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(54) **STRUCTURAL INTERLOCKING EXTERIOR DECK TILE SYSTEM**

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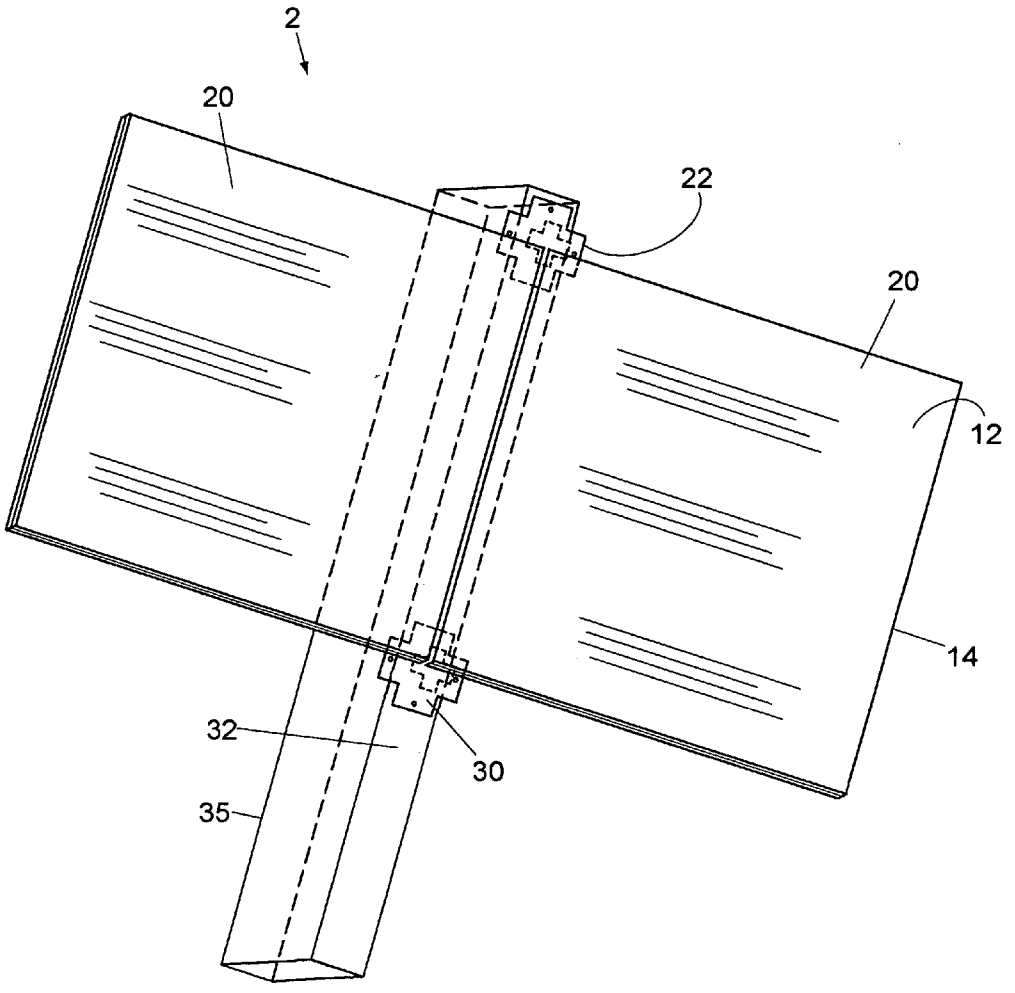
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(57) **ABSTRACT**

A structural deck tile system comprising an interlocking deck tile made of a plywood (or similar material) section coated with a mixture of sawdust and polymers such as recycled plastic. Designs and patterns may be embossed or molded into the top surface of the deck tile. The deck tiles have a cut-out notch at each corner and a plurality of interlocking members fit into the notches between adjoining decking tiles to secure them together at the corners. The interlocking members are screwed to the underlying deck joist infrastructure to secure the tiles as one unitary deck tile system, providing structural capacity, and resulting in an economical, aesthetically pleasing, and structurally sound deck with an easier and faster installation. The reduced weight and interlocking fastener system improves the installation process. The endless variety of designs available for the tiles permits individual creative expression in designing exterior decks.



