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(71) Applicant: **ITALCASE PREFABBRICATI S.r.L.**
Via Benaco 90
I-25081 Bedizzole (Brescia)(IT)

(72) Inventor: **Bertelli Giancarlo**
Via Cure del Lino 96
I-25087 Salo(IT)

(74) Representative: **Modiano, Guido et al**
c/o Modiano & Associati S.r.l. Via Meravigli, 16
I-20123 Milano(IT)

(54) Covering device for buildings in general and for industrial and/or commercial buildings in particular.

(57) Covering device for buildings in general and for industrial and/or commercial buildings in particular, whose peculiarity resides in that it comprises side beams (1) which can be coupled to supporting pillars (2). The side beams define a ledge (3) for supporting roofing beams (4) which have a constant width with a central single ridge (5) and have a concave shape, in a cross-section taken transversely to the extrados, which delimits a V-shaped closed space together with the symmetrically curved sides (6, 7), and have a straight intrados and a flat extrados in a longitudinal cross-section taken along the median plane. The longitudinal edges of the roofing beams, which are provided with reinforcement ridges (9, 10), are spaced and arranged side by side, and curved roofing panels (11), constituted by composite plate-like elements arranged side by side, engage on the edges of the roofing beams. The roofing beams have, on their extrados, an insulating layer (12) and a waterproofing layer (13) which are factory-applied. The insulating layer and the waterproofing layer are laterally delimited by the lateral ridges of the edges and define, on the extrados, inclined surfaces whose slope varies and/or is constant from a median portion of the roofing beams toward their longitudinal ends.

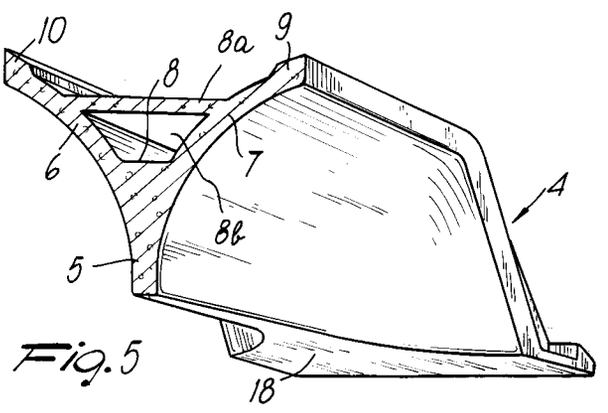

Fig. 5

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The present invention relates to a covering device for buildings in general and for industrial and/or commercial buildings in particular.

Prefabricated elements are currently used in the construction of industrial and/or commercial buildings in order to industrialize the construction of such buildings. Said prefabricated elements, and most of all the roofing beams with the related pillar-connecting supporting beams, have undergone great development in the recent past in order to decrease the amount of on-site work, improve the aesthetic appearance of said buildings and at the same time increase the weatherability and insulation of said buildings.

In preceding patent applications, the same Applicant has described various roofing beams, with related pillar-connecting supporting beams which considerably improved the current situation. Although they excellently perform their task, said roofing beams have some structural problems.

Said roofing beams are in fact too heavy, i.e. they require too much reinforced concrete for their manufacture; on one hand, this entails an excessive load on the pillar-connecting supporting beams, which limits the distance between the pillars to a maximum of 12 meters, and on the other hand constitutes a considerable hindrance to the transportation of said roofing beams on road vehicles. With roofing beams having spans in the range of 20-25 meters, there were in fact limited possibilities of transportation throughout the territory due to the excessive weight of each roofing beam.

Furthermore, the assembly system, which entailed a pillar-connecting beam with an H-shaped cross-section with supporting ledges for the ends of the roofing beam, is particularly sensitive, during the assembly of said roofing beams, to impacts due to the oscillations of said roofing beams which thus damage said pillar-connecting beam.

This damage obviously leads to additional on-site work for the necessary restoration of the damaged structures and/or surfaces.

Finally, said roofing beams required, during their manufacture, the insertion of metallic elements in their wings in order to fix, during the assembly of the covering, roofing panels connecting spaced roofing beams arranged side by side. Both the insertion of the metallic elements and the complicated assembly of said roofing panels entailed an increase in costs which affected the marketability of the product, i.e. of the prefabricated roof.

The aim of the present invention is to eliminate or substantially reduce the problems described above in known types of roofing beams by providing a covering device for buildings in general and for industrial and/or commercial buildings in particular which substantially reduces the weight of each roofing beam, thus increasing the transportability of said roofing beams for an equal span or length.

