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A clay roof tile

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ABSTRACT

A clay roof tile 10, the tile 10 being generally square or rectangular and having a pair of side edges 11, 12, leading and trailing edges 13, 14 and front and rear surfaces 15, 16. A first of the pair of side edges 11 forms an underlap 20 and the second of the pair of side edges 12 forms an overlap 21 so that the underlap 20 of one tile 10 underlies the overlap 21 of another tile 10 when a pair of tiles are laid next to each other. The rear surface 16 includes a plurality of strengthening ribs 25, 27. The portion of the front surface 15 which is exposed in a tiled roof is substantially flat and the leading end 13 extends from the front surface 15 and is generally curved in a direction so that the distal end of the leading end 15 rests upon the front surface of an adjacent tile, at or adjacent the trailing edge 14 of the adjacent tile, when a pair of tiles are laid end to end.

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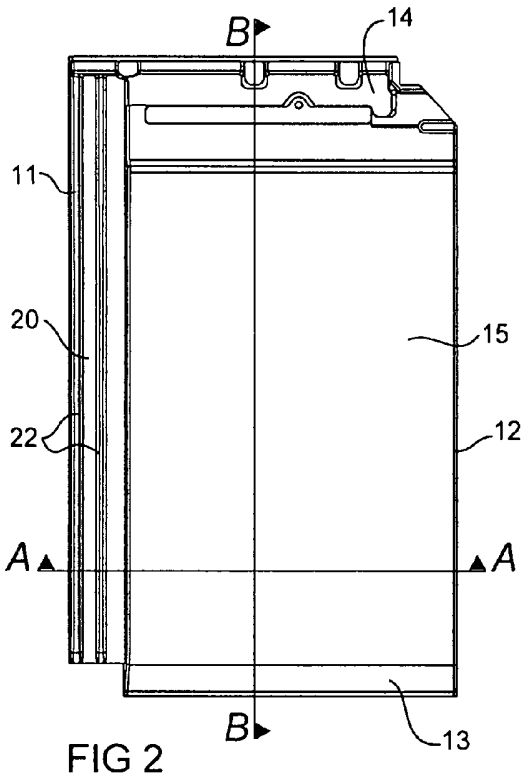

