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(54) Manufacturing system for making wide span roofings having the frame made of shaped sheet purlins

(57) The invention relates to a system for the building of wide span roofings, in which it is foreseen the use of a frame made of shaped sheet purlins (3) which are placed on the frame structure (1) of a building at different distances, depending on the span and on the weight. It is also made of covering (2) and ceiling panels (15), that can be made of insulating panels or the like fastened to said purlins.

According to an embodiment of the invention, these covering and ceiling panels have their stiffening ribs right-angled with respect to the purlins.

This system allows us to obtain a roofing for wide archways, 5-10 metres or more, made of light elements, that can be easily transported and handled without using cranes and is cheap to be manufactured and easy to be assembled.

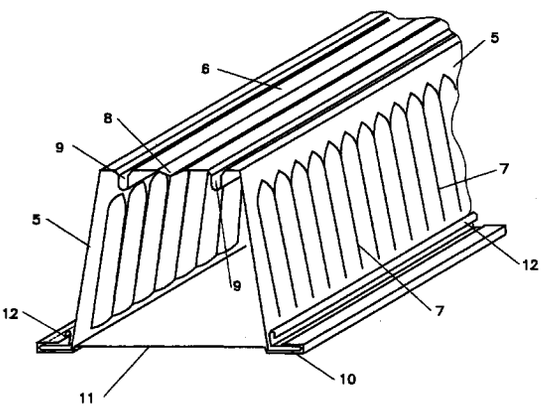

FIG. 8

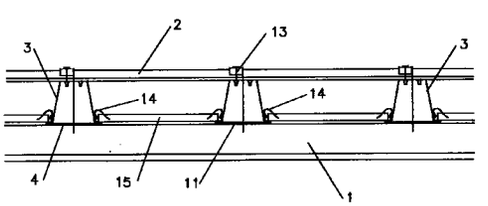

FIG. 6

EP 0 822 300 A2

Description

The present invention relates to a system for the building of wide span roofings, in which it is foreseen the use of a frame made of shaped sheet purlins which are placed on the frame structure of a building at different distances, depending on the span and on the weight.

It is also made of covering and ceiling panels, that can be made of insulating panels or the like fastened to said purlins.

According to an embodiment of the invention, these covering and ceiling panels have their stiffening ribs right-angled with respect to the purlins.

This system allows us to obtain a roofing for wide archways, 5-10 metres or more, made of light elements, that can be easily transported and handled without using cranes and is cheap to be manufactured and easy to be assembled.

Several methods are known, for making the covering of buildings, both civilian and industrial buildings, as traditional concrete/tiles and metal structures.

The first ones, one of which is shown in fig.1, are made using small beams usually made of reinforced concrete, among which some hollow tiles are placed, then the slab is completed by a concrete layer.

Other similar solutions (see also fig. 2) provide for the use of prefabricated panels usually made of reinforced concrete with lightening hollow tiles, and the subsequent completing of the slab with a concrete cast.

They are quite heavy structures, which require relevant time and skilled labour for their assembling.

The roofings made of metal structure usually need the laying of supporting elements like hot-worked rolled metal sections (IPE, HE, etc.), or of reticulated structures usually made of steel, that are then completed with panels and/or covering sheets (fig. 3).

When one need, for wide spans, a high moment of inertia to limit the under charge camber within normal limits, the weight for linear metre (and also the cost) of the hot-worked laminated is very high.

One can use reticulated structures designed for this purpose, thus obtaining higher rigidity and lightness, but this will raise the costs due to the complex manufacturing of the pieces.

It is also known the use of shaped self-bearing metal sheets, placed right-angled with respect to the primary structures, that constitute the support for the covering and, at the same time, the inner surface of the covering itself (see fig. 4).

These sheets however, with the height as they are usually on the market, allow the covering of openings to the extension of 3-5 metres, thus being not useful for wider spans.

This drawback is obviated by using high shaped metal sheets, sometimes higher than 200 mm, of the type as shown in fig. 5.

These solutions, quite unusual for the great investments needed to produce shaped sheets of this type but, above all, for the uncertain technical and economical result, show a high instability due to their high height/thickness ratio and their cost.

