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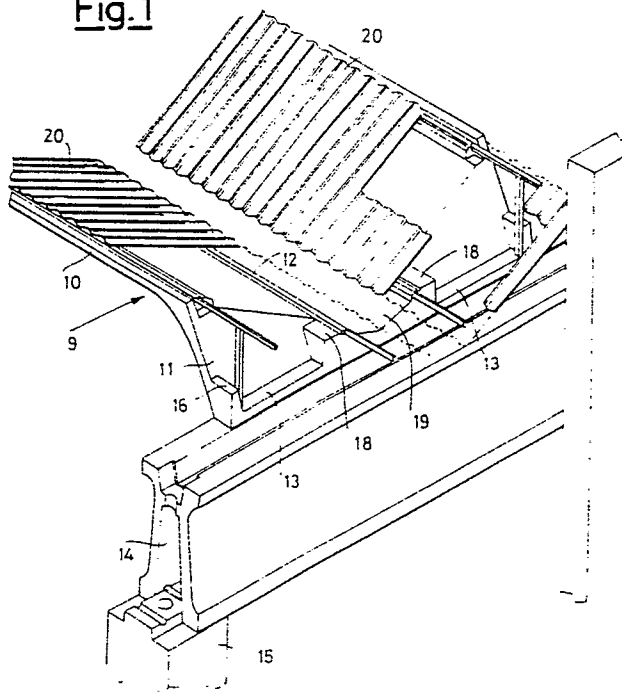
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54 Improvements to prefabricated reinforced concrete self-bearing roofing elements for building construction.

57 A prefabricated reinforced concrete self-bearing roofing element has an essentially "V"-shaped cross section. The sides of the "V" present outerly inter-spaced longitudinal ribs onto which are secured roofing sheets that form a hollow space which serves for housing insulating material and also for allowing air to pass through for ventilation of the structure. The said roofing sheets converge on a longitudinal rain-water gutter from which the said sides of the "V" extend. In addition, the said roofing element terminates at its opposed ends in respective closure headpiece each comprising a shoe for a support girder, which shoe also presents a series of projecting ridges for bearing a shoe of an identical overlaid roofing element.

Fig.1



## IMPROVEMENTS TO PREFABRICATED REINFORCED CONCRETE SELF-BEARING ROOFING ELEMENTS FOR BUILDING CONSTRUCTION

The present invention relates to a number of significant improvement in prefabricated reinforced concrete self-bearing roofings used for industrial buildings.

The general object of the invention is to embody a roofing element for buildings that has the dependability, practicality and efficiency of prepared (damp-proofed) prefabricated corrugated roofing, generally made of asbestos lumber or iron sheeting, and the appearance of a plane structure.

More specifically, the object of the invention is to embody a roofing element that is able to fulfil the following functions:

- to support on its top side an asbestos lumber roof with an elevated slope angle;
- to have an underside so designed that the aesthetic effect is satisfactory;
- to be so shaped that the light striking the lean-to roof does not encounter ribbings or surfaces that reduce it;
- to be so shaped that its static efficiency is maximum;
- to have a shape that maximally facilitates storage and transportation, i.e. a stackable shape.
- to be so shaped that it can be made with use of high-performance equipment (vibratory finishing machines, etc.).

A further object of the invention is to embody a roofing element that is not only able to accept overlaid prepared corrugated sheets, but also to provide:

- underside insulation, without thermal bridging, by the use of soft insulants (rockwool or glasswool);
- elevated slope angle of the corrugated roofing in order to give upperside dependability for special-climate areas (snowfalls, etc.);
- summertime ventilation of the roof, achieved by eliminating the warm air and automatically recalling the cool air (natural summertime conditioning);
- application of the insulation and damp-proofing in the factory and not on-site, assuring workmanlike execution and not sacrificing stackability.

These requirements should not, however, conflict with provision of a satisfactory inner appearance in which the prefabricated elements are correlated with precision (harmonious meeting-up of lines, headpiece closures, elimination of surfaces that touch the form), accepting also the limitation of a rigid modularity of dimensions provided that an aesthetically well-cared-for and functional product is obtained.

According to the invention, the said objects are attained by embodying a prefabricated self-bearing reinforced concrete roofing element of the type having a generally "V"-shaped cross section, wherein the sides of the "V" of the said element extend from a longitudinal rainwater gutter and outerly feature interspaced longitudinal ribs onto which are fixed roofing sheets which converge on the said gutter, the said sheets forming a hollow space that serves both to contain insulant material and for the passage of air for ventilating the structure, and wherein the said roofing element terminates at its opposed ends in respective headpieces each comprising a shoe for a support girder, which shoe also features a series of projecting ridges for bearing a shoe of an identical overlaid roofing element.

