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(54) **Roofing element**

(57) A roofing element constituted by at least two individual equipped elements (10) which are arranged on inclined planes, are mutually connected and can be connected to similar roofing elements so as to form a self-supporting structure which is supported on vertical structures and is adapted to react to both vertical and horizontal loads.

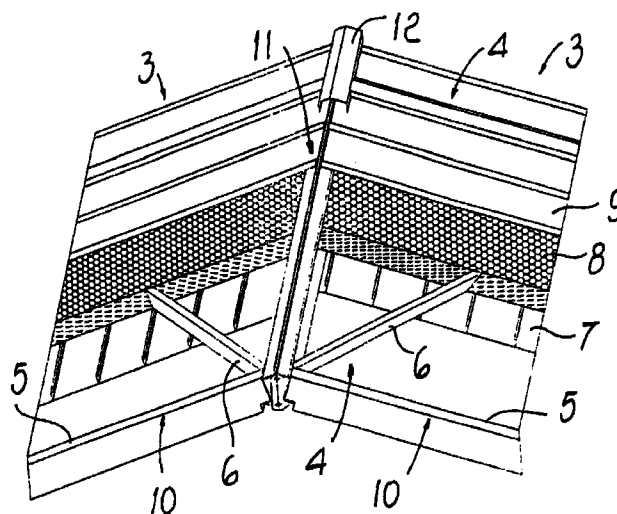


Fig. 2

Description

[0001] The present invention relates to a roofing element.

[0002] Currently in the construction of buildings it is common to first build the vertical and horizontal load-bearing structures and then lay the completion structures, such as claddings, accessories, finishings and connecting elements, in successive gradual steps and in a prearranged and irreversible manner.

[0003] The currently most advanced and most widely used construction method consists in factory-making panels made of reinforced concrete, metal or wood which can act as external or internal cladding or as insulation and possess an independent structural ability to withstand external actions.

[0004] Their use is usually of the complementary type and occurs both for roofings and for walls, and said panels are supported by specifically provided structures.

[0005] In reinforced-concrete panels, the insulation is placed between perimetric borders which constitute the structural supporting elements; however, thermal bridges are present.

[0006] In metal panels, the element that withstands the external loads is constituted by corrugated plates, while the insulation is supported by the metal plates; the elements are linear and have a limited width.

[0007] Conventionally structural strength is unidirectional, even if the components are connected to each other and to the supporting structures.

[0008] Moreover, the assembly of elements whose dimensions are usually chosen so as to withstand specific stresses on a single plane, and the type of coupling, do not provide adequate rigidity of the surfaces, especially roofing surfaces.

[0009] Said roofing is usually produced with horizontal, vertical and in-slope bracing elements; construction occurs by using rods which are subjected to an axial load, are thin with respect to the main elements and are connected thereto so as to constitute another structural assembly.

[0010] Because of the dimensions of the structures whereto they are connected and to the unreliability of the access pathways constituted by the profiles of the main structures, assembly is difficult and connections are difficult to check.

[0011] In the case of electrically welded metal structures, the dimensions of the connecting elements can be compared with those of the main structures. In any case, owing to the number and position of the elements constituting the bracing system the assembly does not provide an immediate response to loads but required evident relative movements.

[0012] Especially in prefabrication, columns are also usually located at well-defined architectural lines, such as gutters, ridges, bases of roof slopes, and all the structural elements are built according to these constraints.

[0013] The aim of the present invention is to solve the above-described problem, eliminating the drawbacks of the cited prior art and thus providing an invention which allows a builder to achieve, in the field of the construction of building roofings, an improvement in quality as regards the roofing element, reduced construction costs with respect to the prior art, and high safety for the workers that work on said roofing element.

[0014] Within the scope of this aim, an object of the present invention is to achieve, in the field of construction of building roofings, high-level functionality characteristics, such as immediate usability of the construction with immediate use, in the building yard, of the areas that are covered as construction proceeds.

[0015] Another object of the invention is to provide a roofing element which is independent of the axial distance between the columns.

[0016] Another object of the invention is to provide a roofing element which allows construction with pitched slopes with relatively small spans which are independent of the axial distances of the columns.

[0017] Another object of the invention is to provide a roofing element providing a natural hindrance to the diffusion of noise.

[0018] Another object of the invention is to provide a roofing element which allows to distribute lighting and ventilation surfaces according to the requirements and over the entire area of the building.

[0019] Another object of the invention is to provide a roofing element which allows to achieve a chosen partitioning into internal compartments, allowing climate control of the areas at will and as required.

[0020] Another object is to provide a roofing element which is reliable and safe in use.

[0021] This aim, these objects and others which will become apparent hereinafter are achieved by a roofing element, characterized in that it is constituted by at least two individual equipped components which are arranged on inclined planes, are mutually connected and can be connected to similar roofing elements so as to form a self-supporting structure which is supported on vertical structures and is adapted to react to both vertical and horizontal loads.

[0022] Further characteristics and advantages of the present invention will become apparent from the following detailed description of a particular but not exclusive embodiment, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a perspective overall top view of the roofing element according to the invention;
Figure 2 is a perspective view of the ridge region of the roofing element;
Figure 3 is a plan view of the roofing;
Figure 4 is a sectional view, taken along the plane IV-IV of Figure 3;
Figure 5 is a sectional view, taken along the plane V-V of Figure 3;

Figure 6 is a sectional view, taken along the plane VI-VI of Figure 3, illustrating an intermediate support on the columns with a lattice girder integrated with the elements;

Figure 7 is a sectional view, taken along the plane VII-VII of Figure 3;

Figure 8 is a view of the structure of an element;

Figure 9 is a sectional view, taken at the plane VI-VI of Figure 3, illustrating an intermediate support on the columns on a lower supporting girder;

Figure 10 is a transverse sectional view of a particular use of the roofing element with an external gutter, with a lateral parapet and a central gutter;

Figure 11 is a view of a detail of the lateral facing with an external cutter;

Figure 12 is a view of a detail of the ridge;

Figure 13 is a view of a detail of the central gutter;

Figure 14 is a view of a detail of a possible connection of the elements on an intermediate support;

Figures 15, 16 and 17 are views of particular connections of the roofing to the front parapet on a metal beam and on a reinforced-concrete ridge.

