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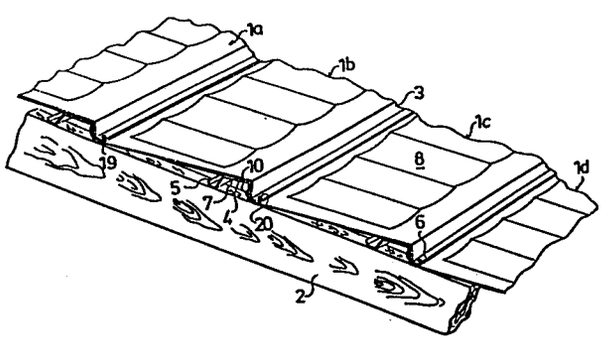
(54) A roofing element.

(57) A sheet-metal roofing element (1a-1d) which in the laying of the roof is intended to be placed in overlapping relationship with an adjacent roofing element, so as to cover an intended roof area. The element has two mutually parallel long sides (5, 6) which are arranged to be placed perpendicular to the direction of the roof-pitch. Provided along at least one of the long sides is a batten-forming spar or beam (7), while that part (8) of the surface of the roofing element located between the long sides is contoured, to enable the element to absorb loads, such as load exerted by a person or snow, and to transmit the load to the aforementioned spar (7).

In accordance with the invention at least a part (9) of the aforementioned spar (7) is made of a material which, in combination with the thickness thereof, has a higher mechanical strength than the remainder of the roofing element (1), and the aforementioned part (9) of the spar and the remainder of the roofing element (8) form a unit.



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A roofing element

The present invention relates to sheet-metal roofing elements of the kind which in the laying of a roof are placed in mutual overlapping relationship, so as to cover the intended roof area.

Although the roofing elements may have any desired contoured shape, they are preferably contoured in a manner such that when laid they give the impression of a tiled roof. The roofing elements are particularly contoured in a manner which imparts the requisite mechanical strength and flexural rigidity thereto.

Such roofing elements are generally known and available on the market.

Known roofing elements of the aforementioned kind are manufactured from sheet-metal blanks, which are formed to the shape intended. In this regard, the roofing elements may, at times, be provided with a beam or spar of some kind along that side of a respective element which, when the element is in position on the roof, lies perpendicular to the pitch of said roof. One purpose of such spars is to enable them to be laid directly on existing roof trusses and fastened thereto, thereby to serve as and to replace conventional roofing battens.

In order for the spars to obtain the necessary rigidity, they must be of a certain height and must be given a more or less complicated cross-sectional configuration. This is because the spars are formed in the same material as the remainder of the roofing, normally sheet steel having a thickness of about 0.5 mm.

The distance to be spanned by the elements between roofing trusses is often 1200 mm, i.e. a centre-to-centre distance of 1200 mm, although greater c/c-distances are to be found. With a material thickness of about 0.5 mm, it is difficult to produce a spar whose load-bearing capacity is high enough for it to be used safely in structures where the c/c-distance is 1200 mm or more. When the spar

is formed to meet these requisites, the height or depth of the spar will be of such high magnitude as to entail a relatively high consumption of material and to result in an unaesthetic appearance of the roof, due to the relatively large step-like notches formed by said spars.

In certain cases it may be desired to produce aluminium roofing elements, partly because aluminium is lighter than steel and partly because it is not so prone to corrosion. The problem relating to the aforesaid spars, however, is accentuated when aluminium is used, because the mechanical strength of aluminium is lower than that of steel and hence in the case of aluminium roofing the requisite height of the spars will be greater than that of a sheet-steel roofing of corresponding thickness.

The present invention relates to a roofing element in which the requisite spars have a high load-bearing capacity and rigidity, and which are far shorter or shallower than the spars of known roofing elements.

