Sept. 14, 1965 M. NUSBAUM 3,205,633

FLOOR OR LIKE TILE

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Fig. 1

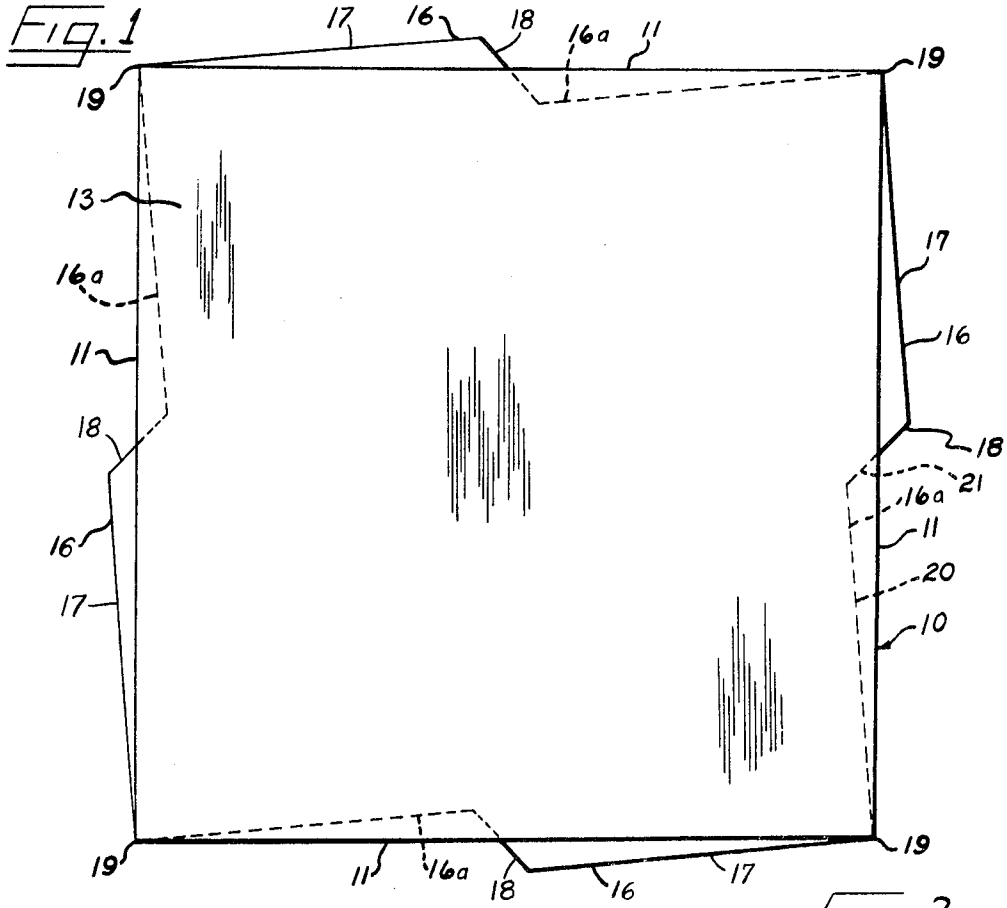


Fig. 2

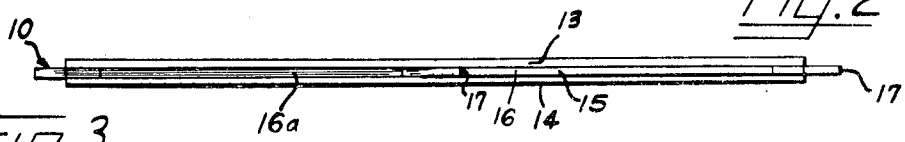
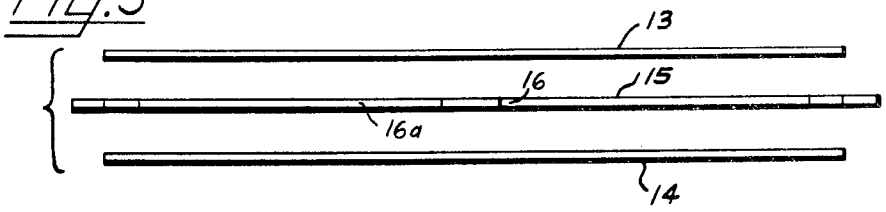


Fig. 3



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Sept. 14, 1965 M. NUSBAUM 3,205,633