FIG 2

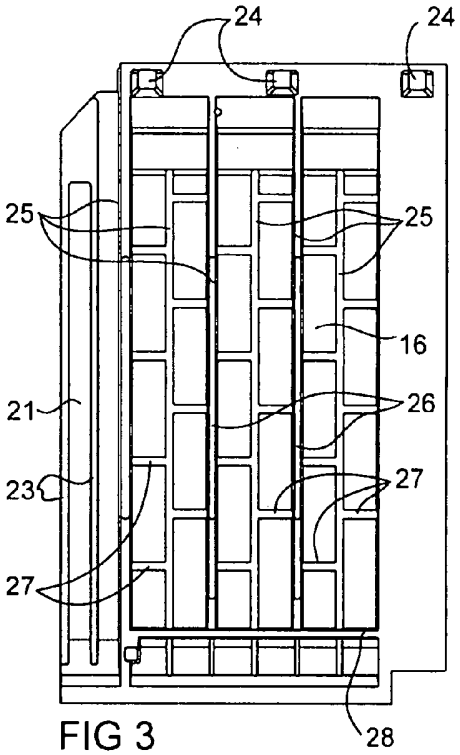

FIG 3

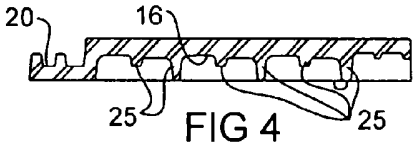

FIG 4

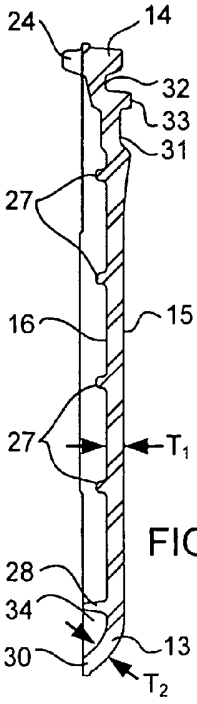

FIG 5

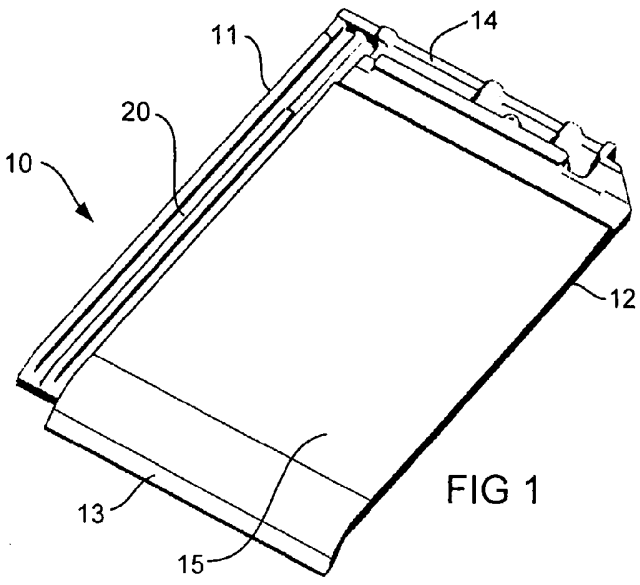

FIG 1

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Patents Act

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Invention Title:

A CLAY ROOF TILE

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The following statement is a full description of this invention, including the best method of performing it known to applicant(s):

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A CLAY ROOF TILE

The present invention relates to a clay roof tile for the roofs of commercial and/or domestic buildings.

Background of the Invention

Clay roof tiles have been employed in both Australia and New Zealand. In respect of such tiles, the design of the outwardly facing tile surface has principally been directed to the aesthetic appearance of the tile, whereas the design of the inwardly facing tile surface has principally been directed to the arrangement for locating the tile on the tile support structure of a roof and for interlocking adjacent tiles together to secure tiles relative to each other and to prevent or resist the ingress of weather elements, such as wind and rain, past the tile and into the roof cavity.

Applicant has recognised that in relation to tile design, it would be desirable to provide a tile which has both an acceptable aesthetic appearance, is securely locatable relative to a roof support structure and to adjacent tiles, and which can employ beneficial manufacturing techniques to provide an improved tile, or to reduce the cost of tile manufacture.

Summary of the Invention

According to the present invention there is provided a clay roof tile, the tile being generally square or rectangular and having

a pair of side edges,

leading and trailing edges and

front and rear surfaces,

a first of the pair of side edges forming an underlap and the second of the pair of side edges forming an overlap so that the underlap of one tile underlies the overlap of another tile when a pair of tiles are laid next to each other,

the rear surface further including a plurality of strengthening ribs,

the front surface is substantially flat and the leading end extends from the front surface and is generally curved in a direction so that the distal end of the leading end rests upon the front surface of an adjacent tile, at or adjacent the trailing edge of the adjacent tile, when a pair of tiles are laid end to end.

A clay roof tile according to the invention has an appealing appearance by virtue of the flat front surface and the curved leading end. In addition, the tile is securable to a tile supporting structure of a roof and can interlock with adjacent tiles. Advantageously, the manufacturing method of the tile can be an upright method, which provides cost advantages compared to manufacture of tiles employing a lay down or horizontal method.

In relation to the advantageous manufacturing method, the glazing and firing of clay tiles in an upstanding position often encounters difficulties with warping or twisting of the tiles which can detract from the appearance of the tiles and thus render the tiles unusable. In some circumstances, the tiles can warp or twist to the extent that they exceed the tolerances of the Australian standards. Because of this, manufacturers tend to adopt manufacturing processes in which the tiles are fired in a laid down or horizontal position, because of the reduced likelihood of warping or twisting by that method. However, it has been found, surprisingly, that the use of a curved leading end can reduce the extent of warping or twisting that occurs in tiles during firing, principally by reducing or eliminating the propensity for the tile to warp or twist. It has been found that the provision of the curved leading end acts to stiffen the tile against twisting and warping, and thus difficulties associated with the manufacture of prior art tiles in an upright glazing and firing position are either eliminated or at least reduced by the present invention. The surprising aspect of the stiffening which the leading end provides is the extent of stiffening that occurs through the length of the tile. That is, the stiffening is not isolated to the immediate vicinity of leading end, but rather, extends a significant distance towards or even to the trailing end of the tile. Thus, tile wastage can be reduced to a level commensurate with or even less than the laid down or horizontal method of firing.