Thus, the present invention relates to sheet-metal roofing elements which, when laying a roof, are intended to be placed in mutual overlapping relationship so as to cover the intended roof area, each of said elements having two mutually parallel long sides intended to be placed at right angles to the pitch of the roof being laid, of which long sides at least one has a batten-forming spar provided therealong, and in which element the surface thereof located between said long sides is contoured in manner to enable the element to absorb load, such as that exerted by a person or snow, and to transmit said load to said spar. The roofing element is characterized in that at least a part of the spar is made of a material which, in combination with the thickness of said material, has a greater mechanical strength than the remainder of the roofing element, and in that said part of the spar and the remainder of the roofing element constitute a unit.

The present invention will now be described in more detail with reference to a number of embodiment thereof

illustrated in the accompanying drawings, in which

Figure 1 is a schematic, perspectiveview of part of a roofing element according to a first embodiment; and

Figures 2-5 are sectional views in larger scale of various embodiments, said sections being taken through a line lying parallel with the pitch of the roof, in respect of a roofing element placed thereon in the manner intended.

Figure 1 illustrates roofing elements 1a-1d placed on roof trusses 2 over a roof pitch area. As illustrated in Figure 1, the lower part 3 of an overlaying roofing element 1b overlaps the upper part 4 of an underlying roofing element 1c. This is shown more clearly in Figures 2-5.

The width of the roofing element, i.e. the length thereof when seen in the roof-pitch direction, normally corresponds approximately to the length of a conventional roofing tile, while the width of the roofing elements, i.e. the length thereof parallel with the roof-pitch is a whole multiple of the c/c-distance plus the overlap.

Thus, the roofing elements are intended to be placed adjacent one another in overlapping relationship, so as to cover the intended roof area. Each of the elements has two mutually parallel long sides 5,6, which are intended to be placed perpendicularly to the direction of the roof-pitch. There is provided along at least one long side 5 an upper part 4 which forms a beam or spar 7 and which is intended to serve as a batten and which thus supports the loads to which the roof may be subjected and transmits said loads to the underlying roof trusses 2. In accordance with one embodiment of the invention, the aforementioned part 3 of the other long side 6 has a substantially Z-shaped or L-shaped cross-section, so as to closely abut the upper part 4 of an underlying roofing element. Thus, the precise form of the aforesaid lower part 3 is determined by the form of the said upper part 4.

The part 8 of the surface of the roofing element located between the parts 3,4 is contoured in a manner to enable the roofing element to absorb loads, such as those

exerted by a person or snow, and to transfer said loads to the aforementioned spar 7.

The contours may have any desired shape, and may, for example, consist of undulating surfaces such as those illustrated in Figure 1.

In accordance with the invention, at least a part 9 of the aforementioned spar 7, is made of a material which, in combination with its material thickness, has a higher mechanical strength than the remainder of the roofing element, this part of the spar being joined to the remainder of the roofing element, so that the roofing element forms an integral unit. The aforementioned part 9 of the spar is intended to be fastened to an underlying surface, such as a roof truss.

Because the part 9 is made of a material which is stronger than the remainder of the roofing element, said part can be given sufficient rigidity to enable it to be secured to a respective roof truss, without requiring the use of special fasteners.

The fact that the spar, or a part thereof, is made of a material which, in combination with the total material thickness, has a higher mechanical strength than the material in the remaining part of the element in combination with its material thickness, has the following three implications. Firstly, that a material having a higher specific mechanical strength, such as a higher stress yield limit, in combination with the thickness of said material provides a higher total mechanical strength measured in the load-absorbing ability of the material; secondly that there is used a material having the same specific mechanical strength or a lower mechanical strength, which in combination with the thickness of said material provides a higher mechanical strength; and thirdly that the roofing element comprises a single piece of sheet metal which has been folded once or several times at the location of said spar, such that the spar comprises a multiplicity of sheet-metal layers.

In accordance with a preferred embodiment of the invention, that part of the roofing element made of the material of lower mechanical strength is folded into that part of the spar which is made of a material of higher mechanical strength.