Because of the constant thickness in every part of the sheet, one has a lot of not useful material in the compressed parts and lacking of it in the parts really resistant.

Furthermore, if a pre-painted intrados is required, all the relevant development of the sheets should be painted with the consequent raising the costs.

These coverings usually don't need any ceiling.

While the limited-height shaped sheets of fig. 4 are a good solution for spans of 3-5 mt., a solution using very high shaped sheets seems not to be convenient.

In order to obviate the above drawbacks, the present invention proposes a building system in which the supporting structure of the roofing comprises a number of sheet purlins, preferably of the box-shaped type, that are fastened to the supporting beams of the building and are the support for covering panels as, e.g. shaped sheets or sandwich panels made of metal sheets and insulating material, that have the stiffening ribs right-angled with respect to the purlins.

In this way it is possible to adapt the supporting structure to the various load conditions by changing the interaxis between the purlins in order to share the weight among more or few elements.

It is then possible, with this solution, to use only a type of purlin for many situations, saving on the manufacturing costs.

The present invention will now be described in details, even if the invention is not limited to these examples, with reference to the figures in which:

- fig. 6 and 7 are sectional views taken along orthogonal planes, schematically showing a roofing made with the system in accordance with the invention;
- fig 8 is a partial perspective view of a supporting element in a building system according to the invention;
- fig 9 is the perspective, schematic view of a stiffening element used in the building system according to the invention;
- fig. 10 shows in a schematic way a particular of another preferred embodiment of a supporting element in a building system according to the invention.

Referring to figures 6 and 7, numeral 1 indicates the supporting structure of a building, while 2 indicates are the covering elements that can be panels, sheets or the like.

Structure 1 is generally made of a metal frame, e.g. "I"-shaped sections or reticular structures, but can also be made of building elements as reinforced concrete beams, supporting walls or the like.

Secondary structural elements, indicated with 3, are placed on the sections 1. These secondary ele-

ments are, according to the invention, made of bent and shaped sheet purlins, closed up at the bottom by a wall 4 clamped to the base, so as to form box-shaped supporting elements.

These purlins 3 are fixed to the supporting structure and are the supporting and fixing frame for the covering panels 2.

The distance among the purlins 3, according to a feature of the invention, depends on the bending moment acting on the roofing, which in its turn depends on the span and on the total load.

These purlins are placed on the supporting structure, at a distance near one to another depending on how wide is the span and/or how is the load on the covering, so as to vary the resistance without the need of using purlins having different height or/and thickness, but only varying the distance among these elements.

Fig. 8 shows a perspective view of the structure of one of these elements.

This structural element or purlin is preferably made of a shaped sheet supporting element and its section is an upside-down U, with two lateral walls 5, preferably diverging, connected with an upper wall 6.

The walls 5 have a number of ribs or the like 7 obtained by bending or drawing, that are made to reinforce the wall against the vertical loads, in order to avoid the risk of collapsing due to the peak load.

The upper wall 6 has a rib 8 along all the purlin, and a pair of ribs 9, deeper than the first one, obtained by bending the sheet that constitutes the supporting element.

The deep ribs 9 have both the purpose of reinforcing the purlin structure and of obtaining, without any hole, a number of seats for auto-threading screws used to fasten the covering panels to the obtained structure.

The walls 5 are bent at their base, both outside and inside, to form a pair of wings 10 having a double thickness, so as to obtain a wide support that also serves as stop means for the insertion of a closure element 11of the bottom. This is a bent sheet that is inserted on the wings 10 in order to obtain a box-shaped structure.

Said structure is made of these elements 5 and 11 and is easy and light to be handled and transported, ensuring a good rigidity and resistance to loads.

The seam between the bent walls 5 and the bottom closure element 11 could be completed by spreading a layer of a structural adhesive, for example of the type used in the aircraft industry, obtaining thus a monolithic body that will be able to better bear the stresses.

The bottom closure walls 11, that will be previously painted, could have a little rustication in order to reduce the light glares and improve the acoustic absorption.