FLOOR OR LIKE TILE

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Fig. 4

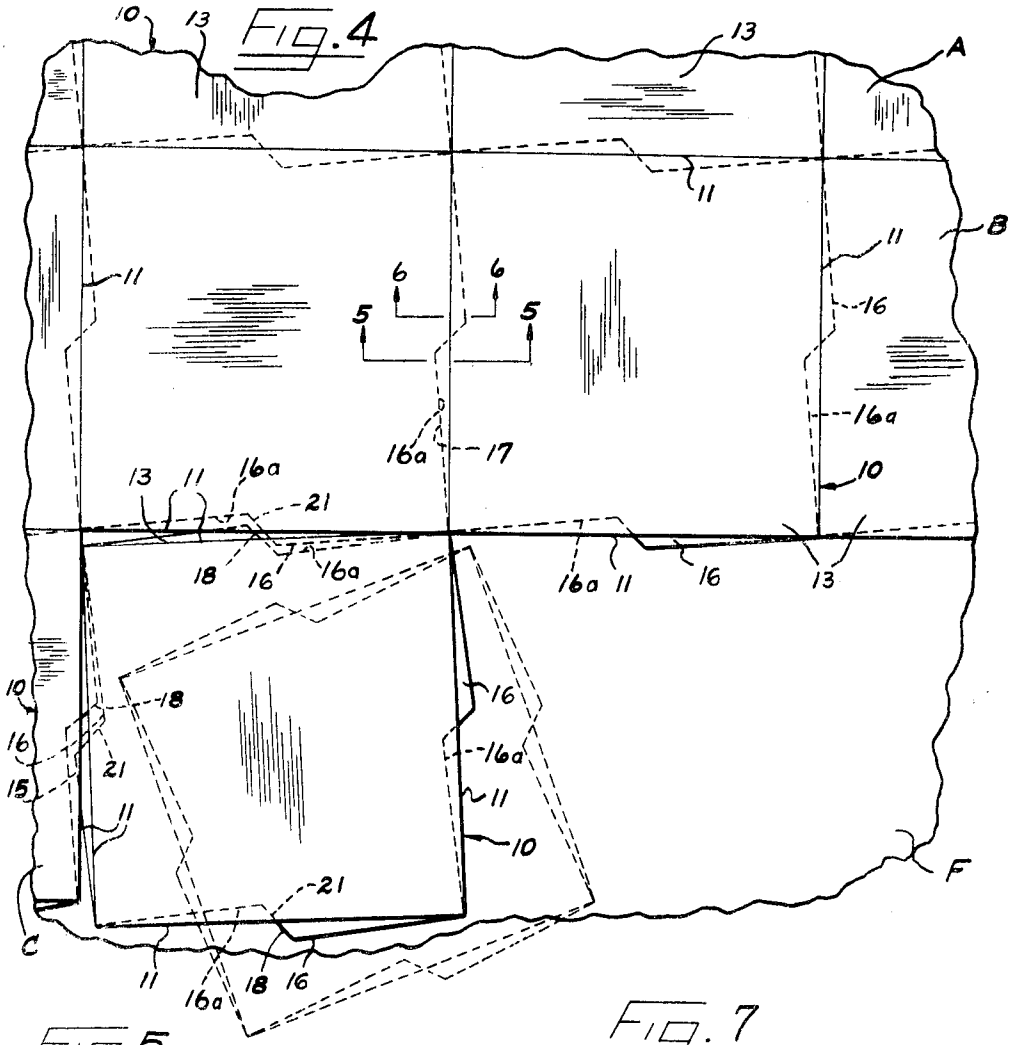


Fig. 5

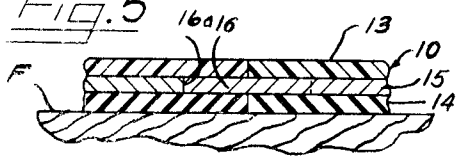


Fig. 6

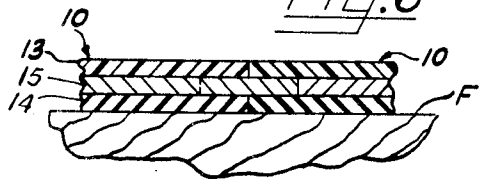
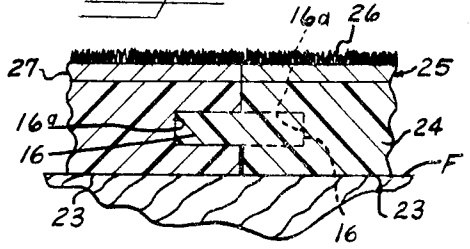