Figures 1, 2 and 3 illustrate examples of how such folds are made, said figures illustrating how at the fold location 10 the stronger part 11,12 and the remaining part 13,14 of the element are bent so as to be folded in with one another.

In the Figure 1 embodiment, the fold location 10 is placed on one leg of the U-shaped spar 7. In the Figure 3 embodiment, the fold location is placed on the bottom of the U-shaped spar 7.

Thus, in the embodiments according to Figures 1 and 3, the U-shaped spar 7 comprises partly the stronger material and partly the weaker material. Such a U-spar, however, will possess considerable strength, since a U-spar is a beam form capable of absorbing heavy loads at right angles to the long direction of the spar in relation to the material from which the spar is made.

A preferred embodiment, particularly when a still higher mechanical strength is required, for example when the c/c-distance exceeds 1200 mm, is illustrated in Figure 2. In this embodiment, the whole of the spar 7 is made of the stronger material. The two legs 15, 16 of the spar are also intended to abut roof trusses 2.

The spars are suitably secured to respective roof trusses with the abutment surfaces of said spars lying thereagainst, as illustrated in chain-lines 17,18 in Figures 2-5, by means of screws or nails 19,20. Figures 2-5 illustrate a roofing element 1 and a part of an overlying roofing element 1'. As will be seen from the figures, the lower part 3 of the overlying roofing element 1' is formed to connect with the upper part 4 of the underlying element 1. The lower part 3 is conveniently secured by means of the same screw or nail 20 used to fasten the spar at its lower portion.

In the embodiment illustrated in Figure 4, the parts 21, 22 of material of mutually different mechanical strength are welded together by means of a weld 23. The weld 23 may either be a full weld or a spot weld.

In the embodiment illustrated in Figure 5, the whole of the roofing element has been made from one and the same piece of sheet metal, which has been folded once or a number of times at the location of the spar 7, so that said spar comprises several layers of sheet-metal. The spar of the Figure 5 embodiment comprises three layers. For the sake of clarity, the layers of the Figure 5 embodiment, and also the fold-in connections of the Figure 2 and 3 embodiments have been shown in a spaced relationship, although it will be understood that when manufacturing such roofing elements adjacent layers and sections of the fold-in connections will be pressed into hard abutment with one another.

The roofing element according to the invention can be made from one and the same material or from different materials. Thus, that part 9 of the spar comprising a material of higher mechanical strength can be made of steel sheet, for example, galvanized steel sheet, while the remainder of the element 3,8, can be made of coated steel sheet of smaller thickness, for example 0.5 mm.

According to one embodiment of the invention, the spar may be made of sheet steel while the remainder of the roofing element is made of aluminium. This provides a corrosion-resistant roofing, which protects the spars. Suitable measures are taken to prevent galvanic contact between the dissimilar metals.

Thus, one important advantage afforded by a roofing element according to the present invention is that a strong spar can be arranged which, because it is made of a material having a higher mechanical strength than the remainder of the roofing element, can be made lower than if it were made from the same material as the remainder of the element, and which can be made to support loads over far greater c/c-distances than 1200 mm, while permitting the remaining part

of the element to be made from a thin material which is light in weight and which can readily be shaped.

Another advantage afforded by the invention is that since the spar and the remainder of the roofing element constitute a unit, the spars and roofing elements do not need to be adjusted relative to one another, as is the case, for example, when a roof is constructed with conventional support battens forming beams or spars for supporting roofing elements of lower mechanical strength.

Thus, a fully sealed roof is obtained by means of the roofing elements according to the invention, simply by securing said elements directly to the roof trusses.

As will be understood, the invention is not restricted to the described embodiments, but that many modifications can be made. For example, instead of having a U-shaped cross-section, the beam or spar may have a C-cross-section or Z-cross-section.

