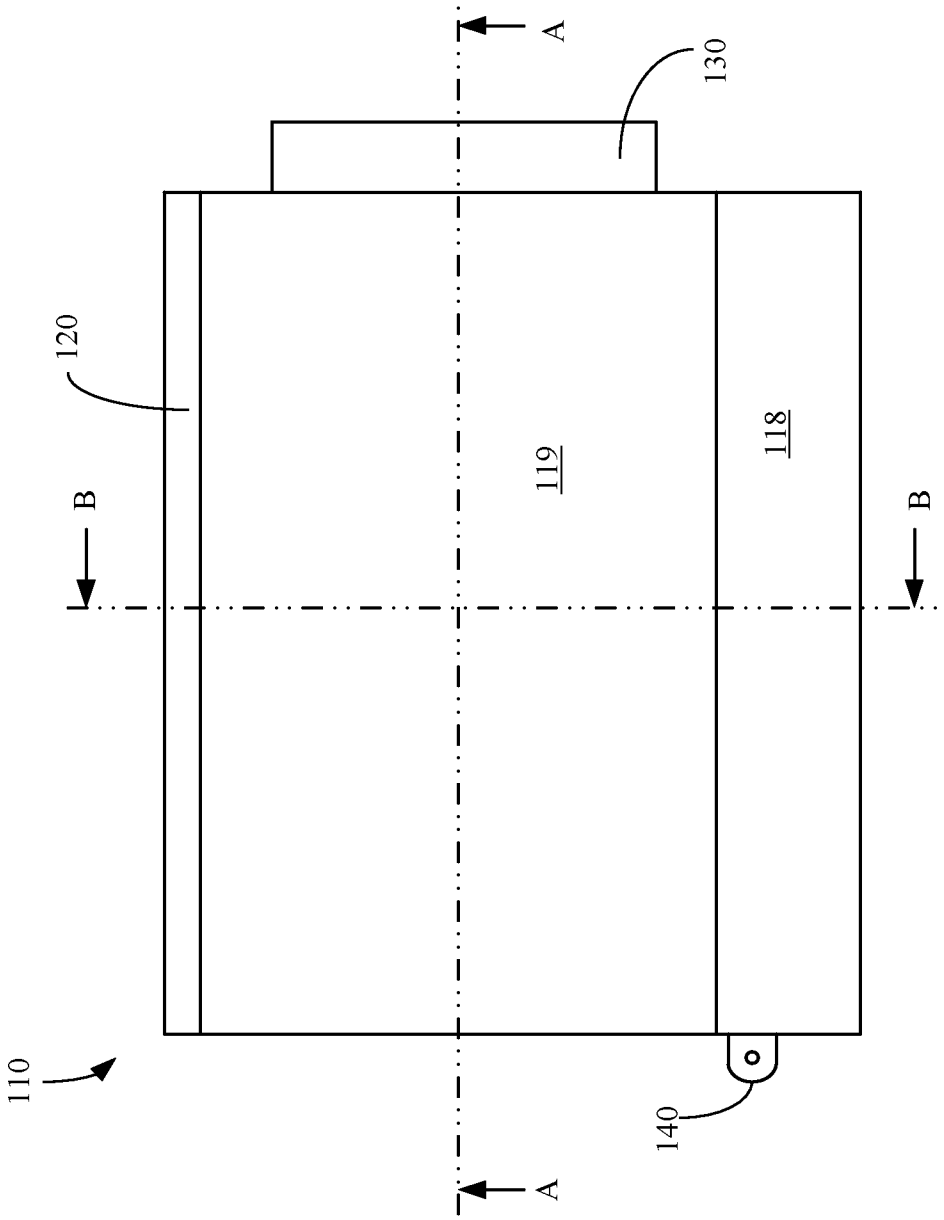

FIG. 6

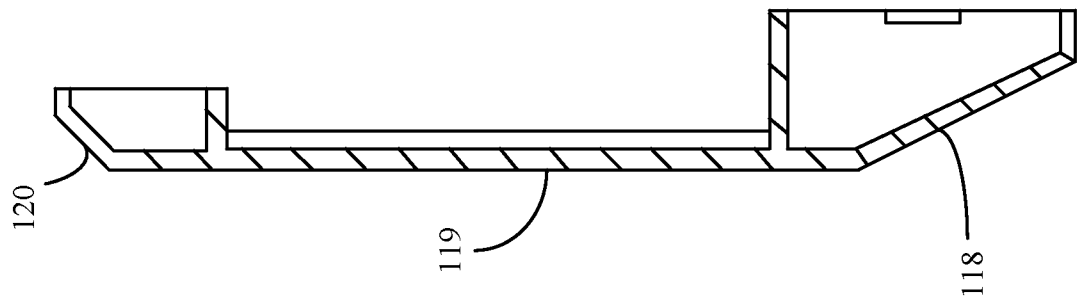

FIG. 7c

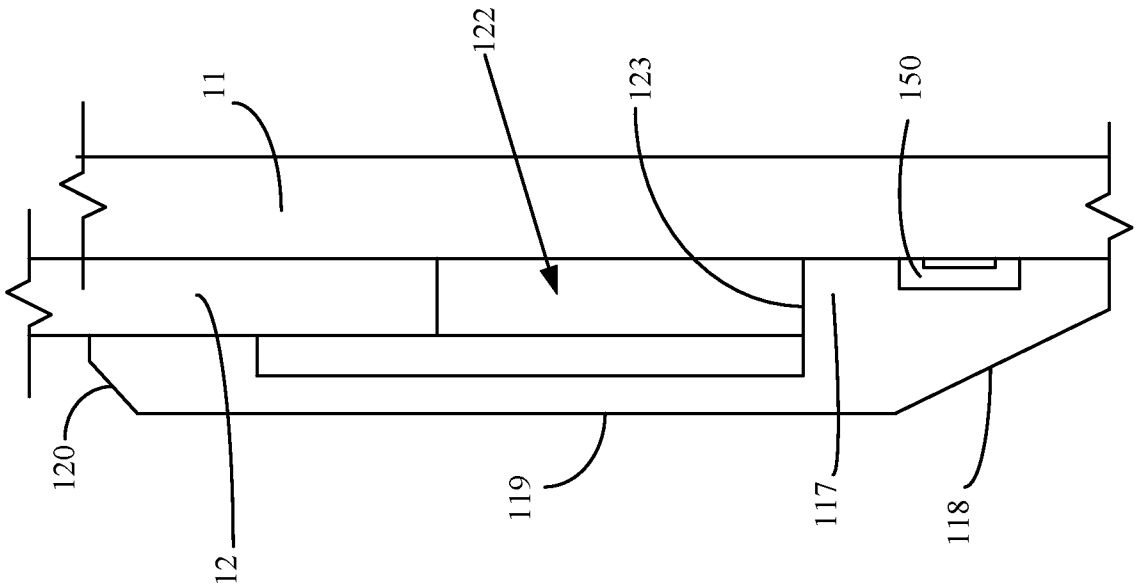

FIG. 7b

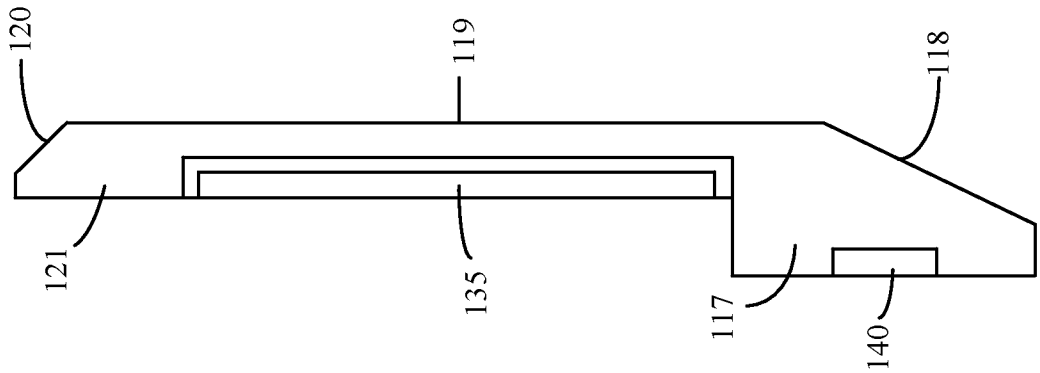

FIG. 7a

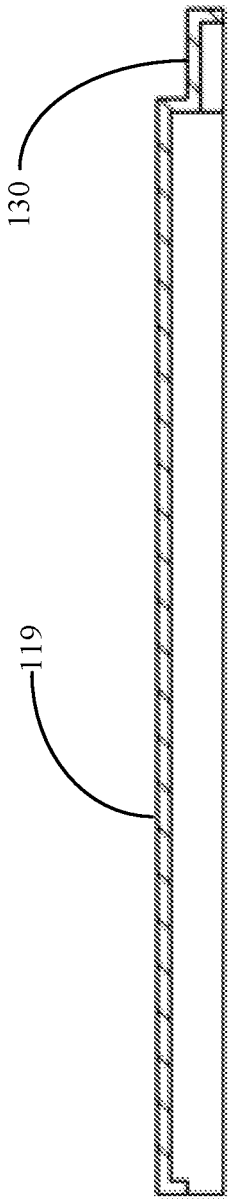

FIG. 7d

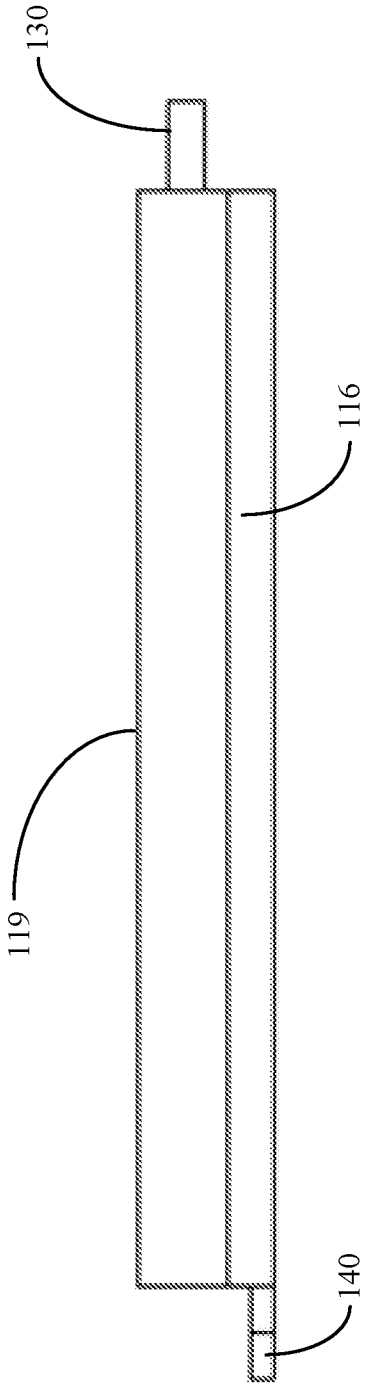

FIG. 7e

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US17/23798

A. CLASSIFICATION OF SUBJECT MATTER
IPC - E01C 13/02; E04C 5/16; E04F 19/02, 19/06 (2017.01)
CPC - E01C 13/02; E04C 5/16; E04F 19/02, 19/061

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
See Search History document

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7,634,883 B1 (LARSON JA, et al.) 22 December 2009; figures 1, 3	1-12
A	US 2004/0062605 A1 (LEHTO T, et al.) 01 April 2004; figures 1, 2	1-12
A	US 2014/0290152 A1 (EVERFLASH, LLC) 02 October 2014; figures 2B, 4D	1-12
A	US 2010/0218360 A1 (MANGONE PG) 02 September 2010; entire document	1-12

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 July 2017 (14.07.2017)	16 AUG 2017
Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer Shane Thomas PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US17/23798

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

-***-Continued Within the Next Supplemental Box-***-

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-12

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/US17/23798

-***-Continued from Box No. III Observations where unity of invention is lacking-***-

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fee must be paid.