The structural and functional characteristics of the invention, as also its advantages over the known art, will become more apparent from an examination of the following description, referred to the appended drawings which show examples of embodiment of the invention. In the drawings:

Figure 1 is a top perspective view illustrating a roofing element embodied according to the principles of the invention;

Figure 2 is a bottom perspective view illustrating the same roofing element as in Figure 1;

Figure 3 shown a particular of the roofing element;

Figure 4 illustrates how it is possible to stack several roofing elements embodied according to the invention;

Figures 5-8 are particulars illustrating the different systems of coupling between the roofing element and other elements;

Figure 9 is a particular illustrating in perspective view the protective grid inserted in the circulation pathway of the roofing ventilation air.

With reference to the drawings, the roofing element in question is indicated overall by 9 and consists of a prefabricated self-bearing reinforced concrete article of substantially "V"-shaped cross section with sides 10 of the "V" that typically terminate in headpieces 11 and outerly present two pairs of spaced longitudinal ribs 12, the more inward of which demarcate a central longitudinal rainwater gutter 19.

As can be clearly seen from Figures 1-4 of the drawings, the headpieces 11 are provided with a shoe 13 for a support girder 14 carried by pillars 15.

The shoe 13 also features two pairs of projecting ridges 16, 18, terminal and central respectively, which serve as bearing members for the shoe 13 when a number of roofing elements are stacked as shown in Figure 4 and, in addition, exactly space the stacked elements so as to prevent the weight from coming to bear on the roofing. Particulars used for raising the roofing element are buried in the central projecting ridges 18.

As Figure 1 of the drawings clearly shows, to the longitudinal ribs 12 there are secured corrugated roofing sheets 20, for example made of asbestos lumber, which, with the element 9, form a hollow space for air circulation and for containment of a layer 21 of insulant material, for example rockwool (Figures 5-8).

With the roofing elements described above with reference to the drawings it is possible to embody structures of different kinds; some non-limiting examples of embodiment are shown in Figures 10-13.

Figures 10, 11 and 12 show the use of the roofing elements disposed spaced apart while Figure 13 shows them in side-by-side arrangement.

In Figure 10, the between-tiles space is covered by curved copings 22 having a translucent central section.

Figure 11 shows the provision for lean-to copings 23, while a continuous skylight 24 is shown in Figure 12.

It is noteworthy that, in the embodiment of a lean-to type structure, the roofing elements according to the invention, as a result of the absence of ribs on their underside, in no way impede light from entering.

No upper opening is provided in the side-by-side arrangement shown in Figure 13.

The structures described above, employing the tiles of the invention, have the great advantage that they permit a summertime ventilation of the roofing, which is conceived and realized so as to set-up air circulation that prevents the irradiation of the damp-proofed roof struck by sunlight from accumulating heat in the underlying structure, which latter can then re-distribute the air into the workplace.

If the said ventilation is to be sufficient it must occur with an appreciable height-difference between the hot air outlet and the cool air inlet.

In the structure according to the invention such height-difference is assured by the step slope angle of the asbestos lumber sheets, which are mounted with a slope of more than 25°.

The air inlet and outlet point (shown by the arrows in Figures 10-13) must not allow small birds to pass through and possibly make their nests. This is assured by means of a special element 25 made of pluri-perforated plastics material (Figure

9) which adapts perfectly to the profile of the asbestos lumber sheets and allows air to pass through: the element 25 has a continuous flat base 26 which is bonded to an underlying listel or gasket, and a wavy upper profile which harmonizes with the section of the asbestos lumber sheeting.

Attention has been drawn to the very advantageous summertime ventilation for the following reasons:

1) it has no adverse effect whatsoever on the winter insulation, in that this is located below the ventilation chamber;

2) if winter cold is taken for granted, by which is meant that heating to mitigate it is assured, it is equally true that summertime heat, when spread and irradiated by a non-ventilated roof, is absolutely intolerable to operators working at their fixed work positions or to those doing heavy work;

3) the summertime ventilation according to the invention is entirely free from maintenance costs and calls for no investments in plant or systems;

4) the said ventilation also makes the static exhausters more efficient if it is wished to change the air, or to exhaust fumes;

5) the said ventilation totally eliminates the vapour barrier problem, i.e. the accumulation of water vapour on unventilated prepared (damp-proofed) roofs that impregnates the insulant and can cause dripping.

