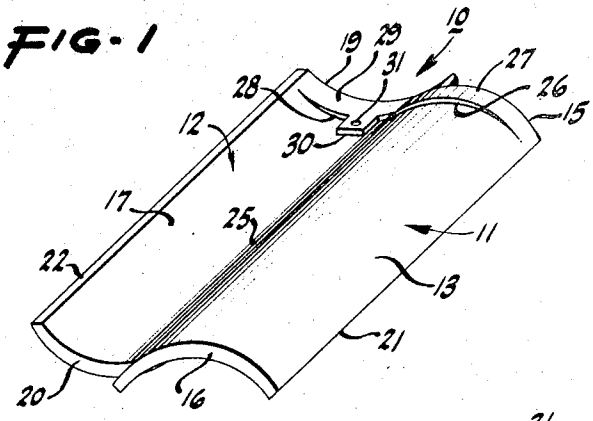
Oct. 31, 1967 J. G. WOTHERSPOON 3,349,534

ROOFING TILE

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FIG-1



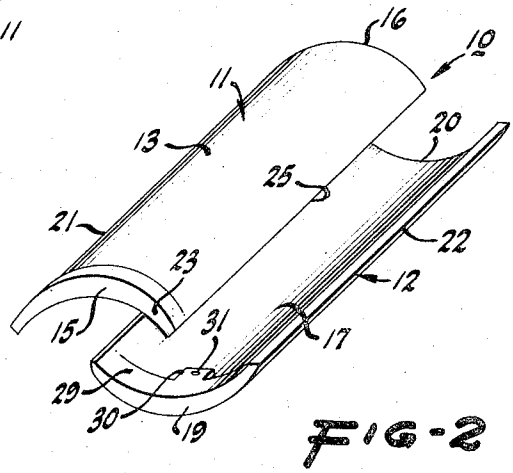


FIG-2

FIG-3

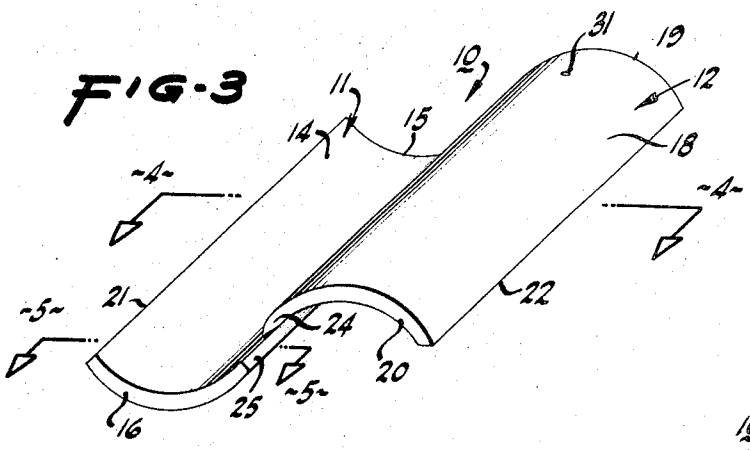
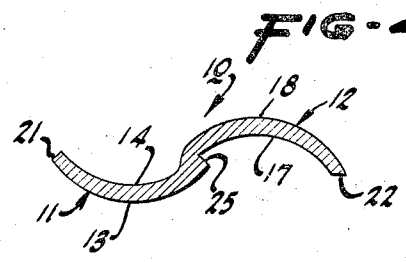


FIG-4



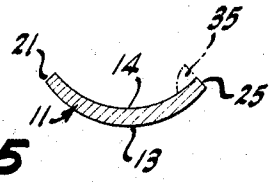


FIG-5

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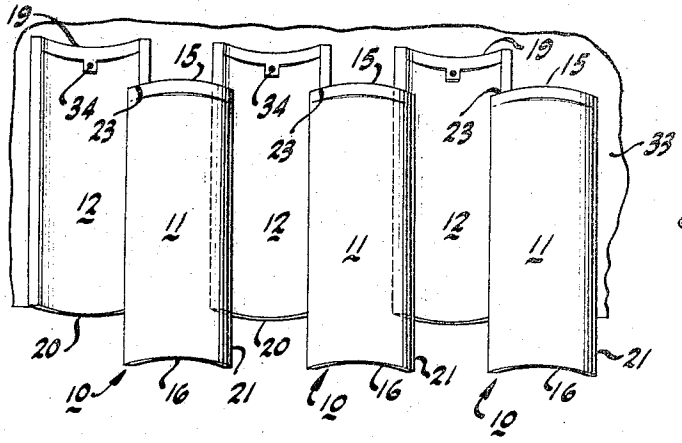