Group I: Claims 1-12 are directed toward a fastening system comprising a tile, a transition member having a lower planar element, and an upper planar element, and a central portion.

Group II: Claims 13-20 are directed toward a fastening system comprising a fastening mechanism, a forwardly angled portion extending from a back side of the top surface, a backwardly angled portion, and a tongue.

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features.

Group I has at least a tile having a tile surface, the tile being disposed above a subsurface, a transition member having a lower planar element, and an upper planar element, and a central portion disposed between the lower planar element and the upper planar element; and a ramp member having a lower planar component, a first upper planar component, a forwardly angled component disposed between the lower planar component and the first upper planar component, wherein the ramp member lower planar member is disposed above the subsurface, the transition member upper planar element is substantially adjacent the tile surface, the ramp member upper planar member is disposed above the transition member upper planar element, the transition member lower planar element is at least partially disposed above the ramp member lower planar member, a fastener inserted through corresponding apertures in the transition member lower planar element and the ramp member lower planar component to secure the fastening mechanism to the subsurface, second upper planar component extending inwardly from the backwardly angled component, a first space being formed between the first upper planar component and the second upper planar component that Group II does not have.

Group II has at least a tongue extends from a first side of the top surface, the tongue being offset from the top surface, a groove is formed under a second side of the top surface, a fastener mount extends from a first side of the bottom surface of the forwardly angled portion; and a channel is formed in a second side of the bottom surface of the forwardly angled portion that Group I does not have.

The common technical features of Groups I and II are at least fastening system comprising a fastening mechanism, a forwardly angled portion, and a backwardly angled portion extending from upper/top surface. These common features are disclosed by US 2010/0218360 A1 to MANGONE, JR (hereinafter 'Mangone'). Mangone discloses a fastening system (fastening device 40, figure 1A, paragraph [0047]) comprising a fastening mechanism (movable arms 42 and 44 and hinge 46, figure 1A, paragraph [0047] and [0048]), a forwardly angled portion (forwardly angled bottom portion, paragraph [0017]), and a backwardly angled portion extending from upper/top surface (bottom forwardly angled portion extending from top generally horizontal operating portion, paragraph [0017]).

Since the common technical features are previously disclosed by the Mangone reference, these common features are not special and so Groups I and II lack unity.