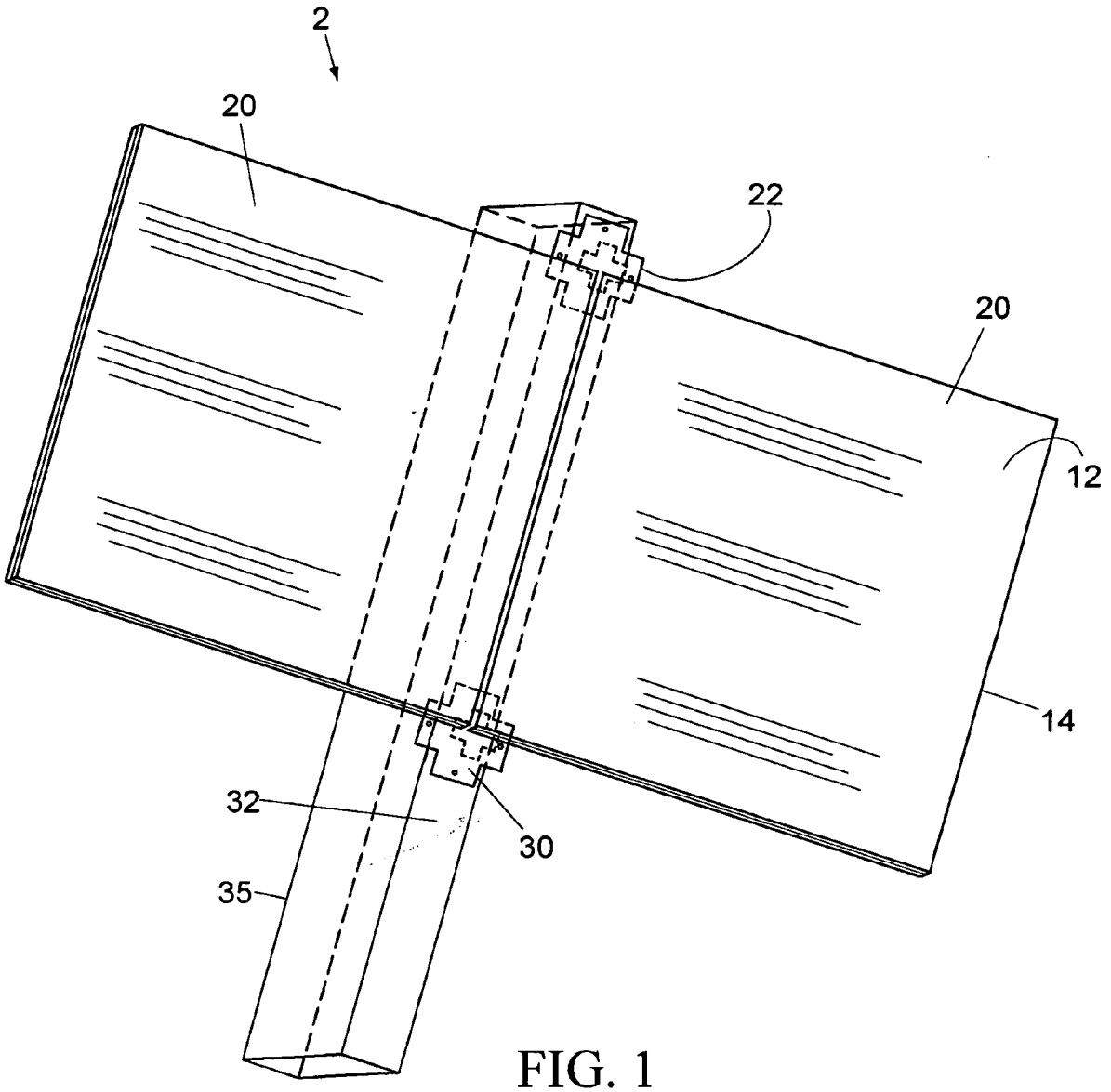


FIG. 1

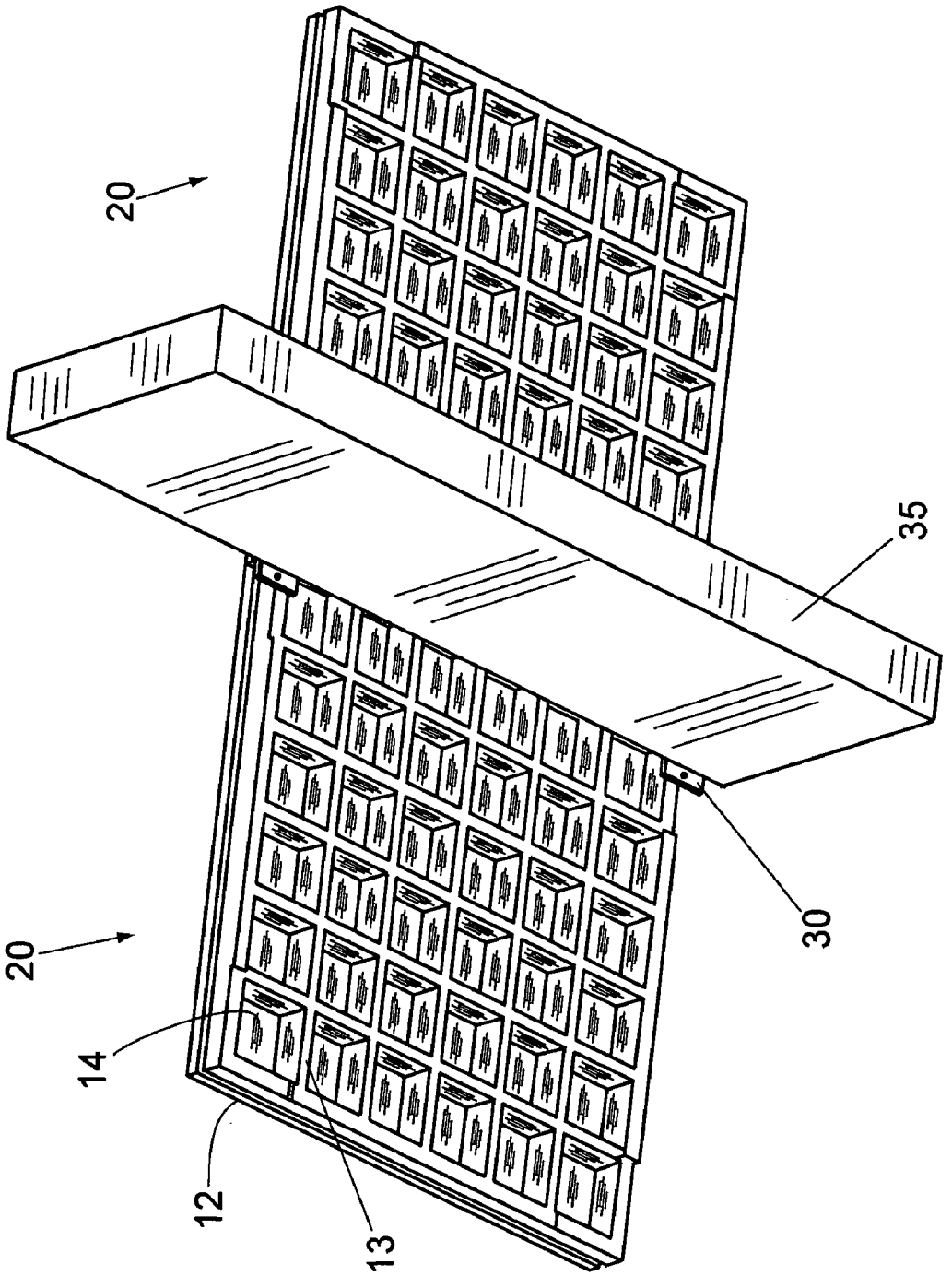


FIG. 2

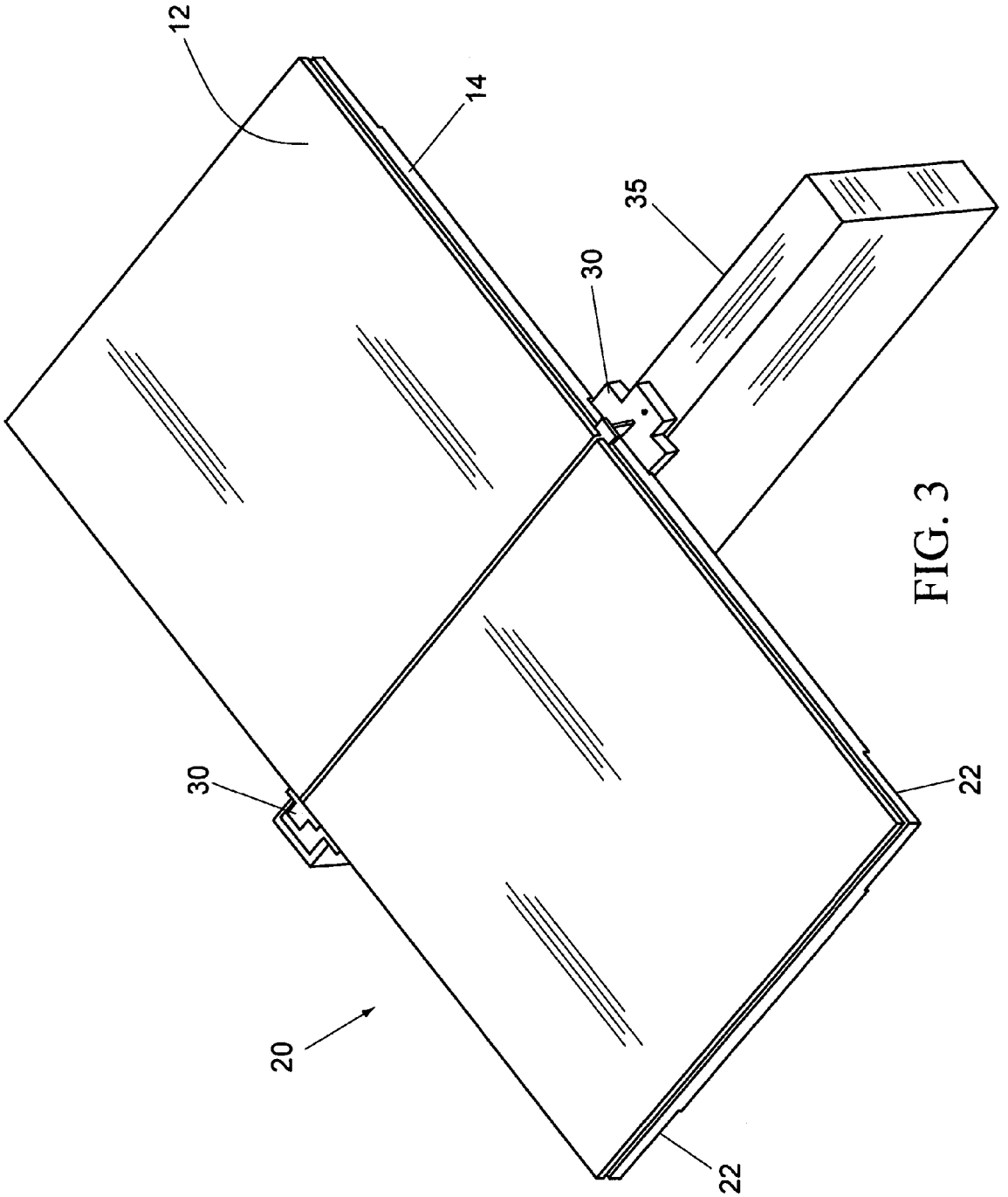


FIG. 3

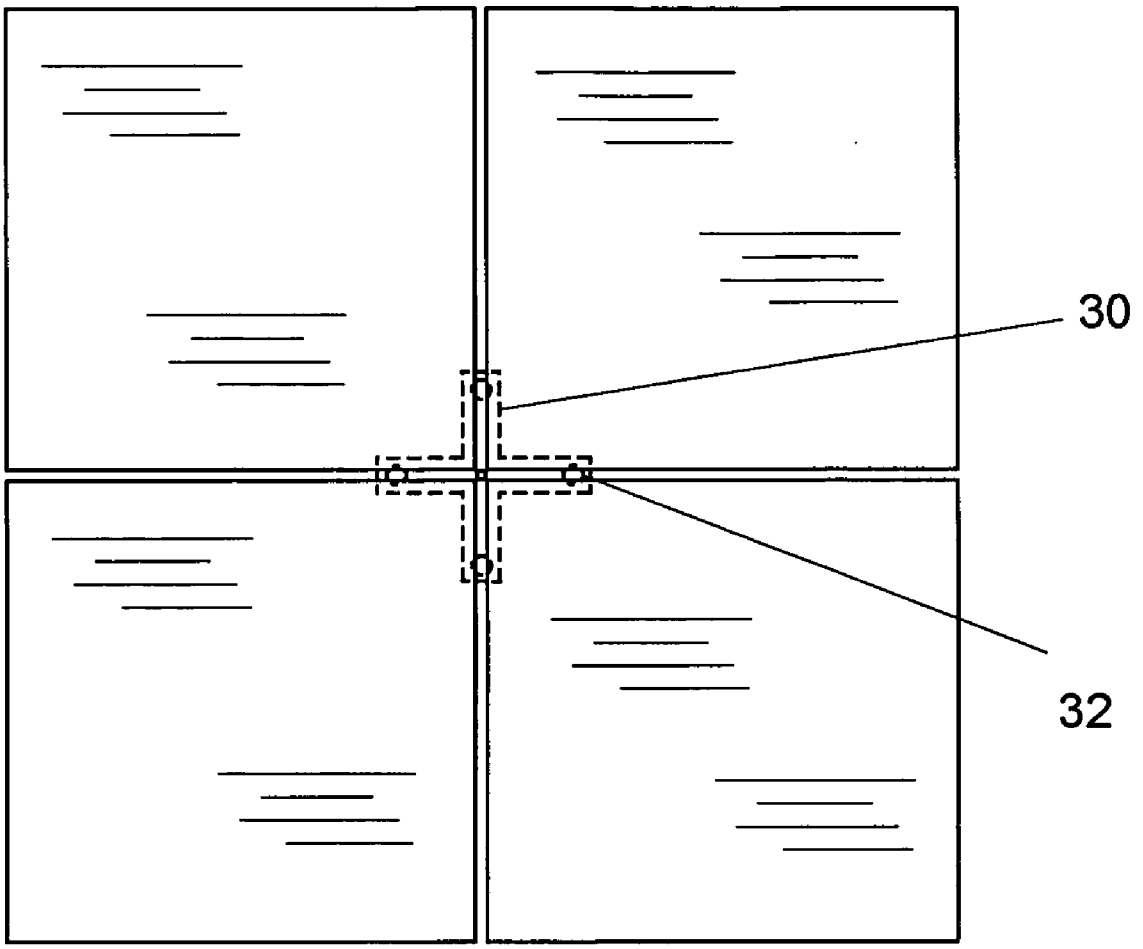


FIG. 4

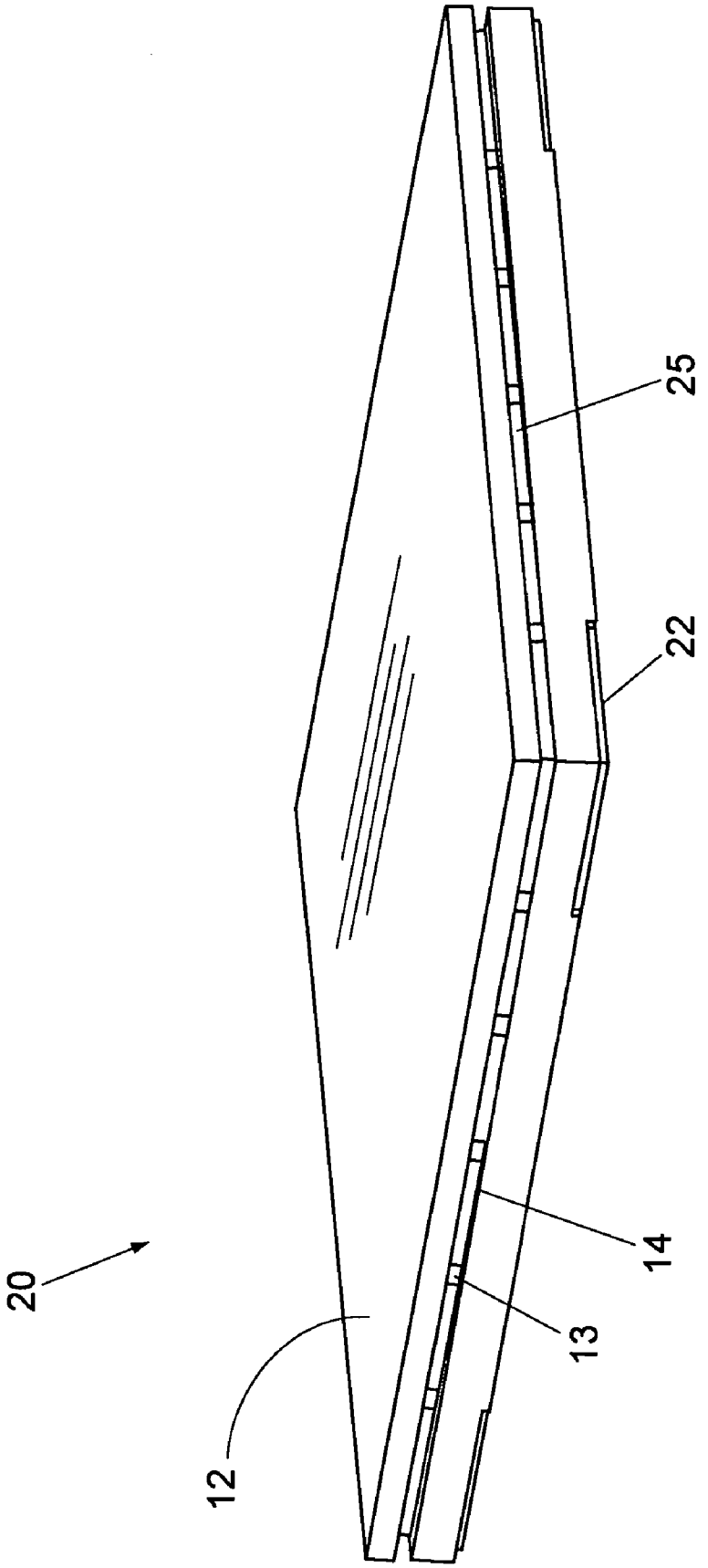


FIG. 5

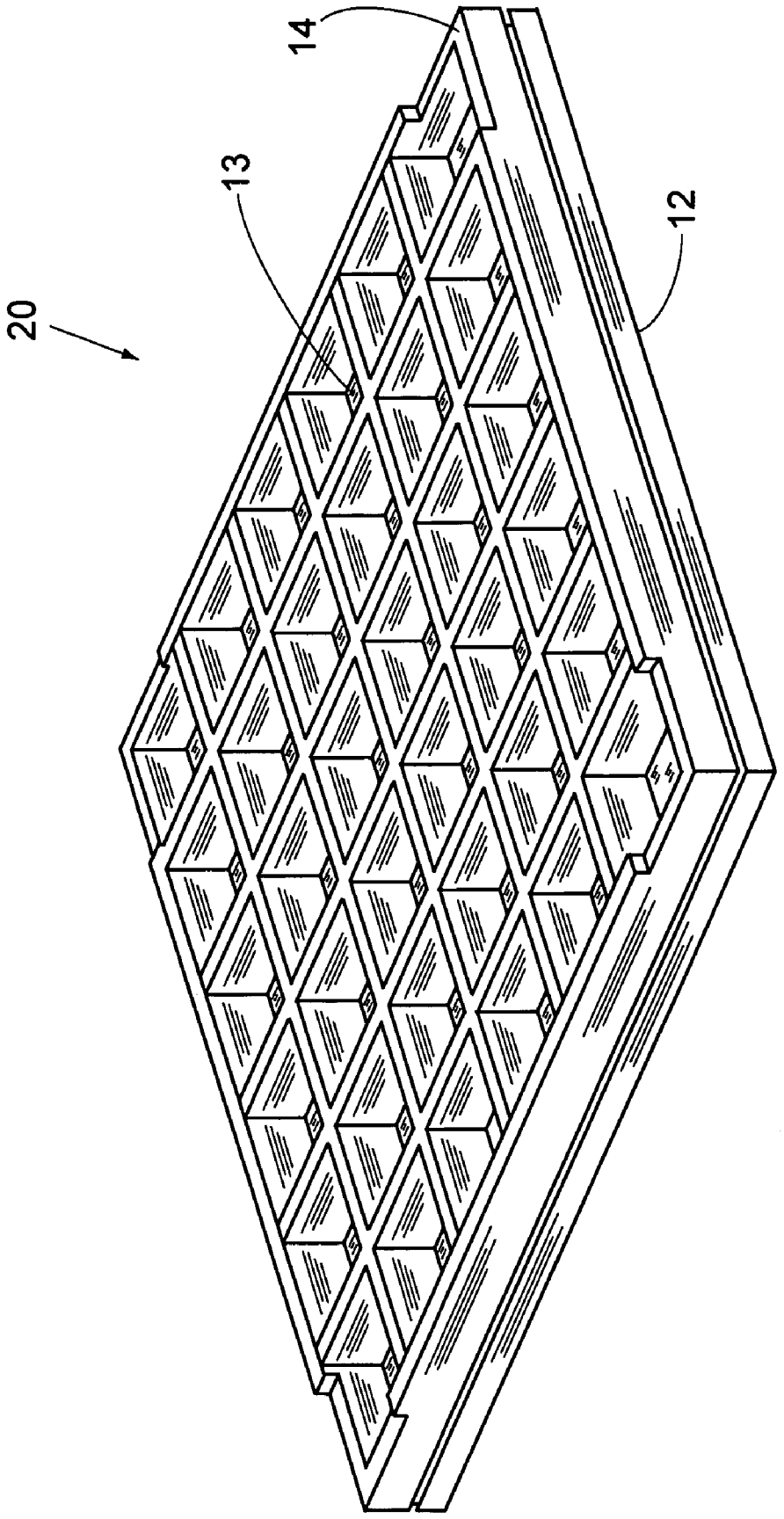


FIG. 6

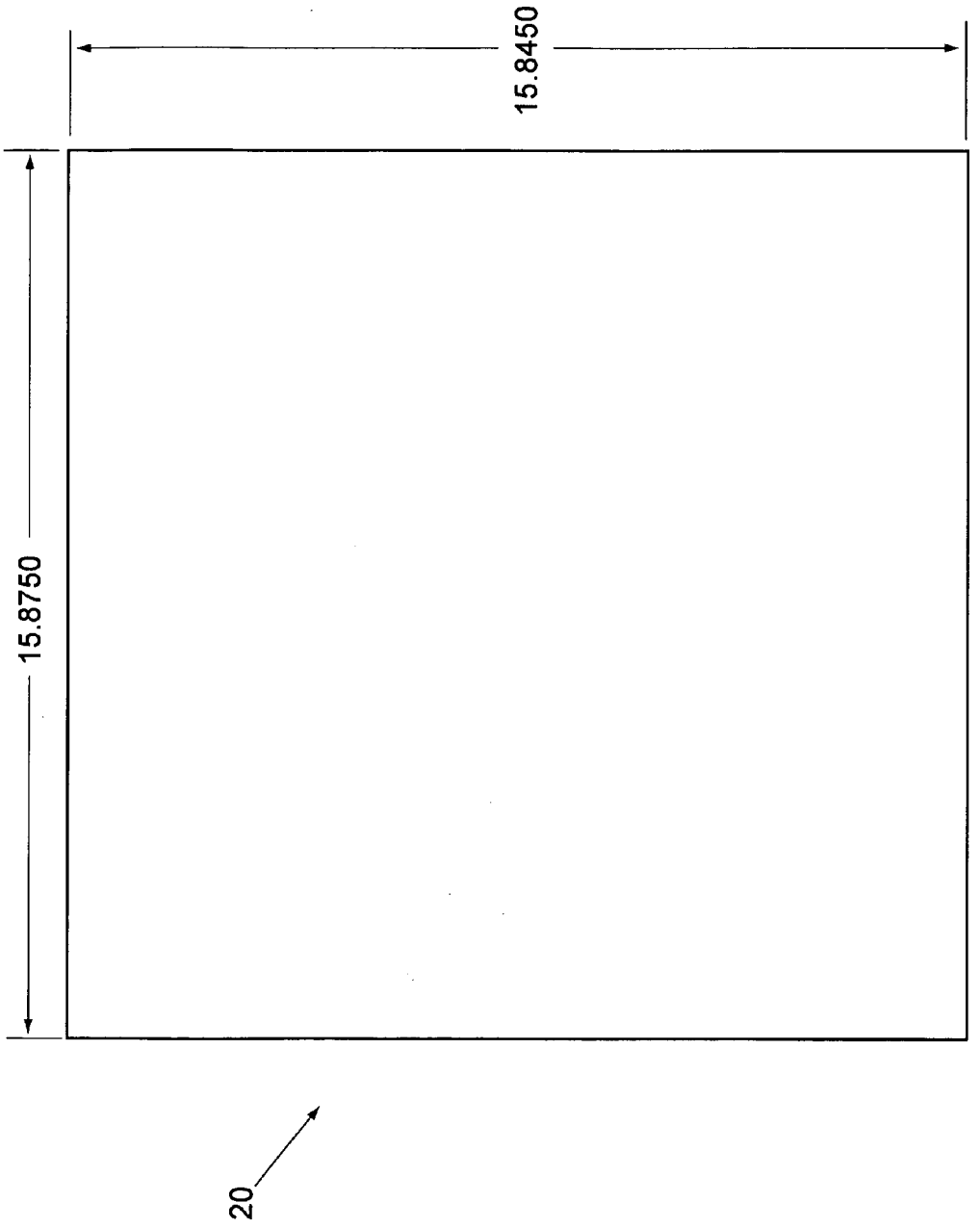


FIG. 7

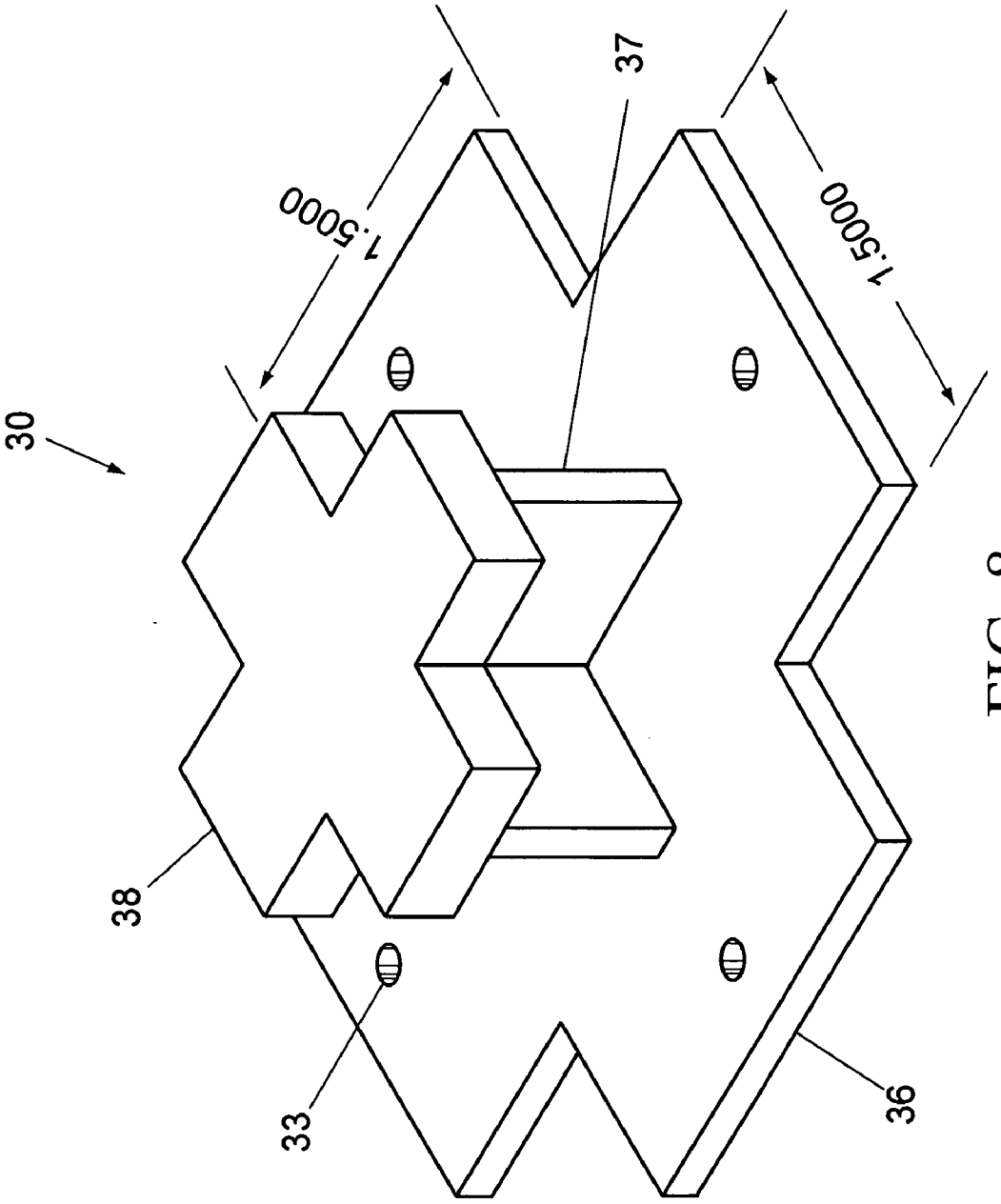


FIG. 8

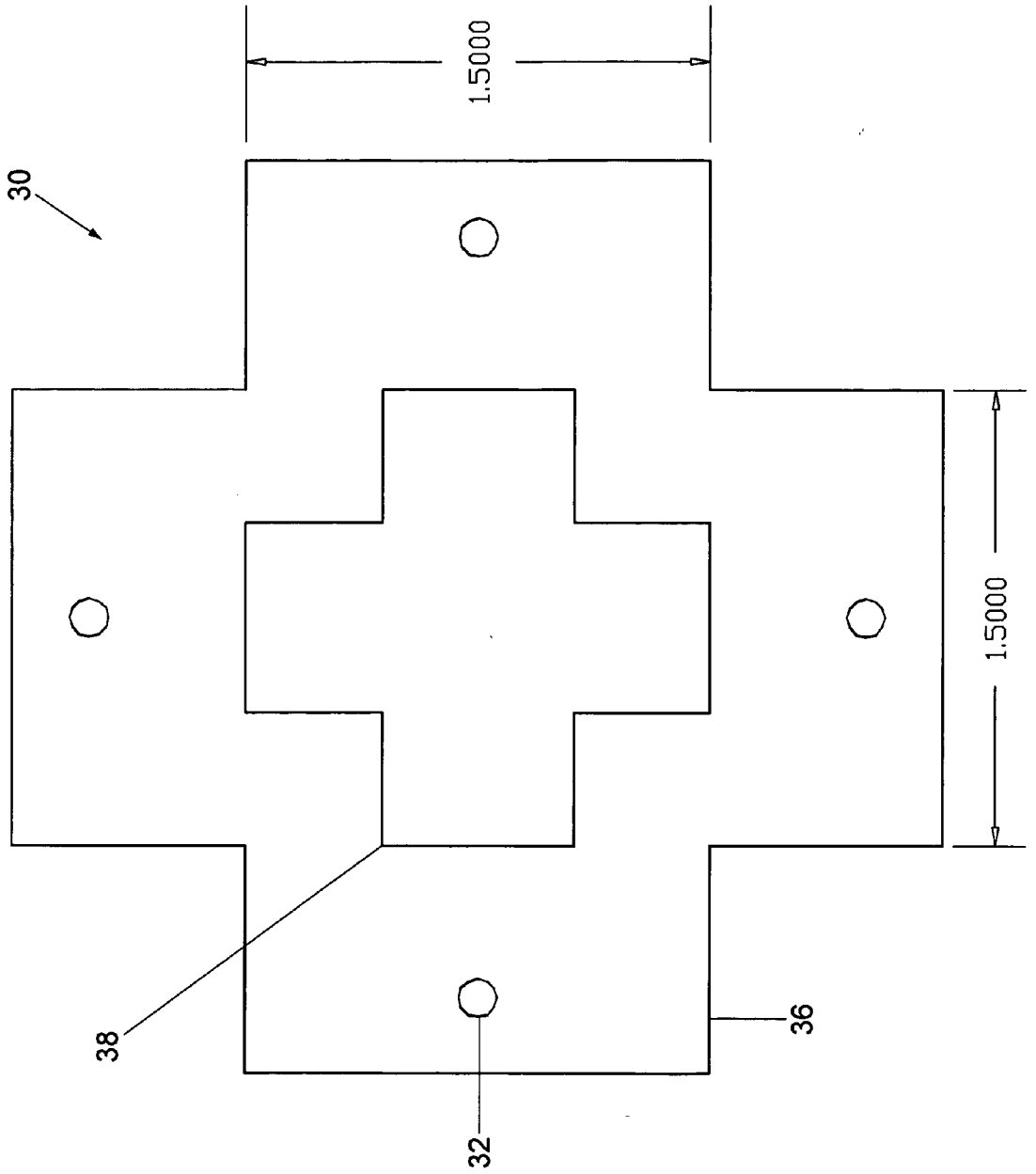


FIG. 9

STRUCTURAL INTERLOCKING EXTERIOR DECK TILE SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application is a continuation-in-part of U.S. patent application Ser. No. 10/769,290 filed: Jan. 30, 2004, which application derives priority from provisional application Ser. No. 60/444,071 filed: Jan. 30, 2003.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to tile systems for exterior decks, walk paths, and other surfaces that utilize a wood joist frame or functionally similar support structure and, more particularly, to a light weight, composite, structural exterior deck tile system with design and interlocking feature, which simplifies assembly, enforces structural soundness and support and ensures a more uniform and enhanced deck appearance. The present invention is the first structurally sound (spanning 16" oc) exterior deck tile system comprised of composite materials for residential and commercial use. The deck tile system provides an infinite range of creative designs by embossing and/or molding designs into the top surface of the composite tiles. This