

[54] TILE ASSEMBLY

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[58] Field of Search **52/570, 592-594**

[56] **References Cited**

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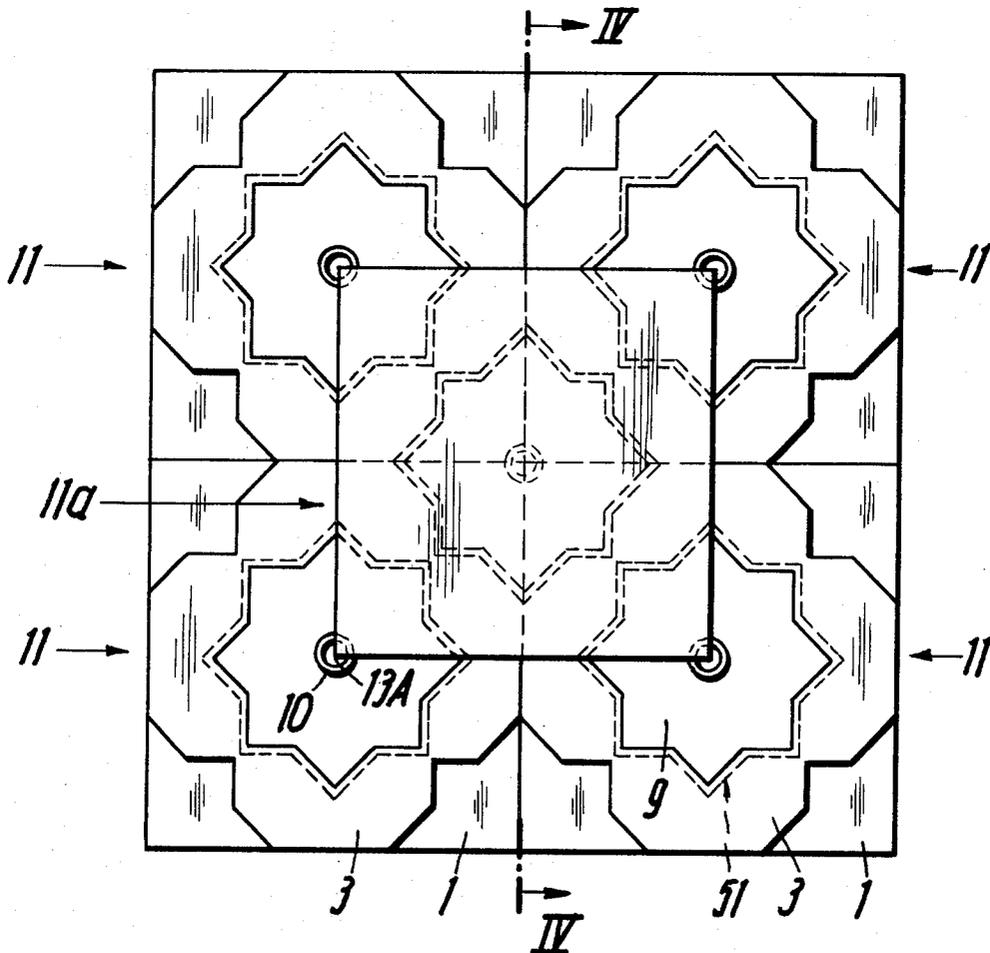
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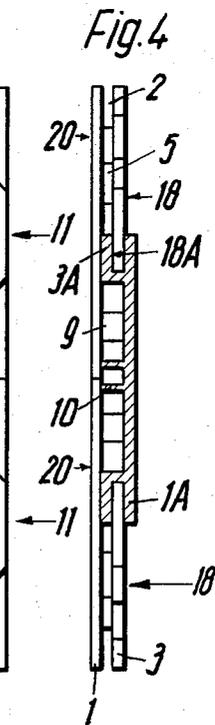
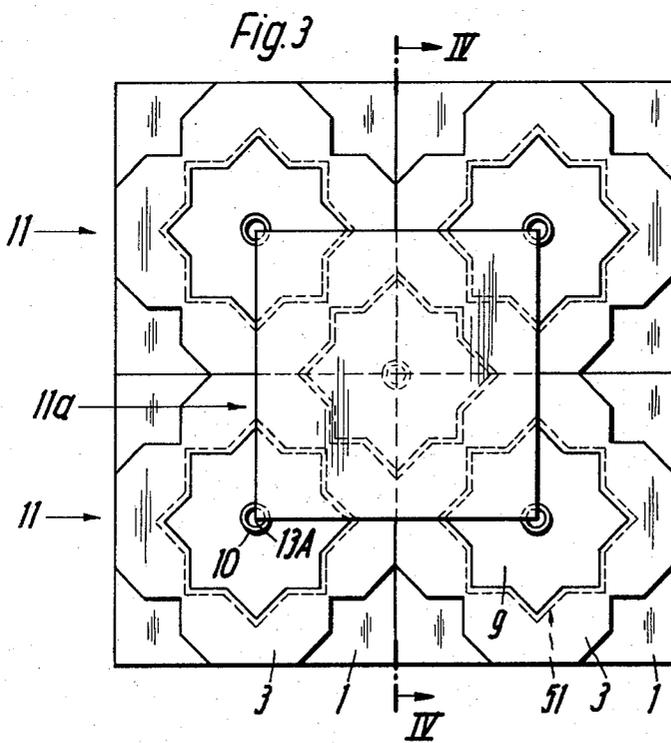
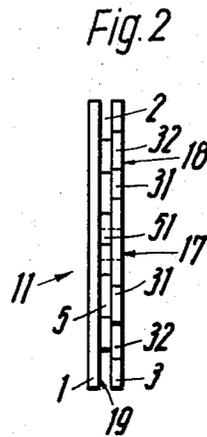
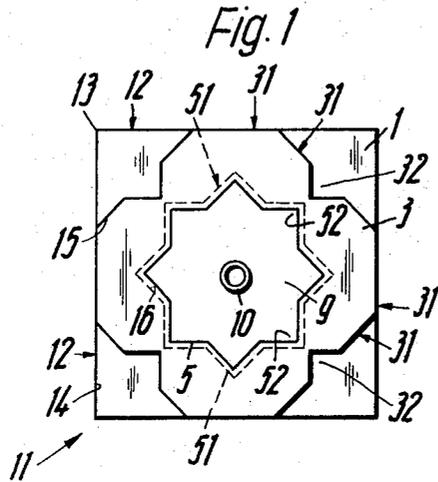
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[57] **ABSTRACT**

