LIGHT WEIGHT MOLDED ROOF TILE

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ABSTRACT

An improved roof tile that is composed of a polymeric isocyanate and water blown component, mineral fiber or fiberglass, said roof tile being molded producing a roof tile with a high R-value thermal insulation and being very light weight. Each tile includes a flat bottom surface including a groove of a predetermined pattern that receives poly foam adhesive for attaching each tile to a roof substrate.
LIGHT WEIGHT MOLDED ROOF TILE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] This invention relates generally to building exterior roof tiles and specifically to an improved building roof tile that is lightweight, durable, has a high R-value providing insulation against heat and cold and is easily installed.

[0003] 2. Description of the Prior Art

[0004] Exterior building roofs have used different materials for protecting a building from inclement weather such as rain, solar energy, heat, cold, snow, ice, and wind damage.

[0005] Typical roofs are made of plywood, tarpaper and shingles. Tiles are also used to cover the plywood and tarpaper. Tiles are made in small pieces and are often made of terra-cotta or other cementous material. Tiles create a great weight on the building structure requiring a more sturdy construction of the building. Installing tile is labor-intensive on roofs and requires hauling and lifting heavy loads of tile pieces and yards of cement for the setup work.

[0006] The present invention overcomes the problems of previously used tiles made of cement and clay materials by providing a lightweight poly based molded cut tile that is durable, has excellent R-value for insulation and is easy and inexpensive to install on a building exterior having a plywood or plank base roof.

[0007] A. Polyurethane based foams are the most insulating roofing systems available today. These products are only available on flat roofs because of limitations of fire resistance on pitched roofs and the surface cannot be satisfactorily finished. The invention will address this problem by molding and cutting "tiles" out of polyurethane, mineral fiber, or fiberglass high insulating core material creating the only highly energy efficient tiles for any sloped roof.

[0008] B. The flammability ratings of available coatings for existing urethane systems do not apply to any roof pitch over 2° on 12°. The current configuration and manufacturing process solves this by utilizing a flame retardant resin with a flame retardant treatment, finished with a flame retardant gel coat mixture, acrylic, or silicone coating.

[0009] C. Solar systems penetrate roof systems thus requiring special flashings, create additional weight on structures, require separate installation, adds no insulation, and creates potential draining and leak points in a roof surface. The invention solves these issues by incorporating a lightweight, high insulating roof panel with embedded solar cells or paintable solar coating. Individual tiles are easy to replace, and very affordable eliminating the need to ever replace any large solar panels.

[0010] D. Available tile roof systems need frequent maintenance and leak after a short service time. The invention solves this problem by overlapping the tiles in a manner which makes water penetration much more difficult if not altogether impossible.

[0011] E. Available pitched roof systems cannot hold up to category 4 hurricane winds. Huge numbers of buildings are in areas where catastrophic damage occurs. The invention solves this problem with its unique tile design. The tiles have been independently tested to withstand over 260 mph winds without suffering any damage.

[0012] F. Hail storms damage all roof systems often allowing major water penetration into the building and massive interior damage. The invention solves this problem because of its hardness, thickness and density. When struck, even if hard enough to crack or dent the tiles, water penetration is not immediately possible because of the characteristics of the tiles core. The tiles can be easily repaired or replaced as needed.

[0013] Concrete and terra cotta roof tiles are subject to degradation due to the composition of the products and the effect of the elements. This causes the tiles to become brittle and routinely fracture and break when basic maintenance is performed. The invention solves this problem by eliminating breakage due to its composition and unique design characteristics.

[0014] Typical Tile roof systems are highly material and labor intensive. The invention solves these problems because it is lightweight, has a more simplified installation, and requires only poly foam adhesive and caulking to install.

SUMMARY OF THE INVENTION

[0015] An array of pre-molded poly foam tiles configured to fit together to complete a building exterior roof covering that appears to be aesthetically a conventional tile, slate, or shake roof.

[0016] Each molded tile is configured for placement at a predetermined location on the roof structure such as the roof peaks or top, bottom rows of the roof and field tiles, which are installed between the bottom row of the roof and the peak or hip and ridge tiles.