[0023] With reference to the above figures, the reference numeral 1 designates a self-supporting structure which is supported on vertical structures 2 constituted by masonry or columns made of reinforced concrete or other material and is constituted by a roofing element, designated by the reference numeral 3, which is in turn constituted by individual equipped elements 10.

[0024] Each one of said equipped elements 10 is constituted by a lattice-like structure 4 having an essentially rectangular plan shape obtained by means of two longitudinal stringers and a plurality of connecting elements 5 which are parallel to each other or are inclined with respect to the stringers and are designated by the reference numeral 6 in the figures in the latter case.

[0025] A false ceiling 7, an insulating element 8 and a covering 9 are arranged at the lattice-like structure 4.

[0026] Each one of the individual equipped elements 10 is arranged on inclined planes, and the elements are mutually connected so as to form a ridge line 11 which is conveniently protected by means of suitable protective elements 12.

[0027] The equipped elements 10 can also be connected to each other, at the ends that form a gutter line 14, either directly to a facing roofing element 3, by means of a suitable first coupling 13 which is advantageously curved so as to form the gutter line 14, or at the end of a vertical structure 2 by means of a suitable second coupling 15 which again forms the gutter line 14.

[0028] Advantageously, at the ridge line 11 a suitable third coupling 16 for connecting and locking the end of the adjacent equipped elements 10 is provided.

[0029] The equipped elements 10 can thus be manufactured beforehand in the factory, for example by providing a fixed skylight 17 with transparent chamber and false ceiling or by means of a skylight 18 which can be

opened for ventilation.

[0030] Figure 14 illustrates a possible solution for connecting the equipped elements 10 on an intermediate support, while Figures 15 to 17 illustrate a detail for the connection of an equipped element 10 on a metal beam 22 or on a suitable reinforced-concrete ridge 23 for supporting a front parapet 24.

[0031] This solution has achieved the intended aim and objects, since it is possible to produce the equipped elements directly in the workshop, subsequently assembling them on-site, each equipped element 10 having a lattice-like load-bearing structure 4 which allows to react both to vertical loads and to horizontal loads, as well as a covering layer, optional insulations and false ceilings and accessories such as skylights, dormers, ventilation openings and suitable first, second or third couplings for connection to each other or at the vertical structures and any systems such as lighting, electricity, etcetera.

[0032] Each equipped element 10 is also arranged on an inclined plane to form inclined roof slopes which have a constant axial distance. Couplings or flanges having a constant ridge pitch act as connections for each individual equipped element, while couplings which have, for example, curved profiles with the same span as the flanges act as lower connections for each equipped element and support or constitute gutters and/or gutter underbodies.

[0033] The stresses applied by the weight of the equipped elements 10 gives adequate pretensioning to all the structural elements, so that the assembly provides immediate response also to horizontal loads.

[0034] The system constitutes a single static unit, providing adequate horizontal bracing; a rigid plane, having a rigidity which can effectively contrast both vertical loads and horizontal thrusts in both directions produced either by wind or by seismic events.

[0035] Prefabrication in the workshop can also reach almost 100% of the roofing, the only constraint being due to the dimensions of the equipped elements to be transported as a function of the limitations forced by transport vehicles and by transport routes.

[0036] In the building yard, the various elements that will constitute a single self-supporting assembly to be rested on the masonry or on the columns, forming a module which is complete with accessories and can provide, in a very short time, covered, completed and finished areas in the building yard, can be assembled at ground level.

[0037] The greater amount of workshop-assembled material leads to a reduction in unexpected problems, with a considerable reduction of costs in relation to the downtimes produced by said problems, furthermore achieving an undisputable quality advantage, since construction and assembly on workbenches leads to higher efficiency, automation, and fast qualitative and quantitative production control.

[0038] Construction costs and yard assembly times

are furthermore reduced, with less need, and with consequently reduced assembly costs, for movable and safety equipment such as scaffolding and nets to cover the entire yard area.

[0039] Accordingly, undoubtedly higher safety is achieved since less danger for workers is present because they are not forced to constantly climb up ladders, scaffolding, gangways and access paths which are often constituted by the structures themselves, because the equipped elements are assembled at "ground" level.

[0040] Finally, excellent functionality is provided because the construction can be used immediately, since the equipped elements are complete with covering structures, gutters and ridges, so that in case of bad weather each installed module provides protection for the assembly of the subsequent modules, thus also giving greater assurances as to assembly times and providing almost complete independence with respect to bad weather.

[0041] Moreover, execution with inclined roof slopes having relatively small spans which are independent of the axial distances of the columns allows a better possibility for dividing into internal compartments, since all have for example the same possibility of lighting, ventilation, etcetera.

[0042] The independence of the roofing from the axial distance between the columns also allows to provide modular elements and therefore automate production.

[0043] The shape with small slopes provides a natural hindrance to the diffusion of noise and integration with sound-deadening false-ceiling material can improve and perfect its characteristics. Accordingly, it is easy to provide for the insulation of machines and/or noise sources even without having to necessarily resort to partitioning into compartments and to enclosures of areas.