A tile consists of two outer layers and an inner layer arranged in parallelism. One of the outer layers is larger than the other outer layer, while the smaller outer layer is larger than the inner layer. A slot surrounds the edges of the inner layer and has a width at least equal to the thickness of the smaller outer layer. Cooperating coupling devices are provided on the smaller outer layer and the inner layer so that when two similar tiles are assembled with the smaller outer layer of one tile extending into the slot of the other tile, the coupling device on the inserted smaller outer layer cooperates with that on the adjacent inner layer to inhibit movements of the tiles in directions other than that to move the coupling devices apart.

10 Claims, 4 Drawing Figures





TILE ASSEMBLY

BACKGROUND OF THE INVENTION

The invention relates generally to tiles, panels and the like such as are used for erecting walls or ceilings or for providing decorative coverings thereon. More particularly, the invention relates to tiles or panels of this type which are composed of two spaced outer layers and an inner layer interposed between the outer layers, the dimensions of the inner layer being smaller than those of either of the outer layers so that a recess or groove is defined between the outer layers.

The known tiles of this type have the disadvantage that, in the construction of walls and the like, special dowel plates are required for connecting adjacent tiles. These dowel plates are inserted in the recesses formed between the outer layers of the tiles. The use of such dowel plates increases the difficulty of erecting walls and the like. In addition, a wall, ceiling or the like made in this manner has relatively low strength since the adjacent edges of neighboring tiles are flush with one another and, as a result, the strength of the wall or ceiling is dependent solely upon the strengths of the relatively thin dowel plates which connect adjacent tiles. Thus, the possible applications of the known tiles are severely restricted.