The curve of the leading end of the tile can be of any suitable shape, such as a part elliptical, substantially constant or oval. Alternatively, a chamfered leading end could be formed. Even a facetted leading end could be formed.

The cross-sectional thickness of the leading end can be substantially the same as the thickness between the front and rear surfaces of the tile. This provides advantages for even drying and firing throughout the entire tile during manufacture, as compared

to a cross-sectional thickness that varies and therefore could require different drying and firing time at different sections of the tile. This reduces the likelihood for cracking that might otherwise occur through sections of a tile which have not been fully or properly dried. A similar advantage is provided in relation to shrinkage, whereby a substantially constant cross-sectional thickness will have a substantially constant rate of shrinkage throughout the entire tile as compared to a cross-sectional thickness that varies and therefore could have different shrink rates at different sections of the tile. A still further advantage is that a potentially more even die pressure can be applied to the clay when forming the tile, so that the compression applied to the pre-dried and fired tile is substantially the same throughout the entire tile.

The curve of the leading end can commence from the front surface and can immediately commence curving in a direction that is toward the front surface of an adjacent tile when a pair of tiles are laid end to end, without providing any curve in the opposite direction, that is away from the front surface of the adjacent tile. In this arrangement, there is a very smooth and aesthetically appealing transition from the front surface to the leading end.

A recess can be formed inboard of the distal end of the leading end and a projection can be formed inboard of the trailing end of the tile and upstanding from the front surface, so that when a pair of tiles are laid end to end, the projection of one tile extends into the recess of the other. This arrangement provides for interlock between tiles which have been laid end to end, contributing to the integrity of a tiled roof.

A condensation rib or ribs can be provided upstanding from the rear surface of the tile and extending lengthwise of the tile in a direction between the leading and trailing ends. The condensation ribs assist to expel condensation that forms against the underside or rear surface of the tile from within a roof cavity. That condensation travels along the condensation ribs and where the ribs extend to a position overlying the front surface of the tile, the condensation is deposited on the front surface and is thus expelled from within the roof cavity.

The rear surface can further include a drift bar which is also upstanding from the rear surface of the tile but extends generally perpendicular to the condensation ribs, so

that it extends widthwise of the tile in a direction between the side edges. The drift bar is positioned at or adjacent the leading end of the tile and can be arranged to extend into a recess formed in the front surface at or adjacent the trailing end of another tile. Either by itself or in combination with the recess, the drift bar operates to form a convoluted path against ingress of wind and rain into the roof cavity. In addition, the drift bar can cooperate with the condensation rib(s), so that condensation that travels along the condensation rib(s) travels to the drift bar for diversion onto the front surface of the next tile.

Neither of the condensation ribs or the drift bar need to extend fully between the ends or edges of the tile, but rather those ribs and the drift bar can be positioned inboard of the ends and edges as required.

In one arrangement, the recess described above is formed between the distal end of the leading end of the tile and the drift bar discussed above. Thus, in that arrangement, the drift bar also contributes to the security of connection between tiles laid end to end.

The underlap of the first side edge of a tile can include channels to capture and transport water that enters between the underlap and the overlap of a pair of tiles that are laid next to or adjacent one another. The channels can discharge any captured water through the leading end of the tile. The channels can be formed by upstanding ribs which extend lengthwise of the underlap in a direction between the leading and trailing ends.

In the above arrangement, the overlap of the second side edge can be provided with upstanding ribs which extend lengthwise of the overlap in a direction between the leading and trailing ends and which are positioned to extend at least partially into the one or more channels of the underlap of an adjacent tile. By this arrangement, a convoluted path is formed between the channels and the upstanding ribs to inhibit the passage of water through the underlap and overlap portions of a pair of adjacent tiles. The convoluted path can also assist to resist wind and dust from travelling through the underlap and overlap region, in order to resist the penetration of wind and dust into

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the roof cavity. The arrangement can also assist side interlocking between adjacent tiles.