Within the scope of the above aim, an object of the present invention is to provide a covering device which eliminates any possibility of damage to the pillar-connecting beam during on-site assembly.

Another object of the present invention is to provide a covering device which eliminates the insertion of metallic elements for the fitting of the roofing panels.

Not least object of the present invention is to provide a covering device which is relatively easy to manufacture and at competitive costs.

This aim, these objects and others which will become apparent hereinafter are achieved by a covering device for buildings in general and for industrial and/or commercial buildings in particular according to the invention, characterized in that it comprises side beams which can be coupled to supporting pillars, said side beams defining a ledge for supporting roofing beams which have a constant width with a central single ridge, a concave shape in a cross-section taken transversely to the extrados and a straight intrados and a flat extrados in a longitudinal cross-section taken along the median plane, with longitudinal edges provided with reinforcement ridges, said roofing beams being spaced and arranged side by side and engaging curved roofing panels constituted by composite plate-like elements arranged side by side, said roofing beams having, on their extrados, an insulating layer and a waterproofing layer, said layers being factory-applied and being laterally delimited by said lateral ridges of said edges and defining, on the extrados, inclined surfaces whose slope varies from a median portion of said roofing beams toward their longitudinal ends.

Further characteristics and advantages of the invention will become apparent from the description of a preferred but not exclusive embodiment of a covering device for buildings in general and for industrial and/or commercial buildings in particular, according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is a perspective view of a covering device according to the invention;

figure 2 is a side elevation view of a roofing beam of the device according to the invention;

figure 3 is a bottom plan view of the roofing beam;

figure 4 is a front elevation view of a lightened head of the roofing beam;

figure 5 a perspective view of an end of the roofing beam;

figure 6 is a front elevation view of a tympanum;

figure 7 is a perspective view of the tympanum;
figure 8 is a side elevation view of the head of the tympanum;
figure 9 is a perspective view of a head of the roofing beam coupled to a lateral portion of the tympanum;
figure 10 is a transverse sectional view of the side beam with installed roofing beams which define a gutter for meteoric water drainage;
figure 11 is a transverse sectional view of an installed roofing beam;
figure 12 is a side elevation view of a form for roofing beams; and
figure 13 is a transverse sectional view of the roofing beam form.

With reference to the described figures, a covering device for buildings in general and for industrial and/or commercial buildings in particular comprises side beams 1 which can be coupled to supporting pillars 2. The side beams 1 define a ledge 3 for supporting roofing beams 4.

Each roofing beam 4 has a constant width with a single central ridge 5 and has, in a cross-section taken transversely to the extrados, as more clearly shown in figures 4 and 11, a concave shape defined by two wings 6 and 7 which extend from the single ridge 5 and which define and delimit, between them, a platform 8. It is furthermore possible to provide a flat arch 8a which joins the wings 6 and 7, delimiting a closed space 8b, thus obtaining greater inertia of the roofing beam.

The roofing beam 5 furthermore has, in a longitudinal cross-section taken along the median plane, a preferably straight intrados and a flat extrados, and the longitudinal wings or edges 6 and 7 have respective reinforcement ridges 9 and 10 which rise from the wings themselves.

The roofing beams, as more clearly shown in figure 1, are spaced and arranged side by side, and roofing panels 11 engage on the ridges 9 and 10 of the wings 6 and 7. Each roofing panel 11 has a curved shape and is constituted by composite plate-like elements.

Each roofing beam 4 has, on its extrados, i.e. on the platform 8 and on the wings 6 and 7, an insulating layer 12 and a waterproofing layer 13 which are both factory-applied; a polystyrene block 8c can furthermore be provided in the space 8b.

The insulating layer 12 and the waterproofing layer 13 are laterally delimited by the lateral ridges 9 and 10 of the wings 6 and 7 and define, on the extrados, inclined surfaces whose slope varies from a median portion of each roofing beam 4 toward its longitudinal ends or heads.

Each side beam 1 has, in a transverse cross-section and as shown in figure 10, a substantially omega-like shape with a lower groove 14 for coupling to a ridge 15 of a respective supporting pillar 1.

The wings 6 and 7 have, in a cross-section taken transversely to the extrados of the respective roofing beam 4, a radius of curvature which is constant along the entire longitudinal extension, thus simplifying manufacture, as more clearly explained hereinafter.

Each roofing panel 11 can be fixed to the respective reinforcement ridge 9 or 10 by virtue of fixing means, such as nails 16, screws and the like, advantageously simplifying the assembly operations, as will become apparent hereinafter.

