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(54) Natural slate roofing tile and method of manufacturing same.

(57) Interlocking roofing tiles of natural slate are produced by machining at least one groove (35, 36; 45, 46) adjacent each of two opposing side edges (32, 34), the groove(s) at one side (32) being formed in the underside of the slate, while the groove(s) at the other side (34) is/are formed in the upper surface of the slate. These grooves are preferably formed by a diamond milling wheel or head of 60 to 80 US. mesh grit size or coarser and they are preferably at least 1.75mm in depth and at least 5mm wide so as to minimize ingress of water when the slates are fixed interlockingly in place on a roof.

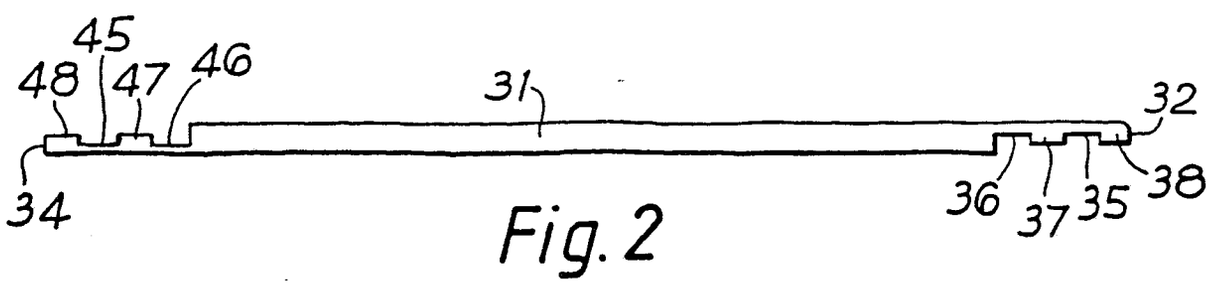

Fig. 2

EP 0 306 571 A1

NATURAL SLATE ROOFING TILE AND METHOD OF MANUFACTURING SAME

This invention relates to interlocking roofing slates.

Traditionally, roofing tiles of natural slate or other materials, such as moulded resin, clay or concrete, have been fixed in position simply by passing one or more nails through holes adjacent the upper edge of each tile into battens of a roof structure. The lower edge of each tile remains substantially free but has to overlap one (single lap arrangement) or preferably two (double lap arrangement) lower rows of tiles to provide an effective waterproof roof cover. Moreover, the side edges of the tiles also have to overlap adjacent tiles in a similar manner to prevent ingress of water.

It is nowadays quite common for moulded or extruded tiles of clay, concrete or plastics material to be formed with a series of grooves and ridges along their side edge margins, whereby adjacent tiles can be interlocked by interengagement, for example, of grooves in the underside of one tile with corresponding ridges in the upper surface of the next adjacent tile. In the moulding process it is a simple matter to incorporate all manner of interlocking groove and ridge arrangements as well as horizontal water bars and projections or recesses for elaborate fastening systems. The extrusion process also enables grooves to be provided during the manufacturing process.

Hitherto, however, interlocking natural slates have not been produced, partly because it is thought likely to prove expensive to cut grooves in the slate and partly because problems are thought to be likely to arise with ingress of water through the assembled slates.

The present invention now proposes a roofing tile of natural slate which is adapted to interlock with other similar tiles of natural slate by having at least one groove formed by machining adjacent each of two opposing side edges, the groove or grooves at one side being in the underside of the slate whilst the groove or grooves at the other side is/are in the upper surface of the slate.

Preferably, each groove is at least 1.75mm in depth and at least 5mm wide.

The remaining ridge at the extreme edge, outwardly of the groove(s), at each side of the slate and, where more than one groove is formed at each side, the ridges between adjacent grooves should be somewhat narrower than the grooves so as to readily interengage therewith upon assembly. Preferably they are at least 3mm in width.

In a standard slate of 10mm thickness, two parallel grooves of 10mm width and 2mm in depth are advantageously formed at each side, with ridges of 8mm width.

The invention also proposes a method of manufacturing a roofing tile of natural slate by machining at least one groove in the underside of the slate adjacent one side edge thereof and also machining at least one groove in the upper surface of the slate adjacent an opposing side edge thereof so that the tile is adapted to interlock with other similar tiles of natural slate. In this respect, the machining is advantageously effected by milling using a diamond impregnated milling wheel or head of 60 to 80 US mesh grit size or coarser.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:-

Fig. 1 is a plan view of one embodiment of a roofing slate produced in accordance with the invention; and

Fig. 2 is an end view of the same slate as in Fig. 1.

