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(54) INTERLOCKING TILE

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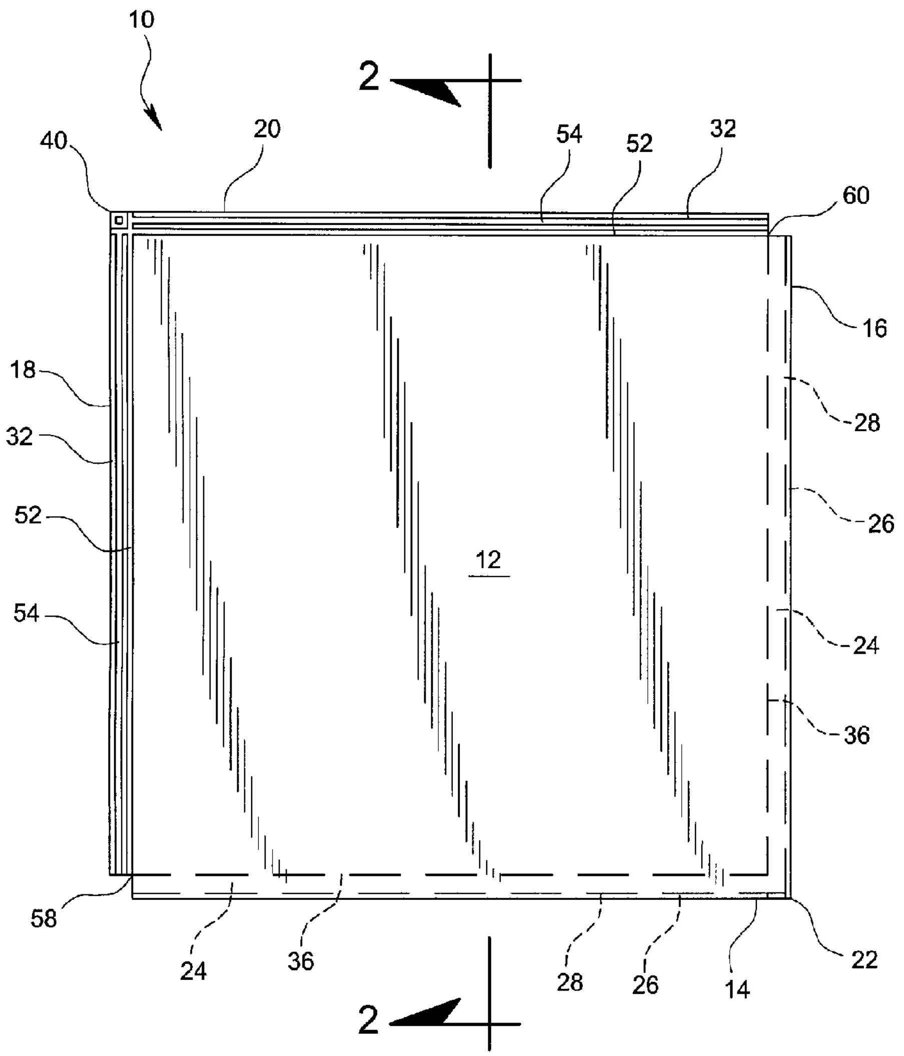
(57) **ABSTRACT**

A loose-laid, non-adhesive plastic tile is interconnected with similar tiles by interlocking channel structures employing gripping means. Contiguous pairs of upper and lower laterally extending walls on peripheral edges of the tile carry longitudinally elongated channels and rails in mating pairs, with one side of the pair on the upper walls and the second side of the pair on lower walls. An optional linear seal carried on at least one side of a channel structure compresses against the other side to seal against penetration by liquids. Gripping elements flank the seal to ensure the upper and lower walls are retained in the plane of the tile. Rails and channels may engage by interference fit. Teeth depending from rails may enter sockets in the bottom of a channel to establish interference fit of a suitable distance transverse to the major plane of a typically thin tile.