FIG. 6

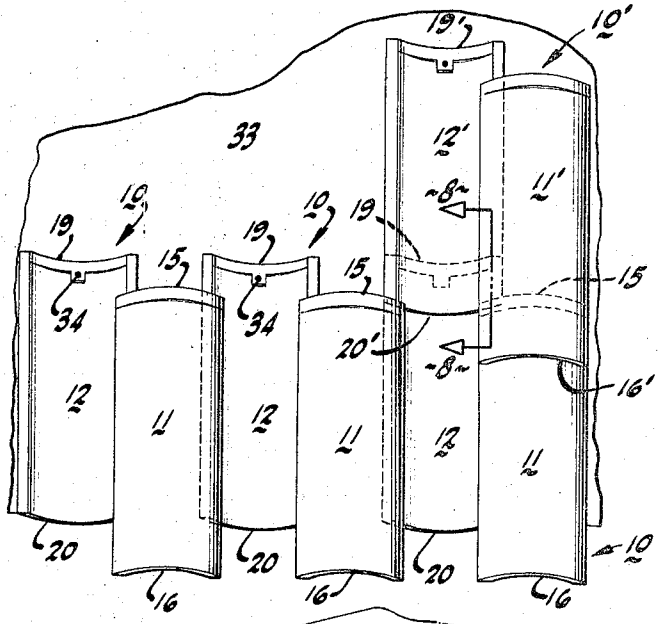


FIG. 7

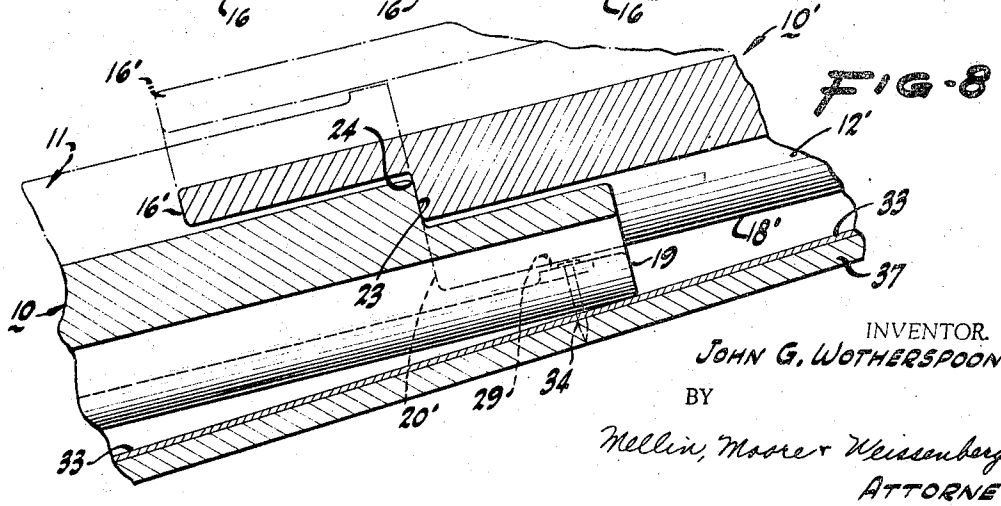


FIG. 8

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ROOFING TILE

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9 Claims. (Cl. 52—520)

This invention relates to roofing tiles, and more particularly to interlocking tiles which give a Mission appearance.

A Mission roof is one styled after the tile roofs used particularly in the old Spanish missions in the southwest part of this country. These roofs used elongated transversely cured tiles laid in overlapping manner on a roof to form courses of alternately concave and convex tiles, with the succeeding courses overlapped thereon so that the tiles form concave and convex rows of tiles from the roof edge to the peak of the roof. The horizontal joints of the concave and convex rows of tiles are offset in such roofs.

It is an object of this invention to provide a one-piece roofing tile having integrally joined concave and convex sections which may be quickly and easily laid in a minimum of time and effect to form a Mission roof.

Another object of the invention is to provide a one-piece tile as above with locking means to hold adjacent courses of tiles in place.

Still another object of the invention is to provide a concrete tile which can be easily manufactured by extrusion and in which the upper surface of the tile will have a finished appearance after extrusion.

Yet another object of the invention is to provide a roofing tile as above having seal means thereon to give weather protection to a roof.

Other objects and advantages will become apparent in the course of the following detailed description.