Moreover, the location of the fold-in connection or the location at which a corresponding connection is made can be placed at positions other than those illustrated. The contours may also have a different shape to that illustrated in Figure 1. Alternative conceivable securing methods include gluing or partial through-punching of the parts with subsequent bending of the tongue-like members thus formed.

A stronger beam may also be secured in a corresponding manner to the lower part of a roofing element.

In accordance with a further embodiment, which is considered to be included in the invention, the roofing elements are made wider, i.e. longer in the direction of the roof-pitch, by folding in the thinner material of the lower part of a roofing element with the upper part of the beam of stronger material of a further element at the place of manufacture, there being obtained, for example, a roofing element which comprises 3 to 4 elements according to Figures 2-5.

Thus, the invention shall not be restricted to the described embodiments, but can be modified within the scope of the following claims.

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CLAIMS

1. A sheet-metal roofing element of the kind which when laying a roof is intended to be placed in overlapping relationship with an adjacent roofing element, to cover an intended roof area, said element having two mutually parallel long sides intended to be placed at right angles to the pitch of the roof being laid, of which long side at least one has a batten-forming spar (7) provided therealong and in which element that part (8) of the surface thereof located between said long sides is contoured, to enable the element to absorb load , such as that exerted by a person or snow, and to transmit said load to said spar (7), characterized in that at least a part (9) of said spar (7) comprises a material which, in combination with the thickness of said material, has a higher mechanical strength than the remainder of the roofing element (1); and in that said part (9) of said spar and the remainder of the roofing element (3,8) constitute a unit.

2. A roofing element according to Claim 1, characterized in that said spar (7) is of U-shaped cross-section; and in that at least the legs (16) projecting from the free legs of the U-shaped spar are arranged to directly abut and be fastened to an underlying support member, such as a respective roof truss (2), said legs (16) being made of the material of higher mechanical strength.

3. A roofing element according to Claim 1 or 2, characterized in that the part (8) of the roofing element (1) made of the material of lower mechanical strength is folded into the part (9) of the spar (7) made of a material of higher mechanical strength.

4. A roofing element according to Claim 1 or 2, characterized in that the said two parts of mutually differing mechanical strength of a roofing element are welded to one another.

5. A roofing element according to Claim 1 or 2, characterized in that the whole of the roofing element (1)

is made from one and the same piece of sheet metal, which has been folded once or a number of times at the location of said spar (7), such that said spar comprises several layers of sheet-metal material.

6. A roofing element according to Claims 1, 2, 3, 4 or 5, characterized in that said spar (7) is made of sheet steel, while the remaining part (7) of the roofing element (1) is made of sheet aluminium.

7. A roofing element according to any one of the preceding claims, characterized in that the spar (7) is made of a sheet material of greater thickness than the remaining part (8) of the roofing element (1).