[0044] The equipped elements also allow to obtain a roofing element in which the lighting and ventilation surfaces can be distributed at will as required over the entire building area.

[0045] The lighting and ventilation percentages can thus vary from 0 to 100% of the entire covered area and can be easily changed over time both in terms of quantity and in terms of position, with a uniform and suitable distribution according to any future demand.

[0046] The ease with which partitioning into compartments at will is possible allows to provide climate control of the areas at one's discretion and according to the requirements.

[0047] The shape and dimensions of the equipped elements are such that it is possible to preinstall in the workshop the service systems, such as electric power lines, hydraulic lines, compressed air lines, telephone lines and even install and/or prepare equipment and the corresponding supports and connectors, with the covering layer and the infilling.

[0048] The disclosures in Italian Patent Application

No. TV97U000038 from which this application claims priority are incorporated herein by reference.

[0049] The invention is of course susceptible of numerous modifications and variations, all of which are within the scope of the same inventive concept.

[0050] Thus, the materials and the dimensions of the individual components of the roofing element may also be the most pertinent according to specific requirements.

[0051] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A roofing element, characterized in that it is constituted by at least two individual equipped components which are arranged on inclined planes, are mutually connected and can be connected to similar roofing elements so as to form a self-supporting structure which is supported on vertical structures and is adapted to react to both vertical and horizontal loads.
2. A roofing element according to claim 1, characterized in that each one of said equipped components is constituted by a lattice-like structure which is substantially rectangular in plan view and is formed by means of two longitudinal stringers and a plurality of connecting elements which are parallel to each other or are inclined with respect to said stringers.
3. A roofing element according to claim 2, characterized in that a false ceiling and/or an insulating element and/or a covering element are associated at said lattice-like structure.
4. A roofing element according to claim 1, characterized in that each one of said individual equipped elements is arranged on inclined planes, said equipped elements being mutually connected to as to form a protected ridge line.
5. A roofing element according to claim 1, characterized in that said equipped elements are mutually connected, at the ends that form a gutter line, directly to another facing roofing element by means of a first connecting element which is curved so as to form said gutter line.
6. A roofing element according to claim 1, characterized in that said equipped elements are connected, at the end of a vertical structure, by

means of a second connecting element.

7. A roofing element according to claim 4,
characterized in that at the ridge line a third connecting element is provided for joining and locking the end of two adjacent equipped elements. 5
8. A roofing element according to claim 1,
characterized in that said equipped elements are factory-made beforehand by forming a fixed skylight with a transparent chamber and false ceiling or by means of an openable skylight for ventilation, dormers, ventilation openings and optional utilities. 10
9. A roofing element according to claim 1, 15
characterized in that each one of said equipped elements is arranged on an inclined plane to form inclined roof slopes which have a constant span, joints or flanges having a constant span at the ridge acting as connection for each individual equipped element, couplings which entail profiles which are curved with the same span as said flanges acting as lower connection for each one of said equipped elements. 20
- 25
10. A roofing element according to claim 1,
characterized in that said equipped elements are mutually assembled at the building yard to form, in pairs, a self-supporting structure to be rested on the masonry or on the columns. 30

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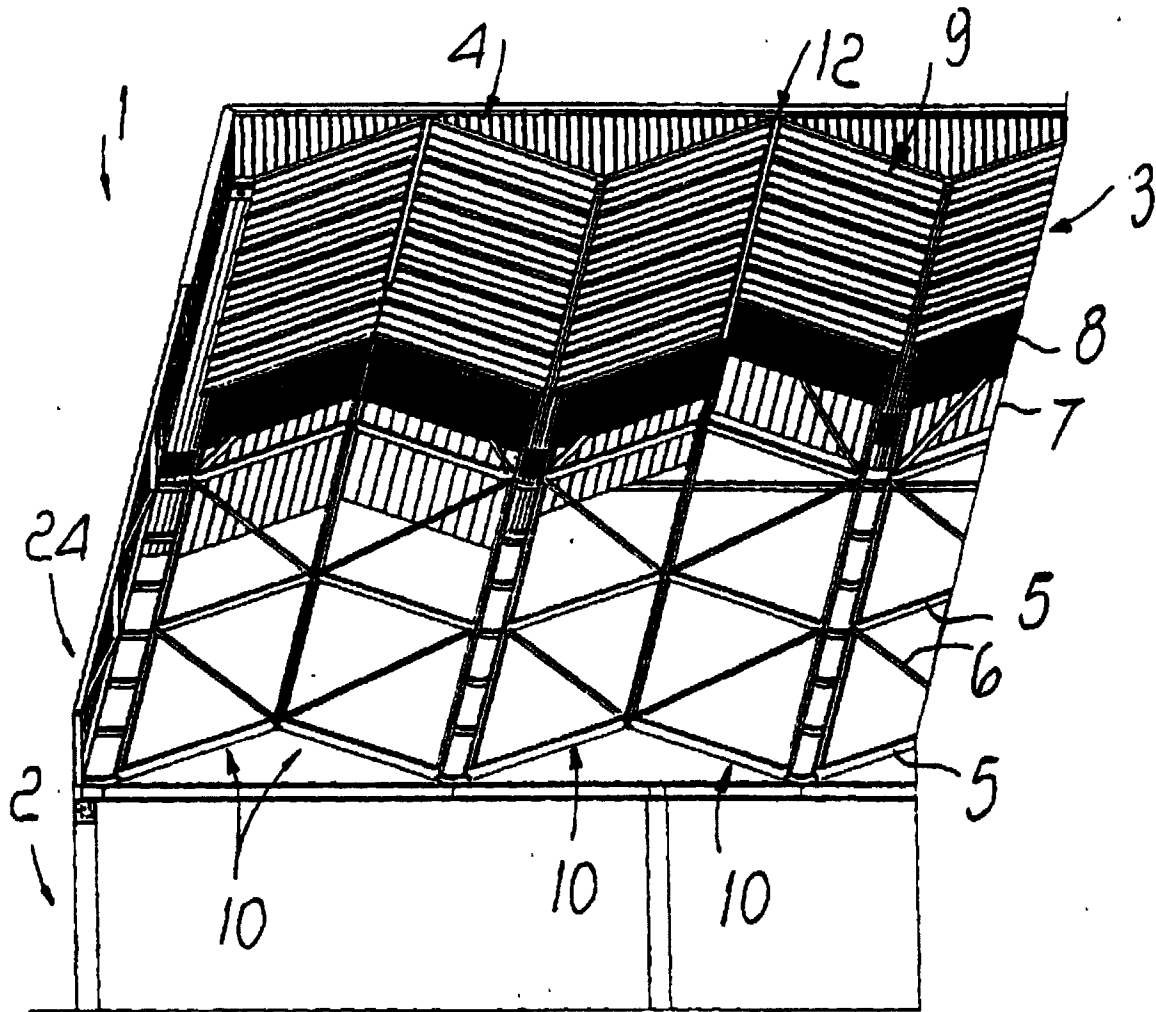