The lateral edges of the wings 10 extend parallel to the walls 5, and at their end will have a little bent wing, shown as n. 12 in fig. 8, in which the fixing clips of the ceiling elements will be blocked.

According to another preferred embodiment, shown schematically in fig. 10, these wings could be obtained by extending to the top and then bending outside the edges of the closing wall 11.

It is also possible to provide for stiffening elements (one is shown in prospective view in fig 9) in order to improve the resistance to the shearing stresses of the purlins.

They must be inserted inside the purlin where it rests on the structure of the building.

These supports comprise preferably (even if it is not necessary) a pair of lateral sides 23 connected by a top beam 24 and by a bottom beam or basement 25.

These supports can be made of metal sheet or by any other suitable material.

The building elements according to the invention can be manufactured by a continuous process, shaping a sheet band by a burnishing-machine and by bending machine in order to obtain supporting elements that are then cut to fit and completed by applying the bottom closure wall 11, that is inserted around the little wings 10 of the elements.

Rigid box-shaped supporting elements are thus obtained; they are particularly light and can be easily transported and assembled.

These purlins are placed to the supporting structure of the building at the required distance to obtain the covering. The interaxis among the purlins depending on the load and on the space that must be covered is calculated by the usual methods, using also multiplication tables, diagrams, etc.

The covering is then completed by placing on these purlins the covering panels, with their ribs right-angled with respect to the purlins themselves.

The panels and the covering sheets are then locked preferably by screws 13 that are inserted into the ribs 9 (fig. 6).

The covering may be completed, where it is required, by a ceiling that can be made of panels, staves, shaped sheets, drilled or not etc. placed among the purlins, and that stand with their edges on the bottom outside bent wings 10, locked by clips or steel springs or the like indicated with number 14 in fig. 6, which are engaged in the ribs or in the outstanding edges 12 (fig. 3).

This system, as it keeps the zone among the contiguously purlins clear, allows us to use this space for the passage of equipment, cables etc. which are then covered with the ceiling elements.

This structure can also be completed with a gasket made of expanded polyurethane covered with a layer of adhesive, which may be applied to the wings 10 in order to cover the vibrations transmission.

We have thus obtained a covering easily adaptable to several building needs, which can cover wide spans and is cheap to be produced and easy to be transported and assembled.

Claims

1. Manufacturing system for making roofings for wide spans, characterised by the fact of providing a frame made of bent sheet purlins that are placed on the supporting structure of a building at a variable distance, and of covering elements that must be placed to said purlins.

2. Building system according to claim n. 1, characterised in that said purlins are placed at a distance one from the other that is a function of the span and of the load on said roofing.

3. Building system according to claim n. 1, characterised in that said covering elements are made of bent sheets or panels having their ribs right-angled with respect to the axis of said purlins.

4. Building system according to claim n. 1, characterised in that that said covering elements are made of single-sheet insulated panels.

5. Building system according to any of the previous claim, characterised by the fact that said purlins are box-shaped.

6. Building system according to claim 5, characterised in that said purlins are made of a bent sheet having a pair of lateral walls connected by an upper covering wall and by a bottom closure wall made of a sheet clamped or fastened to the base of said vertical walls.

7. Building system according to any of the previous claims, characterised by the fact that said purlins have their lateral walls bent to the outside so as to form a bearing surface that rests on the structure and at the same time forms elements around which said bottom closure sheet is bent.

8. Building system according to claim n. 7, characterised by the fact of providing the edges of the bottom sheet of said purlins bent and shaped as to form ribs, which can be engaged by flexible clips of the ceiling elements placed between the pairs of purlins.

9. Building system according to the previous claims, characterised in that said elements have, on their upper wall, some grooves obtained by some refolding on the sheet, which allow the insertion of screws for fastening the covering.