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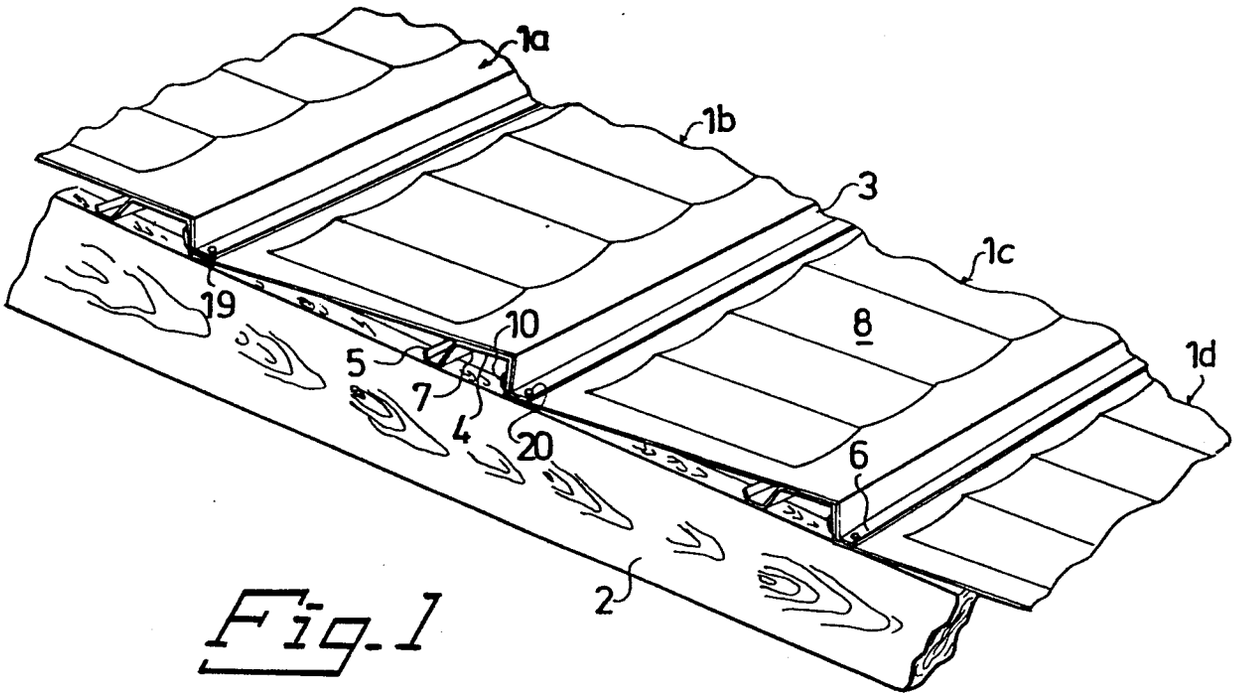