Fig. 1

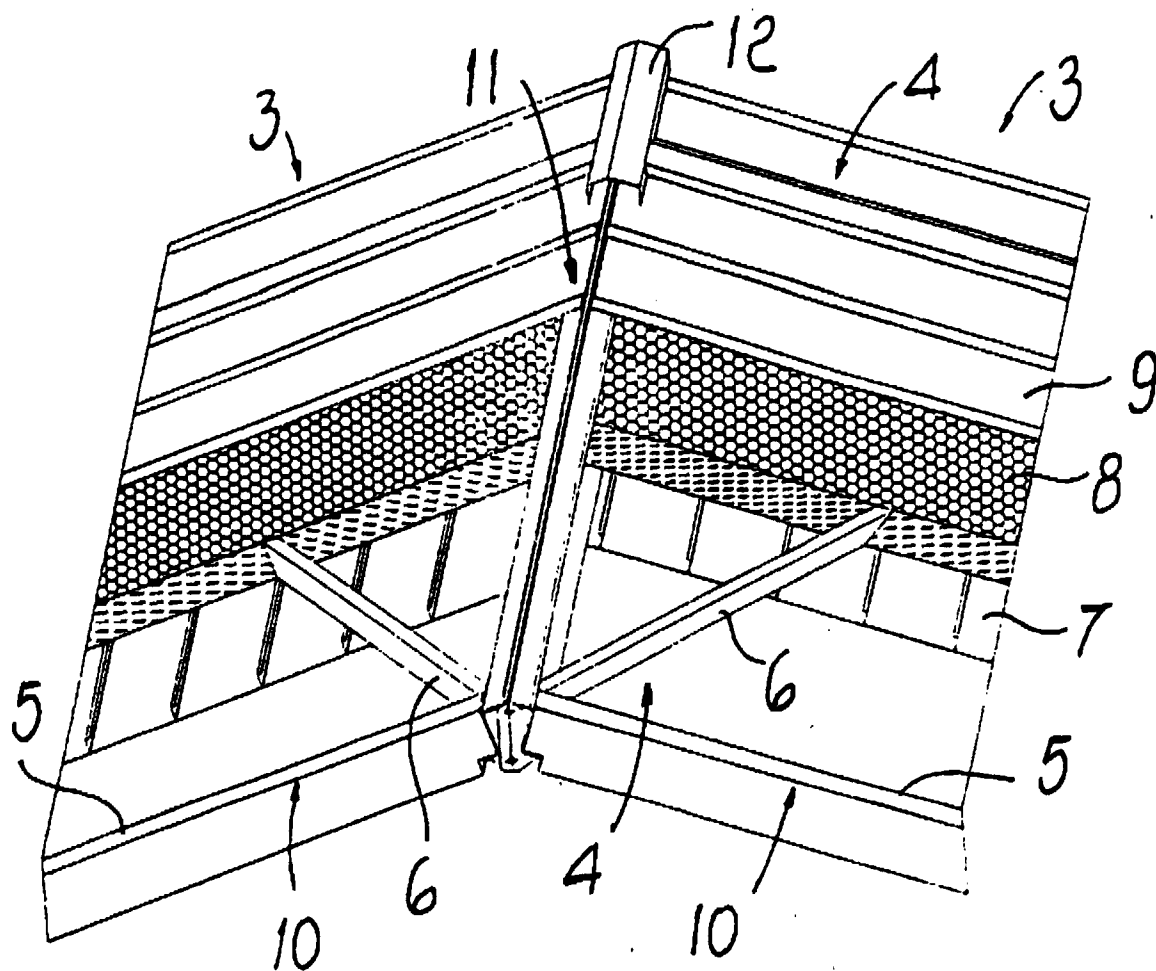