Furthermore, ceilings or ceiling covers made in the above manner are not self-supporting. Consequently, complicated support structures are necessary for supporting such ceilings or ceiling covers. These support structures are not only complicated but are also expensive, especially where the span length or width of the ceiling or ceiling cover is large.

The German published application No. 2,001,799 discloses a square tile which includes two outer layers and an inner layer. A slot completely surrounds the edges of the inner layer. The width of the slot is approximately equal to the thickness of one of the outer layers and the corners of this outer layer are bevelled or chamfered so that the shape of the outer layer approximates that of the inner layer. Thus, when two similar tiles are assembled, the shaped outer layer of one tile is inserted into the slot of the other tile so that the bevelled edges of the inserted outer layer are able to abut the edges of the inner layer.

It has now been found that when such tiles are assembled, the tiles are able to shift relative to one another.

SUMMARY OF THE INVENTION

It is, accordingly, an object of the invention to provide a tile such that, when two or more tiles are assembled, relative movements of the tiles during and after assembly are minimized.

Another object of the invention is to provide a tile which may be quickly and easily assembled with other tiles.

A further object of the invention is to provide a tile which does not require special connecting devices in order to be securely assembled with other tiles.

It is also an object of the invention to provide a tile which, when assembled with other tiles, forms a structure having high strength and good load-carrying ability.

A concomitant object of the invention is to provide a tile which, when assembled with other tiles, forms a structure which is self-supporting for relatively large span lengths and widths and which does not require

complicated or expensive support assemblies for larger span lengths and widths.

Yet another object of the invention is to provide a tile having good insulating properties.

In accordance with these and other objects, the invention provides a tile which comprises a first plate-like section having a peripheral portion and a second plate-like section spaced from and substantially parallel to the first section, the second section encompassing the first section, and at least in part extending outwardly beyond the peripheral portion. An intermediate section is interposed between the first and second sections and includes a marginal portion, and the first section encompasses the intermediate section and at least in part extends outwardly beyond the marginal portion. Thus, a slot is defined intermediate the first and second sections in the region of the marginal portion. The slot surrounds at least a part of the marginal portion and has a width at least equal to the thickness of the first section. Cooperating coupling portions are respectively provided on the first and intermediate sections. When the tile is assembled with another similar tile, the first section of one tile extends into the slot of the other tile and the first section of the one tile lies adjacent the intermediate section of the other tile. As a result, the coupling portion of the thus-inserted first section and that of the adjacent intermediate section cooperate to inhibit movements of the tiles in directions other than that to move the coupling portions apart.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a top view of a tile according to the invention:

FIG. 2 is a side view of the tile of FIG. 1:

FIG. 3 is a top view of an assembly wherein four of the tiles of FIGS. 1 and 2 are assembled with a similar fifth tile: and

FIG. 4 is a view along section IV—IV of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIGS. 1 and 2, a tile or panel according to the invention is indicated generally at 11. The tile 11 is seen to include three layers, an outer layer or first plate-like section 3, another outer layer or second plate-like section 1 and an inner layer or intermediate section 5. As shown in FIG. 2, the respective layers 1, 3 and 5 are arranged in substantial parallelism. The layers 1 and 5, as well as the layers 3 and 5, may be connected with one another by using any suitable connecting means, for example, adhesive means. Of course, it is possible for the layer 1 to be so configured that certain portions of the layer 1 have a thickness sufficient to abut the layer 3, or vice versa, so that the layers 1 and 3 may be directly connected with each other, in which case it may be possible for the layer 5 to be supported without connecting it to the layers 1 and 3. On the other hand, it is also contemplated that the layers 1, 3 and 5 may be integral.