Each roofing beam 4 has, at its ends, lightened heads 17 which have lower surfaces 18 for resting on the respective ledges 3 of the side beams 1. The lower resting surfaces 18 are constituted, as more clearly illustrated in figures 3 and 5, by expansions of the single ridge 5.

Each head 17 has a sloping shape, as illustrated in figures 2, 9 and 10, in order to improve meteoric water drainage. The sloping shape of the heads 17 defines an acute angle together with the lower surface 18.

Each lightened head 17 has, in a median portion, recesses 50 of metallic devices used to vertically store and transport stacked roofing beams and has, along its lateral edges, accommodation seats 19 for ridges 20, shaped complementarily with respect to the accommodation seats 19, which extend from longitudinal ends of a respective tympanum 21.

The tympani 21 are also supported by the side beams 1 and are interposed between ends of spaced roofing beams 4 arranged side by side, as more clearly illustrated in figure 1.

Each tympanum has a base 22 for resting on the respective side beam 1, from which a central slab-like body 23 rises; the ridges 20 extend from the longitudinal ends of said body, which has a curved upper edge. The central slab-like body 23 defines, together with the resting base 22, an acute angle whose breadth is equal to the one delimited by the head 17.

The upper curved edge of the tympanum 21 has a radius of curvature which is equal to the one of the roofing panels 11. A curved plate-like element 24 extends from said upper edge and has, on a free edge, a stiffening ridge 24a. The extrados of the roofing panel 11 adheres on the latter, which delimits the insulation 12 and the waterproofing 13; said extrados can be fixed, for example by means of nails and the like, as previously shown for the ridges 9 and 10 of the roofing beam 4.

Each roofing beam 4 has a width of approximately 1.20 meters and a length comprised between 12 and 26 meters, while its height is comprised between 0.93 and 0.96 meters.

In order to manufacture the above described

roofing beams, a roofing beam form is used which comprises a base frame, defined by means of segments 25 which can be joined in order to obtain preset lengths of roofing beams 4. Movable heads 26 are fixed to the frame. The entire form is in contact with a supporting surface by means of shock-absorbing feet 27.

Means for the movement of an elongated longitudinally extended filler body 29 are movably associated on a first wall or side 28 of the base frame; said filler body penetrates within the form and can be rigidly coupled to a second wall or side 30 of the frame.

The filler body 29 defines, in cooperation with curved ribs 31 supported by cross-members 32 and mechanically supported by pressers 33, the concave shape, as previously described, in the roofing beams 4 in a cross-section taken transversely to the extrados.

The filler body 29 in fact has surfaces which penetrate within the form and have a convex shape which is complementary to the concave shape of the roofing beam. The ribs 31 are mechanically loaded in order to counterbalance the thrusts of the concrete and transmit vibration during the casting step. The filler body 29 is loaded by means of the snap-action traction element 37 which has a neutral point. Furthermore, when the flat arch 8a is produced, the block 8c is inserted beforehand and is kept in position by spacers which are connected either to the filler body or to the reinforcement frame.

The movement means comprise a piston-and-cylinder unit 34 which is pivoted to a lower portion of the base frame. The piston 35 of the unit 34 is instead pivoted to a bar 36 which extends from a lateral edge of the filler body 29 which is pivoted to the first side 28. The filler body 29 is fixed to the second side 30 for example by means of the traction element 37 which is fixed to the edge of the filler body which engages a hook 38 which is fixed to the second side 30.

The radius of curvature of the ribs 31 and the walls of the filler body 29 is such as to keep constant the radius of curvature of the wings of the roofing beam 4 along its entire longitudinal extension. Furthermore, the filler body 29, and most of all its above described movement means, allow to extract the filler body 29 from the form without altering in any way the wing of the roofing beam 4 which is on the side of the snap-action traction element 37 of the filler body.

During assembly, assuming that both the supporting pillars 2 and the side beams 1 are already prepared, a first roofing beam 4 is initially arranged on said beams, followed by a second roofing beam 4 at a preset distance and parallel to the preceding one. The tympani 21 are then inserted on the heads 17 of the roofing beams 4, making the ridges 20 enter the respective accommodation seats 19. Finally, the roofing panels 11 are arranged between the two roofing beams 4 and are nailed to both ridges 9 and 10 of the respective roofing beams 4.