The disposition of the protective elements 25 within the structure 25 is clearly visible in Figures 5-8 of the drawings, which refer to the particulars circled in Figures 10-13.

## Claims

1) Prefabricated reinforced concrete self-bearing roofing element of the type having a generally "V"-shaped cross section, wherein the sides of the "V" extend from a longitudinal rainwater gutter and outerly feature interspaced longitudinal ribs onto which are secured roofing sheets which converge on the said gutter.

2) Element as described in claim 1, wherein it terminates at its opposed ends in respective closure headpiece each comprising a shoe for a support girder, which shoe also presents a series of projecting ridges for bearing a shoe of an identical overlaid roofing element.

3) Element as described in claim 1, wherein the said sheets form a hollow space which serves for housing insulating material and also for allowing air to pass for ventilation of the structure.

4) Roofing element as described in claim 3, wherein provision is made in the said hollow space for protective elements against the entry of foreign bodies, each such element consisting of a grid structure.

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5) Roof structure comprising a plurality of roofing elements in accordance with claim 1 which are disposed spaced apart and in which the space between each successive element is covered by curved coping having a translucent central section.

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6) Structure as described in claim 5, wherein the said space is covered by a continuous skylight.

7) Structure as described in claim 5, wherein the said space is covered by lean-to copings.

8) Roofing structure comprising a plurality of roofing elements according to claim 1, disposed in side-by-side arrangement.