The layer 1, here shown as having a square outline, includes a plurality of facets or edge faces 12 which meet at the corners or corner portions 13 thereof. The layer 1 may have any arbitrary polygonal outline or, in general, may have any outline desired. The facets 12 together define the periphery or peripheral portion 14 of the layer 1. The layer 1 is sufficiently large to encompass the layer 3, that is, the layer 1 is so large that the layer 3 may be superimposed thereon without any portion of the layer 3 extending beyond the facets 12 of the layer 1. As shown, part of the layer 1 extends outwardly beyond the periphery or peripheral portion 15 of the layer 3 or, in other words, part of the periphery 14 of the layer 1 extends outwardly beyond the periphery 15 of the layer 3. It is also possible for the entire periphery 14 of the layer 1 to extend outwardly of the periphery 15 of the layer 3. The periphery 15 of the layer 3 comprises facets, edge faces or edges 31, and some of the edges 31 are shown as being flush with, i.e., in the same plane as, the facets 12 of the layer 1. However, this is not necessary. Other of the edges 31 of the layer 3 are located inwardly adjacent to the corners 13 of the layer 1 or, in other words, these edges 31 are encompassed by the periphery 14 of the layer 1. The inwardly located edges 31 of the layer 3 are here shown as being inclined with respect to the facets 12 of the layer 1. The inclined edges 31 of the layer 3 are provided with at least one coupling portion which is here shown as a recess or indentation 32. In the embodiment shown, the recess 32 is V-shaped and the apex of the recess 32 is right-angular. Also, the recess 32 is preferably centered with respect to the length of its respective inclined edge 31. However, the apex of the recess 32 need not be right-angular and, in fact, it is not necessary for the recess 32 to be V-shaped or, for that matter, to be centered with respect to the length of its respective inclined edge 31. Disregarding the recesses 32, it will be seen that the layer 3 has the form of a truncated square, i.e., a square wherein the corners have been removed so as to form the edges 31 of the layer 3 which are parallel with the facets 12 of the layer 1, so that the layer 3 may be regarded as being substantially square-shaped. When so viewing the layer 3, it is further seen that this layer is rotated 45° with respect to the layer 1 about an axis common to the layers 1 and 3. Another manner of viewing the layer 3 is to regard it as having the form of an octagon. It is to be understood that the form of the layer 3 is not restricted to that described and shown but may be varied as desired or required to suit particular applications. Also, the edges 31 of the layer 3 which are provided with the recess 32 need not be inclined with respect to the facets 12 of the layer 1.

The layer 5 is interposed between the layers 1 and 3 so that at least portions of the layers 1 and 3 are spaced from one another. As explained above with reference to the layers 1 and 3, the layer 3 is sufficiently large to encompass the layer 5. Although the entire periphery 15 of the layer 3 is shown as extending outwardly beyond the periphery or marginal portion 16 of the layer 5, it is possible that only a part of the layer 3 or, in other words, only a portion of the periphery 15 thereof, extends outwardly beyond the periphery 16 of the layer 5. The periphery 16 of the layer 5 includes the facets, edge faces or borders 51 which are inwardly adjacent and substantially parallel to the inclined edges 31 of layer 3. The borders 51 of the layer 5 are also inclined with respect to the facets 12 of the layer 1. The borders

51 of the layer 5 are provided with at least one coupling portion, here shown as a projection or protuberance 52, which is adapted to cooperate with the coupling portion, i.e., recess 32, provided on the inclined edges 31 of the layer 3. The projection 52 and its corresponding recess 32 are complementary. In a preferred embodiment, as shown, the projection 52 is V-shaped and the apex of the projection 52 is right-angular. Also, the projection 52 is preferably centered with respect to the length of its respective border 51. Again, the apex of the projection 52 need not be right-angular nor is it necessary for the projection 52 to be V-shaped or to be centered with respect to the length of its respective border 51 so long as it can cooperate with a corresponding recess 32. The projections 52 impart a star-shaped appearance to the layer 5. However, when the projections 52 are disregarded, it will be apparent that the layer 5 is substantially square-shaped and that the layer 5 may be regarded as being rotated 45° with respect to the layer 1 about an axis common to the layers 1, 3 and 5. The shape of the layer 5 may be varied as desired or required but bearing in mind that the projections 52 provided on the borders 51 of the layer 5 must be able to cooperate with corresponding recesses 32 provided on the inclined edges 31 of the layer 3.