Fig. 7



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FLOOR OR LIKE TILE

Filed Jan. 3, 1963 3 Sheets-Sheet 3

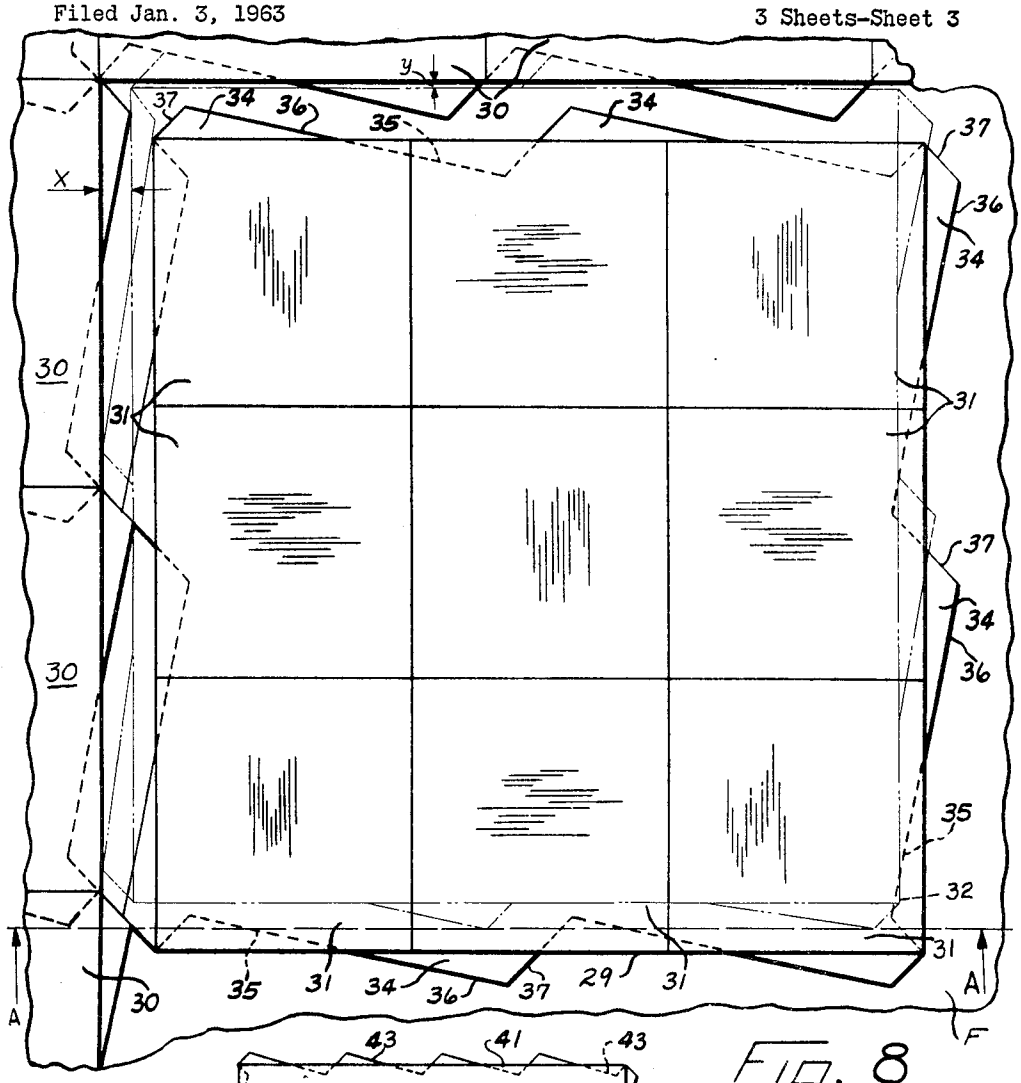

FIG. 8

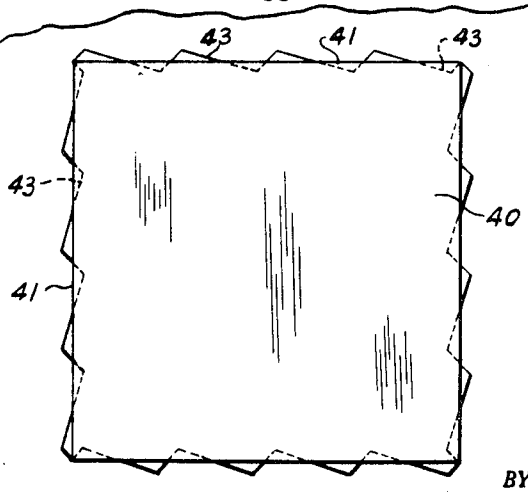

FIG. 9

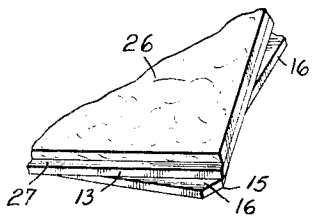

FIG. 10

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United States Patent Office 3,205,633 Patented Sept. 14, 1965