Assembly naturally proceeds, even following a sequence which is different from the one described, until the covering is completed. For the execution of the drainage channels at the side beams 1, let us consider by way of example the channel shown in figure 10. Here, the drainage channel is defined by depositing a mat 39 of insulating material on both heads 17 and by then covering a portion of the beam 1, which is left uncovered by the mutually facing roofing beams 4, with another mat 40 of insulating material. The mats 39 and 40 are finally covered with a layer 41 of waterproofing material which forms, together with the waterproofing layer 13, a continuous waterproofing layer on the entire surface of the covering.

It has been observed that the invention achieves the intended aim and objects, advantageously modifying the shape of the roofing beams in order to simplify their manufacture and installation, furthermore lightening them in order to improve their transportability and thus increase the commercial range of action of a factory for the production of such roofing beams.

Finally, the lower weight allows to increase the distance of the pillars to 15-16 meters.

The invention thus conceived is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept. All the details may furthermore be replaced with other technically equivalent elements.

In practice, the materials employed, as well as the dimensions, may be any according to the requirements.

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 scope of each element identified by way of example by such reference signs.

Claims

1. Covering device for buildings in general and for industrial and/or commercial buildings in particular, characterized in that it comprises side beams (1) which can be coupled to supporting pillars (2), said side beams defining a ledge (3) for supporting roofing beams (4) which have a constant width with a central single ridge (5), a concave shape in a cross-

section taken transversely to the extrados and a straight intrados and a flat extrados in a longitudinal cross-section taken along the median plane, with longitudinal edges (6, 7) provided with reinforcement ridges (9, 10), said roofing beams being spaced and arranged side by side and engaging curved roofing panels (11) constituted by composite plate-like elements arranged side by side, said roofing beams having, on their extrados, an insulating layer (12) and a waterproofing layer (13), said layers (12, 13) being factory-applied and being laterally delimited by said lateral ridges (9, 10) of said edges (6, 7) and defining, on the extrados, inclined surfaces whose slope varies from a median portion of said roofing beams toward their longitudinal ends.

2. Covering device according to claim 1, characterized in that it comprises a flat arch (8a) which joins said longitudinal edges (6, 7) and delimits a perimetrically closed space (8b).

3. Covering device according to the preceding claims, characterized in that said side beams (1) have, in transverse cross-section, a substantially omega-like shape with a lower groove (14) for coupling to a ridge (15) of said supporting pillars (1).

4. Covering device according to the preceding claims, characterized in that said concave shape of the cross-section taken transversely to the extrados of said roofing beams has a constant radius of curvature along its longitudinal extension.

5. Covering device according to one or more of the preceding claims, characterized in that said roofing panels (11) can be fixed, by virtue of fixing means, to said lateral ridges (9, 10) of said longitudinal edges (6, 7).

6. Covering device according to one or more of the preceding claims, characterized in that each roofing beam (4) has, at its ends, lightened heads (17) which have surfaces (18) for resting on said side beams (1) which are constituted by expansions of said single ridge (5).

7. Covering device according to one or more of the preceding claims, characterized in that said lightened heads (17) have a sloping shape suitable to improve the drainage of meteoric water.

8. Covering device according to one or more of the preceding claims, characterized in that said lightened heads (17) have, along respective lateral edges, accommodation seats (19) for longitudinal ends (20), shaped complementarily thereto, of tympani (21) which are supported by said side beams (1) and which are interposed between ends of spaced roofing beams (4) arranged side by side.

9. Covering device according to one or more of the preceding claims, characterized in that it comprises a polystyrene block (8c) accommodated within said closed space (8b).

10. Covering device according to one or more of the preceding claims, characterized in that said roofing beams (4) have a width of substantially 1.20 meters and a length comprised between 12 and 26 meters.

11. Covering device according to one or more of the preceding claims, characterized in that said roofing beams (4) have a height comprised between 0.93 and 0.96 meters.

12. Roofing beam form, characterized in that it comprises a base frame, which can be provided by means of segments (25) which can be joined in order to reach preset lengths of roofing beams (4), and to which movable heads (26) can be fixed, said movable heads being fixable to said base frame, said base frame supporting means for the movement of a filler body (29) which extends longitudinally, which is movably associated with a first wall (28) of said frame, and which can be rigidly associated with a second wall (30) of said frame, said filler body (29) being suitable to define a concave shape in said roofing beams in a cross-section taken transversely to the extrados.

13. Roofing beam form, according to claim 10, characterized in that said movement means comprise a piston-and-cylinder unit (34) which is pivoted to a lower portion of said base frame, the piston of said unit being pivoted to a lateral edge of said filler body.