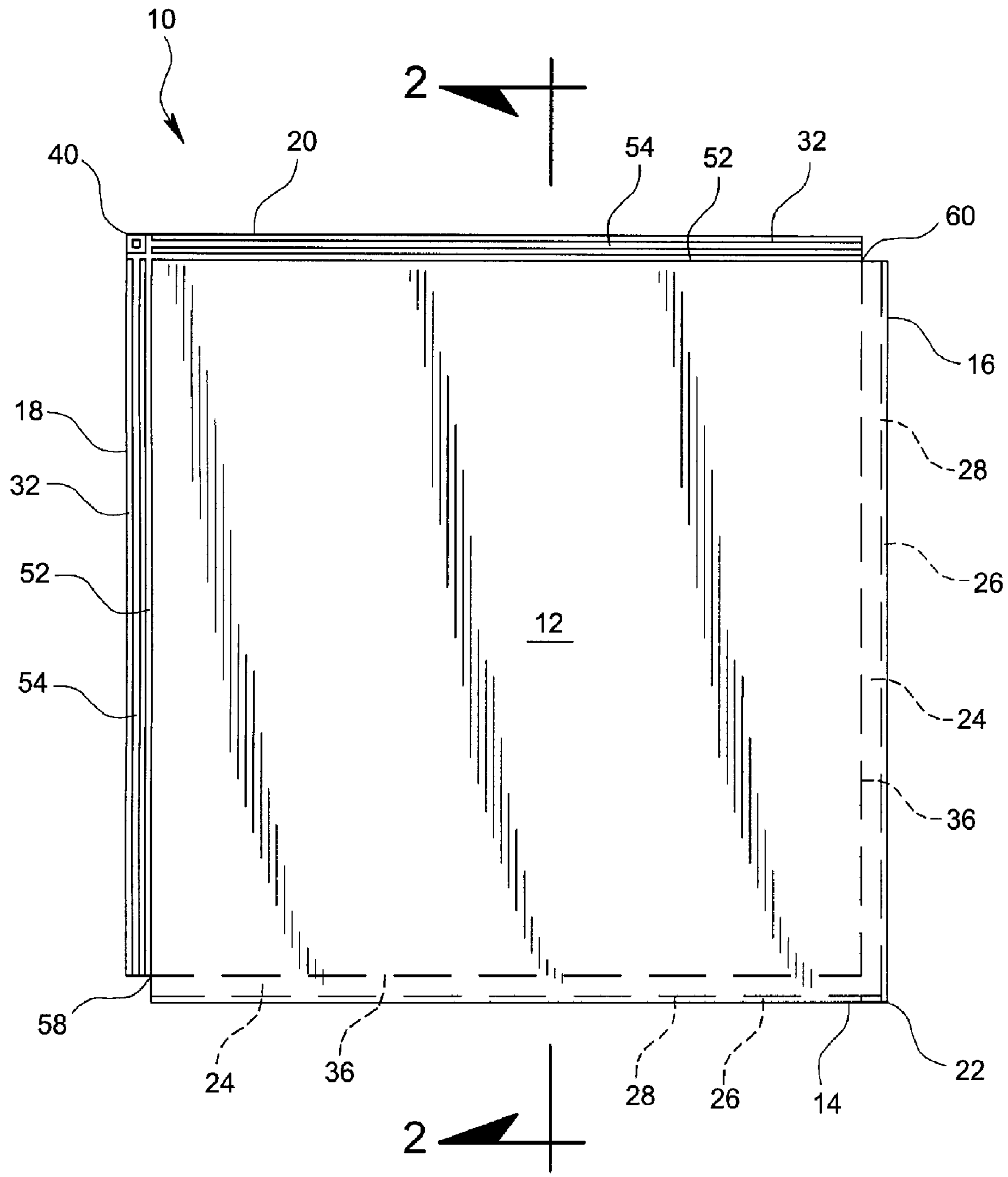


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Fig. 1

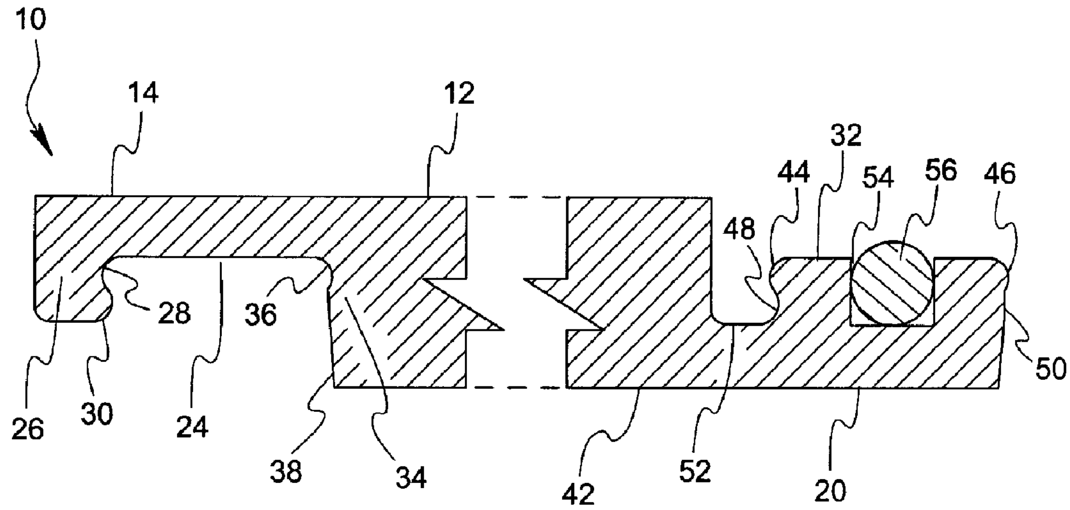
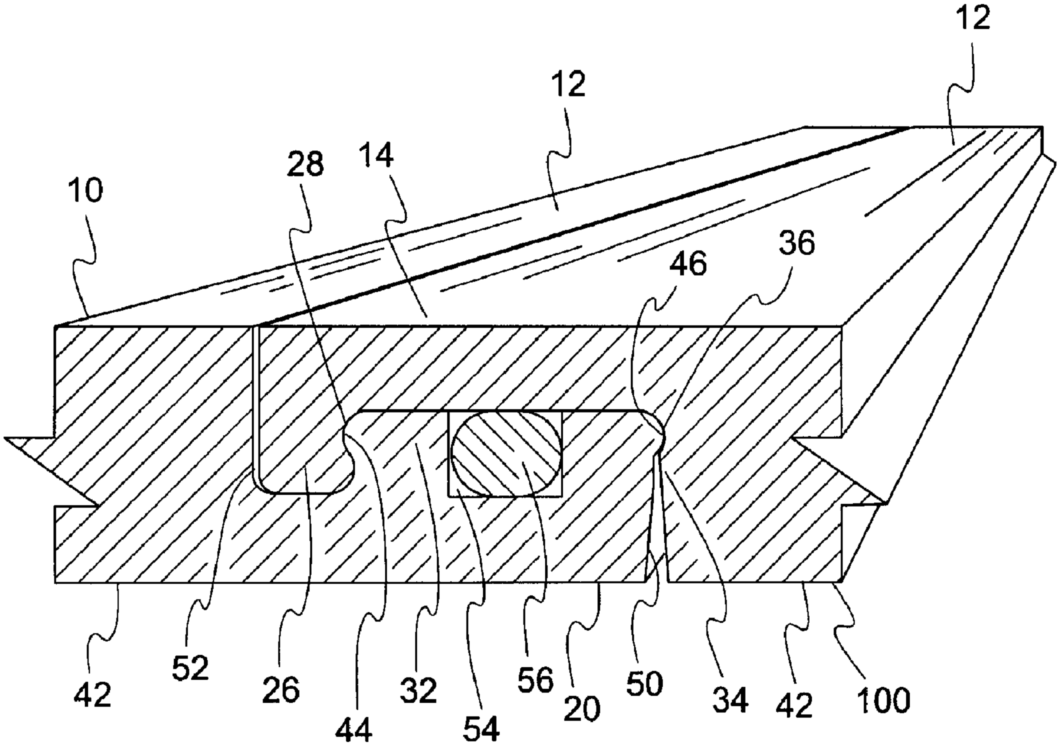


Fig. 2



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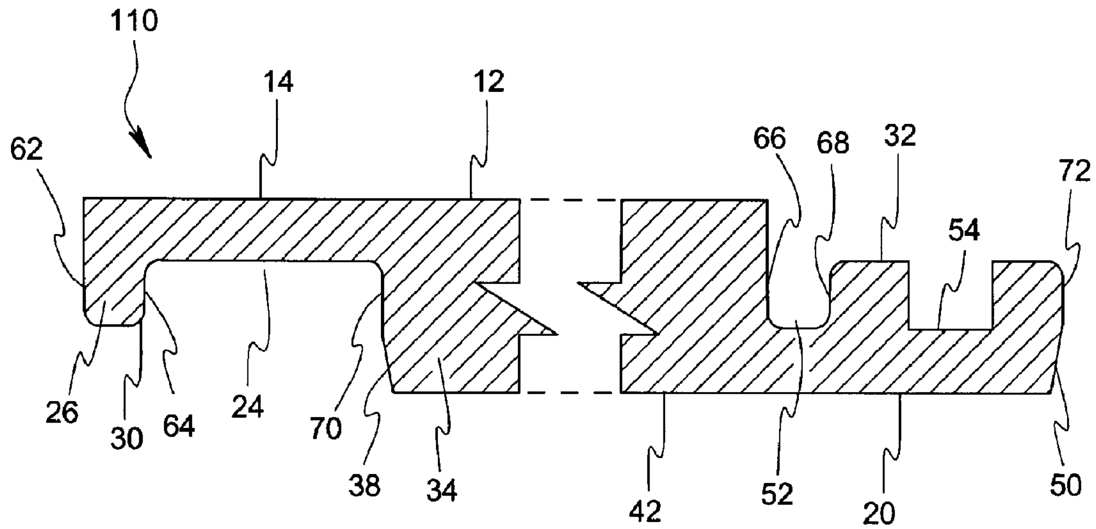