[0017] The present invention uses poly foam or comparable material from which each of the tile pieces are made in separate molds. In one embodiment composition of the tile that is molded uses a complementary system of polymeric isocyanate “A”-component and a composite water-based (HCFC-245fa) blown “B”-component. Using these ingredients, the mixture produces a tile that has lightweight and excellent thermal insulation characteristics. Other compositions for specific roof applications involve modifications to the polyurethane A and B mix as well as mineral fiber and fiberglass cores. Additives for flame resistance and mold control are examples of modifications. Each tile can also include a finish coat that includes gelcoat and similar additives.

[0018] The tiles can utilize solar paint or embedded solar panels for partial or total solar coverage of the structure. There is a metal “Z” bar which is installed at the top of a completed bottom row of tile. These bars can comprise the “grid” for the solar option. Final connections to the panel can be made by a certified electrician.

[0019] There is a different mold for the field tile, a different mold for the bottom row tile and a different mold for the hip or ridge tile. All of the tile pieces for the roof are pre-molded and coated before being delivered to the building site where they are attached to the roof as described herein.

[0020] As an example a home or residential building may have a wooden frame with a plywood sheet roof. A substrate may be prepared and applied to the roof with a hot mop for granular type material or any other type of suitable substrate to which the tiles will be attached. Once a substrate has been installed, poly foam adhesive is used that is put on the substrate and to which the tiles are attached whether it be the hip tile, the field tile or the bottom row roof tile.
The field tiles and the roof bottom row tiles each have on their back sides recessed or grooved areas that are of a predetermined pattern that receives the poly foam adhesive that is applied to the roof substrate for attaching each tile to the roof permanently. The foam adhesive has a setup time. Each of the roof tiles manually receives the poly foam adhesive on the under side of each tile in the domed star shaped area of grooves which is then manually attached to the roof and roof substrate. During the process, the poly foam adhesive must setup and the poly foam adhesive is allowed to harden, firmly attaching the roof tiles to the poly foam adhesive and to the substrate. The roof tiles are installed manually from the bottom up on the roof in a conventional fashion. The first row is installed against the roof edge which contains the bottom row tiles. The field tiles are then overlapped row by row from bottom to top. At the very top of the roof the hip and ridge tiles are adhered to the roof using poly foam adhesive. Note that the field tiles and the roof bottom row tiles have additional side overlapped portions so that not only are they overlapped from top from bottom, they are also interlocked in a side-to-side fashion. The tiles are also staggered in a brick like format from row to row. Hip and ridge tiles will be installed over roof peaks and adjoining field tile areas.

It is an object of this invention to provide an improved molded roof tile made of poly foam, mineral fiber or fiberglass that includes polymeric isocyanate and a water-based blown component that is lightweight, has a high R-value for thermal insulation, is pre-molded into individual units, and is easy to install.

**BRIEF DESCRIPTION OF THE DRAWINGS**

**FIG. 1** shows a bottom perspective view of the field tile used in the present invention.

**FIG. 2** shows a bottom perspective view of the bottom row tile used in the present invention.

**FIG. 3** shows a bottom perspective view of the tile used on the roof peak or the hip and ridge tile.

**FIG. 4** shows a bottom plan view of the bottom of the field tile shown in FIG. 1.

**PREFERRED EMBODIMENT OF THE INVENTION**

Referring now to the drawings and in particular FIG. 1, a field tile 10 is shown as it would appear after molding from a polyurethane material preferably polymeric isocyanate and a water-based (HCFC-245fa) blown component. The field tile 10 shown in FIG. 1 includes a bottom flat surface 12 and a lower recessed overlap portion 14 which is used to overlap the tile below the tile shown in FIG. 1 when a roof is done. The tile 10 includes a side recessed portion 16 that is used to interlock each field tile with an adjacent tile having a recessed portion 20 so that the tiles interlock in a side-by-side row fashion. The end 18 is flat. FIG. 1 shows a recessed groove 12a in the surface 12 that receives a foam adhesive (not shown) that is used to attach tile 10 to a roof surface.