technique of creative designs integral to the decking tiles is comparable to the decorative ceramic tile segment of the interior flooring industry. The possible ranges and combinations of pattern, design, texture, and color are endless. This infinite selectivity allows a far greater opportunity for an aesthetically pleasing design and deck installation

[0004] 2. Description of the Background

[0005] Exterior decks are typically designed using wood (or similar material) pieces that are milled or manufactured to typical lumber industry sizes such as 5/4×6" or 2"×6, and a foot or more in length, wherein the wood pieces are arranged end to end and side to side and attached to a joist structure. The wood pieces may be stained or painted to alter the look and the perimeter of the deck may be adorned with lattice work, railing, benches, planters, etc., but the basic look of the floor of the deck provides little variety. The wood decking boards are typically the same size and installed side by side, such that little variety or design potential exists.

[0006] Exterior decks are typically surfaced by wood, plastic, or composite material deck boards. The most common composition is wood. However, currently there are a variety of wood and synthetic deck boards available in various colors. Unfortunately, the limited sizes, colors, installation methods, patterns, structural support requirements, and other inherent properties and/or limitations place constraints on the creativity and design possibilities of building decks.

[0007] Pressure treated pine dominates installed decking lumber. Unfortunately, wood decking has the inherent properties of warp, split, crack, and wane, which properties greatly hinder appearance, usage, and life expectancy. To minimize appearance defects, improve usage, and increase life expectancy, a garden industry of protective coating applications has developed. This necessitates extensive annual maintenance and still does not eliminate the inherent and problematic wood characteristics, which inevitably leads to the replacement of such wood installations. Thus, the "alternative" exterior deck board industry was born in the early 1990's to provide a low maintenance alternative to wood. Composite (combination of wood saw dust and plastic compounds) and solid plastic decking lumber does not have the "four" characteristics of natural wood (crack, split, wane, warp). As a result, no surface coatings are necessary to combat the negative effects of the "four" characteristics, and termites and rot are not a concern. Additionally installation and usage issues ranging from chemical contact to splinters are not present. The advantages of such decking lumber have yielded tremendous growth rates for this infant sub-contracting industry. There are a number of composite materials used in fabricating decking. One of the first composites introduced was Trex®, a combination of furniture sawdust mixed with polymers. Trex® is formed by combining recycled plastic and sawdust (approximately 50 percent recycled wood, like