Fig. 4

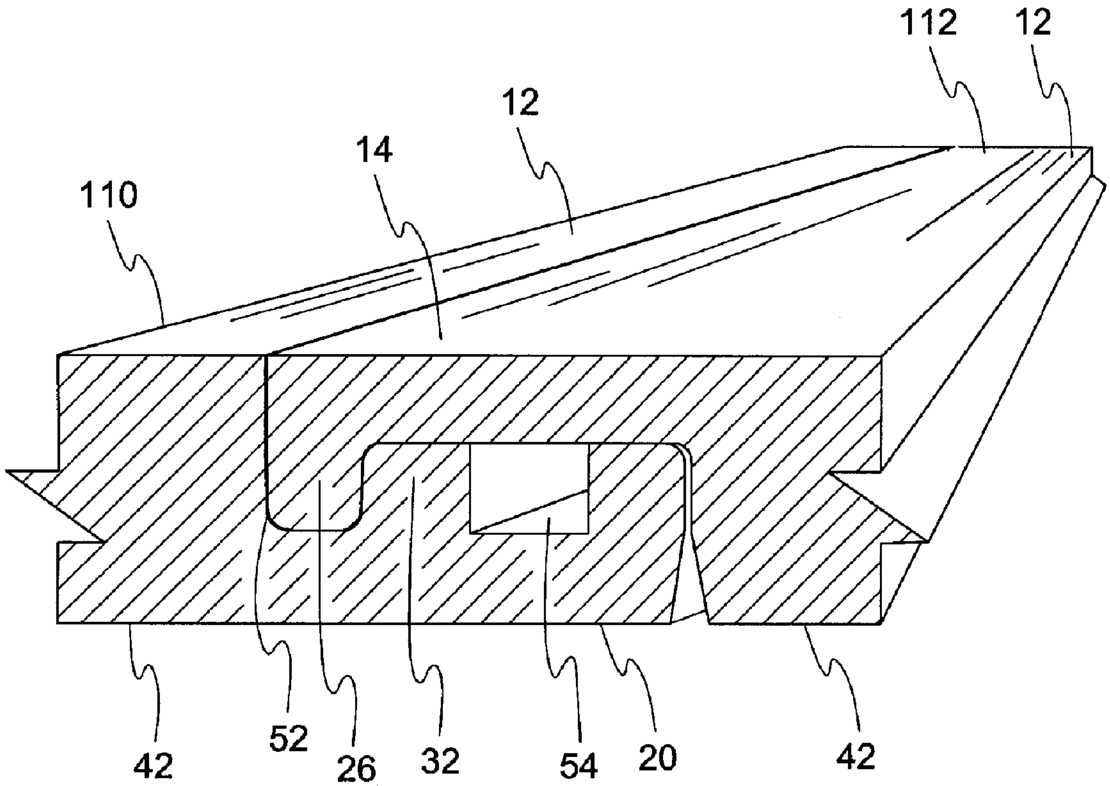

Fig. 5

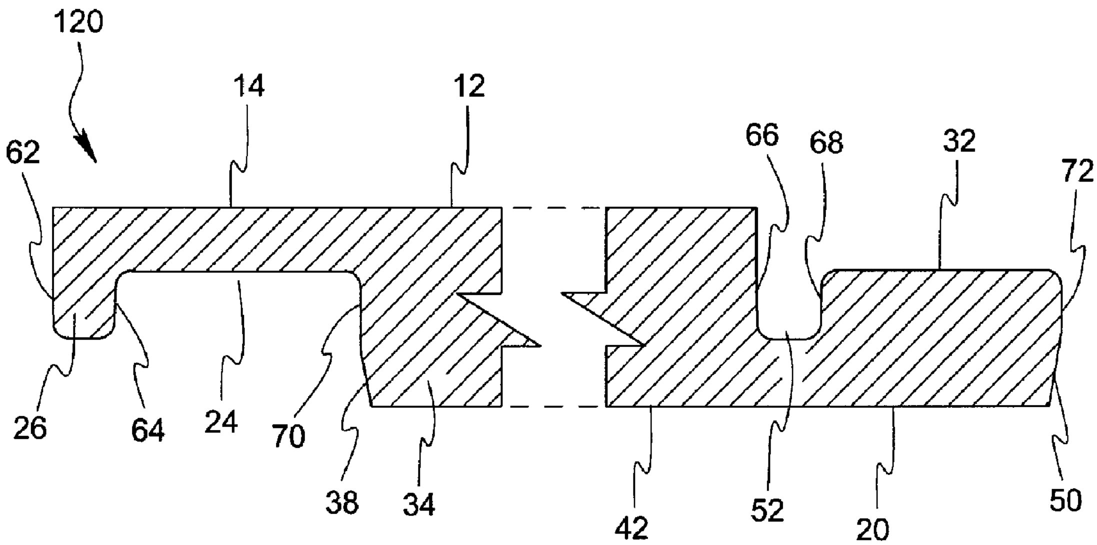

Fig. 6

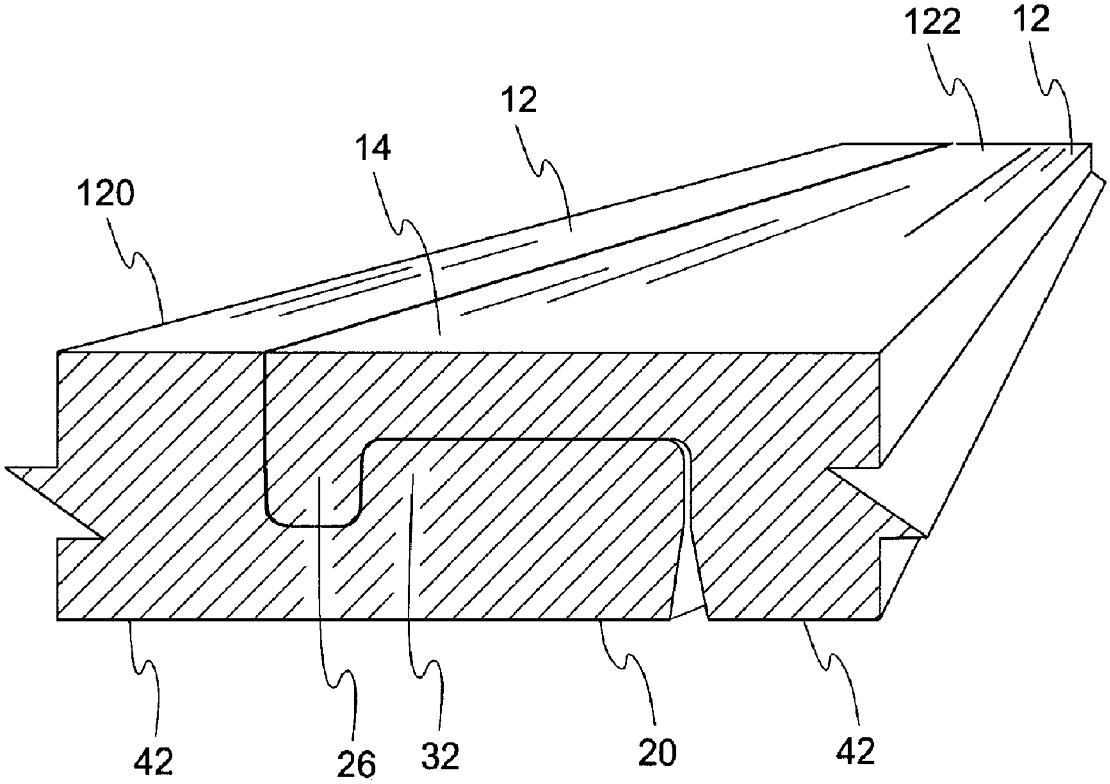

Fig. 7

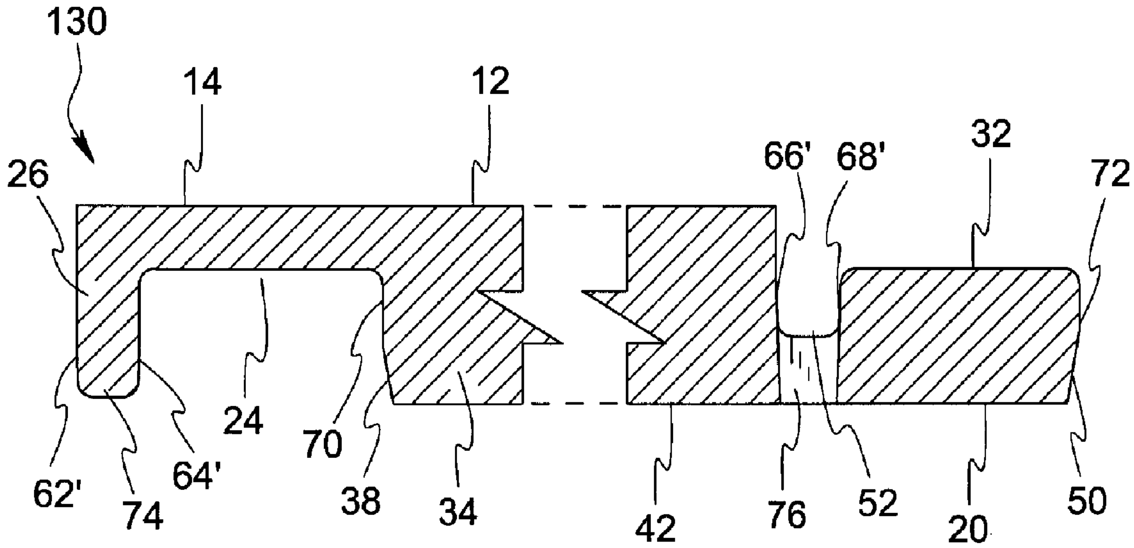

Fig. 8

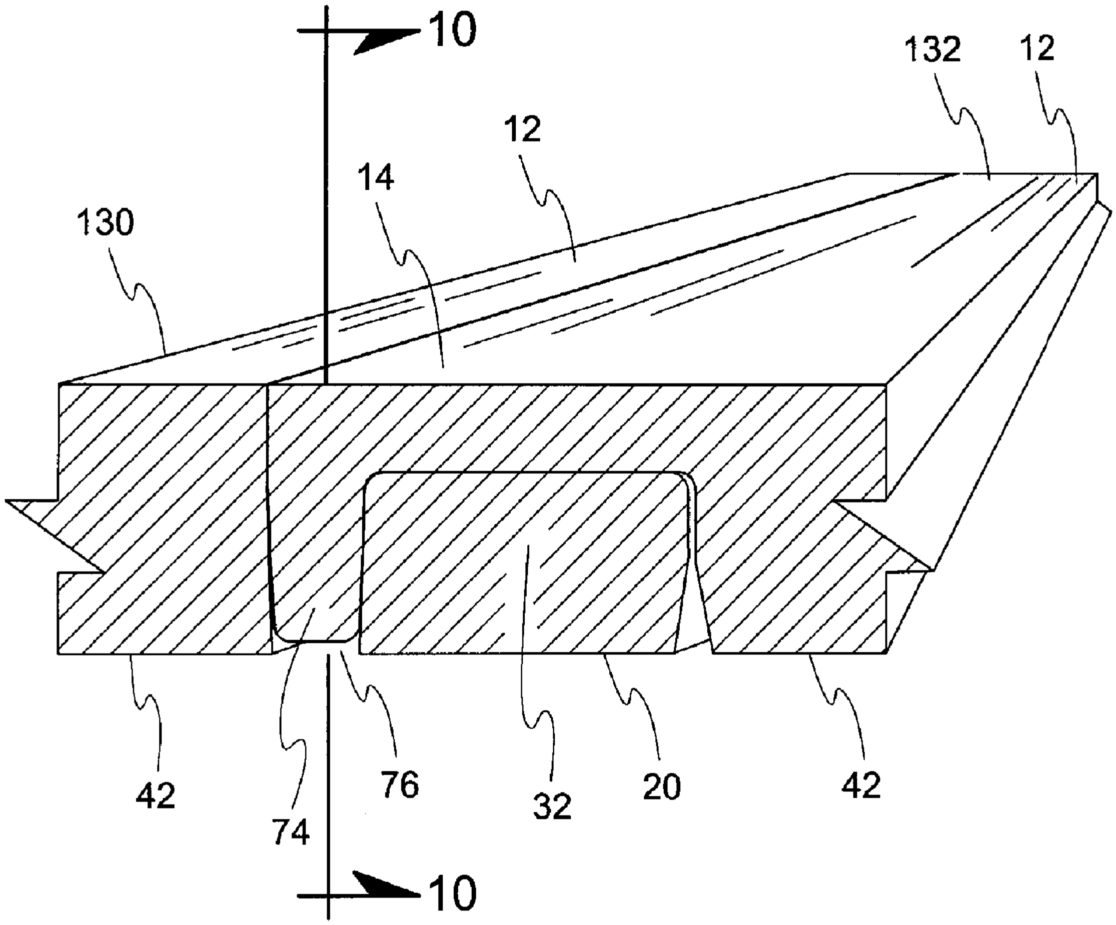

Fig. 9

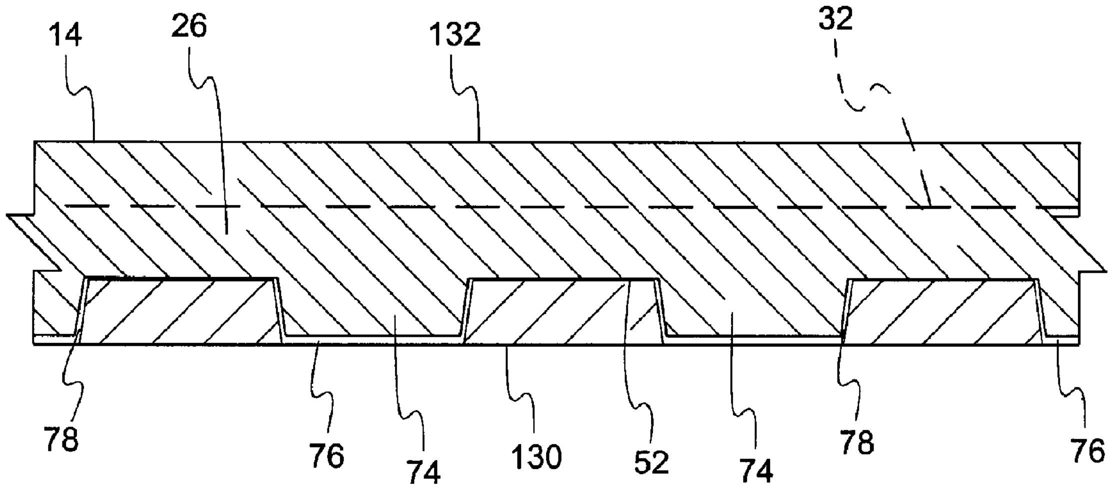

Fig. 10

INTERLOCKING TILE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The invention generally relates to static structures. More specifically, the invention relates to a modular floor tile unit having a discrete edgewise-connecting feature. The structure includes plural modular floor tile units connected by means lying between their major exposed faces, by units with a configuration on one face or edge shaped for interfitting with a mating configuration on an opposed adjacent unit. Each floor tile unit has an integral snap-in or interference-fit interlock. Two opposed edges of each tile unit include two portions with at least one projection or at least one recess that are a constituent part of the tile. In a specific embodiment, interfitting structures engage to function as a waterproof or water resistant seal and also function as latching elements between joined tiles. In another specific embodiment, a waterproof or water resistant seal element is located in the interfitting structures and is secured by latching elements located near the opposite edges of the seal element.