In the drawings forming a part of this application, and in which like parts are designated by like reference numerals throughout the same,

FIG. 1 is a view in perspective of a roofing tile made in accordance with the invention, illustrating the details of the upper surface thereof as seen looking towards the bottom end of the tile.

FIG. 2 is a view similar to FIG. 1, illustrating the details of the upper surface of the tile as seen looking towards the upper end of the tile.

FIG. 3 is a view similar to FIG. 1, illustrating the details of the under surface of the tile as seen looking towards the lower end of the tile.

FIG. 4 is a sectional view of the tile, taken on line 4—4 of FIG. 3.

FIG. 5 is a sectional view of the tile, taken on line 5—5 of FIG. 3, illustrating the portion of the tile which is removed in the manufacture thereof to form the lower locking surface.

FIG. 6 is an illustration in which is plurality of roofing tiles are laid out to form an initial course on a roof.

FIG. 7 is an illustration similar to FIG. 6, showing the addition of the first tile of the second course of tiles on a roof.

FIG. 8 is a sectional view of two tiles in interlocking engagement, taken on line 8—8 of FIG. 7, with the convex sections of the tiles shown in phantom.

Referring now to the drawings, and in particular to FIGS. 1–5, the roofing tile **10** comprises a one-piece body having a generally uniform thickness and having two integrally formed and joined longitudinal convex and concave sections **11** and **12**. The convex section **11** has a transversely convex upper surface **13**, a concave under surface **14**, an upper end **15** and a lower end **16**. The

concave section **12** has a transversely concave upper surface **17**, a convex under surface **18**, an upper end **19** and a lower end **20**. The tile has side edges **21** and **22** extending between the upper and under surfaces of the tile.

As will be noted, the upper end **19** of the concave section **12** extends beyond the upper end **15** of the convex section **11**, and the upper end **15** of the convex section overlaps the upper surface **17** of the concave section so that the overlapping portion of the upper end of the convex section forms a locking shoulder **23** that extends between and is generally perpendicular to the upper surface surfaces of the concave and convex sections and faces toward the upper end of the concave section. Similarly, the lower end **16** of the convex section **11** extends beyond the lower end **20** of the concave section **12**, and the lower end **20** of the concave section underlaps the under surface **18** of the convex section so that the underlapping portion of the lower end of the concave section forms a locking shoulder **24** that extends between and is generally perpendicular to the under surfaces of the convex and concave sections and faces toward the lower end of the convex section.

A shadow shoulder **25** extends downwardly from the upper surface **13** of the convex section to the upper surface **17** of the concave section to give the tile the appearance, when laid on a roof, of being made of two separate but overlapped convex and concave sections.

Each of the convex and concave sections **11** and **12** is provided with a weather seal at the upper end thereof to prevent rain from blowing up under the lapped courses of tile past the upper ends of the tiles. The upper surface **13** of the convex section **11** is provided with an upstanding ridge **26** at the upper end thereof, which has an upper surface **27** provided with a transverse curvature complementary to the transverse curvature of the under surface **14** of the convex section. Similarly, an upstanding ridge **28** is provided on the upper end of the upper surface **17** of the concave section. The upper surface **29** of ridge **28** is transversely curved complementary to the transverse curvature of the under surface of the concave section.

A raised boss **30** is formed on the upper surface of the concave section adjacent to the ridge **28** and a nailing hole **31** is formed through the boss **30** and the concave section.

A typical installation of the roofing tiles **10** on a low-pitched roof is illustrated in FIGS. 6–8. A plywood facing **32** is first laid and nailed to the rafters (not shown) and a fiberglass or felt layer **33** is laid on the plywood to weatherproof the roof. The lower course of tiles is then laid in place along the bottom edge of the roof, with the right-hand edge **21** of a convex section of a tile overlapping the left-hand portion of the concave section of the tile to the right, as illustrated in FIG. 6. As so laid, the right-hand edge **21** and shadow shoulder **25** of each tile **10** will be visible, to give the appearance that all of the convex sections are separate from the concave sections of the tiles. The lower course of tiles are all held in place on the roof by nails **34** which are nailed through the nailing holes **31** of all of the lower-course tiles. Although not illustrated, the lowest course of tiles will usually have the portion of the convex section which extends beyond the lower end of the concave section cut off before installation so that the lower ends of the concave and convex sections of all of the lowest course of tiles will be on a line.