wood fiber from sawdust and used wooden pallet, and 50 percent recycled plastic materials, from plastic grocery bags and industrial stretch film). These materials are mixed together, and then extruded into boards. The boards are then cut as described. Trex® requires virtually no maintenance, comes with a twenty-five year warranty and does not need to be sealed. Newer composite lumbers include: TimberTech®, Correct Deck™ and EverGrain™. The low maintenance aspects of these composite wood panels have helped them to gain widespread acceptance in recent years for above ground applications such as decks.

[0008] While composite lumber has several advantages over wood, it also has disadvantages that begin with its weaker strength. The plastic portion of the composite compromises the tensile strength of the lumber which limits the distance that the composite board can span from joist to joist as compared to like profile sizes of wood boards. While lumber (depending on the species) can typically span 16" oc or 24" oc; composite lumber typically spans 16" oc and frequently 12" oc. The additional time and expense of framing joists 12" oc is costly. Additionally, composite decking is much heavier (up to two times that of wood) and comes in lengths up to 20' necessitating a physically demanding installation. Yet another critique of composite lumber is that its identically matching profiles to wood yield the very same design and creativity limitations as wood decking.

[0009] Therefore, it would be greatly advantageous to provide a lightweight composite structural exterior deck tile system, using generally sixteen inch square composite tiles with an interlocking feature and joist frame.

SUMMARY OF THE INVENTION

[0010] It is, therefore, an object of the present invention to provide a lightweight, composite structural exterior deck tile system with an interlocking feature that provides structural vertical stability, and automatically spaces the decking tiles to give an aesthetically pleasing appearance. It is another of object to provide a structural exterior deck tile system that employs composite tiles.

[0011] It is another object to provide a composite deck tile of 1"-1½" thickness that eases installation through the use of the auto spacing, hidden, interlocking fastener.

[0012] It is yet another object to provide a light weight structural exterior deck tile system that utilizes deck tiles

that are a much lighter weight per square foot than traditional decking, therefore lightening the carrying load and easing the installation difficulty.

[0013] It is still another object to provide a scalable structural exterior deck tile system that facilitates easy replacement of damaged decking tiles.

[0014] It is yet another object to provide a light weight structural exterior deck tile system that provides for endless variations in design, color, patterns, etc.

[0015] It is still another object to provide a lightweight structural exterior deck tile system that employs a joist frame structure for maximum support and stability.