3,205,633

FLOOR OR LIKE TILE

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Filed Jan. 3, 1963, Ser. No. 249,197
The portion of the term of the patent subsequent to Mar. 26, 1980, has been disclaimed
6 Claims. (Cl. 52—591)

This application is a continuation-in-part of copending U.S. patent application Serial No. 659,536, filed on May 16, 1957, now Patent No. 3,082,488, granted March 26, 1963.

This invention relates to tiles, and in particular relates to floor tiles.

Heretofore floor tiles, for example, have been provided in squares of thin material, usually of rubber, asphalt, vinyl plastic, or the like. Considerable skill was, however, required to apply such tiles to floors, usually by means of tacky adhesive. Rough floor surfaces and the difficulty of applying a uniform thickness of the adhesive materials frequently resulted in the finished floor having unsightly wavy surfaces, exposed edges, and misaligned corners, whether the tiles were laid by skilled or unskilled persons. In some instances, tiles made of certain materials could not be satisfactorily adhered to concrete basement floors, and it was impractical to nail or tack tiles of any kind to such concrete floors.

It is a primary object of the present invention to provide interlocking floor tiles adapted to be installed on any kind of floor surface by relatively unskilled persons on a do-it-yourself basis, without use adhesives or other means for attaching the same to the floor.

Another object of the invention is to provide interlocking tiles of the character described, which may be fitted together on a floor in edge-to-edge relationship with no portions of the interlocking edge portions of the tiles unsupported to become damaged, as by shoe heel impressions or by furniture supports.

Another object of the invention is to provide improved tile units of the character described, which when interlocked will have the corners retained in accurately aligned relationship by the interlocking means.

Another object of the invention is to provide improved tiles of the character described which are of polygonal shape, such as square, including interlocking means which permits complemental interlocking of the side of any given tile with any side of any like tile, whereby the tiles are easy to install to have a wide range of patterns or ornamental design arrangements.

Another object of the invention is to provide a tile having an improved tongue and groove interlocking means by which a given tile, of square shape for example, may be easily interlocked with angularly disposed sides of two like tiles previously laid on a floor.

Still another object of the invention is to provide interlocking tiles of the character described, by which tile units of relatively large size may be easily interlocked with corresponding interlocking means of like tiles of the same or smaller size.

Other objects and the invention will be manifest from the following brief description and the accompanying drawings.

Of the accompanying drawings:

FIGURE 1 is a top plan view of a self-locking tile embodying the features of the invention.

FIGURE 2 is an edge view of FIGURE 1.

FIGURE 3 is an exploded edge view, corresponding to FIGURE 2, illustrating a laminated structure thereof.

FIGURE 4 is a fragmentary top plan view on a reduced scale, illustrating a plurality of tiles as shown in FIGURE 1, in interlocked position on a floor.

FIGURE 5 is an enlarged fragmentary cross-section taken substantially on the line 5—5 of FIGURE 4.

FIGURE 6 is a similar enlarged cross-section taken substantially on the line 6—6 of FIGURE 4.

FIGURE 7 is a further enlarged fragmentary cross-section, corresponding to FIGURE 5, and illustrating a modified form of the invention.

FIGURE 8 is a view corresponding to FIGURE 4, illustrating another modification of the invention.

FIGURE 9 is a view corresponding to FIGURE 1 and illustrating a further modification of the invention.

FIGURE 10 is a fragmentary perspective view, illustrating a modification suggested by FIGURES 1 to 8.

Referring particularly to FIGURES 1 and 2, there is illustrated a tile unit **10** comprising a relatively thin plate of generally square shape, providing four straight side edges of equal length. It is understood that the plate may be of other polygonal shapes, but the square plate is shown because it is the most commonly used shape for tile flooring. The plate **10** may be molded of solid material such as rubber, vinyl plastic, asphalt, wood, or other suitable material, having a top facing of good wearing quality. FIGURES 2 and 3, however, indicate the plate **10** as being of laminated structure including upper, bottom and intermediate layers **13**, **14** and **15**, respectively, cemented or otherwise bonded together, as shown in FIGURE 2. The upper layer **13** may be of suitable colorful, ornamental, and long-wearing material such as rubber or vinyl plastic, and may be of square shape defined by straight side edges **11**. The bottom layer may be of relatively hard material, such as wood fiber in some instances, or a cushioning material, such as foam rubber, where desirable or necessary. The intermediate layer **15** immediately below top layer **13**, may be of inexpensive material which is relatively rigid for purposes to be described. Bottom layer **14** is the same size and shape as the upper layer **13**. The rigid nature of layer **15** reinforces the plate **10**.