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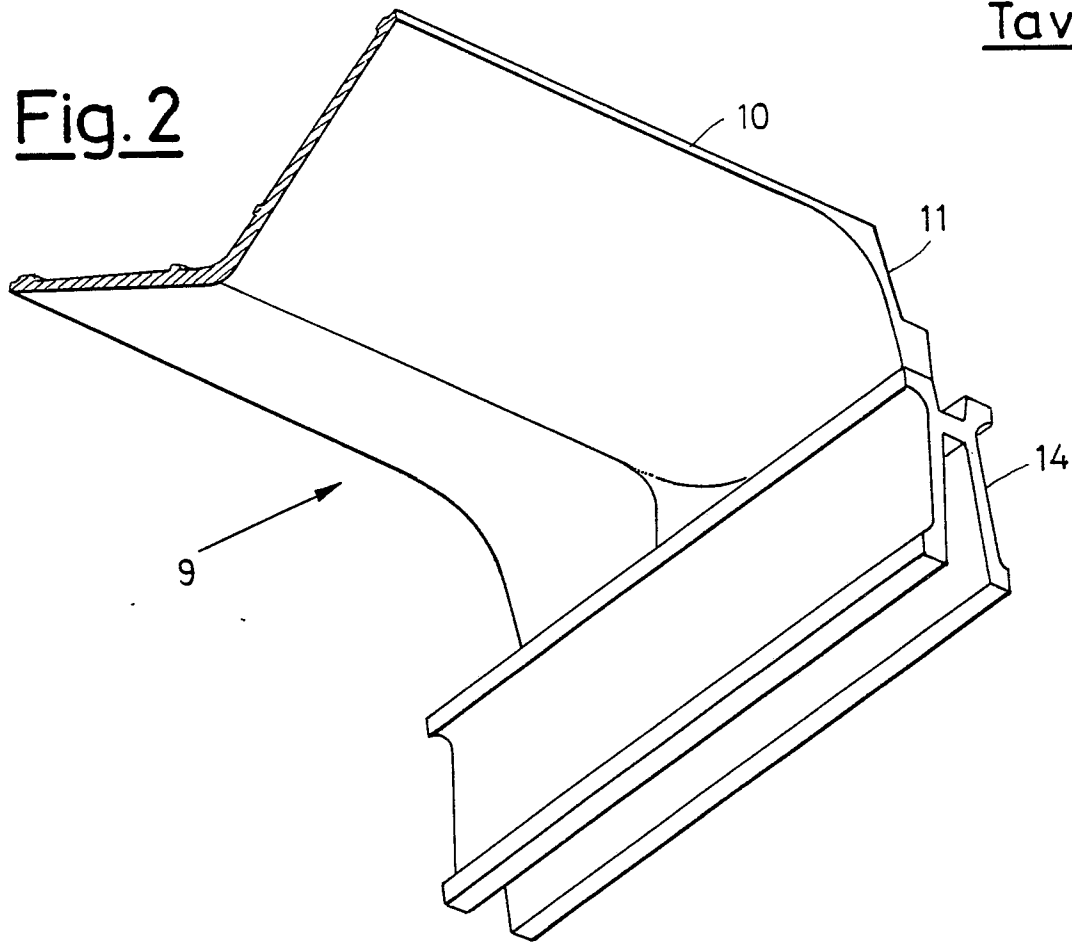
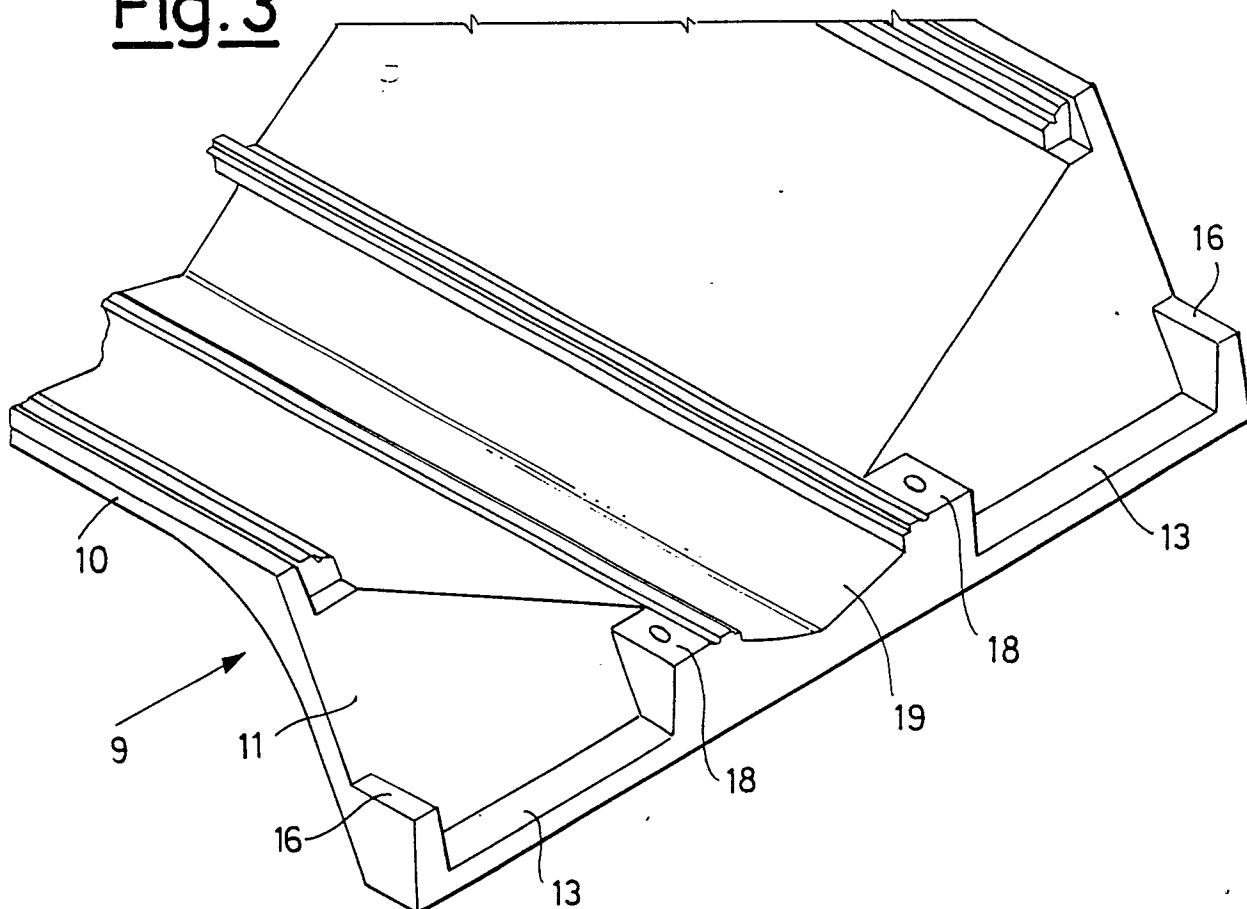
Fig. 2Fig. 3