Fig. 1

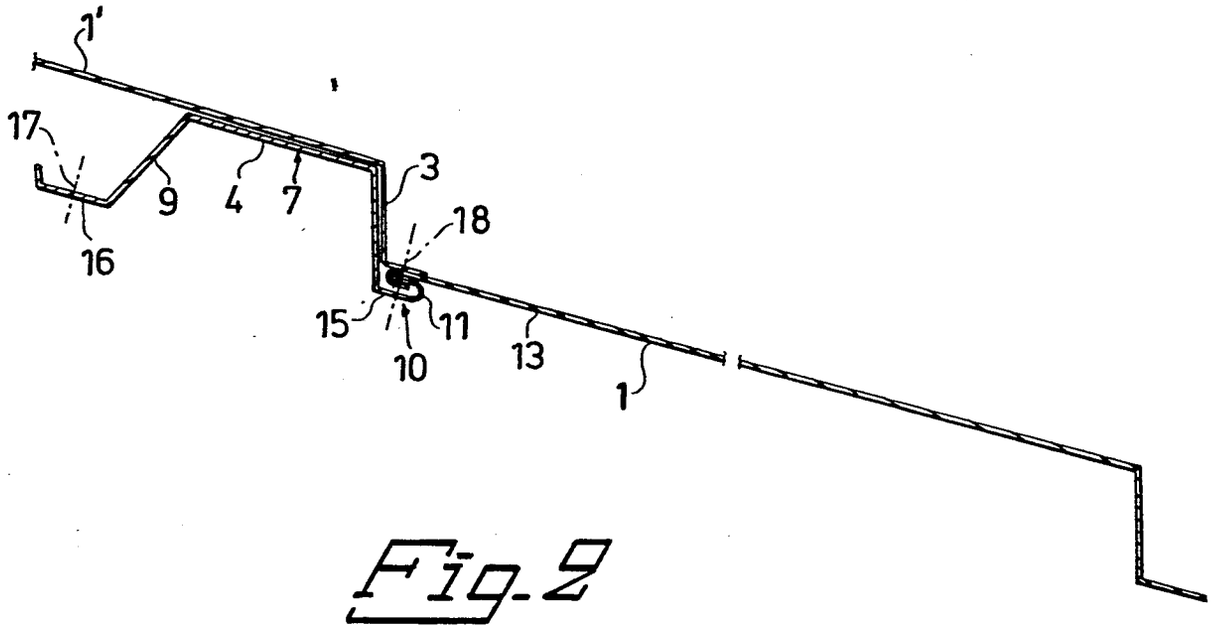

Fig. 2

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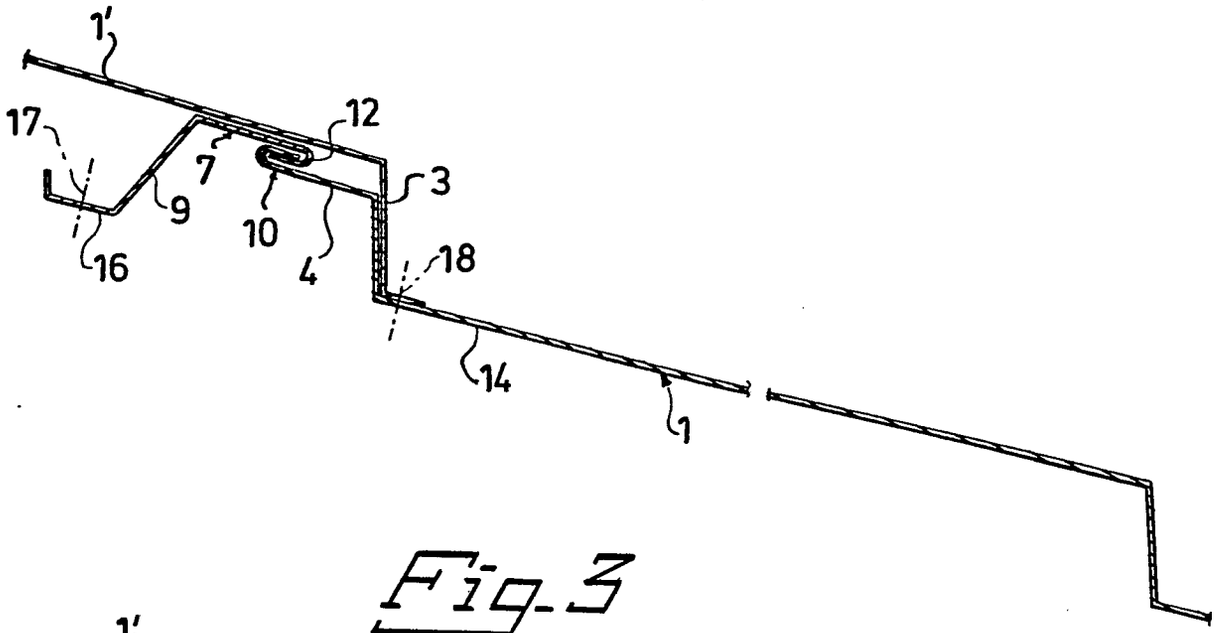