Formed along each edge **11** of plate **10** may be a tongue and a groove **16** and **16***a*, respectively, of identical though oppositely disposed generally tapered shape, adapted to be complementally interlocked with like oppositely disposed tongues and grooves or recesses with a similar plate **10**. When the plate **10** is of laminated structure, these tongues and grooves may be formed as by known stamping methods, in the intermediate layer **15**, in which case the laminations would be bonded together as shown in FIGURES 1 and 2 by use of suitable jigs, fixtures or other means (not shown). The taper of each tongue is defined by a laterally outwardly presented straight edge **17**, tapering from an angularly disposed edge **18** to a point **19** coincident with the corner formed by two adjacent side edges **11**. The inner edge **18** of the tongue may extend extend at a substantially abrupt angle to the edge **11**, an angle of 45° being shown, and thereby forming an obtuse angle with the longer edge **17**. For purposes which will be understood later, corresponding tapered edges **17** of all of said tongues **16** extend in the same direction peripherally of the plate **10**, and the grooves or recesses **16***a* are each oppositely complementally shaped to receive tongues **16** of a similar plate **10**, without substantial clearance between the edges **17** and **18** of the tongues and corresponding inner angularly disposed faces **20** and **21** of the grooves, so that the long tapers of the grooves also all extend in the same direction peripherally of the plate **10**, but opposite to that of the tapered tongues. The shorter edge portion of each groove is aligned with the shorter edge portion **18** of the nearest adjacent tongue **16** on the same side edge of the plate. In other words, the side edges of the plate are of predetermined lengths and the lengths of the tongues and grooves, as shown, are of a unit length which is one of equal increments of said

predetermined lengths of the side edges of the plate, said increment in this instance being one-half the unit length of each said edge of the plate, and in each instance adjacent apices of the narrow ends of next adjacent tongues and grooves coincide at each corner **19** of the plate defined by adjacent cornering side edges **11** thereof. Thus, as the lengths of the tongues and grooves are equal, and are equal to one-half the unit length of the corresponding side edge of the plate, each said side edge **11** is adapted to be selectively complementally interlocked with any side edges of any similar plate **10**, or a portion thereof (one-half in this instance). This feature has a distinct advantage in arranging a plurality of plates **10** with surface patterns, grains, or configurations in a variety of composite designs.

Use of the improved tile of FIGURES 1, 2 and 3 is best shown in FIGURES 4, 5 and 6, wherein FIGURE 4 illustrates a plurality of tiles **10** being laid on a floor F, without adhesives or other means of attachment thereto. Assuming that rows A and B of tiles **10** have been laid on floor F in accordance with the usual practice of starting a row A at the center of a room and working toward a side thereof, each tile **10** is interlocked in tongue-in-groove relationship, as indicated by the zig-zag dotted lines along the plate edges **11**, in FIGURE 4, and as clearly shown in FIGURES 5 and 6. In row C, for example, the tiles **10** are laid from left to right against like tiles of row B, previously laid in the same manner against tiles of row A. That is, one tile **10** is shown being inserted cornerwise, as indicated by chain-dotted and full line positions at the lower left-hand side of FIGURE 4, toward a position of interlocking tongue-in-groove engagement with right-angularly disposed sides **11** of two adjacent tiles **10**, as shown at the right of row B. This cornerwise insertion of the tile is greatly facilitated by the fact that edge **18** of each tongue **16** converges with respect to the inner surface **21** of the groove **16***a* of the next adjacent side edge at the respective corner **19**. Because each tile **10** may have any side thereof interlocked, as described, with any side of any other similar tile, it is a simple matter to arrange groups of tiles with desired matching surface designs, or with the grain or patterns thereof in pleasing relationship. Moreover, the angular relationship of the edges **17** and **18** of each tongue, in interlocked relation to the corresponding surface portions **20** and **21**, respectively, is effective to locate the corners **19** of each tile exactly coincident with corners **19** of adjacent tiles mated therewith, and is further effective to retain matched tiles against relative movement longitudinally of the parallel matching edges **11** of the same.