A single upstanding rib could be provided for entry into each of the channels, although this is not essential. Thus, a single upstanding rib could be provided for entry into just one of the channels in an arrangement in which a pair of channels are provided in the underlap of the first side edge.

The strengthening ribs of the rear surface can form a matrix across the surface to provide for improved strengthening of the tile. The provision of strengthening ribs can advantageously reduce the overall amount of material required for the tile, ie the wall thickness of the tile can be reduced by adoption of the strengthening ribs. The strengthening ribs can have a strengthening effect in both the manufacturing process and when installed on a roof.

In one arrangement, the strengthening ribs comprise lengthwise ribs and lateral ribs. In an arrangement of this kind, three or more lengthwise ribs can be provided, while a plurality of lateral ribs extends between them. In some arrangements, the lateral ribs extending between a first pair of lengthwise extending ribs are offset with respect to the lateral ribs extending between the next pair of ribs. This offset arrangement can be provided for each adjacent pair of ribs as the lateral ribs extend across the tile from one side edge to the other.

In one particular arrangement developed by applicant, the rear surface of the tile includes as least five lengthwise extending ribs, with the lateral ribs extending between the first and second lengthwise ribs and between the third and fourth lengthwise ribs being laterally aligned, and the lateral ribs extending between the second and third lengthwise ribs and between the fourth and fifth lengthwise ribs also being laterally aligned, but being offset from the earlier lateral ribs.

The lateral ribs and the lengthwise ribs can extend to the same height or depth away from the rear surface, or they can extend to different heights. The lengthwise ribs can include the condensation ribs described above. In one arrangement, the lateral ribs extend to about half of the height of the some or all of the lengthwise ribs.

The rear surface of the tile can include one or more projections for engaging a batten of a supporting structure on which a plurality of tiles are laid, the one or more projections being positioned at or adjacent the trailing edge of the tile.

Brief Description of the Drawings

Figure 1 is a perspective view of a clay roof tile according to one embodiment of the invention.

Figure 2 is a top plan view of the roof tile of Figure 1.

Figure 3 is a bottom plan view of the roof tile of Figure 1.

Figure 4 is a cross-sectional view through A-A of Figure 2.

Figure 5 is a cross-sectional view through B-B of Figure 2.

Detailed Description of the Drawings

With reference to the figures, the roof tile 10 includes a pair of side edges 11 and 12, a pair of leading and trailing edges 13 and 14 and front and rear surfaces 15 and 16 (rear surface 16 is illustrated in Figures 3 to 5).

The first side edge 11 forms an underlap 20, while the second of the side edge 12 forms an overlap 21. The arrangement is such that an underlap 20 of one tile 10 underlies the overlap 20 of another tile 10 when a pair of tiles are laid on a supporting structure next to each other.

The underlap 20 includes a pair of channels 22, which run lengthwise of the tile between the leading and trailing ends 13 and 14. The channels 22 are provided to capture and transport water that enters between the underlap 20 and the overlap 21 of a pair of tiles that are laid next to each other.

The overlap 21 includes a pair of upstanding ribs which, like the channels 22, extend lengthwise of the tile between the leading and trailing ends 13 and 14, with the ribs being positioned so that with a pair of tiles laid next to each other, the ribs 23 extend

at least partially into the channels 22, for the purpose of creating a convoluted path between the channels and the upstanding ribs to inhibit the passage of water through the underlap and overlap portions of a pair of adjacent tiles. The convoluted path can also assist to resist wind and dust from travelling through the underlap 20 and the overlap 21 region, in order to resist the penetration of wind and dust into the roof cavity below the tiles. The arrangement can also assist side interlocking between adjacent tiles 10.

The rear surface 16 as shown in Figure 3 includes three projections 24. The projections 24 and provided for abutment against a tile supporting structure of a roof, most likely a baton which extends laterally across the roof, and while three projections are illustrated, any number could be provided, or indeed a single elongate projection or projections could be provided. The projections 24 are positioned at the trailing edge 14 of the tile 10 although they could equally be positioned inboard of the trailing edge 14.