FIG. 7 illustrates the placement of the first tile **10'** of the second course on the roof. As will be noted, the lower end **16'** of the convex section **11'** which extends beyond the lower end of the concave section **12'** overlaps the upper end **15** of the convex section **11** of the first-course tile **10**. Similarly, the lower end **20'** of

the concave section **12'** of tile **10'** overlaps the upper end **19** of the concave section **12** of title **10**. The weather seal ridges **26** and **28** on the first-course tile **10** contact the under surfaces **14'** and **18'** of the second-course tile **10'** throughout since the radii of transverse curvature of the ridges and the under surfaces are the same.

Importantly, the lower locking shoulder **24'** on the second-course title **10'** abuts the upper locking shoulder **23** on the first-course tile so that the upper-course tile is prevented from sliding down relative to the first-course tile.

The second-course tiles are continued to be laid, and then more courses are laid until the roof is complete. In each instance, the lower locking shoulder of an upper tile will engage the upper locking shoulder of the tile therebeneath. The alternate vertical rows of concave and convex sections and the staggered horizontal joints of the concave and convex sections will then give a Mission appearance to the roof.

The roof is quickly laid, as compared to a conventional tile roof using separate concave and convex tiles, because the number of individual tile members is halved by the double construction of the present tile.

Additionally, the amount of overlap of the tile courses is automatically determined by the construction of the tile, the overlap being equal to the amount of longitudinal offsetting of the convex and concave sections of the tile. This has a distinct advantage in that the overlap is uniform from course to course and from roof to roof, and avoids the problem of having too much overlap, which increases the number of tiles used and hence the cost, and avoids the problem of having too little underlap, which will give inadequate weather protection.

In roofs of a low pitch, i.e., up to a 5/12 pitch, only the bottom two courses of tile need be nailed to the roof, the weight of the upper-course tiles being sufficient to hold them in place with the locking shoulders of the lapped tiles in engagement. The fact that the upper-course tiles need not be nailed has two distinct advantages. First, the time for installation of the tiles is greatly reduced. Secondly, the elimination of nailing does away with the puncturing of the waterproofed felt **33** by such nailing and thus preserves the watertight integrity of the roof.

However, on roofs of a pitch greater than 5/12, all tiles are to be nailed. The time for installation will be greater because of the nailing, but the time will still be much less than that required for conventional tile roofs, and all tiles will be held in place both by the nailing and by the engagement of the locking shoulders of the tiles.

Another important aspect of the present invention is that the design of the tiles enables them to be quickly and easily manufactured. It is desired that the tiles **10** be made of cast concrete, and preferably of lightweight concrete. Since the manufacture of cast concrete articles is well known, the apparatus therefor has not been illustrated. Suffice it to say that the method of manufacture of the tiles is carried out by the extrusion process, whereby a movable die filled with concrete is passed under a stationary die which, in effect, wipes the excess concrete from the movable die.

The movable die, preferably made from aluminum, is shaped to form all of the detailing of the upper surfaces of the tile, such as the weather seal ridges, the nailing hole boss, the shadow shoulder, and any other detailing which may be desired, such as trademarks or the like.

The transverse profile of the under surface of the tile **10**, as will be noted from FIGS. 3 and 4, is essentially constant throughout the length of the tile and is devoid of any localized protuberances. Also, the under surfaces of the convex and concave sections fair smoothly into each other. As a consequence, the under surface of the tile may be easily formed by the use of a stationary die member having a transverse profile corresponding to the smoothly curved transverse profile of the tile. No

slump problems are encountered, as would be if there were sharp angles to be formed longitudinally of the lower surface.

As above noted, a movable die is filled with low-slump concrete to form the upper face of the tile and the die is moved past the stationary die member which forms the under surface of the tile. The clearance between the face of the movable die and the stationary die, of course, determines the thickness of the tile. One movable die is used for each tile, and the die with the extruded tile therein is set aside after extrusion to allow the concrete tile to set. However, before the tile is set, the operator removes the small portion of concrete indicated at **35** by the dotted lines in FIG. 5 from the under surface **14** of the convex section **11** which extends beyond the lower end of the concave section **12** in order to form the lower locking shoulder **24**.

The above-described conventional method of extruding concrete will usually produce a roughened or pitted surface in the concrete by the action involved in the scraping off of the excess concrete in the movable die by the stationary die. However, this is of no particular disadvantage here, because the roughened surface produced by the extrusion process is under the surface of the tile, which will not be visible when the tiles are installed on a roof.