Fig.1

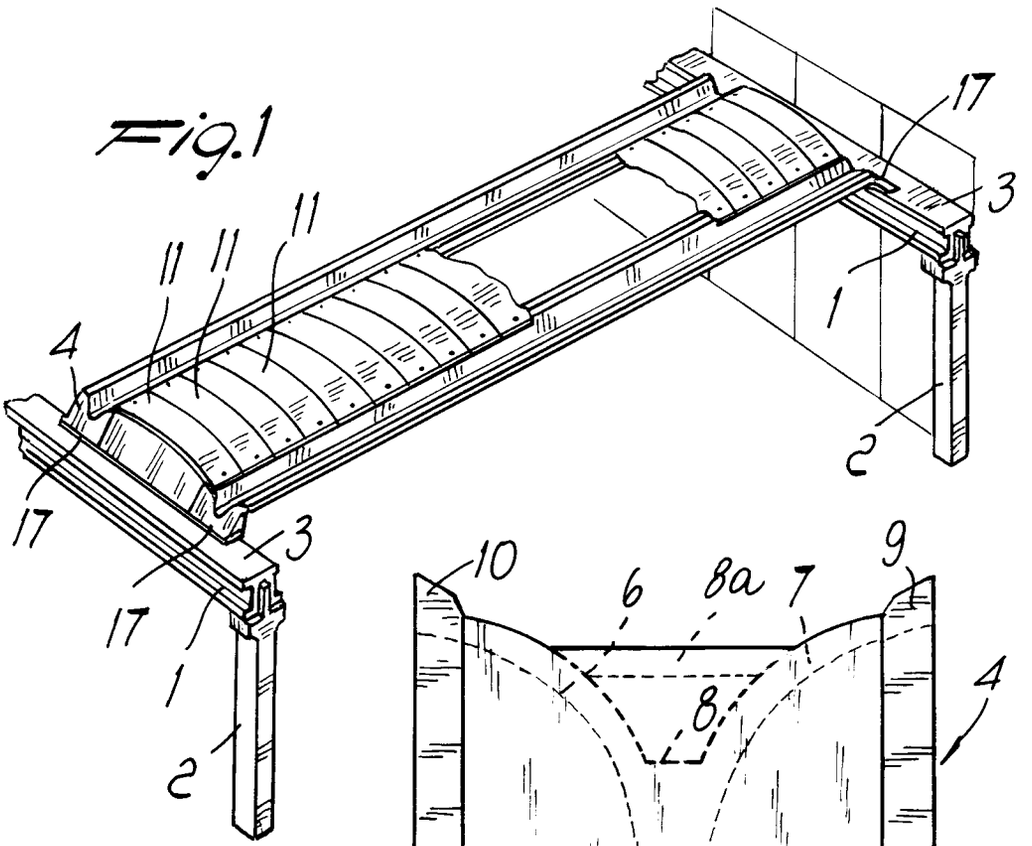

Fig.4

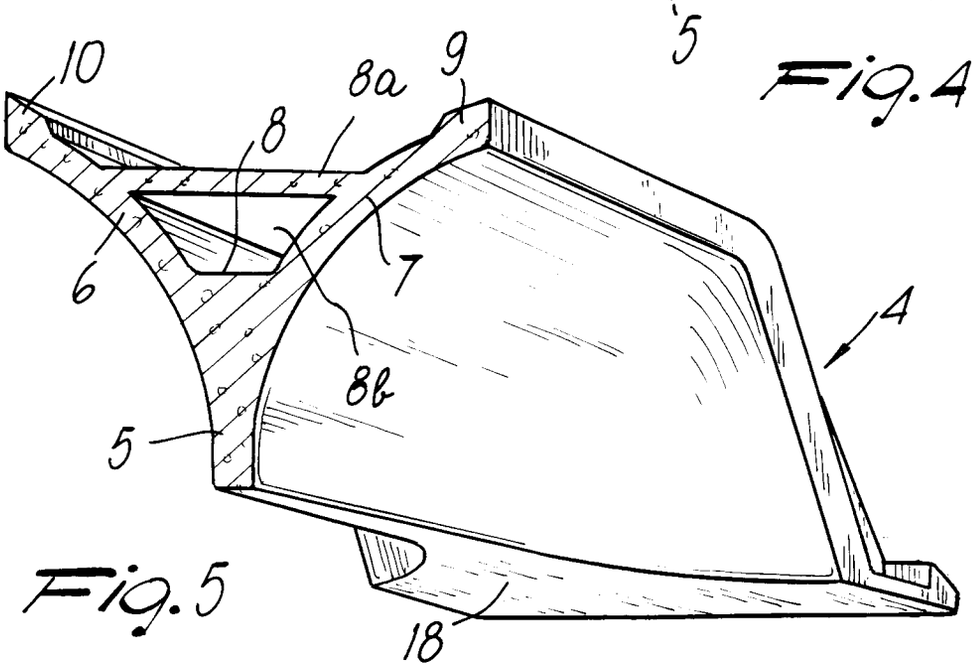

Fig.5

