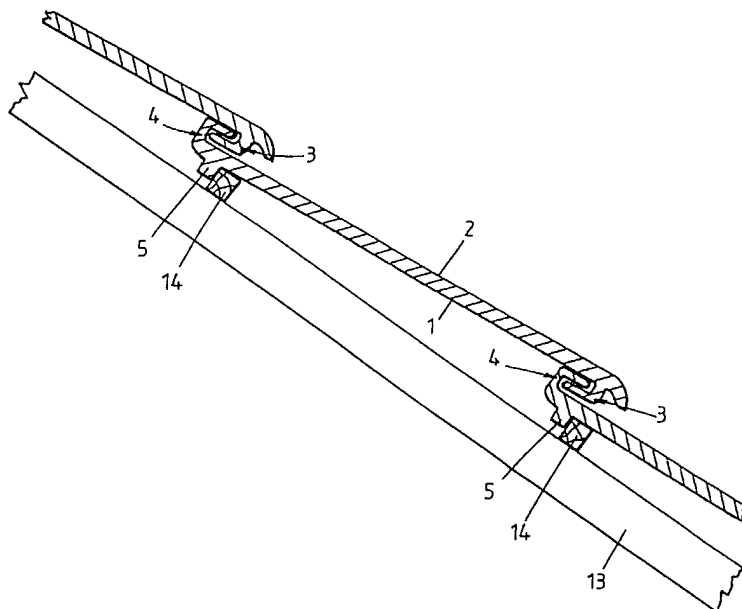




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification<sup>6</sup> : E04D 1/06</p>	<p>A1</p>	<p>(11) International Publication Number: <b>WO 98/29619</b></p> <p>(43) International Publication Date: 9 July 1998 (09.07.98)</p>
<p>(21) International Application Number: PCT/BE97/00141</p> <p>(22) International Filing Date: 30 December 1997 (30.12.97)</p> <p>(30) Priority Data: 9601085 30 December 1996 (30.12.96) BE</p> <p>(71)(72) Applicant and Inventor: SMEETS, Dominique [BE/BE]; Hoogstraat 39, B-3680 Neeroeteren-Maaseik (BE).</p> <p>(74) Agents: VOSSWINKEL, Philippe et al.; Gevers Patents, Holidaystraat 5, B-1831 Diegem (BE).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> <i>With international search report.</i> <i>In English translation (filed in Dutch).</i></p>

(54) Title: ROOF TILE



(57) Abstract

This invention relates to a roof tile with a first (1) and a second side (2), which roof tile comprises means for engaging a further roof tile, upon the at least partially overlapping positioning of the roof tiles, whereby said means comprise a first jaw (3) and an insert member (4) which are applied in line, whereby the first jaw is located on the first side and forms a protrusion, and the insert member is located on the second side, whereby the first jaw engages the insert member, upon the overlapping positioning of the roof tiles. The insert member may have the shape of a jaw, or be formed by a recess which is applied in the first transversal rim.

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### **“Roof tile”**

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This invention relates to a roof tile as described in the preamble of the first claim.

Such roof tiles are used for constructing roofs. When constructing a roof, first a wooden framework is constructed, onto which the  
5 roof tiles are applied. The wooden framework comprises tile laths which are applied in the height direction of the roof. The framework also comprises tile laths which are applied in the longitudinal direction, i.e. the direction parallel to the ridge.

The tile laths are mostly spaced in such a way, that in  
10 the height direction of the roof, two successive rows of roof tiles overlap partially. Thereby the lower part of the roof tiles of the overlying row are situated on the upper part of the roof tiles of the underneath row. Such an overlap of two successive rows of roof tiles is necessary in order to prevent leakage of the roof, due to seepage of water between the roof tiles. The roof  
15 tiles mostly also overlap sideways, in transversal direction of the roof.

The known roof tile contains along its upper rim, in the area where two superposed rows of roof tiles overlap, two rectangular openings. The upper side of the rectangular openings forms the upper rim of the roof tile. From this upper rim, a rim with the shape of a set square, extends in  
20 the direction of the bottom side of the roof tile. The known roof tile further comprises at its bottom side, in the area where two roof tiles overlap, two downward protruding pins which comprise a thickening at their end.

When constructing a roof, the set square is hooked to the tile lath, so as to hang the roof tile with its upper part to the wooden frame  
25 work. The pins of the overlying roof tile are pushed into the rectangular open-

ings of the roof tile underneath. Thereby the pins rest against the front side of the roof tile underneath. The thickening of the pin acts as a barb, and ensures that two superposed roof tiles are held together.

5 The known roof tile has the disadvantage that in the height direction of the roof, the roof tiles have to be attached at a well defined, constant distance from each other, in order to allow the pins to perform their holding function. If the distance between the roof tiles is too small, the pins and thickenings are located in the rectangular openings, and the pins cannot perform their holding function. If the distance between the roof tiles is too large,  
10 the pins of the overlying roof tile meet the upper face of the roof tile underneath, and the pins cannot perform their holding function either.

It is the aim of this invention to provide roof tiles which can be applied to a roof at a variable distance from each other, and at the same time can be held together.

15 This is achieved according to the invention with the measures described in the characterizing part of the first claim.

According to the invention, the first jaw forms a protrusion, and the jaw and insert member are applied in line. Because the jaw forms a protrusion, the jaw and insert member can engage each other, even  
20 when two superposed roof tiles in the height direction of the roof are somewhat displaced with respect to each other, and the roof tiles in their height direction overlap to a greater or lesser degree.