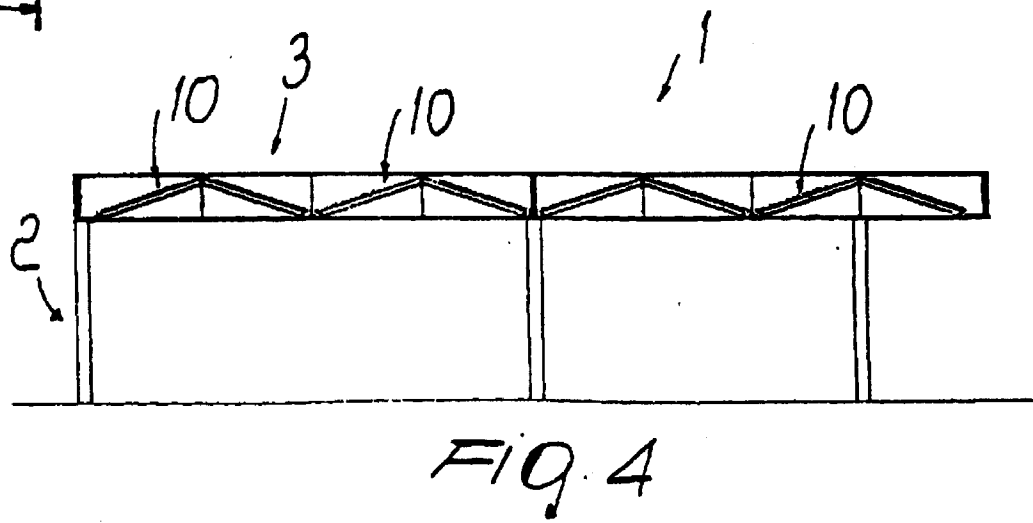
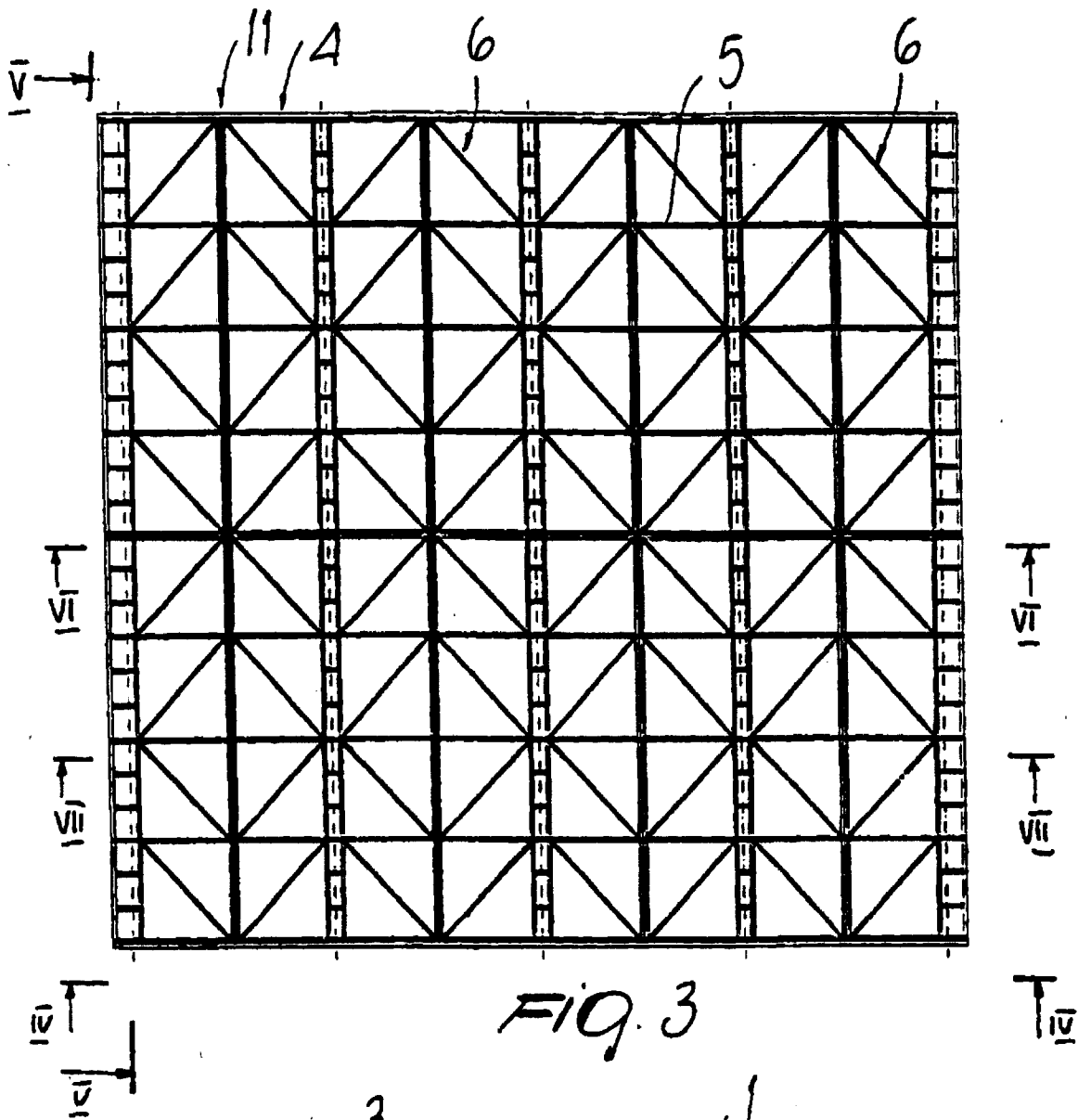