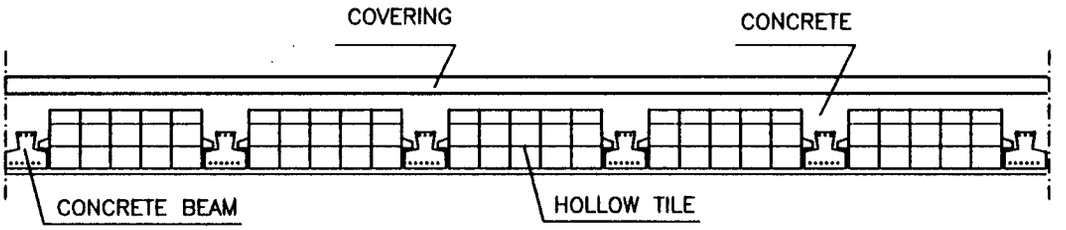

FIG. 1

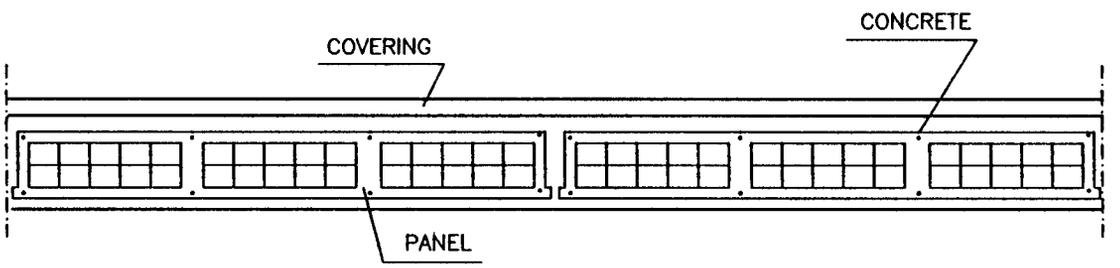

FIG. 2

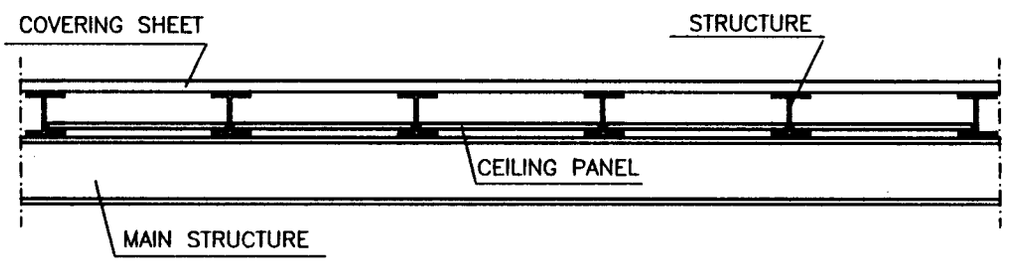

FIG. 3