Because the jaw and insert member of two superposed roof tiles engage each other, two superposed roof tiles are held together. This  
25 allows to prevent a movement of the roof tile in a direction which points away from the roof, for example when the wind is blowing underneath a roof tile. With the roof tile according to the invention, it is thus possible to prevent the roof tile from being blown off the roof.

When constructing a roof, the required number of roof  
30 tile rows in the height direction of the roof is calculated as a function of the height of the roof and the height of the roof tile. Thereby, it is taken into account that two roof tiles should at least partially overlap heightways in order to prevent water from seeping through. Since the height of a roof is not always an



In a second embodiment of the invention, the roof tile is preferably corrugated, and has a first transversal rim on which the second jaw is applied.

5 Because the roof tile is corrugated, the insert member is automatically formed at the hollow side of the corrugation. The transversal rim moreover forms an additional barrier against water possibly seeping through.

10 In a third embodiment of the invention, the first jaw preferably extends in the direction of the upper rim of the roof tile, and the second jaw preferably extends in the direction of the opposite lower rim of the roof tile.

With such a roof tile, one can, after having applied a first row of roof tiles, apply a second row of roof tiles in such a way that the first jaw on the first side of the second row of roof tiles and the second jaw on the second side of the first row of roof tiles engage each other.

15 In a fourth embodiment of the invention, the first and second jaws comprise a side facing the roof tile, to which an additional protrusion is applied. The additional protrusions of the first and second jaws engage each other when two roof tiles are positioned in an overlapping way, so that an improved engagement of the first and second jaws can be realized.

20 The roof tile according to the invention can comprise one first jaw and one insert member, or one first and one second jaw, or two or more first jaws and insert members and second jaws. Through the provision of a plurality of jaws and insert members widthwise of the roof tile, it is possible to have two roof tiles engaging each other at several positions, and to achieve an improved grip, irrespective of the dimensions of the roof tile.

25 According to the invention, the first jaw may be applied in different positions on the roof tile, when considering the roof tile in vertical height and widthwise. The first jaw is preferably applied in the middle of the roof tile. The first jaw can also be displaced to the left or right side rim of the roof tile, when considering the roof tile widthwise. The first jaw can be more or less displaced in the direction of the upper rim of the roof tile.

30 According to the invention, the second jaw can also be applied in different positions on the transversal rim. The second jaw is

preferably applied in the middle of the transversal rim, when considering the roof tile widthwise. According to the invention, the second jaw can also be displaced to the left or right side rim of the roof tile.

5 The transversal rim preferably constitutes the upper rim of the roof tile. Such a transversal rim forms an extra insurance against water seeping through.

According to the invention, the insert member can also be formed by a recess in the transversal rim. In that case, the first jaw on the bottom side of the roof tile is slid into the recess in the transversal rim of the upper side of the roof tile.

10 The roof tile according to the invention can comprise one or more such recesses in the transversal rim.

The recess can be applied in different positions in the transversal rim of the second side of the roof tile. The recess can be applied in the middle of the transversal rim. In that case, the first jaw on the first side of the roof tile is also applied in the middle, when the roof tile is considered widthwise. The transversal rim can also comprise widthwise, on the second side, two or more recesses. In that case, correspondingly two or more first jaws can be applied on the first side of the roof tile.

20 In another embodiment of the invention, the insert member and jaw have the form of a hook.

The length of the jaw may be varied within a broad range, and varies mostly from a few mm to 10 cm or more. The length of the jaw is preferably 0.5 to 10 cm, more preferably 0.5 to 5 cm.

25 The first jaw and the insert member preferably engage each other over at least 10 %, more preferably over at least 20 %, most preferably over at least 30 % of their length. If they engage each other over a too small part of their length, there is a risk that upon a small displacement of the roof tiles in vertical height, the first jaw and the insert member no longer engage each other, and the roof tiles are thus no longer held together.

30 The roof tile according to the invention can have any desired shape.

The roof tile according to the invention can be made of any desired material. The roof tile according to the invention can for instance be made of clay, plastic material, or metal which is for example covered with a finishing coat to provide the appearance of a clay or slate roof tile.

5                   When the roof tile is made of metal, usually a metal sheet is used, which is pressed in such a way that it has the appearance of several contiguous roof tiles. Such a metal sheet, in spite of the often larger dimensions, has a much lower weight than a clay roof tile, and is very suitable for the construction of overlay roofs. Because of the larger dimensions of these  
10 metal sheets, the time needed for constructing of a roof may be shortened.

The roof tile according to the invention can also be made of clay. Clay is a currently used material for the manufacturing of roof tiles. The use of clay allows quite some variation with respect to the shape of the roof tiles.

15                   By altering the shape of the mould in which the metal or clay roof tiles are pressed, it is possible to alter the shape of the roof tiles correspondingly. In that way, it is for example possible to apply, already upon pressing the roof tile, one or several insert members and jaws on the roof tile. Because the roof tile is pressed into the desired shape, and no additional  
20 process steps are required, it is possible to produce the roof tile according to the invention with an economically favourable process on a large scale.

The jaw and insert member may be applied to the roof tile when manufacturing the roof tile. The jaw and insert member may also be applied to the roof tile afterwards.

25                   According to the invention, the jaw and insert member may be made of the same material as the roof tile, or of another material. The jaw and/or the insert member may for instance be made of clay, plastic material or metal.

30                   The invention is further elucidated by means of the attached figures and figure description.

Figure 1 shows a cross section in vertical height direction of the roof, of three superposed roof tiles according to the invention.

Figures 2 and 3 show a top view of the roof tile according to the invention.