Slate is extracted from the ground as a natural product using conventional methods. Blocks of the slate are sawn into cubes with four sawn faces, the two opposite and remaining faces being naturally split. Using a heavy hammer and wedge the slate is split down into rivings of four slates thick. The four slates thick rivings are then split, either using a hammer and chisel, or an automatic slate splitting machine to the final thickness of approximately 10mm thickness.

Instead of being dressed on four sides as is traditional with roofing slate, each slate will be dressed on two adjacent sides, namely the lower edge or tail 31 and the righthand edge 32, as indicated in Fig. 1. The upper edge or head 33 and the lefthand edge 34 of the slate will be left undressed with a sawn edge.

The tail 31 of each slate may be put through a mangle dressing machine to confer a whittled edge on the upper edge of the tail 31.

Two nail holes are then inserted at the head of the slate using an automatic dual headed holing machine operated by compressed air. The machine comprises two hardened points which descend with a slow twisting action to form the holes.

Finally, an interlocking margin is formed on the opposing side edges 32, 34 of each slate. In this respect, in the illustrated example the righthand dressed edge 32 is machined so as to have grooves on its underside, while the lefthand edge 34, which is sawn, is machined so as to have grooves on its upper face. In this way adjoining faces can be interlocked, as will be apparent from Fig. 2.

The slates can vary in size from a probable

maximum width of 30 inches (approximately 75cm) down to 6 inches (approximately 15cm) in width. Heights are normally half the width, but in any case less than the width, and proportionate.

In the illustrated practical embodiment the slate is 336mm wide and 300mm high. Two parallel grooves 35, 36, 45, 46 are formed at each of the opposing edge margins 32, 34 and these are approximately 10mm wide, with an intervening ridge 37, 47 of about 8mm width remaining therebetween and a further ridge, also about 8mm wide, 38, 48 remaining along the extreme margins of the respective edges 32, 34.

When the slates are assembled to provide a roof covering, alternate courses (horizontal rows of slates) have a staggered array of slates so that the grooves, which are liable to allow ingress of water, are not in alignment. Thus, to complete the alternate courses, wider "slate and a half" slates are required at each end. For use at the righthand side, a slate and a half of 486mm width is provided, whilst for use at the lefthand side, a slate and a half of 450mm width, is provided, the reduction in width being due to complete omission of a grooved edge margin at its lefthand edge. Indeed, even for a standard course a special lefthand verge slate without an exposed, upwardly facing grooved edge margin at its lefthand side is provided. The latter is only 300mm wide.

In further embodiments there may be only a single groove adjacent each side edge with a single ridge outwardly thereof, or there may be as many as ten grooves, with a corresponding number of intervening ridges, at each side edge. Obviously a large number of grooves is only likely with a larger size slate.

With a slate of standard thickness (10mm) the groove depth is between 1.75 and 2mm. However, this could be greater if the slate thickness is increased. The width of the grooves may vary from about 5mm to 20mm, with the ridges varying from about 3mm to 15mm, the ridges in all cases being somewhat narrower than the corresponding grooves so that they will fit therein without any difficulty due to slight misalignment etc.

The grooves are formed by milling, preferably using a diamond-impregnated wheel or head of 60 to 80 US mesh grit size or coarser. The milling operation may, in practice, be accomplished in several ways. For example the slates may be laid alternately the right way up, then upside down, on a machine table, and the grooves at the margins machined in using a specially prepared diamond impregnated head, which is attached to a driven spindle, which in turn is mounted onto a beam, which allows the milling head to pass along the slate milling in the grooves.

Alternatively, in a more mechanised production method, the slates may be laid onto a continuously moving endless belt which passes them underneath a diamond milling wheel at one side and across the top of a respective diamond milling wheel at the other side.

Where more than one groove is to be milled adjacent each side edge of the slate, the rims of the respective wheels are, of course, formed with ridges and recesses corresponding, respectively, to the required grooves and ridges at the slate edge margins.

As mentioned, the diamond type used for the milling wheels or head is preferably 60 to 80 US mesh grit size or coarser since it is important that the grooves should have a sufficiently rough surface to minimize the possibility of water travelling upward of a sloping slate assembly via these grooves by means of capillarity. The actual size (width) of the grooves is also important in this respect, and it may be necessary to pass the slate across the wheel surface or to pass the milling head over the slates several times to achieve the correct dimensioning of the grooves.

The resulting interlocking roofing slates are suitable for all roof pitches in moderate exposure down to 25°. The recommended head overlap is 3 inches (approximately 7.5cm), measuring from the fixing holes at the tip. No clips or other devices to hold down the tail of the slate are required due to the higher density of natural slate compared to man-made materials. The naturally split (riven) texture of the slate prevents the rise of water on the riven faces. The specially selected coarse diamond for milling the grooves at the opposing side edge margins helps prevent the rise of water through capillary action in those areas, as mentioned above.