As a result of the interposition of the layer 5 between the layers 1 and 3, a slot or groove 2 is defined intermediate the layers 1 and 3 in the region of the periphery 16 of the layer 5. Although the slot 2 is shown as surrounding the entire periphery 16 of the layer 5, the slot 2 need only surround a portion of the periphery 16 of the layer 5. The width of the slot 2 should be at least equal to the thickness of the layer 3 and, preferably, the width of the slot 2 is approximately equal to the thickness of the layer 3. Thus, when two of the tiles 11 are assembled, it is merely necessary to insert the layer 3 of the one tile 11 into the slot 2 of the other tile 11. The thus-inserted layer 3 will then be adjacent to the layer 5 of the tile 11 into which it is inserted so that one of the inclined edges 31 of the inserted layer 3 faces one of the borders 51 of the adjacent layer 5. The recess 32 of the inserted layer 3 can then mate with the projection 52 of the adjacent layer 5 so that the recess 32 of the inserted layer 3 and the projection 52 of the adjacent layer 5 are able to cooperate and inhibit movements of the tiles 11 in directions other than that to move the recess 32 of the inserted layer 3 and the projection 52 of the adjacent layer 5 apart. In this manner, a precise positioning of the thus-assembled tiles 11 may always be guaranteed.

In a preferred embodiment, the length of the inclined edge 31 of the layer 3 is substantially equal to that of the inwardly adjacent border 51 of the layer 5, although this is not necessary. Also, the lengths of the various edges 31 of the layer 3 may all be equal, as shown, or may differ, if so desired. The same holds true for the lengths of the borders 51 of the layer 5. It is also to be borne in mind that the recesses 32 and projections 52 may be reversed. In other words, the recesses 32 may be provided in the borders 51 of the layer 5 while the projections 52 may be provided on the inclined edges 31 of the layer 3. It is, of course, also possible that some of the inclined edges 31 of the layer 3 are provided with recesses 32 while, simultaneously, other inclined edges 31 of the layer 3 are provided with projections 52 so long as it is remembered that the recesses 32 and projections 52 provided on the layer 3

must be able to cooperate with corresponding recesses 32 and projections 52 which are provided on the layer 5.

As shown in FIG. 1, the center portions of the layers 3 and 5 are cut out or removed or, in other words, are provided with an opening. The openings in the respective layers 3 and 5 at least partially overlap so as to define a cavity or passage 9 extending inwardly from the layer 3 towards the layer 1. Although it is not essential for the invention to cut out the center portions of the layers 3 and 5, doing so results in considerable material savings. Furthermore, the weight of the tile 11 is thereby reduced and, in addition, the thus-formed cavity 9 improves the insulating properties of the tile 11 so that a structure formed by assembling the tiles 11 provides good insulation, e.g., good heat retention and sound deadening. In fact, all of the material in the center portion of the layer 5 may be removed so that all that remains of the layer 5 is a circumferentially complete rim which, as shown here, is star-shaped. As already indicated, it is not necessary to remove material from the center portions of the layers 3 and 5 and, further, the amount of material removed may vary as desired or required for a particular application. It is, of course, also possible to remove material from the center portion of the layer 5 only or from the center portion of the layer 3 only.

When the material in the center portions of the layers 3 and 5 is removed so as to define the cavity 9, it is desirable to provide a protuberance or support member 10 in the cavity 9. The protuberance 10 is here shown as extending outwardly through the cavity 9 from the layer 1. In this embodiment shown, the protuberance 10 is located at the center of the tile 11 and, preferably, the length of the protuberance 10 is substantially equal to the depth of the cavity 9. However, it is not necessary for the protuberance 10 to have a length which is approximately equal to the depth of the cavity 9 and the primary requirement for the protuberance 10 is that the exposed face 17 thereof be located in substantially the same plane as the outer surface 18 of the layer 3. It is to be noted that the depth of the cavity 9 is equal to the distance between the outer surface 18 of the layer 3 and the inner surface 19 of the layer 1. The protuberance 10 may be connected with the layer 1 and extend outwardly therefrom or may be fixed to the tile 11 in any other suitable manner.