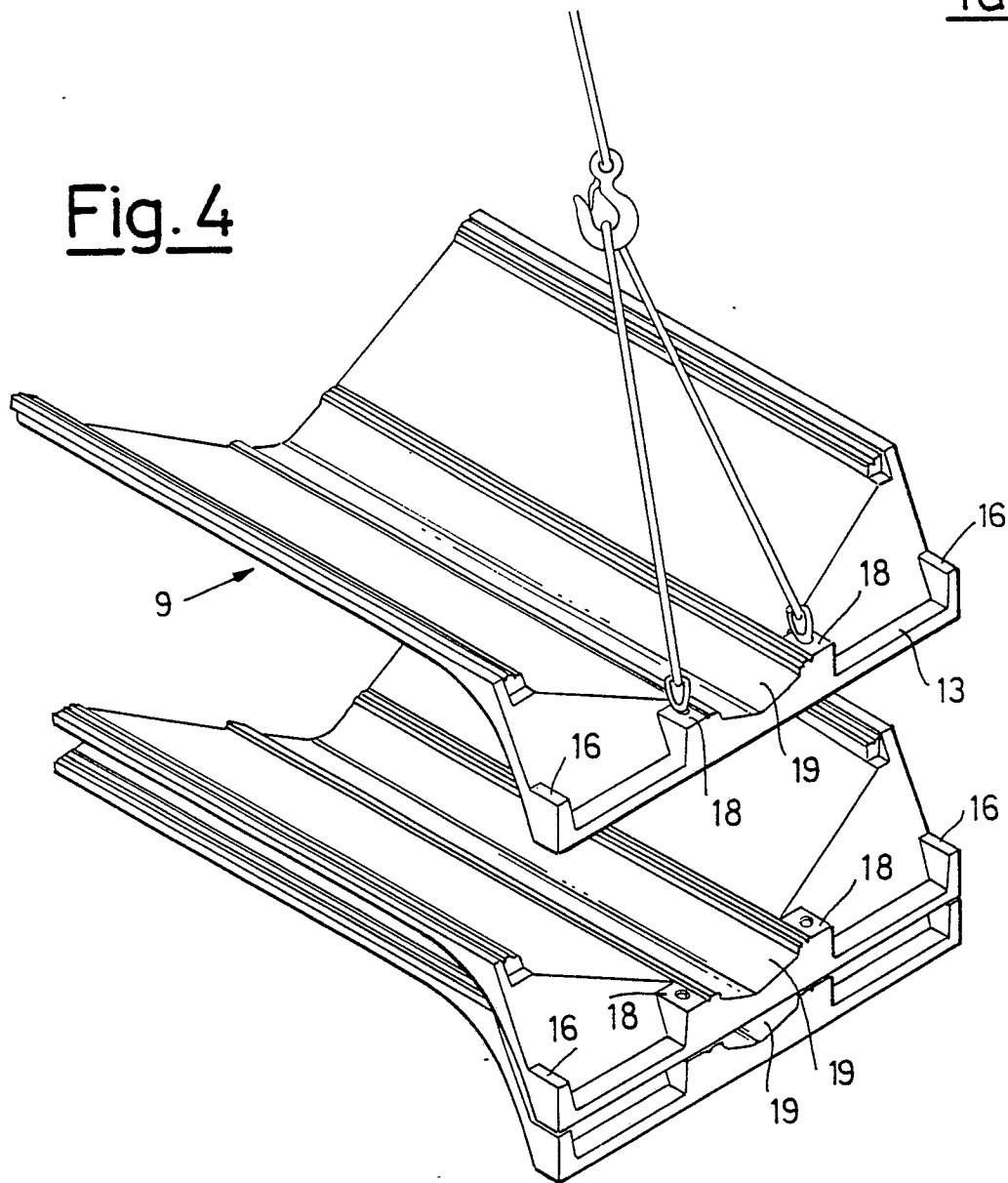
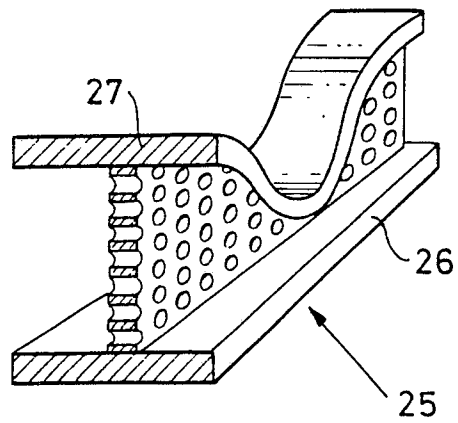
Fig. 4Fig. 9