Fig. 2



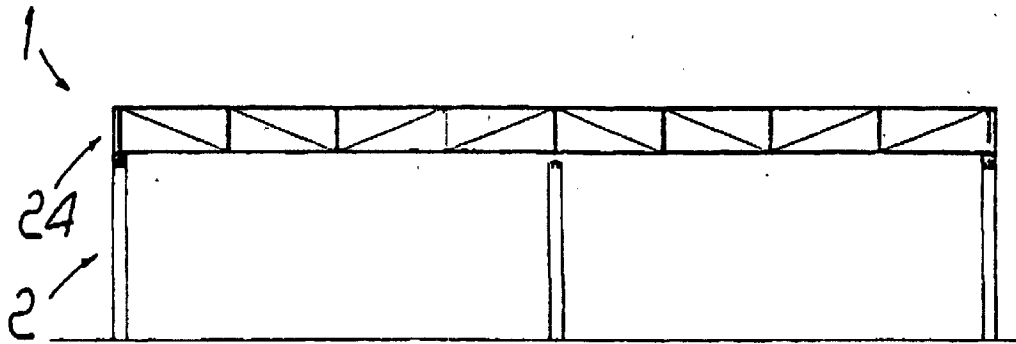


FIG. 5

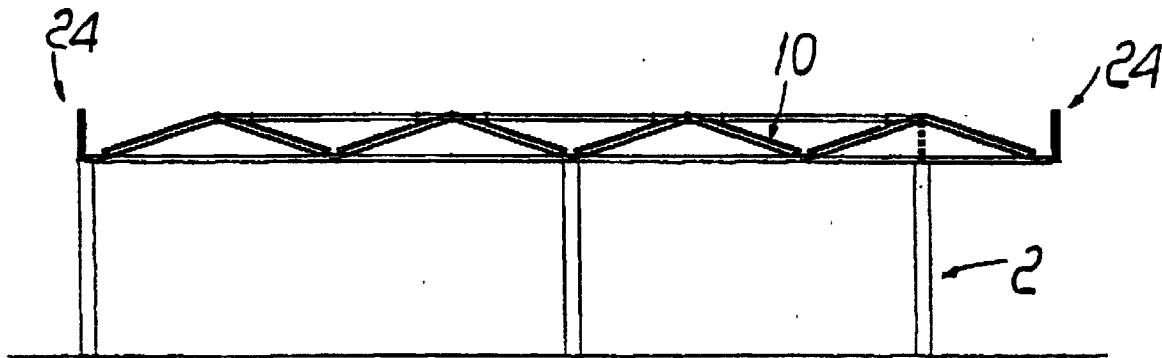


FIG. 6

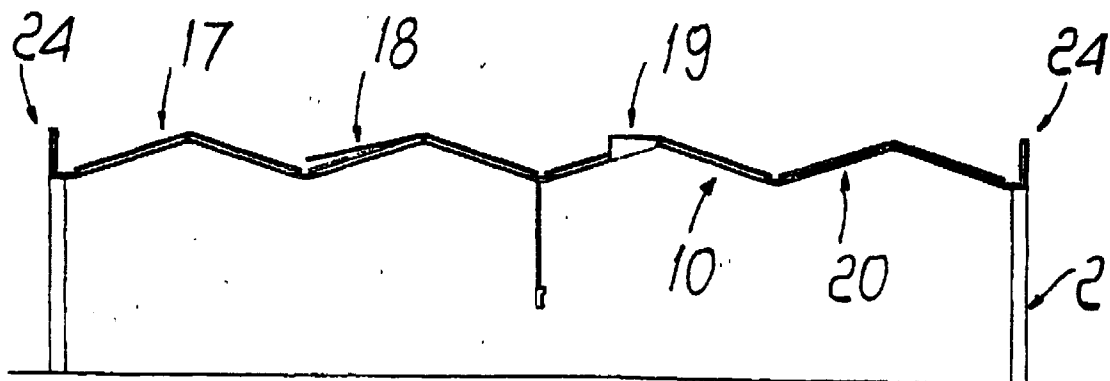


FIG. 7

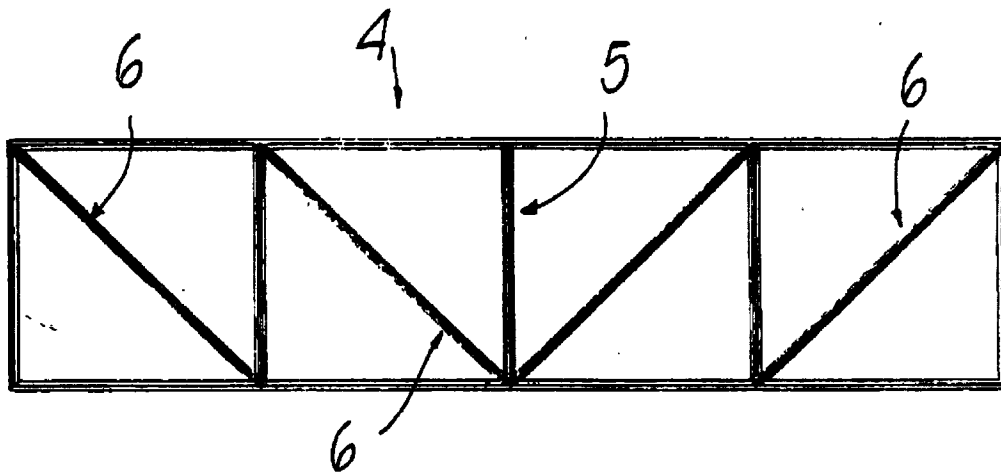


Fig. 8