Figure 4 shows a view on the bottom side of the roof tile according to the invention.

5 Figure 5 shows a top view of a roof tile according to the invention, made of metal.

Figures 6 and 7 show a cross section of the roof tile of figure 5 through lines II-II' and III-III' respectively.

Figure 8 is a section through line IV-IV' in figure 5.

10 In the embodiment of the roof tile according to the invention shown in figure 1, the roof tile comprises a first side 1 and a second side 2. The first side 1 preferably corresponds to the bottom side of the roof tile. The second side 2 preferably corresponds to the upper side of the roof tile.

15 It is also possible to apply the first jaw 3 along a first side rim 8 of the roof tile, and to apply the insert member 4 to a second side rim 9. This allows to displace the roof tiles, not only in the height direction, but also widthwise with respect to each other.

20 The first side 1 is provided with at least one jaw 3. The second side 2 is provided with at least one insert member 4. The jaw 3 and the insert member 4 are positioned in line.

The first jaw 3 and the insert member 4 may be applied on different positions of the roof tile. They may be applied in the middle of the roof tile, when the roof tile is considered widthwise, or be displaced in the direction of one of the sides of the roof tile.

25 In the preferred embodiment of the invention shown in figure 2, the insert member 4 comprises a second jaw 11, which is applied to a transversal rim 10 on the roof tile. The transversal rim 10 preferably constitutes the upper rim 6 of the roof tile. The height of the transversal rim 10 may vary from a few mm to a few cm. When positioning such roof tiles in an overlapping way, the jaw 3 at the bottom side 1 of the overlying roof tile and the insert member 4 at the upper side of a roof tile underneath engage each other.

30

The insert member 4 may also be formed by a recess in the roof tile, or by a jaw applied to the second side 2.

The first 3 and second 4 jaw may extend in different directions. The first jaw 3 may for instance extend in the direction of the right side rim 9 or the left side rim 8 of the roof tile. In that case the second jaw 4, or part of it, will extend respectively in the direction of the left side rim 8 and the right side rim 9 of the roof tile, to allow both jaws to engage each other, upon the overlapping positioning of two roof tiles. The first 3 and second 4 jaw may also be applied slantingly to the roof tile. As is shown in figure 2, the first jaw 3 preferably extends in the direction of the upper rim 6 of the roof tile, and the second jaw 4 preferably extends in the direction of the lower rim 7 of the roof tile.

The first 3 and second jaw 4 may have various shapes. They may for instance have the shape of a jaw, whereby the upper side of the jaw is parallel to the face of the roof tile, and the side of the jaw facing the roof tile is inclined with respect to the face of the roof tile. The side facing the roof tile may also be parallel to the face of the roof tile. In that case, the jaw has the shape of a lip 11 (see figure 2). The jaw may for instance be tapered, rounded, or rectangular. The first 3 and second jaw 4 may also have the shape of a hook.

Preferably, the side of the jaw 3 facing the face of the roof tile and/or insert member 4 is provided with an additional protrusion, in order to allow an improved anchoring of two superposed roof tiles.

The roof tile shown in figures 2, 3 and 4 is preferably corrugated.

The insert member 4 shown in figure 3 comprises a transversal rim 10, in which one or several recesses 12 are provided. Upon the overlapping positioning of the roof tiles, the first jaw 3 and the recess 12 engage each other.

As is shown in figure 4, preferably also at least one additional protrusion 5 is applied to the bottom side 1 of the roof tile. By means of this protrusion 5, the roof tile may be attached to a tile lath.

Furthermore, the roof tile preferably has a number of additional grooves and rims, which allow water to be carried downwards, from one roof tile to the other roof tile, in the direction of the gutter (see figures 2 and

3).

When constructing a roof, first a wooden framework 13 is constructed, which framework comprises tile laths in the transversal direction 14 and in the vertical height direction of the roof. When laying the first row of roof tiles, the roof tiles are hooked to the tile lath 14, by means of the protrusion 5, in transversal direction of the roof.

On top of the first row of roof tiles, a second row of roof tiles is applied, in such a way as to have two superposed roof tiles overlap at least partially, as is shown in figure 1. Thereby, the lower part of the overlying roof tile is resting on the upper part of the roof tile underneath. The roof tiles are mostly positioned so that they also partially overlap in transversal direction of the roof, in order to prevent water from seeping through.

When laying the second row of roof tiles, the first jaw 3 is inserted into the insert member 4 and the roof tile is subsequently hooked to the tile lath by means of the protrusions 5, or attached to the tile lath in another known way.

In the embodiment of the invention shown in figure 5, the roof tile is for instance made of metal. In that case, the upper face 15 of the roof tile may be provided with a finishing coat of plastic material in order to obtain a metal sheet with the appearance of a slate. The length and width of such a roof tile may be varied within broad ranges, for instance from a few tens of cm to several m.

As is shown in figures 5 and 8, the transversal rim 19, which extends parallel to the upper rim 20, is preferably provided with a plurality of recesses 12. The bottom side 1 of the metal sheet is provided with a plurality of jaws 3. The jaws 3 of the first tile are provided for engaging the recesses 12 of a second tile underneath. Thereby, the jaw 3 may for instance be applied to the bottom side of the tile, or to a lower transversal rim 16 of the tile. In that case, the jaw 3 for instance has the shape of a lip. The recesses 12 are preferably, in transversal direction of the tile, regularly spaced. In transversal direction of the tile, the jaws 3 also are preferably regularly spaced.