The rear surface also includes a plurality of strengthening ribs 25 which extend lengthwise of the tile 10, between the leading and trailing ends 13 and 14. Two of the strengthening ribs 25 which are marked 26 also, are condensation ribs along which condensation from within the roof cavity can travel until it arrives at a drift bar 28 (described later herein) for deposit on the front surface of another tile and thus expulsion from inside of the roof cavity. In the embodiment illustrated, the strengthening ribs 25 extend uninterrupted between the leading and trailing ends 13 and 14. In addition, some of the ribs 25 are of a different height away from the rear surface 16 to others of the ribs, as illustrated in Figure 4. It is the condensation ribs 26 in the illustrated arrangement which extend to a greater height than the other ribs 25. .

Extending between the ribs 25 are further strengthening ribs 27. The ribs 27 are lateral ribs which extend perpendicular to the lengthwise extending ribs 25. The height of the lateral ribs 27 is about half the height of the condensation ribs 26 and is about the same height as the other condensation ribs 25.

Each of the ribs 27 extends between a pair of ribs 25. As shown in Figure 3, the ribs 27 extending between a first pair of ribs 25, are offset from the ribs 27 extending between the adjacent pair of ribs 25.

Still referring to Figure 3, a drift bar 28 is illustrated, which extends across the leading end 13 of the tile 10, and is operable to resist ingress of wind and rain into the roof cavity by creating a convoluted path. The convolution can be increased by extending the drift bar 28 into the recess 32 (described later herein) of an adjacent tile.

In addition, the drift bar 28 can cooperate with the condensation ribs 26, so that condensation that travels along the condensation ribs 26 travels to the drift bar 28 for diversion onto the front surface 15 of the next tile 10.

A portion of the front surface 15 of the tile 10 which is exposed when the tile 10 is laid on a roof supporting structure as part of a tiled roof is substantially flat, while the leading end 13 extends from that portion of the front surface 15 and is generally curved as shown in Figure 5. The curvature is in a direction so that the distal end 30 of the leading end 13 will rest upon the front surface of an adjacent tile when two tiles are laid end to end.

In a pair of tiles 10 which are laid end to end, the distal end 30 extends into the recess 31, while the drift bar 28 rests within the recess 32. Likewise, the projection 33 is received within the recess 34 which is positioned between the drift bar 28 and the distal end 30. The interconnection between the various recesses and projections forms at least part of an interlock between a pair of tiles and can assist to resist ingress of wind and rain into the roof cavity by creating a convoluted path.

With reference to the leading end 13 of the tile 10, in the figures, the curve of the leading end 13 is substantially ellipsoidal. In addition, the cross-section thickness T_1 (see Figure 5), between the front and rear surfaces 15 and 16, is substantially the same as the cross-sectional thickness T_2 of the curved leading end 13, providing advantages as hereinbefore described. Moreover, it is evident from Figure 5 that the curve of the leading end 13 commences from the front surface 15 in a direction towards the distal end 30, without any curvature in the opposite direction.

As indicated earlier, the curved leading end 13 advantageously resists or prevents twisting or warping of the tile 10 during manufacture, in particular when the tiles are stood upright in a firing cassette for glazing and firing. Prior art tiles have been found to be difficult to fire in an upstanding condition due to the propensity of the tile to warp or twist. It has been found that sufficient wastage is caused by twisting or warping, that upstanding manufacture of the tiles is often not economical.

The tile 10 as illustrated satisfies the requirements for an aesthetically pleasing appearance, a secure manner in which the tiles can be laid on a supporting structure and between each other, and provides benefits in manufacture. The provision of the curved leading end 13 has contributed to each of these advantages and in particular, in relation to the manufacturing advantages, the benefits provided by the curvature of the leading end 13 have been surprising.

The use of the curved leading end also facilitates the provision of a substantially flat exposed surface portion of the front surface 15, which provides an appearance which is considered in the art to be aesthetically pleasing, but which in the past has been difficult to provide given the propensity for the tiles to warp or twist during manufacture.

The invention described herein is susceptible to variations, modifications and/or additions other than those specifically described and it is to be understood that the invention includes all such variations, modifications and/or additions which fall within the spirit and scope of the above description.