Referring to FIGURES 5 and 6, the bottom square layer **14** of each plate **10** may be slightly smaller than top square **13**, substantially as shown in FIGURE 7, to assure perfect contact of the matching or mating edges **11**, as described, and/or perfect interlocking engagement of the mating tongues and grooves.

Referring now to FIGURE 7, there is shown an enlarged cross-section corresponding to FIGURE 5, illustrating tongue-in-groove engagement of two tiles **23**, **23** of modified form. Each tile **23** may comprise a plate **24** of molded rubber, vinyl plastic, or the like, and a top layer **25** of carpeting suitably bonded thereto. The carpeting may be of known type wherein tufted wool, or other stranded fiber **26** is anchored or bonded in a cushioning layer **27** of soft resilient material, such as foam rubber. The layer **25** may also be of a thin veneer of tough but attractive rubber, vinyl plastic, or the like, but in any event the separate layer **25** makes possible the use of a relatively inexpensive base plate **24**.

FIGURE 8 illustrates use of a modified form of tile **32** with a plurality of smaller tiles **30**, **30** laid on a floor F as described in connection with FIGURE 4. The tile **32** may be of relatively large size, such as eighteen inches square, for use with like tiles **30** of proportionately smaller size, such as nine inches square, for reasons to be described.

The large tile **32** may be made as shown in FIGURE 7 but with matched smaller segments **31**, **31**, say nine six-inch squares, of attractive material such as rubber or vinyl plastic, bonded to a larger square base plate **32**. In place of the six inch segments **31** a single eighteen-inch square of carpet material, such as the layer **25** of FIGURE 7, may be substituted.

FIGURE 8 shows the base plate **32** provided with two spaced tapered tongues **34** and two spaced complementally shaped grooves **35**, formed in each straight side edge **29**, **29** thereof. As before, each tongue and each groove is of unit length which is one of equal increments of a unit length of each side, which in this case is one-fourth the length of each side edge. As before, also, each tongue **34** is longitudinally tapered, as defined by a relatively long edge **36** at an acute angle to the respective side edge **29** of the plate or base **32** and a relatively shorter edge **37**, at a more abrupt acute angle to edge **29**, the edges **36** and **37** being at an obtuse angle to each other. The tongues and grooves extend around the base plate in alternation, and, as in the case of the FIGURE 1 structure, corresponding edges of the tongues taper toward the respective side edges in the same direction peripherally of the base plate.

The smaller tiles **30** have tongues and grooves **34** and **35**, respectively, of the same proportions and sizes as for the larger tile, and in either size of tile each corner has coincident therewith the terminal point of the wide end of tongues and grooves of adjacent side edges forming the respective said corner. Thus any tile **32** may be inserted cornerwise, as shown in FIGURE 8, toward interlocking tongue-in-groove engagement of two adjacent side edges thereof with correspondingly disposed edges formed by the pairs of adjacent smaller tiles **30**. Obviously, the large tile **32** may be similarly assembled on a floor F with like tiles of the same size. Cornerwise assembly of the tiles, in the manner shown in FIGURE 8, is facilitated by an outwardly converging relationship of a side **36** of a tongue **34** and a complemental surface portion of a groove **35**, at each corner of the tile **32**, or **30**, as the case may be.

FIGURE 9 illustrates a tile **40** which is like the tile shown in FIGURES 1 to 6, except that each side edge **41** has four triangular-shaped tongues **42** and four complementally shaped grooves **43**, each of unit length which is one of equal increments of the unit length of each side edge **41**. This structure functions precisely as previously described, except that the tiles of one row may be variously offset with respect to those of an adjacent row of tiles, to produce a greater variety of design arrangements.

FIGURE 10 illustrates a modification of the invention suggested by FIGURES 1 to 8 of the drawings, and wherein layers **13** and **15** have the tongue and groove shape and arrangement of FIGURE 8, and a carpet layer **26** of FIGURE 7 is applied to layer **13**.

Thus has been provided improved tile structures adapted to be quickly and accurately applied on a floor surface by relatively unskilled persons. The various forms of the invention are particularly desirable to satisfy an apparent demand for tiles which may be applied on a do-it-yourself basis, without the usual clutter and messiness incident to assembly of tiles requiring use of adhesives, for example.

In each form of the invention the tongue-in-groove relationship of tiles assembled on a floor locks the individual tile against relative movement in various directions laterally of the floor surface, and also locks each tile against upward movement with respect to an adjacent mating tile, thereby obviating difficulty of persons tripping over exposed edges of tiles. Moreover, the tongue fully complementally engage in corresponding grooves, with no unsupported portions from corner to corner of

the mating tiles, which is important also in eliminating any possibility of grime or dirt getting under the tiles from between mating edges thereof.