The roof tile shown in figures 5-8 may be attached to the wooden framework through the rim 17 or groove 18, in any way known to



List of used reference numbers.

1. first side, bottom side of roof tile
2. second side, upper side of roof tile
- 5 3. first jaw
4. second jaw
5. protrusion
6. upper rim
7. lower rim
- 10 8. left side rim
9. right side rim
10. transversal rim
11. lip
12. recess
- 15 13. framework
14. tile lath
15. upper face
16. lower transversal rim
17. rim
- 20 18. groove
19. transversal rim
20. upper rim

**CLAIMS**

1. A roof tile with a first and a second side, which roof tile comprises means for engaging a further roof tile, upon the at least partially overlapping positioning of the roof tiles, characterized in that said means comprise a first jaw and an insert member which are applied in line, whereby the first jaw is located on the first side and forms a protrusion, and the insert member is located on the second side, whereby the first jaw engages the insert member, upon the overlapping positioning of the roof tiles.
2. A roof tile according to claim 1, characterized in that the insert member is formed by a second jaw which forms a protrusion with respect to the second side of the roof tile.
3. A roof tile according to claim 2, characterized in that the roof tile is corrugated, and comprises a first transversal rim, whereby the second jaw is positioned on said transversal rim.
4. A roof tile according to any one of claims 2 or 3, which roof tile comprises a lower and an upper rim, characterized in that the first jaw extends in the direction of the upper rim of the roof tile, and the second jaw extends in the direction of the lower rim of the roof tile.
5. A roof tile according to any one of claims 1 to 4, characterized in that the first and second jaws comprise a side facing the roof tile, to which side an additional protrusion is applied.
6. A roof tile according to any one of claims 3 to 5, characterized in that the transversal rim forms the upper rim of the roof tile.
7. A roof tile according to claim 1, characterized in that the roof tile is corrugated, and comprises a first transversal rim, whereby the insert member is formed by a recess in the first transversal rim.
8. A roof tile according to any one of claims 1 to 6, characterized in that the first jaw and the insert member have the shape of a hook.
9. A roof tile according to any one of claims 1 to 8, characterized in that the roof tile is made of metal, and is provided with a first