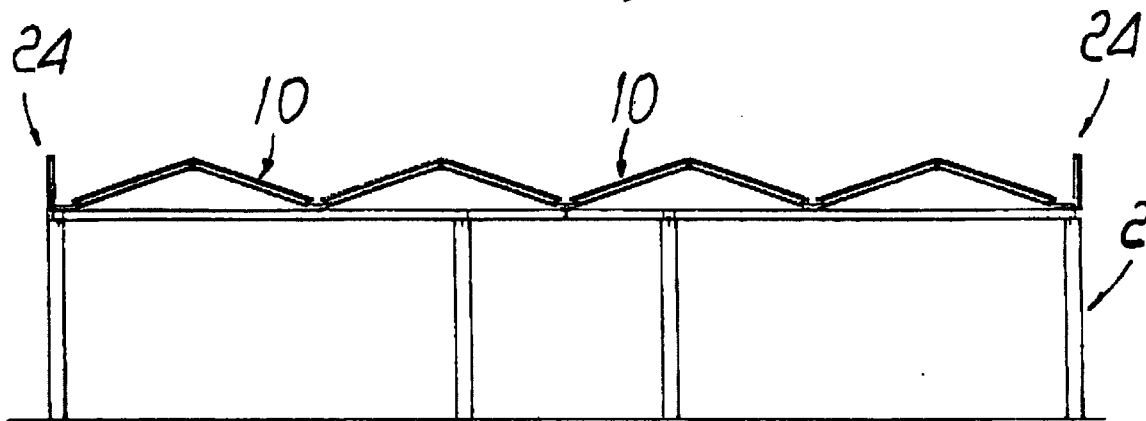


Fig. 9

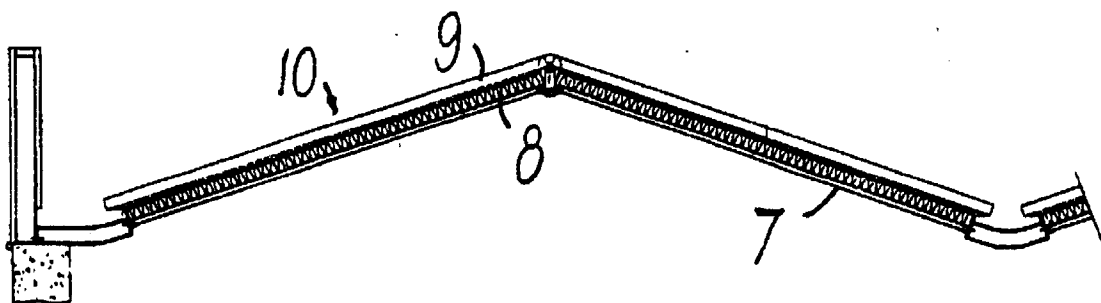
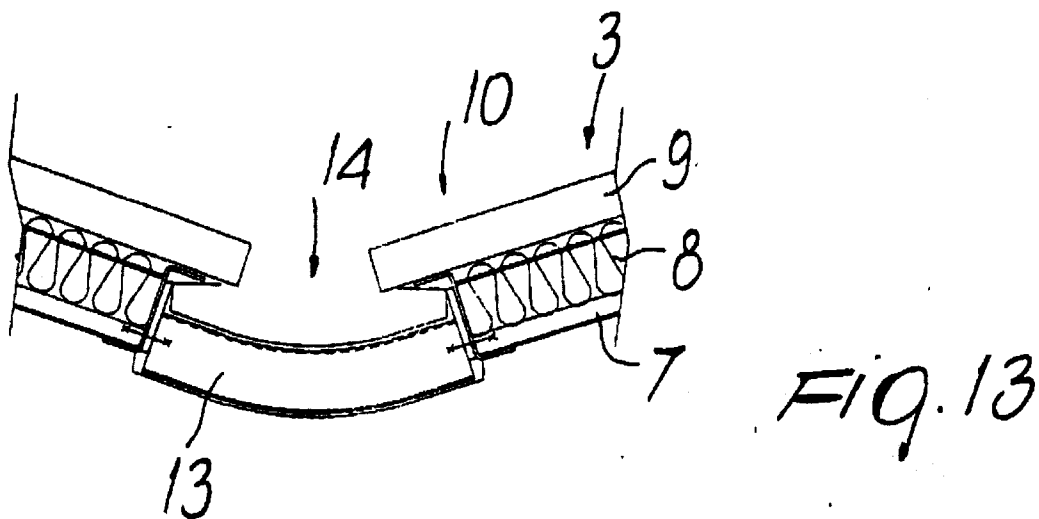
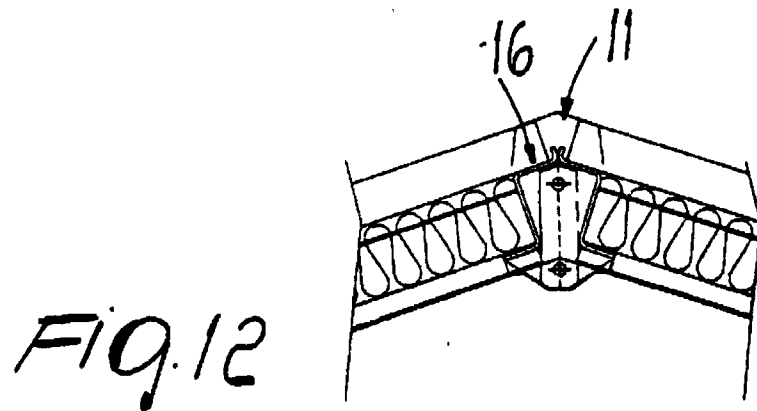
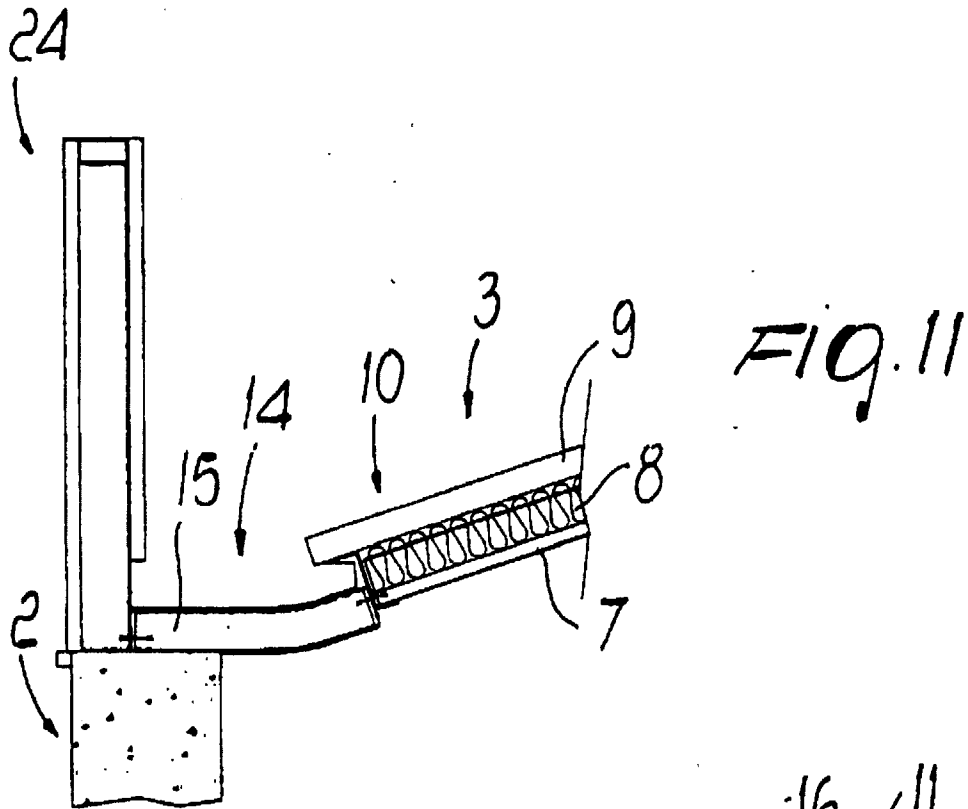