[0003] 2. Description of Prior Art

[0004] Floor surfaces can be classified as permanent, semi-permanent or temporary.

[0005] Permanent floor surfaces are those fastened to a static structure. For example, in architectural structures, the floor might be poured concrete, aggregate, ceramic tile, or various wood products attached to the structure by fasters or adhesive materials. Permanent plastic floor surfaces also are common in the form of resilient sheet flooring or floor tiles. An adhesive can attach permanent resilient flooring to an underlying surface. The adhesive tends to seal the interfaces between permanent floor tiles, with the result that liquids typically do not penetrate the interfaces. Such tiles may closely abut each other in rows and columns or staggered patterns, wherein uniformity of size enables the close, gap-free arrangement.

[0006] Semi-permanent or temporary floor surfaces are those that are loose-laid or attached by a readily released fastening means to an underlying permanent floor or ground. This type of flooring is desirable and even preferred to permanent floor surfaces in numerous situations. For example, a temporary floor surface may provide special characteristics such a cushioning, decoration, special game surface or playing surface, protection for high traffic pathways, and easy repair or replacement in case of damage or staining. A loose laid tile floor can be easier to install than a permanent surface because it requires little preparation of the underlying surface. In case of error during installation, replacing or reinstalling any part of the surface readily corrects the error.

[0007] Loose-laid tile employs integral interlocking keys to maintain the relative position with neighboring tiles. A variety of keys are known. However, achieving a reliably snug assembly between loose-laid tiles is a longstanding problem. The installer has no ability to change or improve upon the fit between interlocking tiles. Manufacturing tolerances determine how closely the tiles can fit. Gaps between tiles can be of concern both because of appearance factors and also because of contamination entering the gaps. Large gaps can allow dirt to enter, and such dirt can be difficult to remove from an assembled floor. Even small gaps can allow liquids to enter. Water and cleaning solutions passing through gaps might produce mold and mildew or damage the underlying permanent floor surface. Notably, loose-laid tile is particularly popular for use on garage floors. Automotive fluids such as gasoline, oil, and antifreeze also are undesirable and possibly dangerous or damaging for long term exposure. Consequently, it can be important for loose-laid tile to resist liquid and to allow clean up of spills without requiring disassembly of an excessive portion of the floor.

[0008] The problem of excessive gaps between loose-laid tiles is caused, in part, by the common practice of employing a plurality of interlocks or engagement elements arranged along each side of a tile. For example, one edge of a typical tile carries a plurality of male dovetail interlocks alternating with a plurality of female dovetail interlocks. A certain tolerance or clearance is required in the size of each male or female dovetail simply to be able to receive a mating dovetail from a neighboring tile. The required clearance must be increased to accommodate spacing variations between juxtaposed dovetails on the single tile. Tiles constructed of molded plastic materials require still more clearance due to uneven shrink rates of different tiles and different batches of tile. If inadequate clearance is provided, it may be difficult or impossible to join the interlocks of neighboring tiles. Thus, when loose-laid tiles are assembled, it is common to find considerable looseness and gaps between them.

[0009] Another longstanding problem with loose-laid tile is in achieving a level floor surface. The underlying surface will have imperfections in its uniformity. Because loose-laid tile is not adhered to the underlying surface, tiles overlying high points tend to protrude above the others.

[0010] U.S. Pat. No. 6,526,705 to MacDonald teaches an interlocking square tile that employs a plurality of hidden dovetail interlocks. Dovetail keys of about one-half the tile height, at the lower one-half of the tile height, are located around the four edges of each tile. On two of the ninety-degree edges of the square, the dovetail keys extend uncovered beyond the major exposed face of the tile. On the other two ninety-degree edges, the major exposed face of the tile on the upper one-half of the tile height covers the dovetail keys. The covered keys of one tile are engaged with the uncovered keys of another to form a continuous floor surface in which the major exposed faces at the top one-half of the tile are substantially continuous. The dovetail keys on the bottom one-half of the tile height are entirely hidden in the assembled tile array.

[0011] As a measure to reduce liquid penetration, the two sides of the tile carrying the exposed dovetails also carry a snap-in strip, shaped as an elongated, upstanding rib with an enlarged top end. The two sides of the tile carrying the covered dovetails carry a mating, downwardly open channel, suitably enlarged at its inner end to receive the enlarged top end of the rib. Due to the flexibility of plastic tile, which typically are formed of polyvinyl chloride, the rib snaps into the channel. With reasonable precision in manufacturing, these tiles have little gap, although liquids still might penetrate the junctions. Notably, the combination of two fastening systems—the dovetails and the rib—is undesirable because it creates a constrained design requiring increased tolerances in the fit between tiles.

[0012] U.S. Pat. No. 5,791,114 to Mandel teaches another variation of interlocking tiles that employs non-hidden dovetail keys. Dovetail keys simply extend from all four sides of the tile, over the full height of the tile. These exposed dovetail keys engage the similar full-height keys of each neighboring tile to form a substantially continuous floor surface. From the major exposed face of the tile, the dovetail keys are fully visible at each intersection. Invariably, the intersections have gaps that allow liquids to penetrate between tiles, and any tile is able to move out of a smooth floor plane if resting on a high point or obstruction.

[0013] U.S. Pat. No. 6,098,354 to Skandis teaches a joining system for loose-laid interlocking tile that employs hidden interlocks in which the mating keys are male-female sets. One side of the set is configured as loops that extend sideways, uncovered, from the lower half of two continuous sides of a tile. The other side of the set is configured as pegs that depend from the major exposed face of the tile on the other two continuous sides and terminate in free ends at the bottom face of the tile. The pegs fit through the open tops of the loops of a juxtaposed tile to lock the tiles together. The connection between tiles can be loose, with considerable gaps that allow liquids to penetrate between tiles. This type of tile can employ a supporting grid or array of pockets on the bottom face to enable drainage.

[0014] U.S. Pat. No. 5,630,304 to Austin teaches a tile joining system of hidden interlocks in which mating interlocks consist of a cavity on the bottom of a first tile that receives an upwardly extending member of the second tile. The interlock is secured by gravity. However, this interlock could fail to secure the tiles in a uniform plane if the underlying surface is uneven.

[0015] U.S. Pat. No. 6,282,858 to Swick shows roofing tiles that employ an interlock similar to the Austin patent, with the addition of a foam seal between overlapping edges of two roof tile panels.

[0016] It would be desirable to achieve a close fit and with liquid resistant seal and, optionally, a liquid-proof seal between loose-laid interlocking tiles, while also ensuring that the tiles are secured in a smooth, generally planar array.

[0017] It would be further desirable to form a floor surface of interlocked tiles with hidden interlocks, wherein the interlocks can be engaged or disengaged by moving a tile vertically, such that disassembly of an adjacent tiled area is not required.

[0018] It would be further desirable to form a floor surface of interlocked tiles with close spacing between tiles.

[0019] To achieve the foregoing and other objects and in accordance with the purpose of the present invention, as embodied and broadly described herein, the method and apparatus of this invention may comprise the following.

SUMMARY OF THE INVENTION

[0020] A general object of the invention is to provide a resilient floor tile with interlocking edge elements that enable juxtaposed tiles to be assembled by a vertical snap or press-in assembly method to secure tiles together.

[0021] Similarly, an object of the invention is to permit disassembly of interlocking floor tile by vertical motion relative to a horizontal floor surface, without requiring tilting or twisting.

[0022] Another object is to provide a tile interlock system that allows assembly of closely abutting tile such that gaps are substantially eliminated.

[0023] A further object is to provide an interlock that combines vertical assembly or disassembly with means for maintaining the assembled tiles in a smooth, generally planar array, despite a possible degree of irregularity in the underlying surface.

[0024] A more specific and optional object is to provide an effective a seal to prevent liquids from seeping or leaking between tiles.

[0025] A further and optional feature is to provide an interlocking floor tile that can be assembled in an offset pattern.

[0026] According to the invention, an interlocking plastic floor tile requires no adhesive for assembly to another like tile. The tile has four peripheral edges. Each of a first two contiguous peripheral edges include a laterally extending upper wall carrying a downwardly facing first channel structure of predetermined first configuration that is engageable and interlockable with a second predetermined channel structure. The two upper walls meet at a first ninety-degree corner. Each of a second two contiguous peripheral edges, opposite from the first two contiguous edges, include a laterally extending lower wall carrying the predetermined second channel structure in upwardly facing orientation. The second two walls meet at a second ninety-degree corner diagonally opposite from the first ninety-degree corner. Separate like tiles are assembled in juxtaposed relationship by engaging the first channel structure carried by an upper wall of a first such tile with the second channel structure carried by a lower wall of a second such tile to produce an engaged and interlocked junction between the respective first and second channel structures of the respective upper wall and lower wall of the respective first and second juxtaposed tiles.