**FIG. 4** shows the tile back side 12 and grooved or recessed pattern 12a that looks like an asterisk that is basically a groove 12a that is molded in the bottom surface of tile 10 as shown in FIG. 1. It is sufficiently deep to receive poly foam adhesive while the foam is setting up in the semi fluid stage to allow each tile to be firmly attached to the roof substrate. To attach the tiles 10 to a roof substrate, the tile 10 bottom surface 12 is placed in direct contact with a substrate (not shown) and with the groove pattern 12a filled with foam adhesive that binds the tile bottom 12 to the roof substrate. The poly foam adhesive is applied to the tile groove pattern 12a and to a substrate on the roof. During the adhesive foam setup, the tile groove is filled with poly foam adhesive to be pressed against the roof substrate and upon foam set up, the foam adhesive sets up and the tile is firmly attached to the roof substrate. The groove pattern 12a could be ½ inch deep, or sufficiently deep to attach the tile to the substrate. The field tile 10 shown in FIG. 1 is the primary tile used with the present invention and is used in all the areas on the roof except the very peak of the roof and the very last bottom row of tiles on the roof. The tile 10 shown in FIG. 1 can be hand sawed to change the length or fit along the side edge if necessary. The R-value of the tile shown 10 in FIG. 1 is extremely high for insulation against heat and cold and is also extremely light weight because each tile 10 is made of molded polyurethane foam like material.

Referring now to FIG. 2, tile 30 is shown that is used as the bottom row of roof tiles. Tile 30b configured different than tile 10 due to its placement at the bottom edge of the roof to provide an aesthetic shape. The bottom row tile 30 includes a bottom surface 32 which shows in FIG. 2 the recessed grooves 32a for receiving poly foam adhesive for attaching the bottom row roof tile 30 to the roof substrate. The tile 30 bottom edge portion has an overhanging extended bottom 34 as the last tile at the bottom of the roof. The tile 30 also has side edge recesses 36 and 38 so that tiles can be interlocked side-by-side together during the installation process along the bottom of the roof. The top surface 40 of the bottom roof tile is shown. The bottom roof row tile 30 is made of and molded from the same material as the field tile 10 FIG. 1 which is a polyurethane foam described above which is individually molded for each piece and is extremely lightweight. The tile 30 also provides an aesthetic look like a conventional clay, cement, slate or wood shake tile. FIG. 2 shows the recessed groove pattern 32a which looks like an asterisk * in the bottom surface 32 of the tile 30 shown in FIG. 2 to receive measured poly foam adhesive (not shown) during setup phase for firmly attaching the tile 30 to the roof after the foam adhesive sets up which is forced into the recessed grooves 42 in each tile.

Referring now to FIG. 3, the molded hip and ridge tile 50 is shown which is used where different fields of tile meet and at the very top of the roof peak for covering the upper row of field tiles. The ridge tile 50 is molded and made of the same material as the field tile 10 FIG. 1 and is very light weight. A flat bottom surface 58 of ridge tile 50 can also receive adhesive foam along its bottom for attaching the ridge tile 10 to the adjacent field tiles 10 FIG. 1 at the peak of the roof. Tile 50 can also be overlapped through recessed portion 54 at one end.

Using the field tile 10 FIG. 1, the bottom row tile 30 FIG. 2, and the ridge tile 50 an entire roof structure can be installed quickly and easily using pre-molded tile made of a very light weight material and foam adhesive which allows for quick setup and attachment to the roof structure.

Available tile roof systems need frequent maintenance and leak after a short service time. The invention solves this problem by overlapping the tiles in a manner which makes water penetration much more difficult if not altogether impossible.
[0033] The instant invention has been shown and described herein in what is considered to be the most practical and preferred embodiment. It is recognized, however, that departures may be made therefrom within the scope of the invention and that obvious modifications will occur to a person skilled in the art.

What I claim is:

1. A molded polyurethane foam, mineral fiber, or fiber glass roof tile comprising:
   a relatively thin substantially rectangular body said body having a top surface, a flat bottom surface, top and bottom edges, parallel side edges, the bottom flat surface having a groove for receiving a poly foam adhesive used to attach the roof tile to a roof surface.

2. A molded roof tile as in claim one wherein:
   said roof tile is composed of a polymeric isocyanate and a water-based blown component, said roof tile having a high R-value related to the thermal insulation and being lightweight.

3. A molded roof tile as in claim one wherein:
   said roof tile flat bottom surface groove is shaped like an asterisk.

4. A molded roof tile that may be embedded with various solar devices can be coated with solar paints.

5. A molded roof tile that is finished with gel coat, silicone, or elastomeric coatings.

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