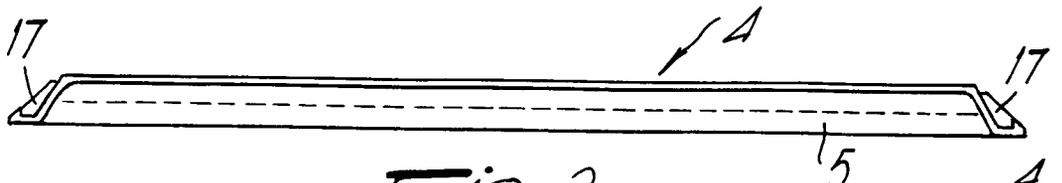

Fig. 2

Fig. 3

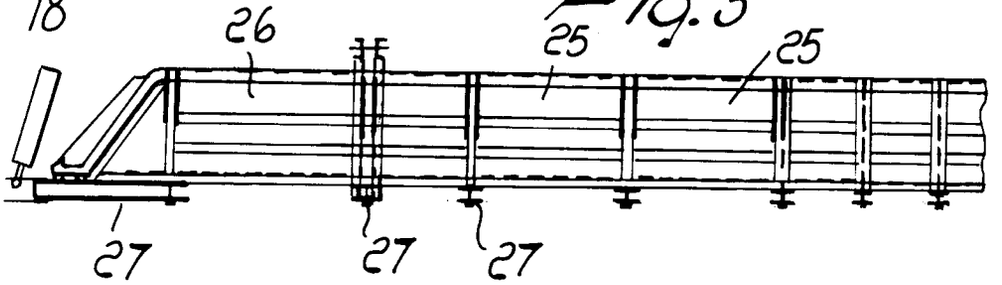

Fig. 12

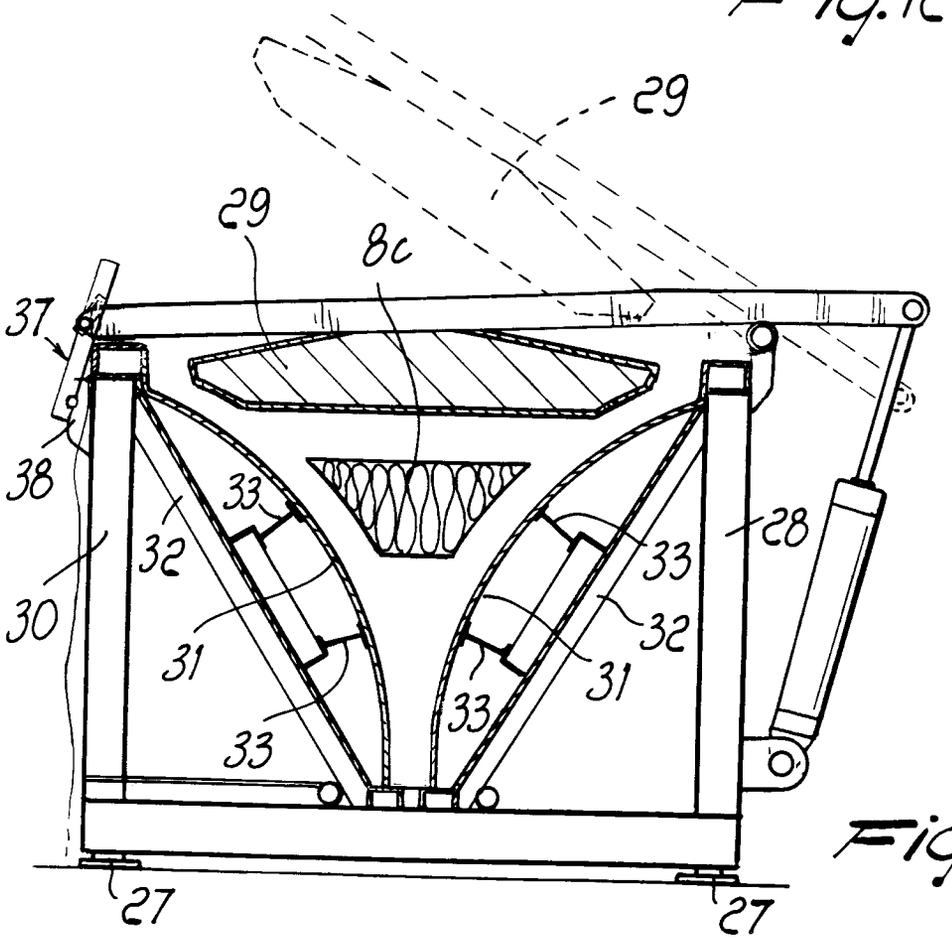