[0027] According to a further aspect of the invention, in an interlocking plastic floor tile of the type described, above, one of the first and second channel structures additionally defines a groove that opens toward the other channel structure and carries a flexible seal. The seal is located such that it will be compressed and will seal against the other channel structure when the first and second channel structures are engaged and interlocked. The seal prevents low-pressure liquid flow or seepage between the assembled tiles.

[0028] According to a related aspect of the invention in the embodiment employing a flexible seal as described, above, the channel structure carrying the seal defines snap-in elements both outwardly from the seal and inwardly from the seal. The other channel structure defines mating snap-in elements, such that at the junction between assembled tiles, the seal is contained between a pair of engaged snap-in rails and channels. The pair of engaged snap-in rails and channels contains the seal.

[0029] According to another aspect of the invention in which two tiles are assembled at an interlocked junction, the upper wall of one tile and the lower wall of the other, respectively carrying the interlocked first and second channel structures forming the interlocked junction, are configured such that the upper wall covers the lower wall, whereby the upper wall hides the interlocked junction from view.

[0030] According to a still another aspect of the invention, in each of an assembled plurality of interlocking plastic floor tiles, the extension walls are terminated at diagonally opposite corners where upper walls and lower walls converge, such that the upper and lower walls do not cross, thereby allowing assembly of like tiles in an offset pattern between rows of tiles.

[0031] The accompanying drawings, which are incorporated in and form a part of the specification, illustrate preferred embodiments of the present invention, and together with the description, serve to explain the principles of the invention. In the drawings:

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] **FIG. 1** is a top plan view of a floor tile with integral edgewise interlocking rails and channels according to an embodiment of the invention. Edges of interlocking rails and channels below the major exposed face of the tile are shown in phantom.

[0033] **FIG. 2** is a vertical cross-sectional view taken along the plane of line **2-2** of **FIG. 1**, with an intermediate portion of the tile broken away, showing the tile edges with interlocking rails and channels in a first embodiment wherein the interlock is by snap-together assembly.

[0034] **FIG. 3** is a fragmentary perspective view in vertical cross-section of an interlocked junction between two tiles of the type shown in **FIG. 2**, showing a system of interlocking rails and channels and a seal when the tiles are in latched relationship.

[0035] **FIG. 4** is a view similar to **FIG. 2**, showing the interlocking rails and channels in a second embodiment wherein the interlock is by interference-fit assembly.

[0036] **FIG. 5** is a view similar to **FIG. 3**, showing an interlocked junction between two tiles of the type shown in **FIG. 4**.

[0037] **FIG. 6** is a view similar to **FIG. 2**, showing the interlocking rails and channels in a third embodiment wherein the interlock is by interference-fit assembly of a rail into a channel.

[0038] **FIG. 7** is a view similar to **FIG. 3**, showing an interlocked junction between two tiles of the type shown in **FIG. 6**.

[0039] **FIG. 8** is a view similar to **FIG. 2**, showing the interlocking rails and channels in a fourth embodiment, wherein the interlock is by interference-fit assembly of teeth into sockets.

[0040] **FIG. 9** is a view similar to **FIG. 3**, taken through a tooth and showing an interlocked junction between two tiles of the type shown in **FIG. 8**.

[0041] **FIG. 10** is a fragmentary cross-sectional view taken along the plane of line **10-10** of **FIG. 9**, showing the engagement of teeth and rail of one tile in the channel and sockets of a neighboring tile.

DETAILED DESCRIPTION

[0042] The invention relates to a floor tile formed of rigid, semi-rigid, or flexible materials. For purposes of description and example but not of limitation, the tile will be described with reference to an installation as floor tile in a horizontal position. Relative terminology, including references to top, bottom, base, upward, downward, vertical, horizontal, and the like, should be understood in this frame of reference and can be readily translated to other frames of reference, as required. References to outer, outermost, and like terminology refers to positioning relatively closer to the perimeter of a tile, while references to inner, inside and like terminology refers to positioning relatively less close to a perimeter.

[0043] With reference to **FIGS. 1-3** of the drawings, the invention is a plastic floor tile **10** that carries first and second interlocking elements. Each type of element is engageable with an element of the opposite type. A mated pair of interlocking elements is distributed between two juxtaposed tiles to lock the tiles together on two orthogonal axes. First, the interlocked tiles are secured against separation on a coplanar axis transverse to their juxtaposed edges, such as by parting or widening the junction between tiles. Second, the interlocked tiles are secured against separation transverse to the plane of the interlocked tiles, such as by an edge of one tile rising above the juxtaposed edge of the other. On a third orthogonal axis coplanar and parallel to the juxtaposed edges, the interlocking elements are slidable to enable the joined tiles to be adjusted in relative position, whether for alignment in rows and columns or for creating a staggered arrangement of offset tiles.

[0044] The interlocking elements may be configured as rail or channel structures. For example, snap-in channels or rails are located at opposite edges and a predetermined thickness from base to top. The snap-in rails or channels are for interconnecting with neighboring tiles. When installed within an assemblage of similar tiles, the tile **10** provides a main body having a major exposed face **12** that has four peripheral sides and is of the predetermined thickness from base plane to top plane so that an installed tile floor surface is substantially uniform and smooth, assuming the underlying surface is suitably uniform and smooth. A benefit gained from the snap-in rails is that the tiles can maintain a smooth surface appearance despite a degree of irregularity in the underlying surface.

[0045] A center, main body portion of each tile is of the predetermined full or maximum thickness. Walls extend laterally from all four sides of the main body for a minor distance and define a single interlocking structure at each edge. The lateral extensions at two contiguous sides of the tile define a first interlocking structure of a two-part, mating, interlocking set. Lateral extensions at the other two contiguous sides of the tile define a second interlocking structure of the two-part, mating, interlocking set. Two adjacent tiles are interlocked by engaging a first interlocking structure from one tile with a mating, second interlocking structure from the other.

[0046] Uniquely, the two-part interlocking structures are longitudinally elongated, linear structures in which each component extends parallel to a juxtaposed edge of a tile. The channels and rails extend continuously for the length of each side edge of the tile, providing a continuous and uniform mating along each entire edge, such that relative linear sliding between joined tiles is possible, enabling the assemblage of tiles to be arranged either in rows and columns or in staggered arrangement. The single linear joined pair of interlocking elements provides minimal design constraint and correspondingly requires little clearance or tolerance, thereby enabling a close fit with minimal gap between tiles.

[0047] A further feature is that the peripheral edges of each tile are linear, and contacting edges of the various lateral extensions also are smooth and linear. The interlocking structures are characterized by the absence of further constraining elements such as dovetail joints. Thus, the smooth and linear edge contact surfaces can be designed and produced without excessive constrained design, resulting in minimal gaps between joined tiles and further enabling and supporting the previously described ability to slide tiles along juxtaposed edges.

[0048] The lateral extension walls defining each of the two mating structures of the interlocking set are of less thickness than the full thickness of the center, main portion of the tile, as described above. In an interconnected assembly between neighboring like tiles, first and second mating structures overlap and engage to approximately equal the predetermined, full thickness of the tile, such that the rails and channels are substantially fully supported when assembled in mated arrangement. The first pair of lateral extension walls **14** and **16** define the first member of the mating set, have a predefined thickness less than the full thickness, and depend from the plane of the top surface **12** of the tile. The second pair of lateral extension walls **18** and **20** define the second member of the mating set, have a predefined thickness less than the full thickness, described above, and extend upward from a base plane of the tile. On adjacent tiles to be interconnected, a lateral extension wall of each type overlaps the other. The mating channels and rails or other structures of the two walls engage and are pressed together by motion perpendicular to the major surfaces of the tile, which motion would be vertical compression where the tile is installed horizontally, such as on a floor.

[0049] The pair of first two contiguous extension walls **14**, **16** are arranged to meet at a square corner **22**, such as at approximately ninety degrees in a horizontal plane, forming a common first corner **22**. The top of each is aligned with the plane of the major exposed face **12** of the tile. Conveniently, these first extension walls **14**, **16** may be referred to as the top extensions. **FIG. 2** shows the structure of top extension **14** as representative of the first pair of extension walls **14** and **16**.

[0050] According to a preferred arrangement, a top extension wall forms a recessed or female channel structure **24** on its undersurface. The channel **24** is bounded at the outward edge of the tile by a depending end wall **26** that will be referred to as the downward channel wall. A space exists between the undersurface of walls **14**, **16** and the bottom **42** or base plane of a tile **10**. This space exists because the predefined thickness of the top extensions **14**, **16** is less than the predetermined, full thickness of the center portion of a tile **10**. The channel **24** opens to the space below the top extensions **14**, **16**.

[0051] According to the embodiment of **FIGS. 2 and 3**, inside channel **24**, near the top surface of the channel **24**, the downward channel wall **26** is undercut at a slight negative angle to create a first or outermost snap-in receptor area **28**. The inner surface of downward channel wall **26** is configured with an entry radius **30** below the undercut **28** to aid in reception of a mating, male snap-in rail **32**, described below, into channel **24**.

[0052] An inside wall **34** of channel **24** is similarly undercut to form a second, innermost snap-in receptor area **36** facing the outermost receptor area **28**. The inside wall **34** of the snap-in channel **24** is configured at an entry surface portion **38** with an entry angle to further aid in reception of a male snap-in rail **32** into the female channel **24**.