Fig. 5

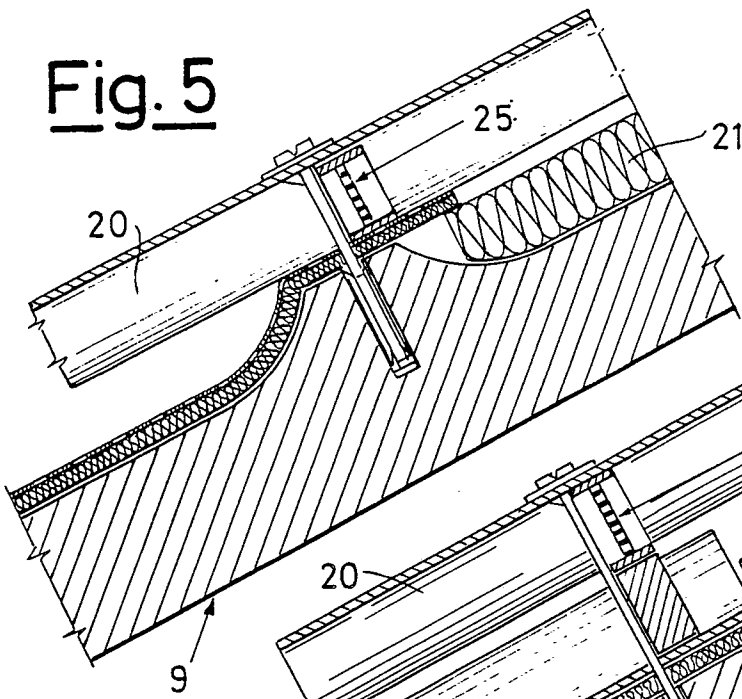


Fig. 6

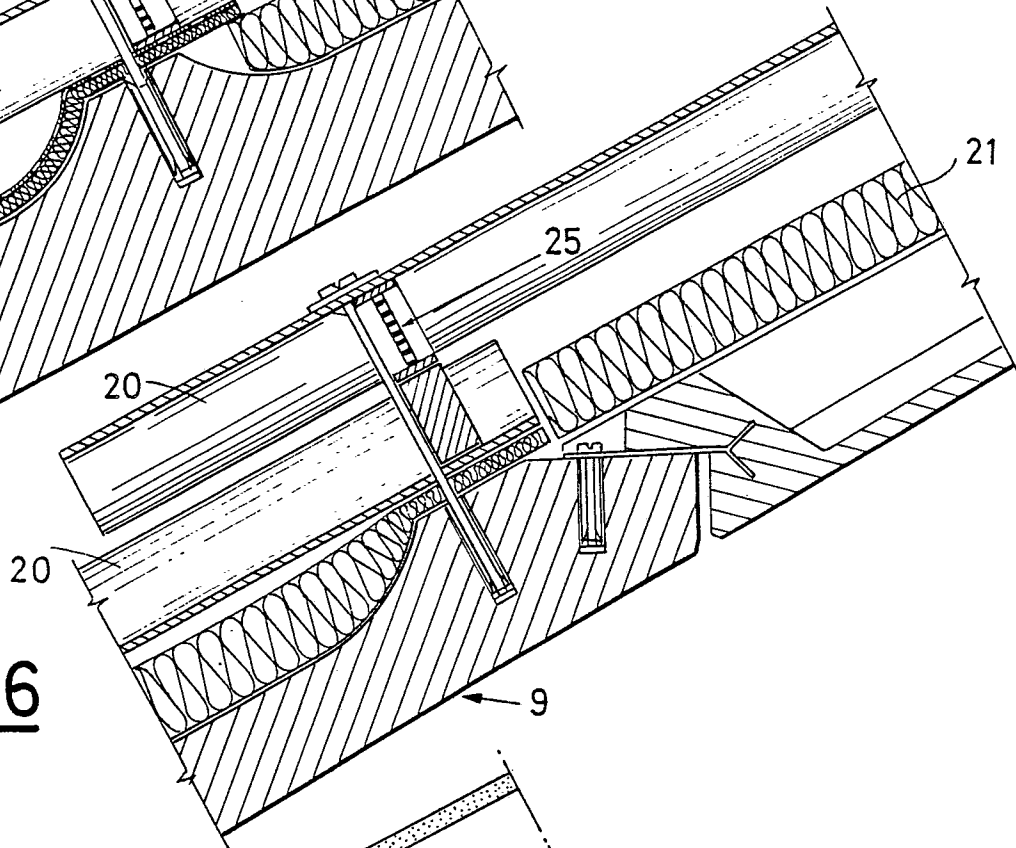


Fig. 8