The advantage of such interlocking roofing slates is that their assembly entails only a single head lap compared to the conventional double lapped arrangement. This results in much more economic use of slate on a roof, with an approximate gain in cover from 1 tonne of slate of 75%. Also, a similar lower proportion of fixing materials is required and the time and labour needed to lay slate on a given area is correspondingly reduced.

In order to save cost in the milling process it may prove expedient to firstly remove half the slate thickness at the edge margins (i.e to the innermost groove border at each side) by the conventional splitting technique. This would involve nicking the slate to a depth of half the slate thickness, e.g. to 4 to 5mm, and then using the natural cleavage to split the edge margin region, e.g. 36mm in the illustrated example, away. Milling, as described above would then follow. With the slate thickness

reduced to half, by the aforesaid means, or by milling, a particularly smooth overlap and interengagement of adjacent slates can be achieved.

Claims

1. A roofing tile which is adapted to interlock with other similar tiles by having at least one groove formed adjacent each of two opposing side edges (32,34), the groove or grooves (35,36) at one side being in the underside of the slate whilst the groove or grooves (45,46) at the other side is/are in the upper surface of the tile, characterised in that the tile consists of natural slate and the grooves (35,36; 45,46) are formed by machining of the slate.

2. A roofing tile as claimed in claim 1 wherein each groove (35,36; 45,46) is at least 1.75mm in depth and at least 5mm wide.

3. A roofing tile as claimed in claim 1 or 2 wherein ridges (38,48) remaining at the opposing side edges (32,34) of each slate, outwardly of the respective grooves (35,36; 45,46), are narrower than said grooves.

4. A roofing tile as claimed in claim 1, 2 or 3 wherein two or more side-by-side grooves (35,36; 45,46) are formed adjacent each opposing side edge (32,34) of each slate, and ridges (37,47) remaining between the respective grooves at each side are narrower than said grooves.

5. A roofing tile as claimed in claim 3 or 4 wherein the grooves (35,36; 45,46) are from 5mm to 20mm in width and the ridges (37,38,47,48) are from 3mm to 15mm in width.

6. A method of manufacturing a roofing tile of natural slate by machining at least one groove (35,36) in the underside of the slate adjacent one side edge (32) thereof and also machining at least one groove (45,46) in the upper surface of the slate adjacent an opposing side edge (34) thereof so that the tile is adapted to interlock with other similar tiles of natural slate.

7. A method as claimed in claim 6 wherein the machining is effected by milling using a diamond impreganted milling wheel or head of 60 to 80 US mesh grit size or coarser.

8. A method as claimed in claim 7 wherein the slate is passed beneath the milling wheel or head on a continuously moving belt.

9. A method as claimed in claim 7 wherein the milling wheel or head is moved across the surface of stationary slate.

10. A method as claimed in claim 7 wherein the slate is passed underneath a first diamond milling wheel or head at one side thereof and across the top of a second diamond milling wheel or head at the other side thereof.