CLAIMS:

1. A clay roof tile, the tile being generally square or rectangular and having
a pair of side edges,
leading and trailing edges and
front and rear surfaces,
a first of the pair of side edges forming an underlap and the second of the pair of side edges forming an overlap so that the underlap of one tile underlies the overlap of another tile when a pair of tiles are laid next to each other,
the rear surface further including a plurality of strengthening ribs,
the portion of the front surface which is exposed in a tiled roof is substantially flat and the leading end extends from the front surface and is generally curved in a direction so that the distal end of the leading end rests upon the front surface of an adjacent tile, at or adjacent the trailing edge of the adjacent tile, when a pair of tiles are laid end to end.

2. A clay roof tile according to claim 1, the curve of the leading end being substantially constant.

3. A clay roof tile according to claim 1 or 2, the cross-sectional thickness of the tile between the front and rear surfaces being substantially the same as the cross-sectional thickness of the leading end.

4. A clay roof tile according to any one of claims 1 to 3, the curve of the leading end commencing from the front surface and curving in a direction that is toward the front surface of an adjacent tile that is laid end to end with tile, without curving in the opposite direction that is away from the front surface of the adjacent tile.

5. A clay roof tile according to any one of claims 1 to 4, a recess being formed inboard of the distal end of the leading end and a projection being formed inboard of the trailing end and upstanding from the front surface, the projection of one tile of a pair of tiles laid end to end extending into the recess of the other of the pair of tiles.

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6. A clay roof tile according to any one of claims 1 to 5, the rear surface further including one or more condensation ribs upstanding from the rear surface and extending lengthwise of the tile in a direction between the leading and trailing ends.

7. A clay roof tile according to any one of claims 1 to 6, the rear surface further including a drift bar upstanding from the rear surface and extending widthwise of the tile in a direction between the side edges.

8. A clay roof tile according to claim 7, wherein the drift bar extends away from the rear surface an amount for it to be in contact with the facing front surface of another tile of a pair of tiles laid end to end.

9. A clay roof tile according to claim 7 or 8 when dependent on claim 5, the recess being formed between the distal end of the leading end and the drift bar.

10. A clay roof tile according to any one of claims 1 to 9, the underlap of the first side edge including upstanding ribs extending lengthwise of the underlap in a direction between the leading and trailing ends, to form one or more channels to capture and transport water that enters between the underlap and overlap of a pair of tiles that are laid next to each other.

11. A clay roof tile according to claim 10, the overlap of the second side edge including upstanding ribs extending lengthwise of the overlap in a direction between the leading and trailing ends and being positioned to extend at least partially into the one or more channels of the underlap.

12. A clay roof tile according to any one of claims 1 to 11, the strengthening ribs forming a matrix across the rear surface.

13. A clay roof tile according to claim 12, the strengthening ribs including three or more lengthwise extending ribs and a plurality of lateral ribs extending perpendicular to the lengthwise extending ribs, each of the lateral ribs extends between a pair of lengthwise extending ribs, with the lateral ribs extending between one pair of

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lengthwise extending ribs being offset with the lateral ribs extending between another pair of lengthwise extending ribs.

14. A clay roof tile according to claim 13, including at least five lengthwise extending ribs, the lateral ribs extending between the first and second lengthwise extending ribs and between the third and fourth lengthwise extending ribs being laterally aligned, and the lateral ribs extending between the second and third lengthwise extending ribs and between the fourth and fifth lengthwise extending ribs being laterally aligned.

15. A clay roof tile according to any one of claims 1 to 14, the rear surface including one or more projections for engaging a batten of a supporting structure on which a plurality of tiles are laid, the one or more projections being positioned at or adjacent the trailing edge of the tile.