The purpose of the protuberance 10 is most easily apparent from FIGS. 3 and 4. FIG. 3 is a top view of an assembly of five tiles 11 made and assembled in accordance with the invention and FIG. 4 is a view along the section IV—IV of FIG. 3. Four tiles 11 are shown as being assembled with a similar fifth tile (here denoted by 11A for clarity) in the same manner as described earlier. The outer surfaces 18 of the layers 3 in the tiles 11 are all located in the same plane and the outer surface 18A of the layer 3A in the tile 11A is adjacent to those of the tiles 11. The outer surfaces 20 of the layers 1 in the tiles 11 are also all located in the same plane. As is seen, the protuberance 10 of the tiles 11 are so positioned that the corners 13A of the layer 1A in the tile 11A partly overlap the exposed faces 17 of the respective protuberances 10. Thus, the protuberances 10 support the corners 13A of the tile 11A and prevent these corners from being forced into the cavity 9. This is especially important when the tiles 11 are made of brittle materials which are not capable of withstanding

large amounts of bending. Although the protuberances 10 have been shown and described as being located at the centers of the respective tiles 11, this is not necessary. For example, more than one protuberance 10 may be provided in each tile 11, the various protuberances 10 in each tile 11 being off-center with respect to the tile 11. Also, if the shapes of the layers 1 of the tiles 11 are different than shown, then it may become necessary to shift the protuberances 10 with respect to the centers of their respective tiles 11 in order that they may be properly positioned so as to support the corners 13 of an overlying tile 11.

Various modifications of the invention are possible. The layers 1 and 3 need not be of equal thickness. It is also contemplated to provide a cavity in the layer 1 intermediate the major surfaces thereof. Such a cavity would serve to improve the insulating properties of the layer 1 and of the tile 11 as a whole. The cavity may be machined in the layer 1 or the layer 1 may include two overlying plate-like portions spaced from one another so as to define a cavity therebetween. In the latter case, the plate-like portions may be connected with each other in any suitable manner, a preferred method being to connect only the corner areas of the plate-like portions by means of appropriate connecting members, for example, triangular connecting members or inserts located in the regions of the corners of the plate-like portions. The cavity may be partially or entirely enclosed and, if desired, may be filled with a suitable substance, such as cement, before or after assembly of the tiles 11. A very advantageous modification in this regard, especially where the tiles 11 are used to form a structure which is to be self-supporting, is to provide a metal reinforcing member in the cavity, the particular metal to be used depending upon weight considerations and other considerations such as the load to be borne by the structure. A suitable reinforcing member may be made of structural steel, for example.

It is further contemplated to use the tiles 11 for making arcuate structures. In such a case, the individual tiles 11 may be arcuate.

The tiles 11 may be made of any conventional structural materials such as metals, plastics and the like. Another suitable material is cement such as, for example, porous cement or asbestos cement. Furthermore, the tiles 11 may be provided with a protective covering of weather-resistant material. In addition, the tiles 11 may be provided with a middle layer of insulating material for deadening sound and/or for the purpose of heat insulation. Of course, such insulating material may also be provided in the cavity or cavities of the tile 11 when the tile 11 includes such a cavity or cavities. The dimensions of the tiles 11 may be varied as desired or as required to suit particular applications. It is self-understood that the tiles 11 of the invention may serve equally well as toys.