[0053] A pair of second contiguous lateral extension walls **18**, **20** of the tile **10** are similarly arranged to meet at a square corner **40** of approximately ninety degrees and lie at opposite edges of the tile **10** from the first two lateral extension walls **14**, **16**. The second lateral extension walls **18**, **20** meet at common corner **40** that is diagonally opposite from corner **22**. The pair of second lateral extension walls **18**, **20** is aligned with the bottom face **42** or base plane of the tile **10**. Conveniently, the second lateral extension walls **18**, **20** may be referred to as the base extensions. **FIG. 2** shows the structure of base extension **20** as representative of the second pair of extension walls **18** and **20**. A space exists between the upper surface of the base extensions **18**, **20** and the top plane of tile **10** at major face **12**. This space exists because the predefined thickness of the base extensions **18**, **20** is less than the predetermined, full thickness of the center portion of the tile **10**.

[0054] According to the preferred arrangement, on its upper face each of the base extensions **18**, **20** carries a male channel structure, which will be referred to as a male channel or rail **32**. The male and female channel structures are complimentary and adapted for mutual engagement. The male rail **32** is an elongated linear rib with a face wall and opposite sidewalls. The rail **32** is configured with mating size and shape to the female channel **24**. In the embodiment of **FIGS. 2 and 3**, the rail **32** can be configured to enter the snap-in channel **24**, and snap-in portions on the sidewalls of the rail **32** will be engaged in the receptor areas **28**, **36**. Correspondingly, in the embodiment of **FIGS. 2 and 3**, the top side edges of the rail **32** include optional opposite wider edge snap-in portions **44**, **46** that are wide enough to snap-fit into the receptor areas **28**, **36** of the snap-in channel **24**. Below these relatively wider portions **44**, **46**, the sidewalls of rail **32** are sufficiently narrow at respective inner and outer wall surfaces **48**, **50** to fit between the snap-in channel entry wall surfaces **30**, **38** below the receptor areas **28**, **36**. The wide top **44**, **46** and narrower lower wall surfaces **48**, **50** of the rail **32** can be fabricated by undercutting the sidewalls of the rail at a suitable distance below the top areas **44**, **46**.

[0055] The inner side edge **48** of the rail **32** is spaced from the central, full thickness area of the tile by an upward opening channel **52**. This upward opening channel **52** is of a size and shape suitable for receiving the downward channel wall **26** of a top extension **14**, **16** when the rail **32** is snapped into a female channel **24**. One wall of channel **52** at surfaces **44**, **48** shares the profile of rail **32**, which enables the groove **52** to share a snap-in function with wall **26**.

[0056] As described thus far, the floor tile **10** has a unique assembly structure employing engageable channels and rails at four peripheral edges **14**, **16**, **18**, and **20**. The peripheral edges **14** and **16** extend laterally from the plane of the upper surface of the tile and carry a downwardly facing first channel structure configured to engage and interlock with a second channel or rail structure. The first channel structure extends longitudinally parallel to an edge of the tile, and the extending edges **14** and **16** approach or meet at a first ninety-degree corner. Peripheral edges **18** and **20**, which are opposite from the first edges **14** and **16**, extend laterally from the plane of the base of the tile and carry the mating, second channel or rail structure **52**, **32** in an upwardly facing orientation. The extending edges **18** and **20** approach or meet at a second ninety-degree corner diagonally opposite from the first ninety-degree corner. Two tiles are assembled in juxtaposed relationship by engaging the first channel structure **24** carried by one of the walls **14** or **16** of the first tile with the second channel or rail structure **52**, **32** carried by one of the walls **20** or **18** of the second tile. A longitudinally elongated interlocked junction between the first and second channel or rail structures of the mating walls **14** and **20** or the mating walls **16** and **18** engages the assembled two tiles.

[0057] In a further and optional feature, the junctions between assembled tiles may include a seal to prevent seepage of liquids. Either or both top and base extension walls may carry a seal. The seal is located such that it will be compressed and will seal against the other channel or rail structure when the first and second channel or rail structures are engaged and interlocked. The seal extends parallel to the longitudinally elongated channel or rail structures. In assembled tiles, the assembled array of seals forms a linear barrier at each of the four edges of each tile.

[0058] The snap-in rail **32** is wide enough to allow one or more intermediate, upward facing slots or seal channels **54** to be formed in the face thereof between the lateral edges **44**, **46** of the rail **32**. Seal channels **54** preferably are central between edges **44**, **46**. Optionally, a channel **54** carries a linear flexible seal **56** of suitable size to be engaged for retention during handling by the bottom and sides of the seal channel **54**. The top of the seal **56** protrudes above the open top of the seal channel **54** when top and bottom extensions are not engaged. Locating the slot **54** in base extension wall **18** or **20** may be preferred so that gravity helps to retain the seal rather than to displace it.

[0059] One suitable configuration of the linear seal **56** is as an elongated tube, cylinder, or strand of circular transverse cross-section. The cross-sectional configuration of the seal channel **54** differs from the configuration of the seal **56**, itself, so that voids are present between the seal **56** and the interior of the channel **54** before the seal **56** is compressed by joining adjacent tiles **10**, **100**. For example, the seal channel **54** can be square or rectangular in cross-section, while the seal **56** is round. Between these two shapes, if the uncompressed diameter of the seal **56** is approximately equal to the width of the seal channel **54**, empty spaces will be found in the corners of the seal channel **54** and possibly in other areas of the seal channel **54**, as well. The empty space should be sufficient in volume to allow reception of displaced portions of the seal **56** when the seal **56** is compressed by the snap-in joining of adjacent tiles **10**, **100**.

[0060] The seal **56** typically is formed of a different material or composition from the remainder of tile **10**, which allows the seal **56** to have substantially different characteristics than the remainder of tile **10**. The preferred seal **56** is formed of a highly compressible, thin-skinned foam material in preference to a denser, deformable material such as the high-density rubber as commonly used for o-ring seals. The difference in materials allows the seal to be specially adapted to the unique needs of sealing between loose-laid tiles. The seal **56** or any plurality of seals are of a flexible material such as soft rubber, or skinned surface foam that exhibit properties to allow the seal to be compressed with low force so as not cause the snap-in interlock between tiles to deform or disengage. The cross-section of the seal **56** may be circular, triangular, square or any shape that may both seal, but not cause the snap-in interlock between tiles to disengage or deform.

[0061] The seal **56** is located between the snap-locked structure formed at one sidewall of channel **24** by surfaces **28**, **44** and the snap-locked structure formed at the second sidewall of channel **24** by surfaces **36**, **46**. As a result of this two-sided snap lock, both snap locks oppose any counter-compressive, separating force exerted by the seal **56** between top and bottom extensions. The tile **10** typically is formed of flexible plastic material such as flexible polyvinyl chloride, which may be deformed by certain forces. The two-sided snap lock resists any tendency for deformation at the junction of the tiles.

[0062] The snap-in structures or other interlocking means are sized and configured such that the flexible seal **56** will become compressed when the interlock is engaged. The fit is suitable to form an effective seal to prevent low-pressure flow or seepage of liquids, such as when the assembled floor is cleaned with water, or when water has accumulated on the floor surface due to melting snow etc.

[0063] Alternatively the seal may be applied in place at the time of tile assembly on a floor utilizing any commercially suitable material.

[0064] As described, the seal operates to prevent seepage of liquids between loose-laid tiles. The seal is chosen both to achieve a suitable degree of sealing and to allow mated extension walls of the tile to achieve but not exceed the predetermined full thickness of the central areas of the tile. At the same time, the extension walls flank the seal with a pair of snap-in interlocks as a further and complimentary means for ensuring that the extension walls maintain a flat appearance between assembled tiles.

[0065] Optionally, the tiles **10**, **100** are mated in a configuration wherein rows of tile are offset from one another. Within a single tile **10**, upper extension walls **14**, **16** are non-intersecting and non-overlapping with the lower extension walls **18**, **20**. Both varieties of extension wall terminate prior to reaching a crossing configuration at any corner of a tile **10**. Therefore, the extension walls may be described as approaching a junction or crossing configuration but terminating immediately prior to such a crossing.

[0066] A third corner **58** of tile **10** is located at one of the two meeting points or approaching junctions between a top extension with a base extension, for example at the corner of extension walls **14** and **18**. A fourth corner **60** of tile **10** is located diagonally opposite from the third corner **58**, at the other of the two meeting points or approaching junctions between a top extension and a base extension, for example at the corner of extension walls **16** and **20**. At the third and fourth corners **58**, **60**, the lateral extension walls **14-20** are absent, have terminated, or do not cross, according to the top view of **FIG. 1**. Both the top extensions **14, 16** and the base extensions **18, 20** terminate at the corner points **58, 60**, at the end of the central, full-thickness portion of the tile.

[**0067**] With the lateral extension walls **14-20** absent, the view of **FIG. 1** shows a notched appearance at diagonal corners **58, 60**. This notched corner configuration at the junction corners between upper and lower extension walls enables tiles **10, 100** to be assembled in offset patterns, if desired.

[**0068**] **FIG. 3** best shows an assembly method between a first tile **10** and a similar second tile **100**, configured to snap together at least at the outside edge of a channel groove **52** of the first tile and the inside edge of a depending channel wall **26** of the second tile. The drawing employs the same reference numerals for elements of each tile as previously described. First, the tile **10** is placed on the floor. Second, the tile **100** is located so that its channel **24** is immediately above rail **32** of the first tile **10**. Third, the second tile **100** is pressed vertically or normally to the surface of the first tile to snap channel **24** on to rail **32**, thus securing the tiles **10** and **100** together. Conveniently, the channel **24** can be pressed on to rail **32** by hand force at one or more initial positions, such as at the opposite ends of the channel. The remainder of the channel can be applied to the rail by sliding fingers progressively together from the end positions. This assembly technique is especially suitable when the tiles **10, 100** are formed of a flexible plastic such as polyvinyl chloride. This completes the assembly of one tile **10** to another tile **100**. Subsequent tiles are then assembled in the same manner to create the covering of an entire floor. Assembly is possible in square rows and columns or in offset rows, as desired.