In actual use of the invention, where the tongue and groove arrangement of FIGURE 9, for example, is combined with the laminated structures of FIGURES 1 to 3, and when the tongues and grooves **42** and **43**, respectively, are defined portions in a backing layer **32** of relatively rigid material corresponding to layer **15** of FIGURES 2 and 3, the cushioning bottom layer **14** may be omitted. In such instances, when the tiles **31** are laid on a floor, each tile is firmly locked against the floor by the tongue **42** thereof being received in the grooves of the next adjacent or matching tile, and it is impossible to lift or otherwise remove any tile out of its locked position, except piece-by-piece in a manner converse to that in which the tiles are installed as previously described. That is, if it is desired to remove a particular tile, spaced at a distance from a given edge of the installed flooring, it is necessary to remove tiles, starting at that edge, and continue removing them until said particular tile is reached. Such removal of the tile, however, is accomplished in the same easy manner in which they are installed as described above in connection with FIGURES 4 and 8.

The relatively rigid layer **15**, in fact, serves to retain the unitary tiles firmly interlocked, in edge-to-edge relationship, regardless of expansion and contraction of plastic, tufted carpet, or other relative more elastic layers supported or reinforced by the relatively rigid layer.

In further amplification of the description, it should be noted that in all forms of the invention shown and described there are the same number of tongues as recesses on each respective side edge of the tiles. Also, in each form shown, each corner of the tiles has edge portions of an adjacent tongue and a recess converging to the respective corner, from opposite sides of the side edge of the tile from which the respective corner tongue extends.

With particular reference to FIGURES 5, 6, 8 and 9, the adjacent edge portions of adjacent tongues and recesses, as for example **34** and **35** respectively of FIGURE 8, of any corner of the tile are convergent to such corner, from opposite sides of the side edge **29** or **41** of the tile from which the respective corner tongue extends, and the angle between such side edge and the adjacent short edge portion of the respective recess includes an area to the corresponding corner having the full thickness of the tile, whether or not the cushioning layer **14** of FIGURES 5 and 6 is omitted. In this structure, moreover, the close proximity of the apices of the outer side portions of corner tongues **34** (FIGURE 8), and of the corresponding wide portions of the corner recesses **35**, to the respective corners, provide requisite optimum interlocking engagement at the corners of like tiles assembled tn mating corner relationship as shown in part in FIGURE 8.

Referring particularly to FIGURES 4, 8 and 9, it is to be noted that on any side of the respective tiles the straight edges defining longer sides of the tongues and recesses are in parallelism and the straight edges defining the shorter sides of the tongues and recesses are likewise in parallelism. It is also self-evident that the next adjacent unlike sides of tongues and recesses defining each aforesaid "full thickness" corner areas are always outwardly convergent or tapered. The FIGURE 1 tile incorporates these same relative conditions, includes the outwardly convergent, "next adjacent unlike sides" **18** and **20** at each corner **19**.

In further reference to the structure operatively exemplified in FIGURES 4, 8 and 10, for example, the ratio of said shorter edge portions **18** and **21** to said longer edge portions **17** and **20** of the respective tongues **16** and recesses **16***a* being such that when any one side edge **11** of the plate is moved edgewise with respect to any side edge **11** of a like plate for any unit of inclined plane movement of the complementally engageable tongues and recesses **16** and **16***a* along the longer said side edge portions **17** and **21** thereof the resultant relative movement of the two right-angularly disposed directions in the same ratio that said widest portions of the tongues are to said longer edge portions thereof. With particular reference to FIGURE 8, for example, it is readily apparent that in laying tiles on a floor in successive rows, ordinarily each successive tile may be inserted edgewise on the floor toward mating cornering relationship with two other cornering tiles, without difficulty (see full-line positions in FIGURE 8). The taper which the long edge portion **36** of each corner tongue **34** makes with the short edge portion **37** of the corresponding corner recess provides such a substantial amount of clearance that the tile being positioned on a floor may be pushed into place more or less haphazardly until it eventually comes into self-centering mating tongue and groove relationship. That is, ordinarily the tiles may be more or less thrown into mating relationship due to the angular relationship and proportions of the edge portions of the tongues and recesses.