[0016] According to the present invention, the above-described and other objects are accomplished by providing a structural exterior deck tile system comprising a plurality of composite deck tiles formed of a mixture of sawdust and plastic, and having a top surface layer and a bottom frame layer. The top surface layer may be molded or embossed with a pattern or design to provide a unique aesthetic appearance. Each deck tile includes a peripheral groove and is notched at each corner to coordinate with at least one interlocking member that fits into the notches at the corners of adjoining tiles. The tiles are generally sixteen inches square but may be manufactured in various sizes and shapes. The sixteen inch tiles are easily carried and handled. The interlocking members are compression fitted to the corners to secure the tiles together as one unitary deck tile. The structural exterior decking tile system provides an economical composite deck surface that can be built at a similar weight ratio to conventional wood decking boards and one half the weight of typical composite deck boards without compromising structural integrity. Moreover, the deck tile system provides a much improved aesthetic appearance over the current standard exterior deck. An infinite range of creative designs may be employed by embossing and/or molding designs into the top surface of the composite tiles. The possible ranges and combinations of pattern, design, texture, and color are endless. This infinite selectivity allows a far greater opportunity for an aesthetically pleasing design and deck installation.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Other objects, features, and advantages of the present invention will become more apparent from the following detailed description of the preferred embodiments and certain modifications thereof when taken together with the accompanying drawings in which:

[0018] **FIG. 1** is a top perspective view of the preferred embodiment of a structural deck tile system according to the present invention.

[0019] **FIG. 2** is a bottom perspective view of the structural deck tile system as in **FIG. 1**.

[0020] **FIG. 3** is a top view of two composite tiles **20** attached to a joist **35** as in **FIGS. 1-2**.

[0021] **FIG. 4** is a top perspective view of a plurality of composite decking tiles **20** with interlocking members **30** as in **FIGS. 1-3**.

[0022] **FIG. 5** is a side perspective view of a single deck tile according to the present invention.

[0023] **FIG. 6** is a bottom perspective view of the sub frame layer **14** of the tile **20FIG. 7** is a plan view of a single deck tile according to the present invention.

[0024] **FIG. 8** is a 3D perspective view of the interlocking member.

[0025] **FIG. 9** is a plan view of the interlocking member of **FIG. 8**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0026] **FIGS. 1 and 2** are top and bottom views, respectively, of a structural exterior deck tile system **2** according to a preferred embodiment of the present invention. The tile system **2** generally comprises a plurality of reinforced deck tiles **20** each formed with particular corner notches and peripheral grooves, and interlocking members **30** that fit into the peripheral grooves at the notches to structurally anchor the deck tiles **20** together in quadrangles, and to anchor the deck tiles **20** to the joist foundation of a deck by a single wood screw **32**. The tiles **20** have reduced mass and thickness, easy self-aligning installation, and collectively form aa structurally superior joist frame for structural stability.

[0027] Each deck tile **20** further comprises a sub frame layer **14** formed of composite ribs **13** (or struts), and a unitary composite layer **12** overlying and joining the ribs **13** of sub frame layer **14** and forming a design surface thereon. The sub frame layer **14** preferably comprises parallel evenly-spaced parallel ribs **13**, and composite layer **12** is integrally formed on top and joins the ribs **13** of sub frame layer **14**. This yields a deck tile **20** that is formed in a generally square tile format. Relative dimensions are important to the present deck tiles **20** to balance their structural soundness with comparatively large size, and so exemplary dimensions will be given herein. The overall dimensions of the illustrated tiles **20** are approximately ⅜"×**15**⁄**7**;**8**"×**15**⁄**7**;**8**". Composite layer **12** is an approximately ⅜" thick layer of composite material as conventionally used in fabricated decking, e.g., recycled plastic and sawdust (approximately 50 percent recycled wood, such as wood fiber from sawdust and used wooden pallet, and 50 percent recycled plastic materials, from plastic grocery bags and industrial stretch film). Each rib **13** of the sub frame layer **14** preferably comprises the same material as composite layer **12**, and the entire deck tile **20** inclusive of sub frame layer **14** and composite layer **12** may be integrally molded, such as by injection or compression molding. In either case the molding is preferably completed with a design plate to impart an ornamental imprint-design on composite layer **12**, thereby giving a true carved "tile" appearance which has heretofore not been available for outdoor deck structures. This flexibility in the appearance of the deck tiles **20** provides for a multitude of possibilities in design, pattern, shape and color, thus creating a decorative and aesthetically pleasing effect, previously unknown in the decking industry. The spaced ribbed composite design of the sub frame layer **14** allows the resulting deck tile **20** to be structurally sound and yet capable of spanning 16" O.C. (on-center).

[0028] In addition, each tile **20** is formed with a ⅛" height×⅜" deep×1" length cut-out notch **22** at each corner of the deck tile **20** (approximately ⅓ of the way from the bottom of the decking tile **2**). Cut-outs **22** help to allow a quadrangle of deck tiles **20** to be secured together at the

edges by a plastic interlocking member **30** and a wood screw **32**. Quadrangles of deck tiles **20** are successively secured at the edges over the open joists **35** of an otherwise standard deck infrastructure until the deck is completely surfaced with deck tiles **20**. The combination of reduced mass and thickness, plus easy self-aligning installation and joist frame, greatly reduces assembly time and complexity, as well as the weight of the final deck, while maintaining structural stability.

[**0029**] **FIG. 3** is a top view of two composite tiles **20** attached to an existing deck joist **35** by two interlocking members **30**. The interlocking members **30** are cross-shaped structures that fit down into the cut-out notch **22** at the corners of the tiles **20**. The arms of the interlocking members **30** fit into slots defined in the sides of the tiles **20** to anchor them. Thus, both the interlocking members **30** and tiles **20** may be secured with standard wood screws **32**.

[**0030**] **FIG. 4** is a top perspective view of a plurality of composite deck tiles **20** assembled together, with fastener **30** shown in dotted lines. The interlocking feature of interlocking member **30** gives the ability to fasten the entire deck tile system **2** around the deck infrastructure from edge-to-edge. If a deck tile **20** is ever damaged, the discrete fastener design facilitates easy replacement. One skilled in the art will appreciate that the foregoing deck tiles **20** may be provided in other forms including square and rectangular sizes ranging from 12"×12" to 24"×24". Given an array of composite deck tiles **20** of differing dimensions, it becomes a simple task to compile an entire deck surface having a unique aesthetic appearance.

[**0031**] **FIG. 5** is a side perspective view of the single deck tile **20** of **FIG. 4** illustrating the ribs **13** extending downward from the composite surface **12**. The ribs **13** are generally ⅜ inches thick by one inch in height. The ribs **13** are spaced every 3" OC and run in both directions (intersecting to form a matrix), thereby allowing the tile **20** to placed in any direction to meet the surface design's requirements. The outermost ribs **13** form a rectilinear boundary **13**B that circumscribes the inner ribs **13**. An upper groove **25** runs around this boundary **13**B, groove **25** being approximately ¼"×¼"×¼". The groove **25** is adapted for compression-fit insertion of a section of the interlocking fastener **30** (as described more fully below in regard to **FIGS. 8 and 9**, the interlocking member **30** comprises three vertical sections: a base section **36**, a leg section **37**, and a raised section **38**, the latter of which fits inside groove **25**).

[**0032**] In addition to the upper groove **25**, each corner of the tile **20** along the outer boundary **13**B is formed with a recessed notch **22** measuring ⅛" high by ⅜" leg depth by 1.5" length. This recessed notch **22** receives the lower base **36** of the interlocking fastener **30** (lower base **36**, leg section **37**, and raised section **38** are described more fully below in regard to **FIGS. 8 and 9**, and the base **36** fits inside groove **25**).