The upper surfaces of the tile, which are formed by the configuration of the movable die, will be smooth and in full conformance with the shape of the movable die because there is no relative movement of the concrete in the movable die as the tile is extruded. Thus, the upper, or visible, surface of the finished tiles will have a smooth finished surface permitting accurate factory-controlled consistent quality of the upper tile surface, even though the tiles be made out in the field.

The tiles, being made of extruded concrete, can be colored as desired by the addition of a coloring agent to the concrete mix. The tiles will be integrally colored therethrough, and thus any cuts made in a tile will expose the same color as the surfaces of the tile.

Merely by way of illustration, one form of the tile presently being made is 21 inches long by 13 inches in width, with an effective exposed area when installed of 18 by 12 inches. The tiles are generally ½ inch thick, but ⅝ of an inch at critical points. With these tiles, 83 are required to cover a ten-by-ten-foot square.

It is to be realized that the form of the invention herein shown and described is to be considered as a preferred embodiment of the invention, and that various changes may be made in the shape and size of the tile without departing from the spirit of the invention and the scope of the appended claims.

Having thus described my invention, what I claim is:

1. A roofing tile comprising a one-piece body having a generally uniform thickness and having first and second integrally joined longitudinal sections, said first section having a transversely convex upper surface and said second section having a transversely concave upper surface, said sections each having an upper end, the upper end of one of said sections extending beyond the upper end of the other of said sections, and the upper end of said other section having a portion thereof overlapping the upper surface of said one section to form a locking shoulder extending between and generally perpendicular to the upper surfaces of said sections and facing toward the upper end of said one section.

2. A roofing tile comprising a one-piece body having a generally uniform thickness and having first and second integrally joined longitudinal sections, said first section having a transversely convex upper surface and said second section having a transversely concave upper surface, said sections each having upper and lower ends, the upper end of one of said sections extending beyond the upper end of the other of said sections and the lower end of the other of said sections

extending beyond the lower end of said one section, the upper end of said other convex section having a portion thereof overlapping the upper surface of said one section to form a locking shoulder extending between and generally perpendicular to the upper surfaces of said sections and facing toward the upper end of said one section, and the lower end of said one section having a portion thereof underlapping the under surface of said other section to form a locking shoulder extending between and generally perpendicular to the under surfaces of said sections and facing toward the lower end of said other section.

3. A roofing tile as set forth in claim 2 and further including a ridge formed on the upper surface of each of said first and second sections adjacent the upper ends thereof, each ridge having a transverse curvature complementary to the transverse curvature of the under surface of the section on which the ridge is formed.

4. A roofing tile as set forth in claim 2 and further including a generally longitudinal shadow shoulder extending downwardly from the upper surface of said other section to the upper surface of said one section where said sections join.

5. A roofing tile as set forth in claim 4 and further including a ridge formed on the upper surface of each of said first and second sections adjacent the upper ends thereof, each ridge having a transverse curvature complementary to the transverse curvature of the under surface of the section on which the ridge is formed, said second section having a nailing hole formed therethrough adjacent the upper end thereof.

6. A roofing tile comprising a one-piece body of extruded concrete having a generally uniform thickness and having first and second integrally joined longitudinal sections, said first section having a transversely convex upper surface and said second section having a transversely concave upper surface, said sections each having upper and lower ends, the upper end of one of said sections extending beyond the upper end of the other of said sections and the lower end of said other section extending beyond the lower end of said one section, the upper end of said other section having a portion thereof overlapping the upper surface of said one section to form a locking shoulder extending between and generally perpendicular to the upper surfaces of said section and facing toward the upper end of said one section, the lower end of said one section having a portion thereof underlapping the under surface of said other section to form a locking shoulder extending between and generally perpendicular to the under surfaces of said sections and facing toward the lower end of said other section, the under surfaces of said sections being faired smoothly into each other, and the transverse profile of the under surface of said body being essentially constant and devoid of localized protuberances throughout the length of said body.

7. A roofing tile as set forth in claim 6 and further including a ridge formed on the upper surface of each of said first and second sections adjacent the upper ends thereof, each ridge having a transverse curvature complementary to the transverse curvature of the under surface of the section on which the ridge is formed.

8. A roofing tile as set forth in claim 6 and further including a generally longitudinal shadow shoulder extending downwardly from the upper surface of said other section to the upper surface of said one section where said sections join.

9. A roofing tile as set forth in claim 8, and further including a ridge formed on the upper surface of each of said first and second sections adjacent the upper ends thereof, each ridge having a transverse curvature complementary to the transverse curvature of the under surface of the section on which the ridge is formed, said second section having a nailing hole formed therethrough adjacent the upper end thereof.

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