Another very important feature of the invention comes into play when the last tile in each row of tile is being positioned next to a wall. In this case, the principle of the inclined plane is utilized to minimize the amount of space required for insertion of each successive tile. That is, assuming that in FIGURE 8 the wall of the room extends substantially along the line A—A, the tile being inserted may be tilted at a slight angle to the floor to permit insertion of the forward tongues **34** of the tile within the corresponding grooves **35** of the ajacent tile (at the top of FIGURE 8), while the straight side at the left of the tile being inserted is spaced from the corresponding straight side of the adjacent tile a distance approximating the maximum width of the tongues (at the left of FIGURE 8), and otherwise substantially as indicated in chain-dotted lines in FIGURE 8. In this chain-dotted line position the long sides of the tongues are engaged with the corresponding long sides of the mating grooves before the corresponding mating straight edges engage, but the spacing between these mating edges, indicated at y, is relatively slight and, therefore, negligible for reasons which will be explained later. It will be apparent that while the tile being inserted is in the chain-dotted line position it may be dropped into flat engagement with the floor surface without interference with the wall A—A, and it then may be slid flatwise to the left, into full interlocking position with the two adjacent angularly disposed mating edges of previously laid tiles. The letter x indicates the spacing between the adjacent edges at the left before full interlocking insertion is accomplished.

Accordingly, it will be noted that on the principle of the inclined plane, while the fully inserted tile is moved a distance x to the left it is moved forwardly only a very slight distance y. This explains why the unitary tiles may be inserted at the side of a room where the spacing is substantially equal to the width of the tile plus the width of one tongue. In the commercial form of the invention, the ratio of x to y is approximately 8 to 1. In other words, where $x=\frac{1}{4}$ inch, $y=\frac{1}{32}$ inch or less. In actual practice a slight clearance is allowed between the edges of the triangular tongues and the mating edges of the corresponding grooves, so that the forward edge of the tile being inserted will actually be in engagement with the corresponding edge of the mating tile in the relative position shown in chain-dotted lines in FIGURE 8.

Of course, the floor space being covered will as often as not require portions of outside squares nearest a wall to be cut to fit. The partial squares, however, may be started in at a slight angle to the wall and then otherwise slid flatwise into interlocking position, as described above

in connection with FIGURE 8, to have cut edge against wall A—A.

Other modifications of the invention may be resorted to without departing from the spirit thereof or the scope of the appended claims.

What is claimed is:

1. A floor or like tile comprising: a relatively thin, unitary plate having an upper portion of rectangular shape defined by straight side edges; a lower portion of said plate below said rectangular portion being formed with reference to said side edges and having alternate tongues and recesses extending outwardly and inwardly, respectively, of said side edges, peripherally around the plate; each said side edge of the plate having the same number of tongues as recesses; said tongues being substantially uniformly thin and each tongue being defined by angularly opposed edge portions tapering substantially in divergent straight lines from an apex thereof, and each line being disposed at an acute angle to the respective side edge of the plate and the recesses being correspondingly defined; one of said opposed edge portions of each tongue and recess being longer than the other, the longer and shorter edge portions of each recess being aligned continuations of the longer and shorter edge portions of the tongues, respectively; and corresponding edge portions of like tongues of the respective said side edges being so tapered from the apices of the respective tongues in the same general direction peripherally around the plate; said corresponding edge portions of any side edge of the plate thereby being adapted for inclined-plane sliding engagement with oppositely disposed said corresponding edge portions of the side edge of a like tongued and recessed plate toward edge-to-edge relationship of the like plates; the lengths of said tongues and recesses along said side edges being proportioned with reference to predetermined lengths of the respective side edges that the short edge portions of a tongue and the aligned continuation of the recess nearest each corner apex terminate in spaced relationship to the respective corner apex; said like plates in said edge-to-edge relationhsip thereby being adapted to have the opposite tongues and recesses thereof complementally interlocked with corresponding tongues and recesses thereof when the like plates are laid flatwise on a supporting surface.

2. A floor or like tile as in claim **1**, wherein said upper and lower plate portions are integrally formed of relatively rigid synthetic resin material.

3. A floor or like tile as in claim **1**, wherein said upper portion of the plate has affixed thereto a covering of flooring-like decorative material.

4. A floor or like tile as in claim **1**, wherein said upper portion of the plate is of square shape.

5. A floor or like tile as in claim **1**, the longer edge portions of a tongue and a recess terminating at each corner apex of said plate and having adjacent edge portions thereof convergent to and intersecting at the respective corner apex from opposite directions inwardly and outwardly of the edges of the plate.

6. A floor or like tile as in claim **5**, wherein at least the lower portion of said plate is of relatively rigid material, and the tongues being relatively rigid extensions of said lower portion.

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