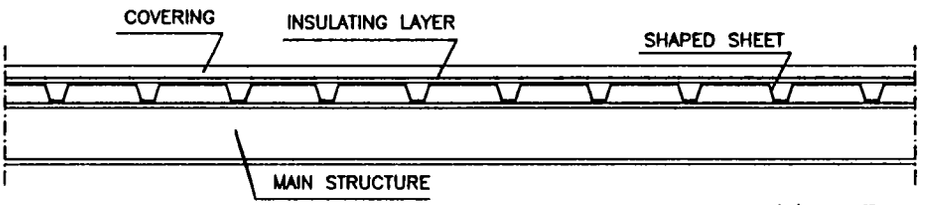

FIG. 5

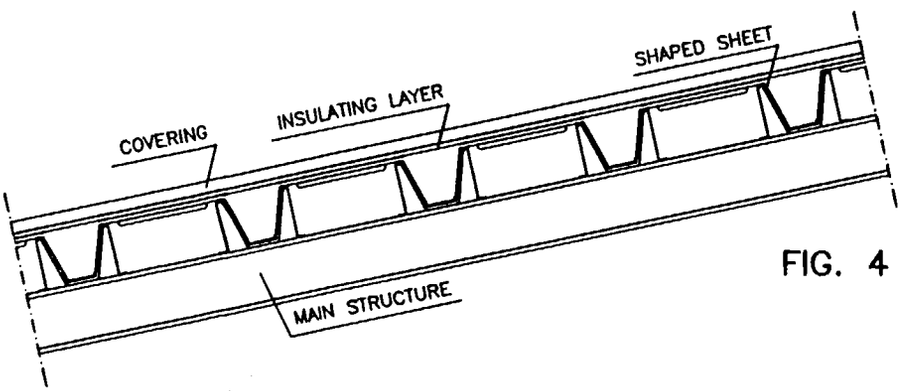

FIG. 4

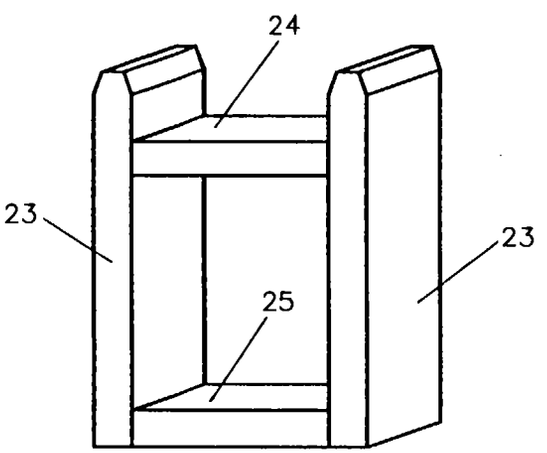

FIG. 9

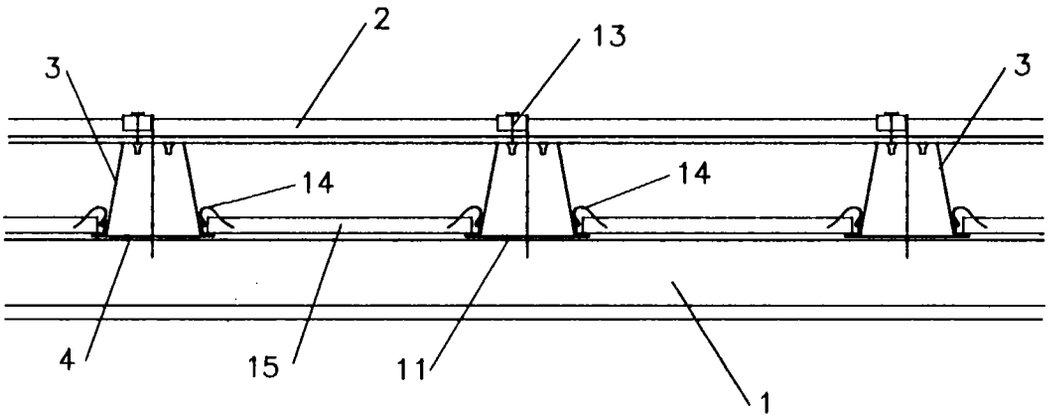