[**0069**] The engagement between juxtaposed tiles is an engagement of channel and rail structures. One type of engagement between channel and rail structures is between a female snap-in channel **24** defined in top extensions **14, 16** and an upwardly extending male snap-in rail **32** defined in base extensions **18, 20**. Channel **52** also receives downward channel wall **26**. The channel structures function equally well if reversed in relative orientation between top and bottom positions.

[**0070**] As previously stated, the seal **56** is optional. The seal channel **54** or its equivalent is a desirable element of rail **32** regardless of whether the seal is employed. Channel **54** provides added flexibility to rail **32** so that the structures forming channel **24** can more easily deflect the sides of rail **32** during the snap-on process. **FIGS. 4 and 5** show the use of an empty channel **54**.

[**0071**] In an assembled array of tiles according to this invention, the interlocked junction between tiles is hidden from view, as best shown in **FIG. 3**. The upper wall of one tile **100** and the lower wall of the other tile **10**, respectively carrying the interlocked first and second channel structures forming the interlocked junction, are configured such that the upper wall covers the lower wall, whereby the upper wall hides the interlocked junction from view.

[**0072**] The snap-in interlocking structures of **FIGS. 2 and 3** are effective to establish and maintain a horizontal alignment between juxtaposed tiles. Assembly and disassembly take place by vertical movement of one tile to another. The snap-in structures also are effective to resist passage of liquids, with or without the use of a seal **56**. The snap-in structures are an engaging or gripping means for securing the tiles together in horizontal alignment and resisting passage of liquids. Alternative engaging or gripping means may serve similar functions and are described, below.

[**0073**] **FIGS. 4 and 5** illustrate a second embodiment of the invention in which a modified tile **110** carries vertical interference-fit structures in place of vertical snap-in structures. An interference-fit structure of a first tile **110** is configured to engage a cooperatively configured structure of an identical second tile **112** in a frictional engagement. Typically, the interlocking structures can be considered to be male or female structures. One or both is an elongated linear channel or rail aligned to be parallel with an edge of the tile. The channel or rail is configured with a taper that interferes with full engagement between the channel and rail before the two tiles are in full horizontal alignment. As a result, vertical force is required to fully seat one tile in planar alignment with the other. When used with floor tile, the taper might be small, such as one or two degrees. Further, the interference point can be a small dimension from full horizontal alignment, such as one-tenth inch from alignment. The material of the tiles should have a low hardness in order to permit easy assembly. On the Shure harness scale, a hardness of about eighty-five to ninety is suitable. Due to its flexibility, polyvinyl chloride is a suitable material for either snap-in fit or interference fit. Due to its rigidity or semi rigidity, polypropylene is better suited for interference fit.

[**0074**] In **FIGS. 4 and 5**, channel wall **26** of tile **110** is configured with a downwardly converging taper. As one option, outer wall surface **62** tapers from true vertical. Additionally or alternatively, inner wall surface **64** tapers from vertical. The tapering surfaces of the two walls **62, 64** can be flat, each tapering at a small angle such as, for example and not as limitation, one or two degrees from vertical. Channel **52** of one tile will receive a wall **26** of the other during assembly of two similar tiles **110, 112**. The configuration of channel **52** may include downwardly converging sidewall surfaces **66** and **68**. The resulting configuration of channel **52** may produce a zero clearance fit with channel wall **26** before channel wall **26** is fully bottomed in channel **52**. Vertical force applied to the mating structures will engage the interference fit and bring the tiles into horizontal alignment. It is not required that each of surfaces **62-68** be tapered from vertical. As little as one surface may be tapered to achieve the interference fit.

[**0075**] Channel **24** and rail **32** of mated tiles **110, 112** may be engaged by an additional or optional interference fit. The inside channel wall surface **70** may taper upwardly toward the opposite channel wall surface **64**, such that wall surfaces **64** and **70** converge upwardly. The outside wall surface **72** of rib **32** may taper upwardly, such that surfaces **68** and **72** converge upwardly. As previously described, a zero-clearance fit is achieved between the channel **24** and rib **32** before two tiles **110, 112** being joined are fully horizontal. Added vertical force can engage tiles with an interference fit.

[**0076**] **FIG. 5** shows tile **110** engaged in horizontal alignment with similar tile **112**. In this drawing figure, the interference fit is established between channel wall **26** and channel **52**. The interference fit is especially useful if a material of construction is poorly suited for snap-in assembly. For example, due to its rigidity, polypropylene is suited for interference fit.

[0077] **FIGS. 6 and 7** illustrate another interference fit between tiles that do not use a separate seal element **56**. The interference fit provides a surface-to-surface seal at one or more locations between the mated channel and rail structures. Thus, the seal **56** is optional. A snap-in junction provides similar alternative sealing between the snap-in elements of **FIGS. 2 and 3**.

[0078] Tile **130** of **FIGS. 8, 9**, and **10** shows another embodiment of a junction interlocked by interference fit. In this embodiment, channel wall **26** will be referred to as rail **26** that extends downwardly as in prior embodiments and, in addition, defines a plurality of spaced apart, further depending teeth **74**, best shown in **FIG. 10**. Tapered outer and inner surfaces of the rail **26** extend over both the height of the rail **26** and of each tooth **74**. Thus, the outer surface **62'** and the inner surface **64'** extend downwardly over both the height of the rail **26** and the tooth **74**.

[0079] At the opposite side edge of the tile **130**, channel **52** carries the addition of tooth sockets **76** at spaced intervals corresponding to the spacing of teeth **74**. The tapered side surfaces of channel **52** are modified such that surfaces **66'** and **68'** extend over both the height of channel **52** and the height of each socket **76**.

[0080] When two similar tiles **130, 132** are joined as shown in **FIGS. 9 and 10**, an interference fit results between surfaces of the channel wall including teeth **74**, and surfaces of channel **52** including sockets **76**. Surface **62'** may engage against surface **66'** and surface **64'** may engage against surface **68'**. The bottom end of each tooth socket **76** may be open to allow each tooth **74** to enter the full depth of the socket, as required. However, in the fully engaged position as shown in **FIG. 10**, the tooth is shorter than the depth of the socket so that it does not protrude from the bottom of the tile **130**. The tooth is supported against further entry by the bottom of rail **26** contacting the bottom of channel **52** between the positions of the sockets **76**. With further reference to **FIG. 10**, the height of the top of rail **32** is shown in phantom. Extension wall **14** rests on the top of rail **32** to further support the teeth **74** at a predetermined entry into sockets **76**. Thus, the teeth provide opposite elongated surfaces suited for establishing an interference fit between mating tile edges, while being reliably supported against over-insertion into the tooth sockets.

[0081] The sockets **76** and teeth **74** are configured to allow a clearance **78** at the longitudinal edges of the teeth. This clearance ensures that the plastic material of the teeth have an available displacement area. The position of the teeth **74** and sockets **76** is substantially pre-established with respect to the edge of the tile **130, 132** so that the two tiles will have no substantial gap between them when the teeth are engaged on sockets **76** by interference fit.

[0082] The clearance **78** provides no significant design constraint. The clearance **78** is aligned with the longitudinal dimension of the interlocking elements, where longitudinal sliding between juxtaposed tile edges is desirable. Thus, a substantial clearance **78** enables juxtaposed tiles to be precisely aligned and does not contribute to an increased gap between tiles. The number and relative position of the teeth **74** and sockets **76** can be selected to allow relative tile placement within common staggered patterns, such as one-half tile offset. Axial sliding between juxtaposed tiles remains possible within the chosen clearance **78** and also by raising the teeth **74** above the sockets **76** while sliding a tile.

[0083] **FIGS. 5, 7, 9** and **10** show a further assembly method between a first tile **120, 130** and a similar or matching second tile **122, 132**, wherein the first tile includes a channel **52** configured with an interference fit with respect to a rail **26** of the second tile. The first tile **120, 130** is placed on the floor. Next, the second tile **122, 132** is located so that its rail **26** is immediately above an upwardly open channel **52** in the first tile **120, 130**. Third, the second tile **122, 132** is pressed vertically or normally to the first tile to engage the rail **26** into the channel groove **52** such that the two tiles become secured by interference fit. This completes the assembly of a first tile **120, 130** to a second tile **122, 132**. Subsequent tiles are then assembled in the same manner to create the covering of an entire floor. Assembly is possible in square rows and columns or in offset rows, as desired.

[0084] Optionally, the rail **26** includes a plurality of depending teeth **74**, and a longitudinally extending channel **52** includes a matching plurality of tooth sockets spaced along the longitudinal length of the channel **52**. A clearance **78** exists between the teeth **74** and sockets **76** in the longitudinal dimension of the channel **52**, while the interference fit exists between a tooth and the longitudinal walls of the channel **52** or sockets **76**.

[0085] The described embodiments provide a single linear engagement system that lies parallel to each edge of a tile. The linear engagement between a channel and rail eliminates much of the constrained design resulting from the use of dovetail junctions. Thus, clearances and tolerances can be relatively small, with the result that juxtaposed tiles are disposed close to one another and without substantial gap. This closeness is helpful in creating a strong resistance to penetration by liquids at the tile edges. The linear junction also permits the tiles to be arranged in offset, staggered arrangements while maintaining the described closeness between juxtaposed tiles. Finally, the assembly of such tiles benefits from a reliable fit requiring low assembly forces. Such low forces can benefit from the presence of a longitudinal groove or channel **54** extending parallel to the rail **26** or channel **52**.