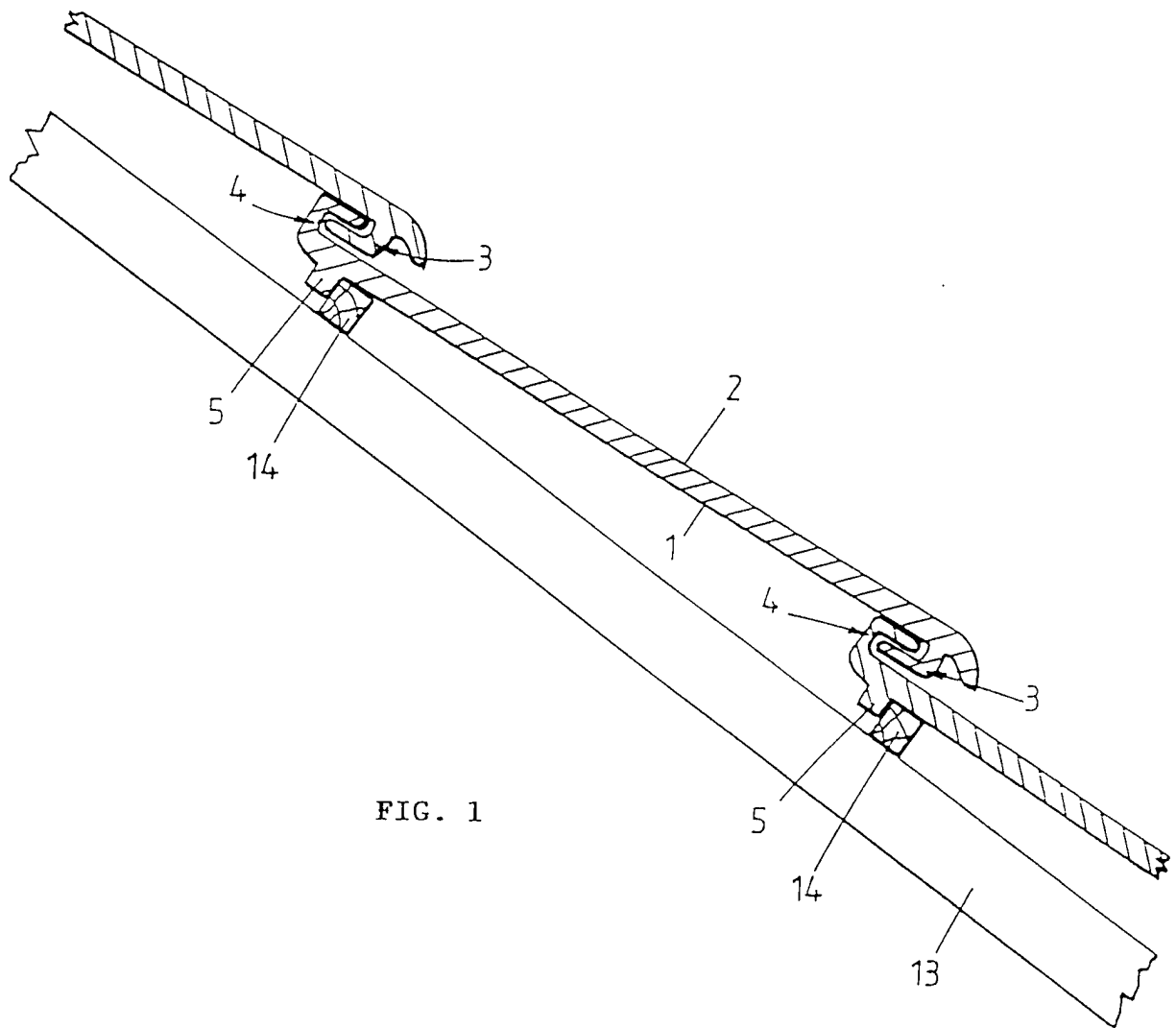


FIG. 1

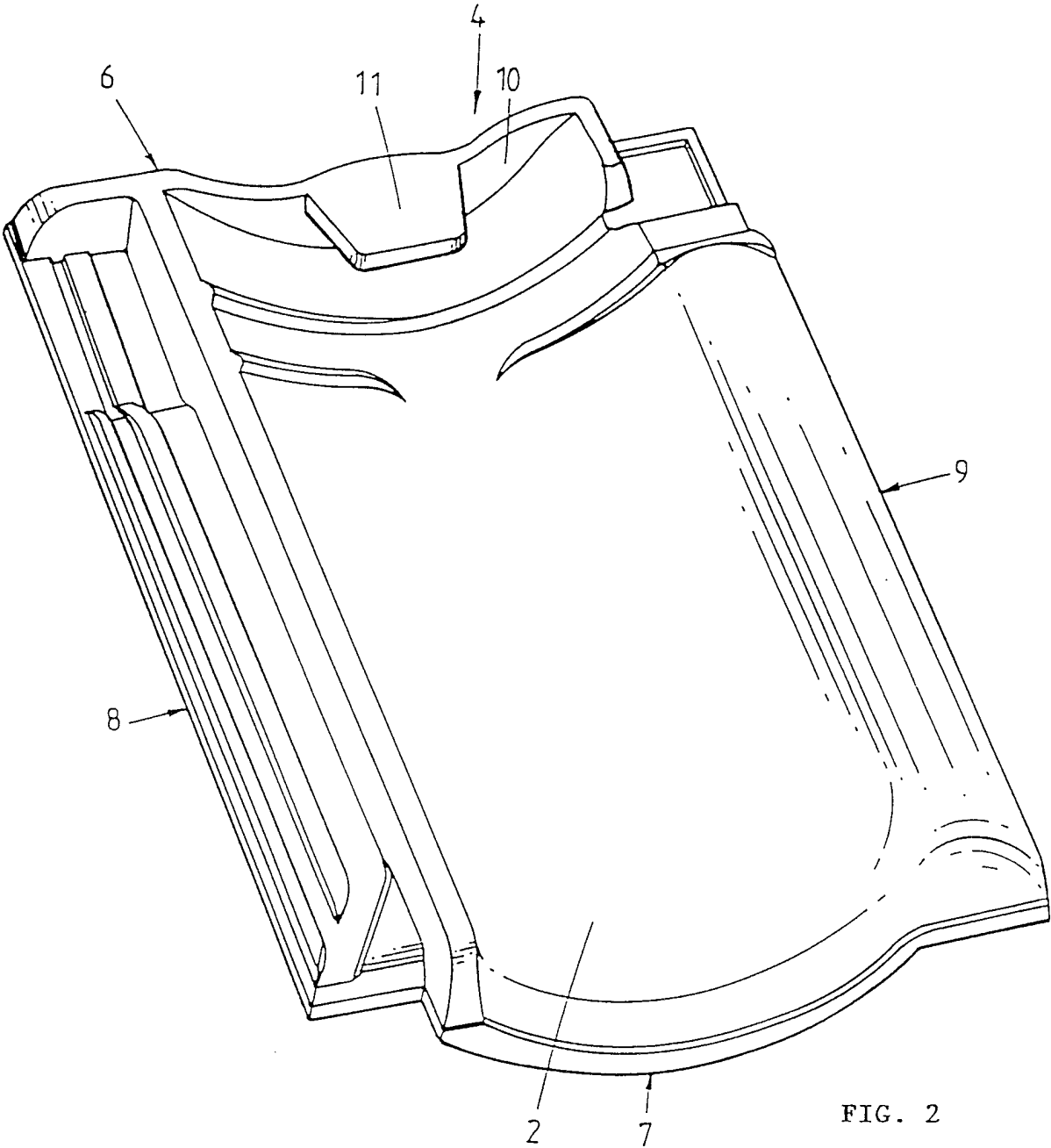


FIG. 2