[**0033**] **FIG. 6** is a bottom perspective view of the sub frame layer **14** of the tile **20**, further illustrating the ribs **13** extending downward from the composite surface **12** and the layout of recessed notches **22**.

[**0034**] **FIG. 7** is a plan view of a single deck tile **20** according to the present invention. In the illustrated embodiment, the deck tile **20** is approximately sixteen (15.875') by sixteen (15.845") inches square, and may be any color with any design [DESIGN] molded or embossed in the top surface of the tile **20**. Thus, the collective arrangement of the tiles **20** creates an over-all pleasing aesthetic appearance. The deck tile system provides an infinite range of creative designs by embossing, injection molding, and/or compression molding designs into the top surface of the composite tiles. As with ceramic tiles, the possible ranges and combinations of pattern, design, texture, and color are endless. The deck owner is no longer restricted by limited choices in color and accessories, where one deck doesn't look much different than another. With the present invention, an individual deck owner may have her own unique design.

[**0035**] **FIG. 8** is a 3-D perspective view of the interlocking member **30** of **FIG. 6**. The total height of the interlocking member **30** is approximately one inch, and there are three distinct sections running vertically from a lower base section **36**, a leg section **37**, and a raised section **38**. Both the lower base section **36** and raised section **38** are in the shape of a Greek cross (with cruciform arms), the lower base section **36** being a larger cross relative to raised section **38**. In use, each of the arms of the base section **36** of the interlocking member **30** fits into a corresponding recessed notch **22** in a quadrangle of four arranged tiles **20**, and each of the arms of the raised section **38** compression fits into each corresponding groove **25** of those four tiles **20** to form a friction fit.

[**0036**] **FIG. 9** is a plan view of the interlocking member **30** according to the present invention. The interlocking member **30** is preferably formed of high-density polyethylene, or like material, and is defined with a pre-tapped screw hole **33** in each arm of the cross of the base section **36**. Again, each arm of the raised section **38** of the interlocking member **30** is friction/compression fit into the groove **25** of each of four deck tiles **20**, and interlocking member **30** is then screwed to the underlying supporting joist **35** via four wood screws **32**, one through each of the screw holes **33** in each arm of the base section **36** of the interlocking member **30**. The base section **36** secures into the recessed notch **22** of each tile **20** at the corner allowing four tiles to be fastened with one interlocking fastener **30**.

[**0037**] It should now be apparent that the foregoing invention provides a uniform and decorative appearance to decks, utilizes a joist structural frame to provide maximum support, and automatically spaces the deck tiles to give an aesthetically pleasing deck structure. The "hidden fastener" interlocking feature allows a much easier installation and uniform appearance. The deck tile system provides an infinite range of creative designs by embossing and/or molding designs into the top surface of the composite tiles. This technique of creative designs integral to the deck tiles is comparable to the decorative ceramic tile segment of the interior flooring industry. The possible ranges and combinations of pattern, design, texture, and color are endless, and size of the tiles enables the installer to easily carry and handle them. This presents a far greater opportunity for an aesthetically pleasing design and deck installation. Moreover, the mechanism to attach the interlocking tiles to a joist frame provides maximum structural support unlike any other non-standard deck tile system can provide.

[**0038**] Having now fully set forth the preferred embodiments and certain modifications of the concept underlying

the present invention, various other embodiments as well as certain variations and modifications of the embodiments herein shown and described will obviously occur to those skilled in the art upon becoming familiar with said underlying concept. It is to be understood, therefore, that the invention may be practiced otherwise than as specifically set forth in the appended claims.

I claim:

1. A structural exterior deck tiling system, comprising:

a plurality of composite deck tiles each formed from a mixture of sawdust and plastic, each of said deck tiles having a composite surface layer atop a sub frame layer, said sub frame layer comprising a matrix of intersecting ribs with a substantially rectilinear outer boundary, each corner of said outer boundary being defined by a recess having a lateral groove therein;

a plurality interlocking members adapted to fit within the outer boundary corners of said tiles when said tiles are laid side-to-side, said interlocking members comprising upper cruciform arms for insertion into the lateral groove of said recess, and lower cruciform arms; and

a plurality of screws for securing one of said interlocking members to an underlying deck joist infrastructure,

whereby said deck tiles and interlocking members provide vertical and lateral stability atop said underlying deck joist infrastructure and an aesthetically pleasing appearance.

2. The structural deck tile system according to claim 1, wherein said composite surface layer is compression molded or embossed with an ornamental design.

3. The structural deck tile system according to claim 1, wherein said layer of composite is injection molded.

5. The structural deck tile system according to claim 1, wherein said interlocking members are injection molded of high density polyethylene.

6. The structural deck tile system according to claim 1, wherein the dimensions of said deck tiles are sixteen (15⅞") inches by sixteen (15⅞") inches.

7. A structural exterior deck tiling system, comprising:

a plurality of composite deck tiles each formed from a mixture of sawdust and plastic, each of said deck tiles having a surface layer atop an integrally-molded sub frame, said sub frame comprising a plurality of parallel ribs inside a rectilinear outer boundary, and each corner of said boundary being defined by a recess having a groove therein;

a plurality interlocking members each adapted to secure a quadrangle of said tiles together corner-to-corner, and to secure said quadrangle of tiles to a deck foundation, said interlocking members comprising a lower section adapted to fit within the recesses at the corners of said quadrangle of tiles and an upper section adapted for insertion into the lateral grooves within the recesses at the corners of said quadrangle of tiles;

a plurality of screws for securing each interlocking member to an underlying deck joist infrastructure by said base section;

whereby said deck tiles and interlocking members provide vertical and lateral stability atop said underlying deck joist infrastructure and an aesthetically pleasing appearance.

8. The structural deck tile system according to claim 7, wherein said composite surface layer is compression molded or embossed with an ornamental design.

9. The structural deck tile system according to claim 7, wherein said layer of composite is injection molded.

10. The structural deck tile system according to claim 7, wherein said interlocking members are injection molded of high density polyethylene.

11. The structural deck tile system according to claim 7, wherein the dimensions of each deck tile is approximately sixteen inches by sixteen inches.

12. The structural deck tile system according to claim 7, wherein said interlocking member further comprises a lower base section, an intermediate section, and a raised section.

13. The structural deck tile system according to claim 12, wherein the lower base section is in the shape of a cruciform.

14. The structural deck tile system according to claim 13, wherein the raised section is in the shape of a cruciform.

15. A structural exterior deck tiling system, comprising:

a plurality of composite deck tiles each formed from a mixture of sawdust and plastic, each of said deck tiles having a surface layer atop an integrally-molded sub frame, said sub frame comprising a plurality of reinforcing ribs;

a plurality interlocking members each adapted to secure a quadrangle of said tiles together corner-to-corner, and to secure said quadrangle of tiles to a deck foundation; and

a plurality of screws for securing each interlocking member to an underlying deck joist infrastructure;

whereby said deck tiles and interlocking members provide vertical and lateral stability atop said underlying deck joist infrastructure and an aesthetically pleasing appearance.

15. The structural deck tile system according to claim 15, wherein each of said deck tiles has a surface layer embossed with an ornamental design.

16. The structural deck tile system according to claim 15, wherein each of said deck tiles has a surface layer bearing an integrally-molded ornamental design.

* * * * *