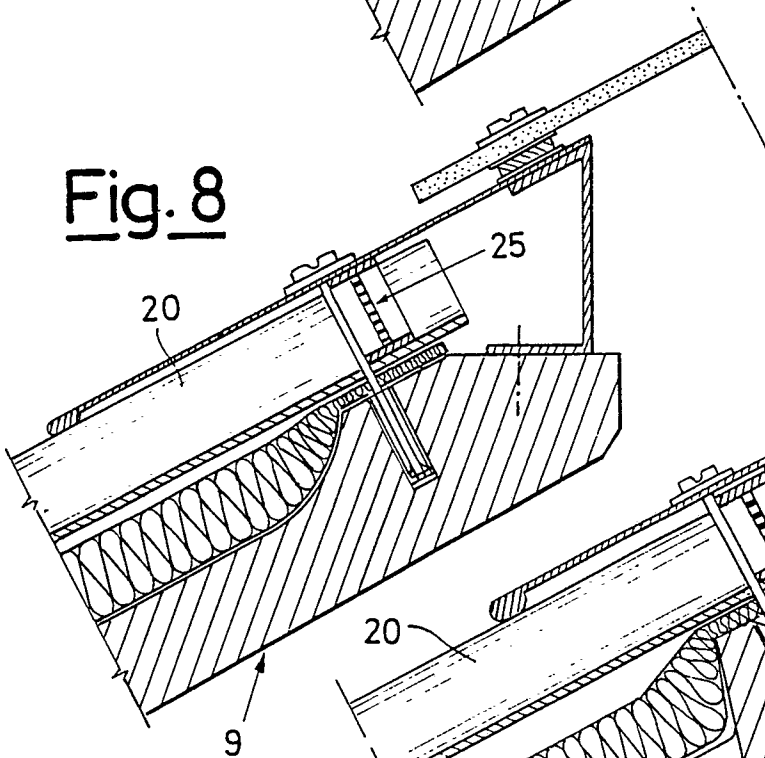


Fig. 7

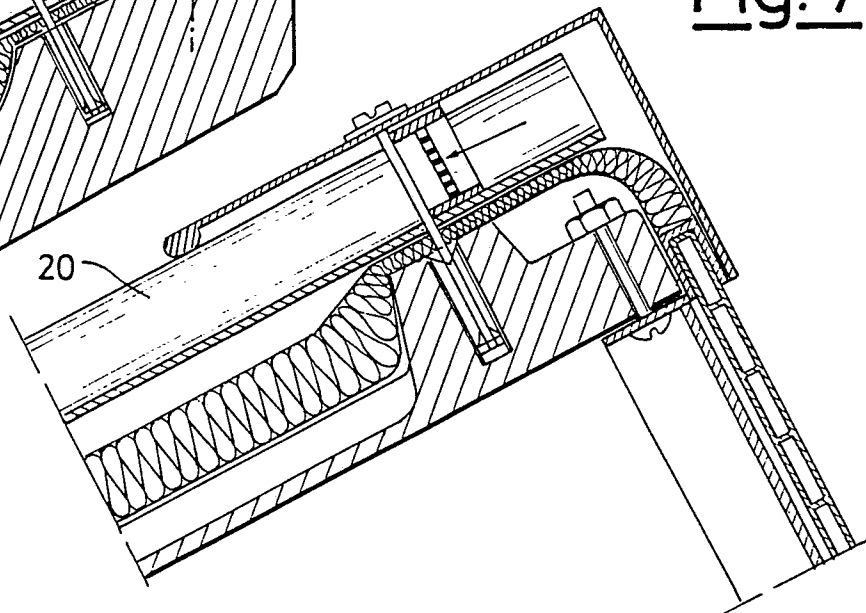
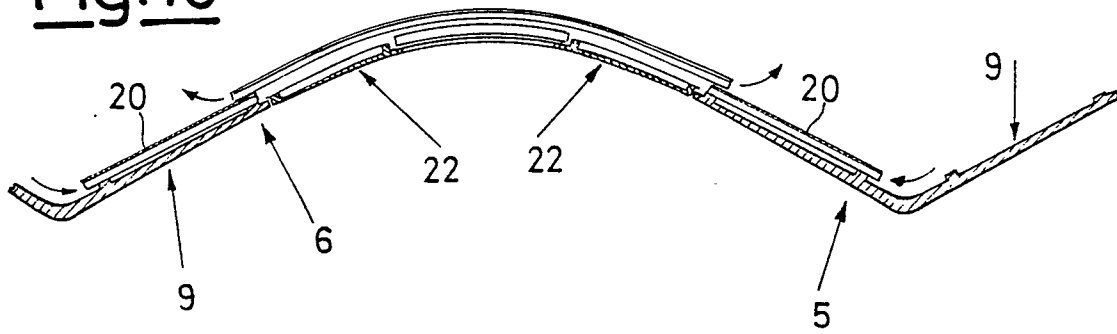