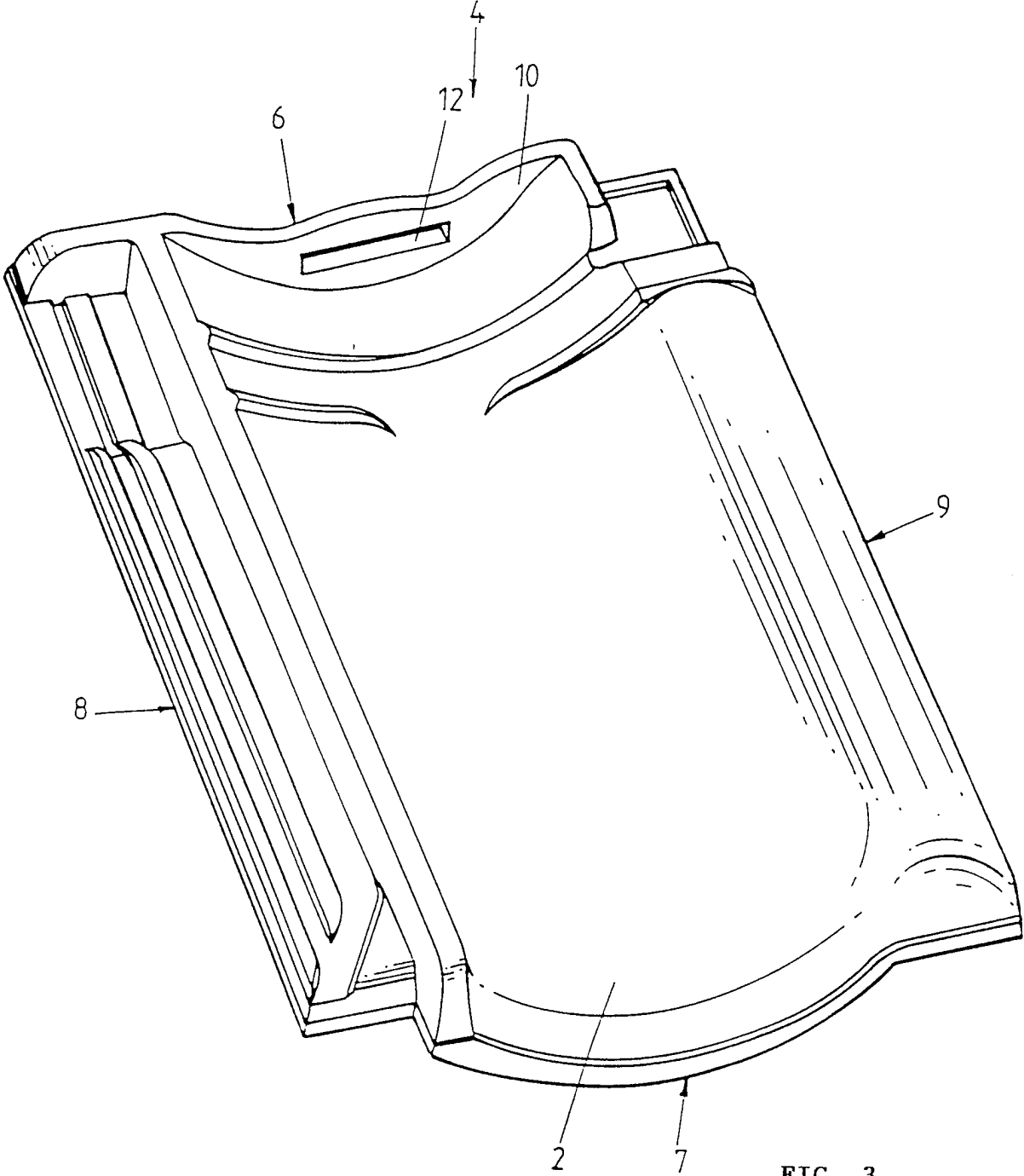


FIG. 3

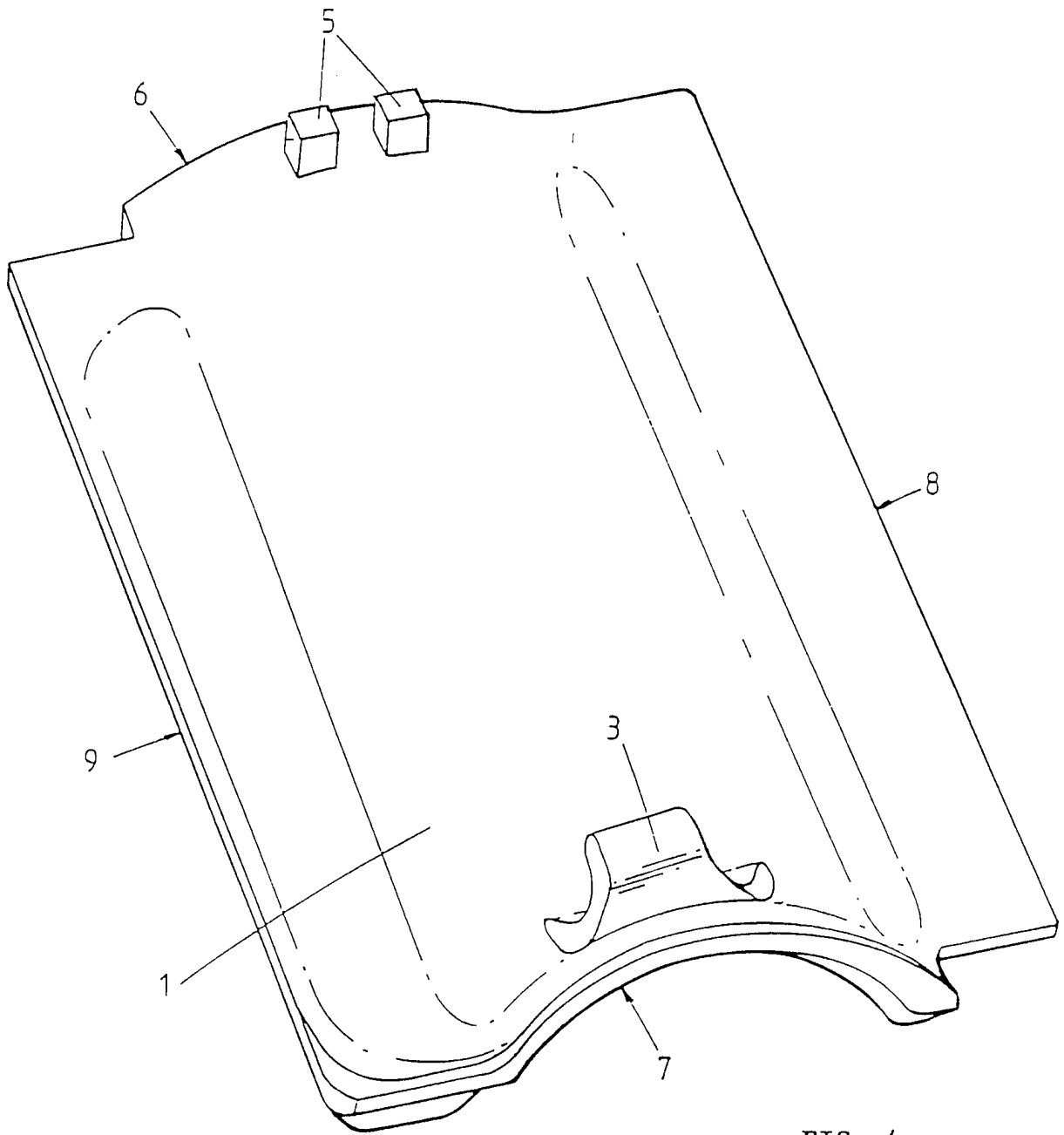


FIG. 4