Fig. 3

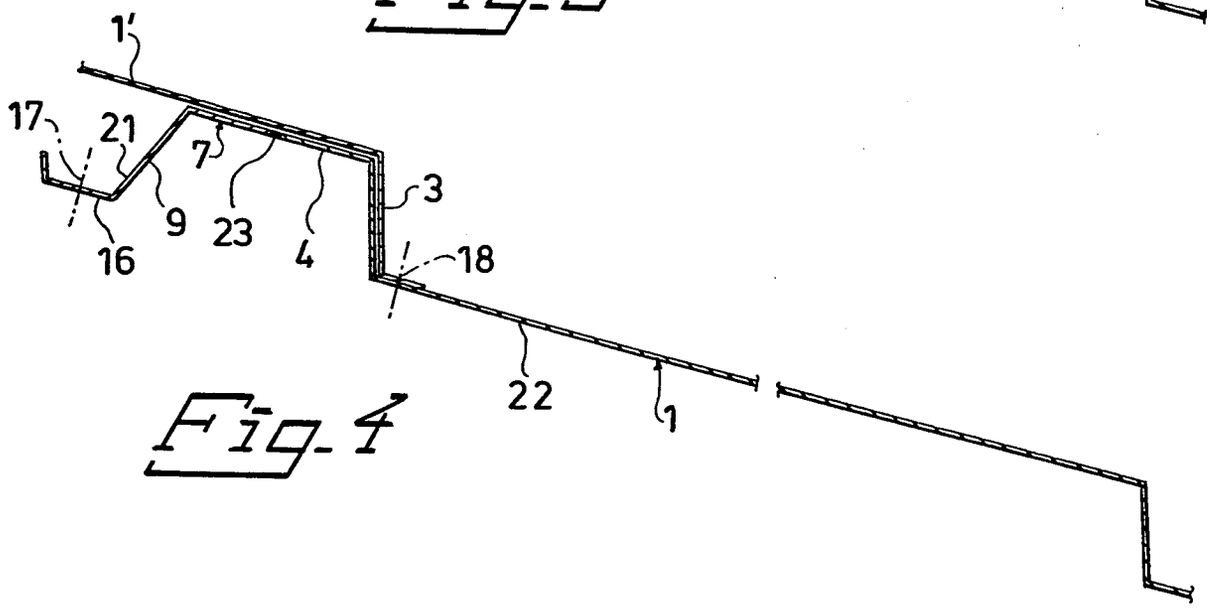

Fig. 4

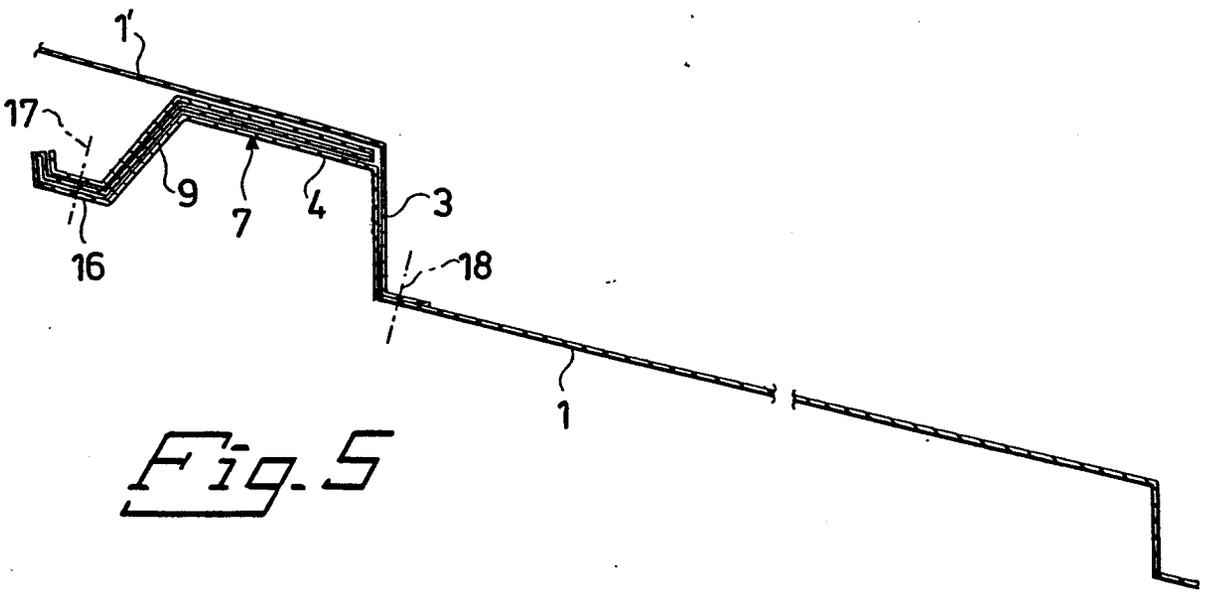

Fig. 5