Fig. 13

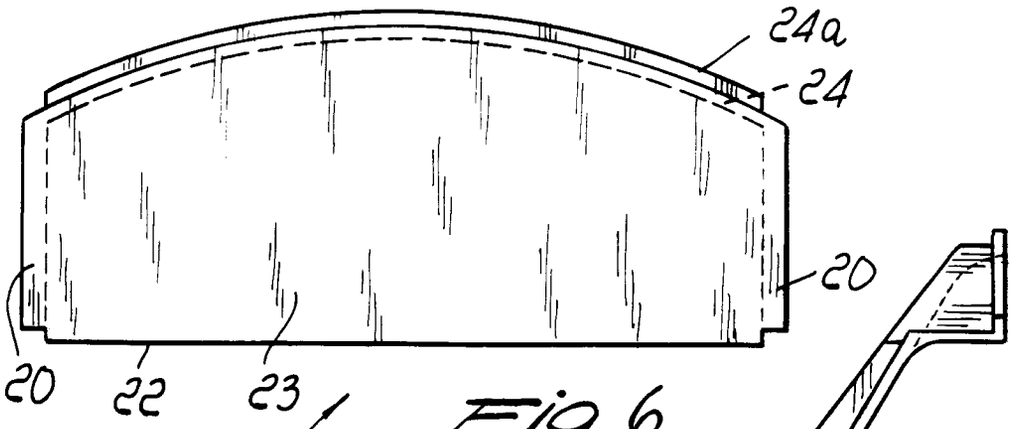

Fig. 6

Fig. 8

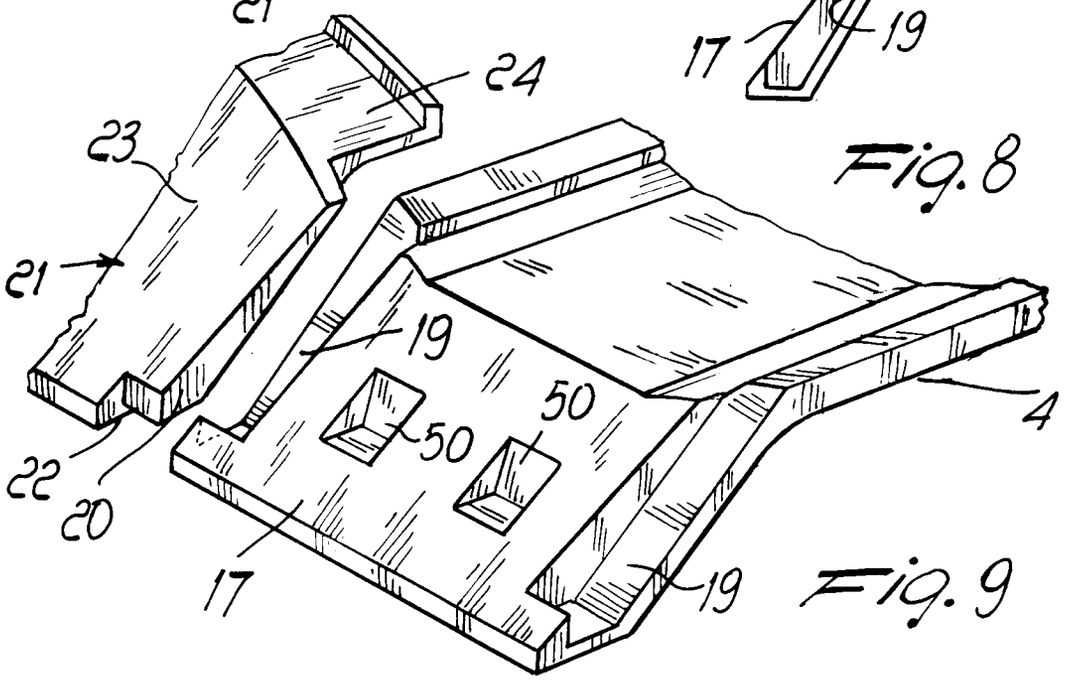