Fig. 10



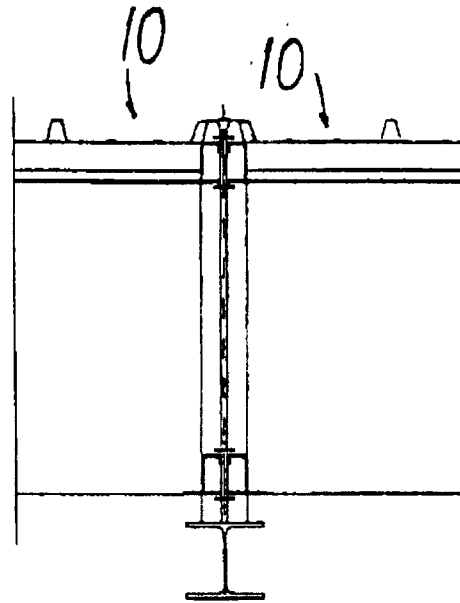


FIG. 14

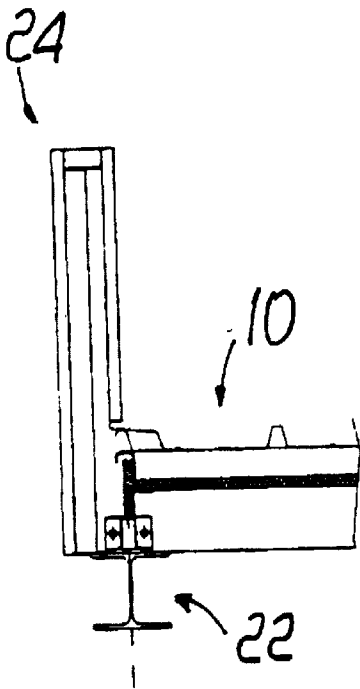


FIG. 15

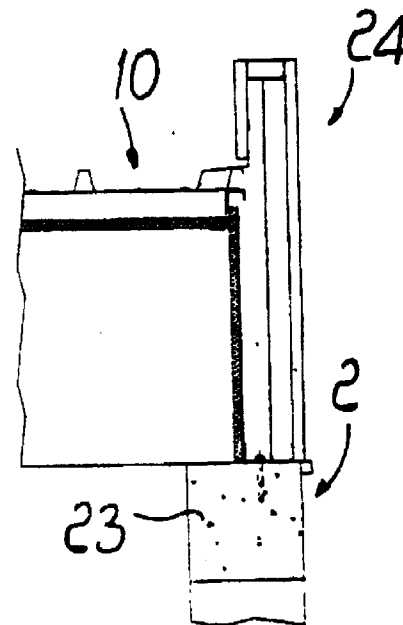


FIG. 16

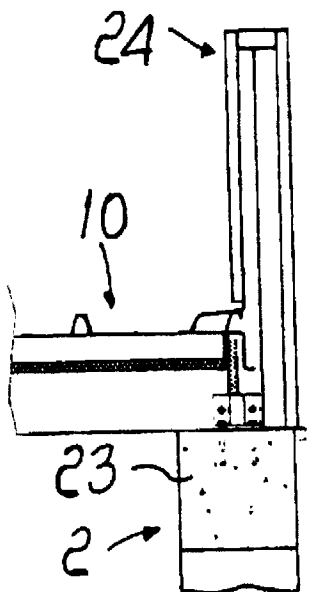


FIG. 17