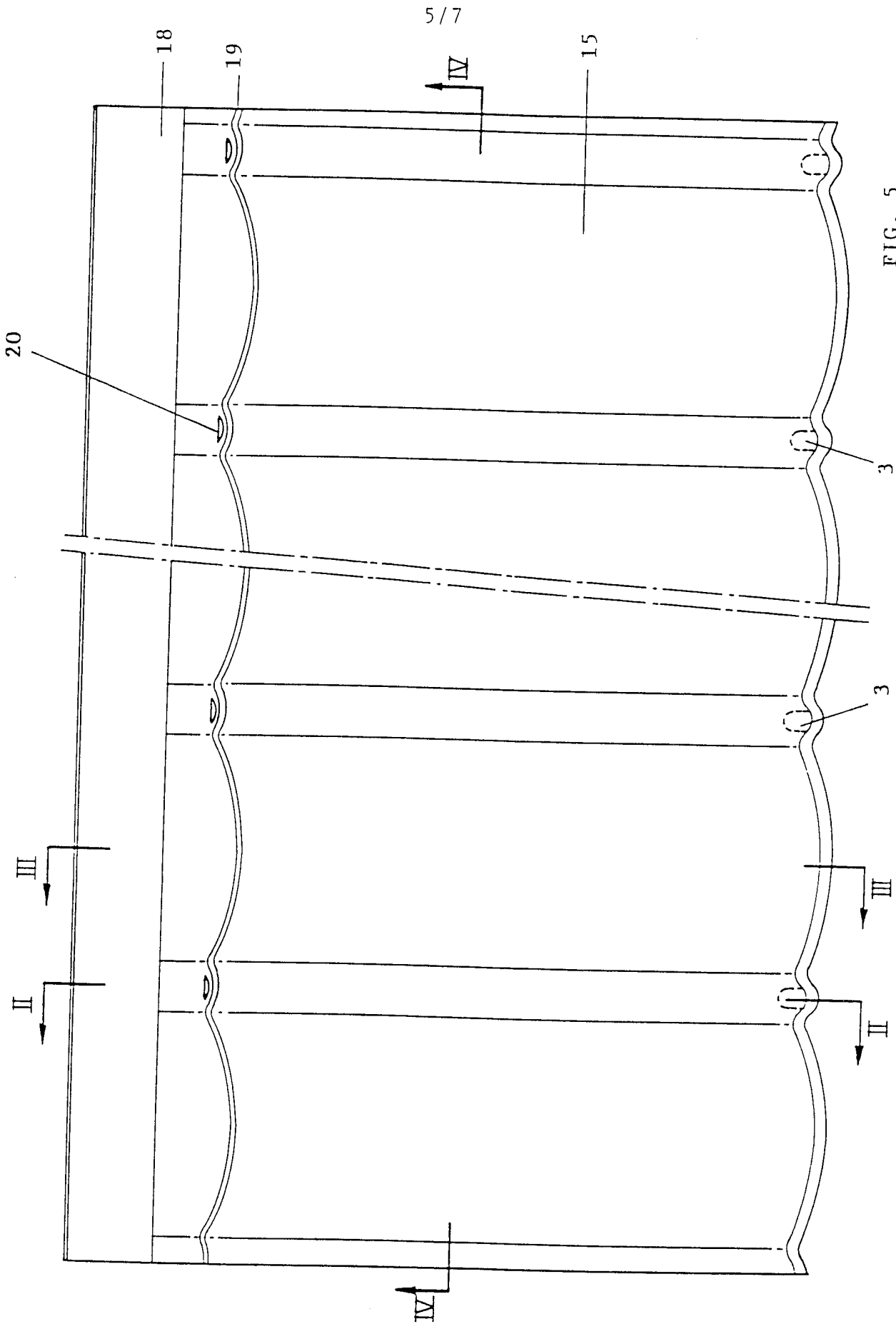
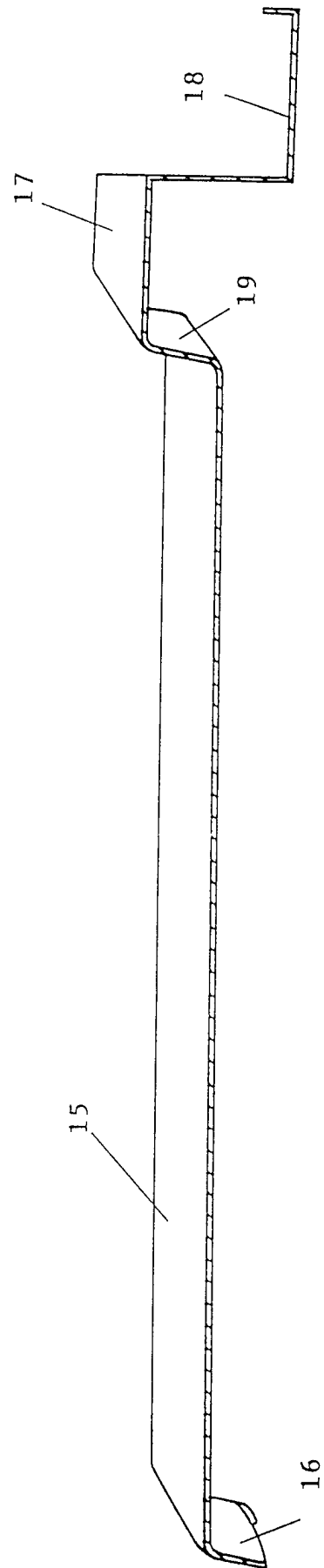
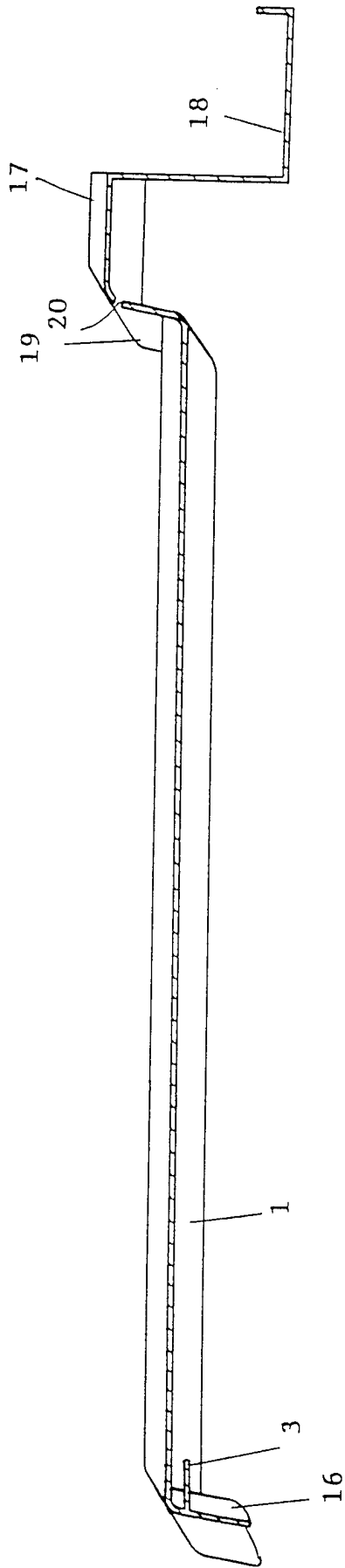