16. A clay roof tile substantially as herein described with reference to the accompanying drawings.

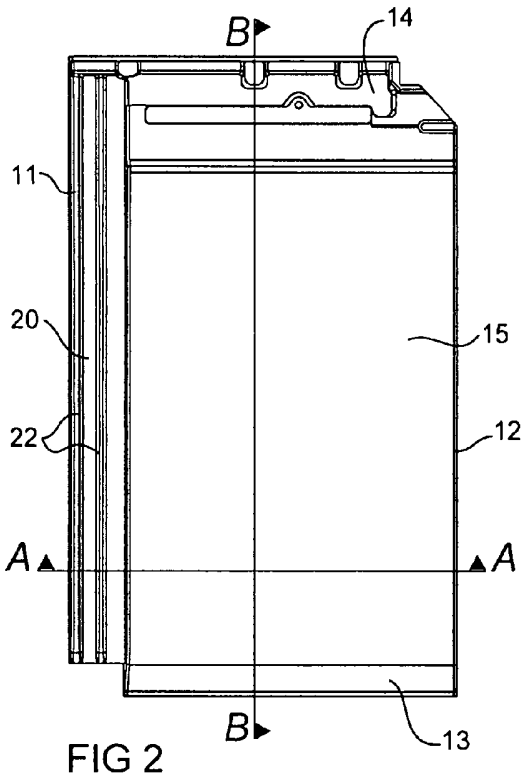

FIG 2

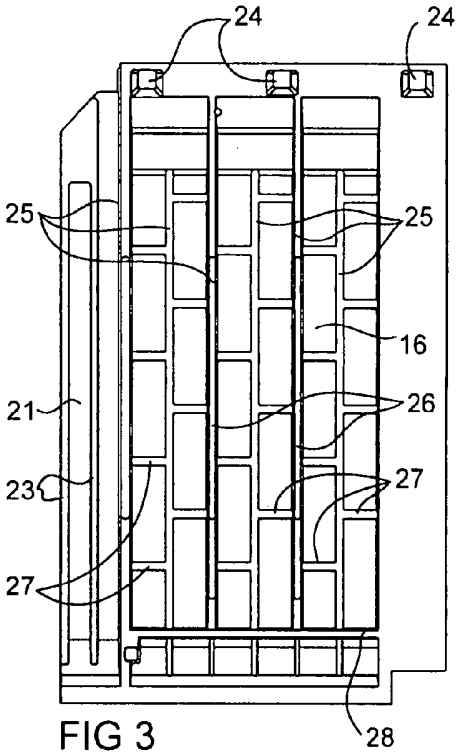

FIG 3

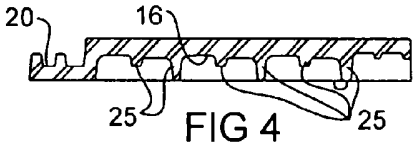

FIG 4

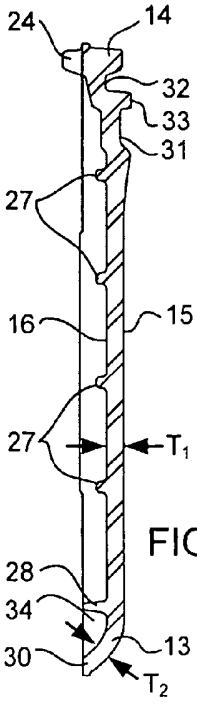

FIG 5

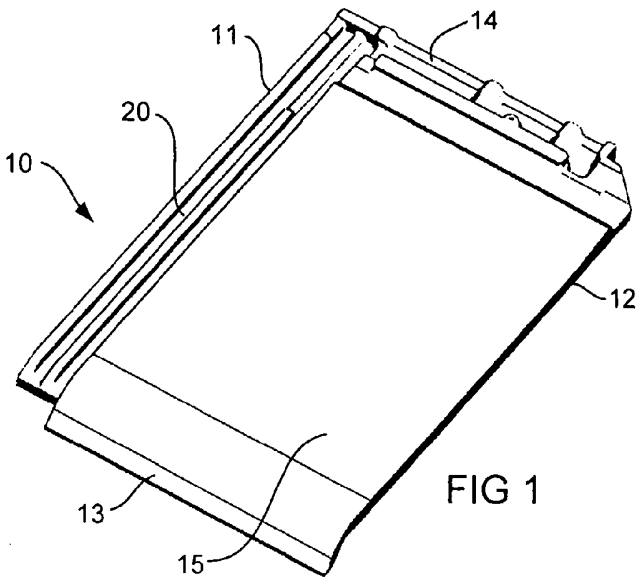

FIG 1