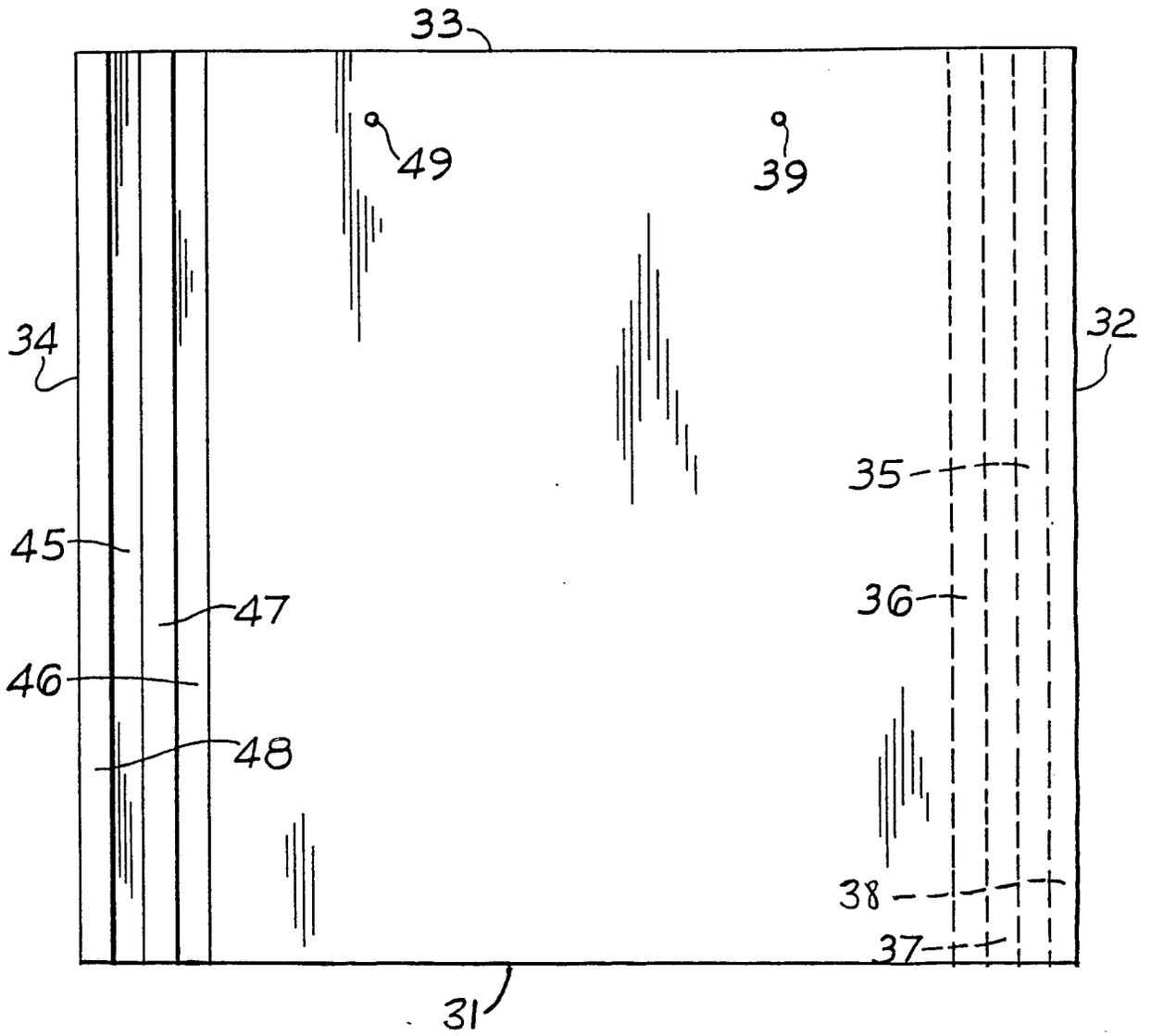
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Fig. 1

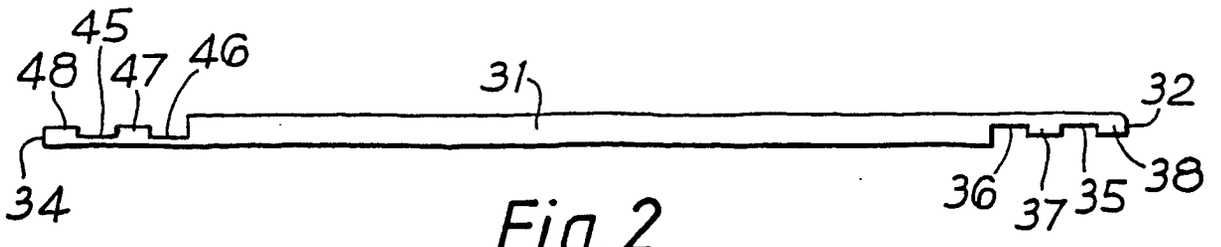
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Fig. 2

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EUROPEAN SEARCH REPORT

Application Number

EP 87 30 7920

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Y	FR-A- 645 508 (CHOMMELOUX) * Whole document *	1,3,4,6	E 04 D 1/14
Y	WO-A-8 601 558 (MARLEY TILE) * Page 2, lines 7-37; page 3, lines 1-18; figures 1,2 *	1,3,6	
Y	DE-C- 199 913 (HECKERT) * Figures 1-3 *	1,3,4	
A	DE-C- 28 040 (PASSAVANT) * Figures *	1,2,5	
A	DE-U-8 507 035 (ERTL) * Page 1, lines 4-12; page 2, lines 1-10,23-27; page 4, lines 28-35; page 7, lines 32-36; figure 1 *	6-9	
A	US-A-1 509 585 (CHASE) * Page 1, lines 56-60,70-78,100; page 2, lines 1-20; figures 1,3,4 *	6,8,10	
A	US-A-3 839 942 (FERCHLAND) * Column 5, lines 50-68; column 6, lines 1-9; figures 6,7 *	6,10	TECHNICAL FIELDS SEARCHED (Int. Cl.4) E 04 D
A	EP-A-0 128 408 (WESELY) * Page 4, lines 12,13; page 5, lines 14-35; figure 1 *	6,7,9	
A	GB-A- 776 412 (MARIENBERGER) * Claims 1,2; figures 1,2 *	8	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26-04-1988	HENDRICKX X.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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