FIG. 5



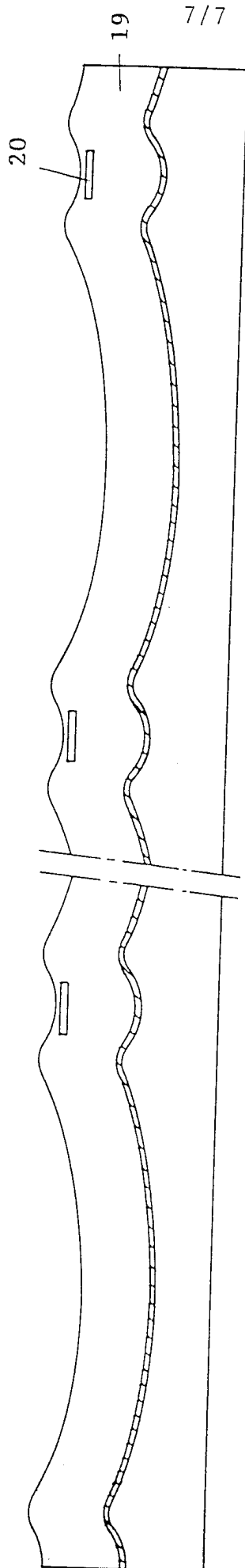


FIG. 8

# INTERNATIONAL SEARCH REPORT

Intern: al Application No  
PCT/BE 97/00141

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 E04D1/06

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 E04D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 3 363 380 A (MERRILL) 16 January 1968 see figures ---	1-6,8 9
X	FR 938 691 A (HAVAUX ET AL.) 21 October 1948 see the whole document ---	1-4,6,8
X	FR 579 772 A (MOSER) 23 October 1924 see the whole document ---	1-4
A	US 2 685 852 A (GÖDEL) 10 August 1954 see the whole document ---	1-4
A	FR 2 286 253 A (PREMILLIEU) 23 April 1976 see figures ---	7
A	US 2 631 552 A (KORTER) 17 March 1953 see figures ---	1,7
-/--		

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Patent family members are listed in annex.

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Date of the actual completion of the international search

9 April 1998

Date of mailing of the international search report

24/04/1998

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# INTERNATIONAL SEARCH REPORT

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**C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT**

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR 539 891 A (BAER-KANA ET AL.) 1 July 1922 see the whole document -----	1
A	FR 438 744 A (CHIOGNA) 25 May 1912 see the whole document -----	9

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/BE 97/00141

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US 2631552 A	17-03-53	NONE	
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FR 438744 A		NONE	