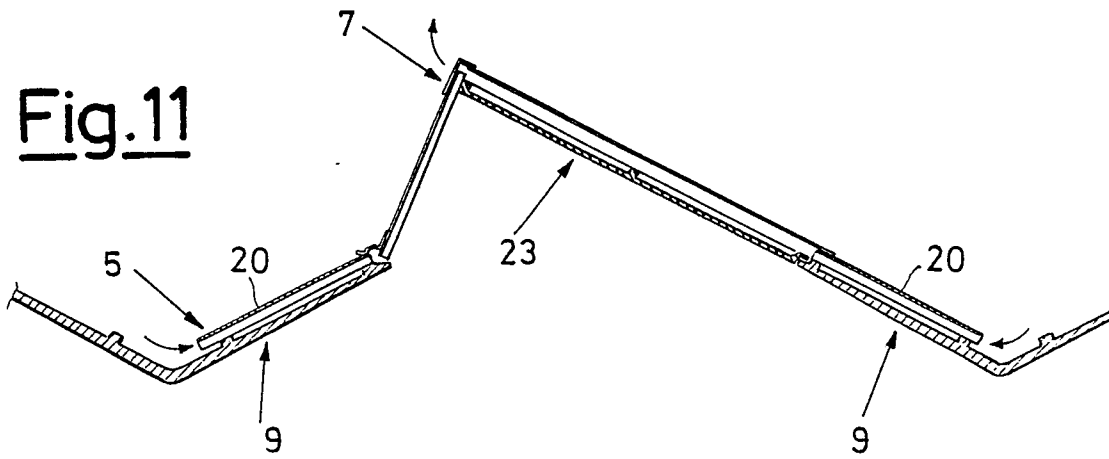
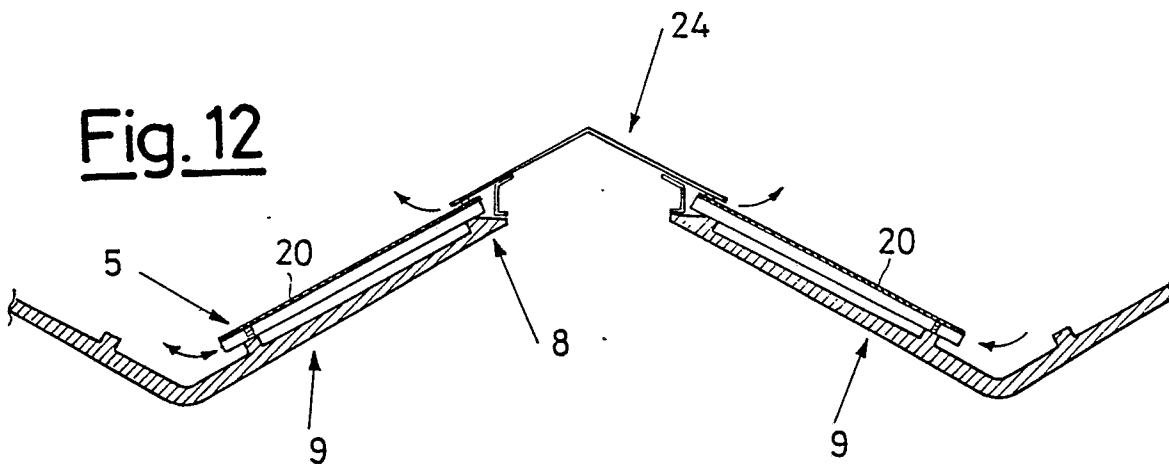


Fig.10Fig.11Fig.12Fig.13