[0086] The forgoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be regarded as falling within the scope of the invention.

What is claimed is:

1. In an improved interlocking floor tile for participation in a loose-laid assemblage of like floor tiles, the improved floor tile having a main tile body defined between a top surface, a bottom surface, and four peripheral edges, wherein each of a first pair of two contiguous peripheral edges includes a laterally extending upper wall; wherein each of a second pair of two contiguous peripheral edges, opposite from said first pair, includes a laterally extending lower wall; the improvement comprising:

first and second longitudinally elongated interlocking elements suitably configured for securing two tiles joined at one juxtaposed edge of each in substantially coplanar relationship on two orthogonal axes while maintaining a mutually slidable relationship on a third orthogonal axis, the secured axes including a coplanar transverse axis relative to said juxtaposed edges and an axis transverse to the common plane of the tiles, and the slidable axis including a coplanar parallel axis to the juxtaposed edges;

wherein each of said first and second interlocking elements is disposed with its longitudinal dimension parallel to a different peripheral edge of the tile, each of said upper walls carries a first element of said set in downwardly extending relationship, and each of said lower walls carries a second element of the set in upwardly extending relationship; and

said peripheral edges are substantially linear, enabling sliding movement between juxtaposed edges of like joined tiles.

2. The floor tile of claim 1, wherein:

said first and second interlocking elements respectively comprise first and second channel structures configured for mutual engagement;

said first channel structure comprises a female channel having opposite sidewalls spaced at a first selected width and having a relatively wider snap-in reception area defined in at least one of said sidewalls; and

said second channel structure comprises a male channel, having a face wall and opposite sidewalls spaced at a second selected width narrower than said first selected width, and having at least one relatively wider edge portion extending to greater than said first selected width and suitably positioned to engage said snap-in reception area when the second channel structure is received in the first channel structure.

3. The floor tile of claim 2, wherein:

said male channel defines a longitudinally elongated linear slot in said face wall, spaced between said opposite channel sidewalls, providing an improved ability of said wider edge portion of the channel to deflect during reception of the second channel structure into the first channel structure.

4. The floor tile of claim 2, wherein:

said female channel defines said snap-in reception area in both sidewalls thereof;

said male channel defines said relatively wider edge portion on each of said opposite sidewalls thereof, suitably positioned to snap in to said snap-in reception areas when the second channel structure is received in the first channel structure; and

a compressible linear seal is carried in said longitudinally elongated linear slot in said face wall and extends from said face wall sufficiently to be compressed against the female channel when the male channel is engaged in the female channel, and the seal is arranged such that the relatively wider edge portions in each of the opposite sidewalls of the male channel provide two-sided locking engagement on each lateral side of said seal, opposing disengagement of said first and second channel structures under counter-compressive force of the compressed seal.

5. The floor tile of claim 1, wherein:

said first interlocking element comprises a female channel that defines longitudinally extending, opposite sidewalls;

said second interlocking element comprises a male channel that defines a face wall and longitudinally extending, opposite sidewalls;

said female and male channels are configured to be mutually engageable by moving two tiles from non-coplanar position into coplanar position;

the female and male channels are configured to have interference of fit between respective sidewalls prior to said tiles reaching coplanar position; and

the female and male channels are lockable in a relative longitudinal position by forcing the tiles into coplanar position with respective sidewalls of the female and male channels in interference fit.

6. The floor tile of claim 5, wherein:

said male channel defines a longitudinally elongated linear slot in said face wall, spaced between said opposite male channel sidewalls, providing an improved ability of said male channel to deflect during entry into said female channel in interference fit.

7. The floor tile of claim 6, wherein:

a compressible linear seal is carried in said a longitudinally elongated linear slot in said face wall of said male channel, arranged such that said seal is compressed against said female channel when the female and male channels are engaged in interference fit.

8. The floor tile of claim 6, further comprising:

a plurality of teeth arranged on said male channel at longitudinally spaced intervals, positioned to enter said female channel in advance of the male channel when the male and female channels are being engaged;

a plurality of sockets each sized and positioned for receiving at least one of said teeth, arranged in the female channel at like longitudinally spaced intervals;

wherein each tooth includes a sidewall generally parallel with a sidewall of the male channel, and each socket includes a sidewall generally parallel with a sidewall of the female channel, arranged such that the sidewalls of the teeth and sockets create an interference fit prior to said tiles reaching coplanar position.

9. The floor tile of claim 8, wherein said sockets and said teeth are mutually sized to allow a clearance between the sockets and teeth at longitudinal ends of the sockets and teeth, such that the teeth are longitudinally moveable in the sockets.

10. A method of assembling a first tile with a like configured second tile, comprising:

providing a first and second tiles wherein the first tile includes a channel parallel to an associated tile edge thereof and the second tile includes a rail parallel to an associated tile edge thereof, wherein said rail and channel are engageable to bring said first and second tile into generally coplanar alignment when their respective associated edges are juxtaposed;

configuring said rail and channel with an interference fit, wherein said interference arises before the first and second tiles reach generally coplanar alignment;

placing the first tile on a floor with the channel upwardly open;

locating the second tile such that the rail is immediately above the open channel; and

pressing the second tile normally to the first tile to engage the rail into the channel such that the two tiles become secured by interference fit.

11. An improved assemblage of at least two loose-laid interlocking floor tiles, wherein each floor tile includes a main tile body defined between a top surface, a bottom surface, and four peripheral edges; each of a first pair of two contiguous peripheral edges of each tile includes a laterally extending upper wall; each of a second pair of two contiguous peripheral edges of each tile, opposite from said first pair, includes a laterally extending lower wall; the improvement comprising:

the first tile includes a longitudinally elongated rail, depending from said laterally extending upper wall and disposed parallel to a juxtaposed peripheral edge of said first pair of edges;

the second tile includes a longitudinally elongated, upwardly open channel in said laterally extending lower wall, disposed parallel to a juxtaposed peripheral edge of said second pair of edges;

said rail is engaged in said channel in an interlocking relationship joining said juxtaposed edges of each tile in substantially coplanar relationship on two orthogonal axes while maintaining a mutually slidable relationship between the first and second tiles on a third orthogonal axis, the secured axes including a coplanar transverse axis relative to said juxtaposed edges and an axis transverse to the common plane of the tiles, and the slidable axis including a coplanar parallel axis to the juxtaposed edges; and

said peripheral edges are substantially linear, enabling longitudinal sliding movement between the first and second tiles along the juxtaposed edges.

12. The assemblage of floor tile of claim 11, wherein:

said upwardly open channel includes opposite sidewalls generally spaced at a first selected width and a snap-in reception area, relatively wider than first selected width, defined in at least one of said sidewalls; and

said rail includes a face wall and opposite sidewalls generally spaced at a second selected width narrower than said first selected width of the channel, and at least one relatively wider area of a rail sidewall extending to greater width than said first selected width and suitably positioned to engage in said snap-in reception area when the rail is received in the channel.

13. The floor tile of claim 12, wherein:

said rail defines a longitudinally elongated linear slot in said face wall, spaced between said opposite rail sidewalls, providing an improved ability of said wider area of rail sidewall to deflect during reception of the rail into the channel.

14. The assemblage of floor tile of claim 12, wherein:

said channel includes a snap-in reception area in both sidewalls thereof;

said rail includes a relatively wider area of rail sidewall in each of of said opposite sidewalls thereof, suitably positioned to snap into said snap-in reception areas when the rail is received in the channel; and

a compressible linear seal is carried in said longitudinally elongated linear slot and extends from said face wall sufficiently to be compressed against the channel when the rail is engaged in the channel, and said seal is arranged such that the relatively wider area of rail sidewall in each of the opposite sidewalls of the rail provide two-sided locking engagement on each lateral side of the seal, opposing disengagement of the rail and channel under counter-compressive force of the compressed seal.

15. The assemblage of floor tile of claim 11, wherein:

said channel defines a pair of longitudinally extending, opposite channel sidewalls;

said rail defines a face wall and a pair of longitudinally extending, opposite rail sidewalls; and

the relative spacing of said channel sidewalls and rail sidewalls establishes an interference fit between the engaged rail and channel when said tiles are coplanar.

16. The assemblage of floor tile of claim 15, wherein:

said rail defines a longitudinally elongated linear slot in said face wall, spaced between said opposite rail sidewalls, providing an improved ability of said rail to deflect during entry into said channel in interference fit.

17. The assemblage of floor tile of claim 16, wherein:

a compressible linear seal is carried in said a longitudinally elongated linear slot in said face wall of said rail, arranged such that said seal is compressed against said channel when the rail and channel a engaged such that the juxtaposed edges of each tile are in substantially coplanar relationship.

18. The assemblage of floor tile of claim 16, wherein:

said rail includes a plurality of teeth arranged at longitudinally spaced intervals;

said channel defines a plurality of sockets each sized and positioned to house at least one of said teeth, arranged in the channel at like longitudinally spaced intervals;

wherein each tooth includes a sidewall generally parallel with a sidewall of the rail, and each socket includes a sidewall generally parallel with a sidewall of the channel, arranged such that the sidewalls of the teeth and sockets create an interference fit when the tiles are in coplanar position.

19. The assemblage of floor tile of claim 18, wherein said sockets and said teeth are mutually sized to allow a clearance between the sockets and teeth at longitudinal ends of the sockets and teeth, such that the teeth are longitudinally moveable in the sockets.

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