FIG. 6

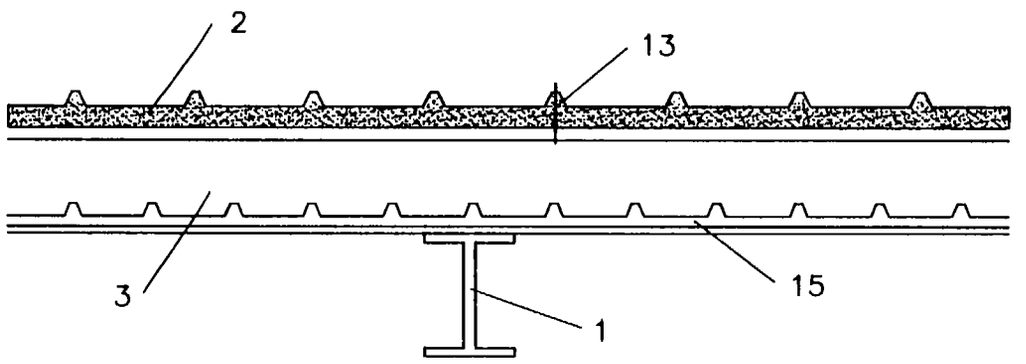

FIG. 7

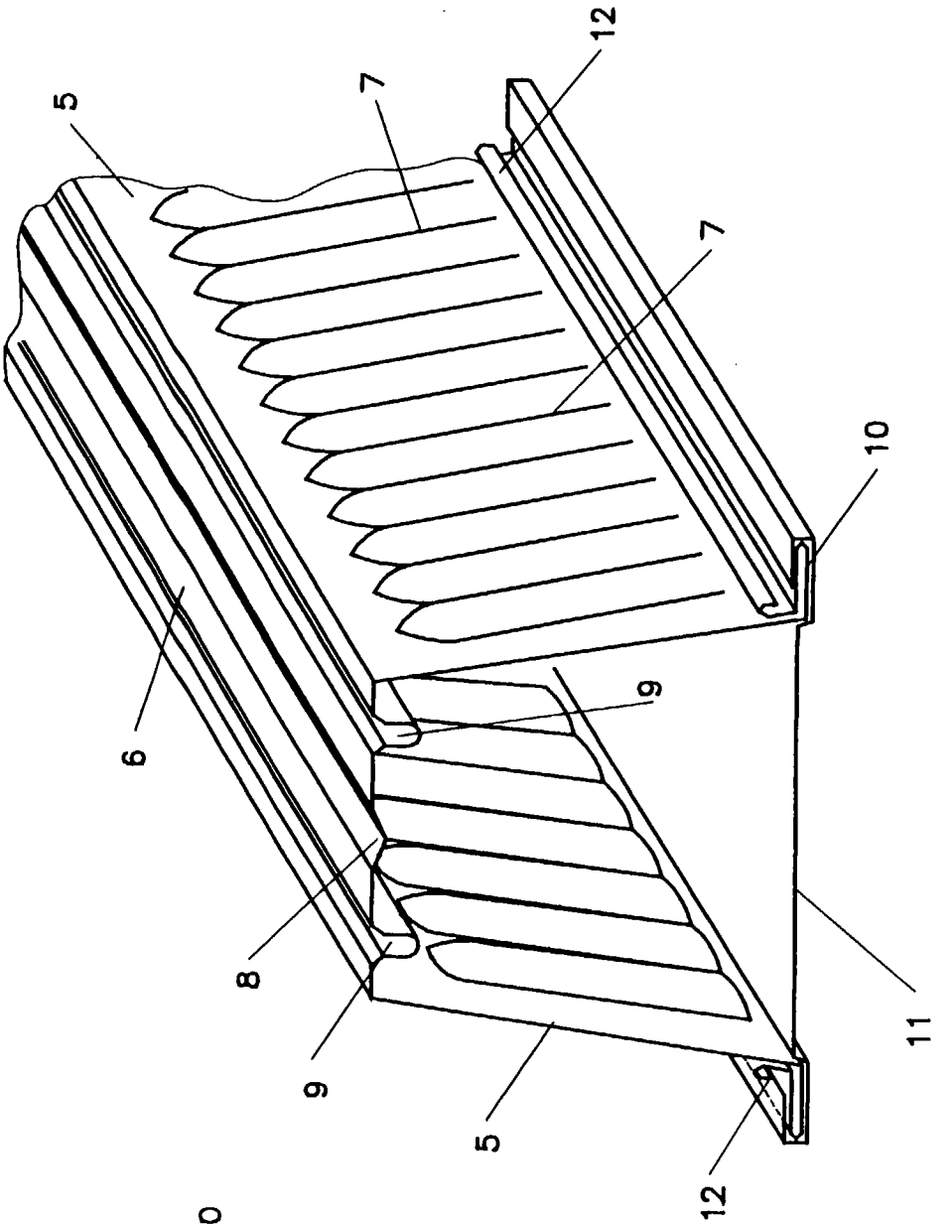

FIG. 8

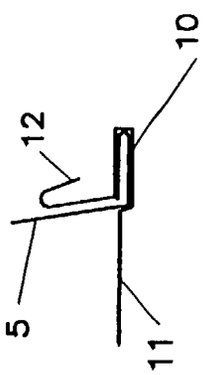

FIG. 10