In summary, walls, wall coverings, ceilings, ceiling coverings and the like made from tiles in accordance with the invention are very stable and possess high strength and, further, the structures made from these tiles have smooth and even outer surfaces on both sides. In many cases, the structures assembled from the tiles of the invention require no after-treatment. The tiles of the invention may also be used for making arcuate structures, such as arcuate ceiling coverings, in which case the tiles themselves may have a form which describes a portion of an arc. Furthermore, the struc-

tures made from the tiles of the invention are self-supporting over relatively large span widths and lengths so that in many cases no special support assembly for these structures is required. For larger span widths and lengths, the support assemblies required for these structures are much less complicated and much cheaper to manufacture than those required heretofore. The sealing of the joints of such structures may be accomplished by using conventional sealing bands or strips of elastic material which may, for example, be welded to the structure at the areas where the corners of adjacent tiles meet. Also, no special connecting devices are required for assembling the tiles.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions and assemblies differing from the types described above.

While the invention has been illustrated and described as embodied in a tile, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

I claim:

1. In a tile assembly, a combination comprising at least three identical tiles, each of said tiles being composed of three superimposed and interconnected layers, the first and second layers of each respective tile surrounding the third layer thereof and having portions extending outwardly beyond the latter so that said three layers of the respective tile define with one another a slot having a width approximating the thickness of said second layer, each respective layer being composed of four quarter-sections of predetermined shapes, the shape of the quarter-section of said second layer substantially corresponding to the shape of said portion of said first layer which extends outwardly beyond said third layer, said first layer having an exposed surface and a circumferential surface bounding said exposed surface, a first and a second of said tiles being situated adjacent to one another so that the respective circumferential surfaces of said first and second tiles abut one another and said exposed surfaces thereof face in one direction, the third tile being interfitted with said two tiles so that said exposed surface thereof faces in the opposite direction, one quarter-section of said third tile being interfitted with a quarter-section of said first tile and another quarter-section of said third tile being interfitted with a quarter-section of said second tile so that the respective quarter-sections of said second layer of said third tile extend into the associated slots of said first and second tiles and engage the associated quarter-sections of said third layers thereof and vice versa, whereby a four-layer structure is obtained, two outer layers of said structure being formed exclusively by the first layers of the respective tiles and the two inner layers being formed by the interfitting second and third layers thereof, said first and second tiles re-

straining said third tile during the assembling and disassembling of the tile assembly to movement in only one predetermined direction parallel to said exposed surface.

2. The tiles as defined in claim 1, wherein each tile has a peripheral portion which includes at least one edge face located inwardly of the outwardly extending portion of said first layer, said marginal zone includes at least one edge face located inwardly of the outwardly extending portion of said second layer, and one of said coupling portions comprises at least one projection provided on one of said faces and the other of said coupling portions comprises at least one complementary recess provided in the other of said faces.

3. The tiles as defined in claim 2, wherein said projection and recess are each V-shaped, the respective apexes of said projection and recess being right-angular.

4. The tiles as defined in claim 1, wherein said first layer has a polygonal outline and includes a plurality of facets meeting at the corners thereof, said peripheral portion includes a plurality of edge faces at least some of which are inwardly adjacent to said corners, and said marginal zone includes a plurality of edge faces inwardly adjacent and substantially parallel to said some edge faces.

5. The tiles as defined in claim 4, wherein said some edge faces of said peripheral portion are provided with at least one of said coupling portions and said edge faces of said marginal zone are provided with at least one coupling portion adapted to cooperate with the coupling portion provided on said edge faces of said peripheral portion.

6. The tiles as defined in claim 5, wherein each of said coupling portions is centered with respect to the length of its respective edge face.

7. The tiles as defined in claim 1, wherein said second and third layers each have a center portion provided with an opening, said openings at least partially overlapping so as to define a cavity extending inwardly from said second layer towards said first layer.

8. The tiles as defined in claim 1, wherein said first layer includes at least one corner portion and said second layer has an outer surface facing away from said first layer; and further comprising at least one support member in said cavity having an exposed face, said exposed face being located in substantially the same plane as said outer surface and being effective for supporting the corner portion when the tile is assembled with another similar tile so that the corner portion of one tile overlies the cavity of the other tile.

9. The tiles as defined in claim 1, wherein said second layer has a substantially square-shaped outline rotated 45° with respect to said first layer about an axis common to all of said layers.

10. The tiles as defined in claim 1, wherein said slot completely surrounds said marginal zone.

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