Fig. 9

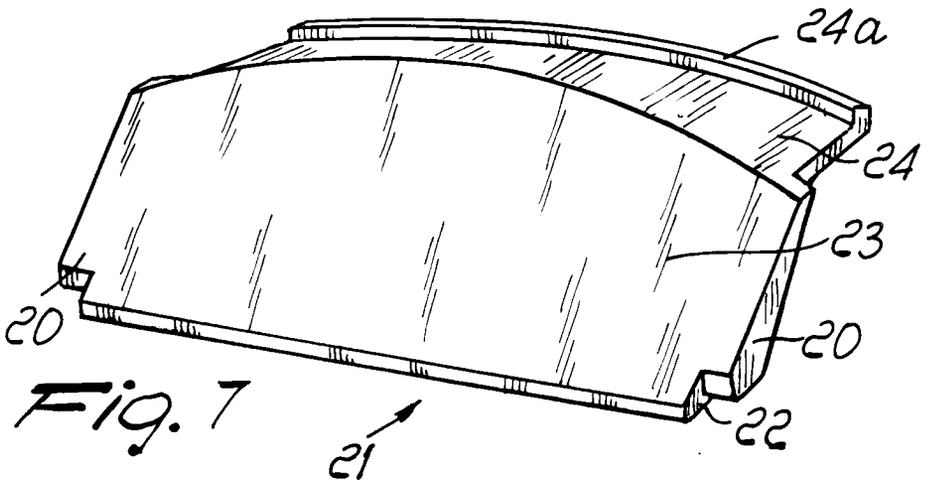

Fig. 7

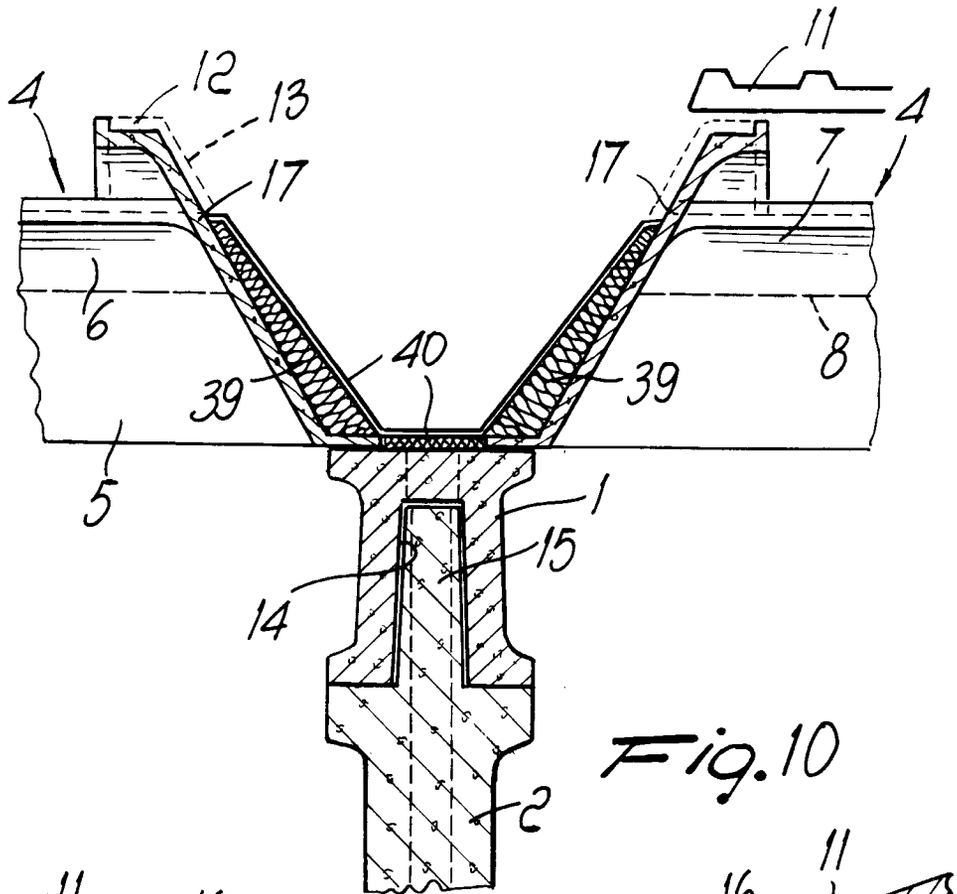

Fig. 10

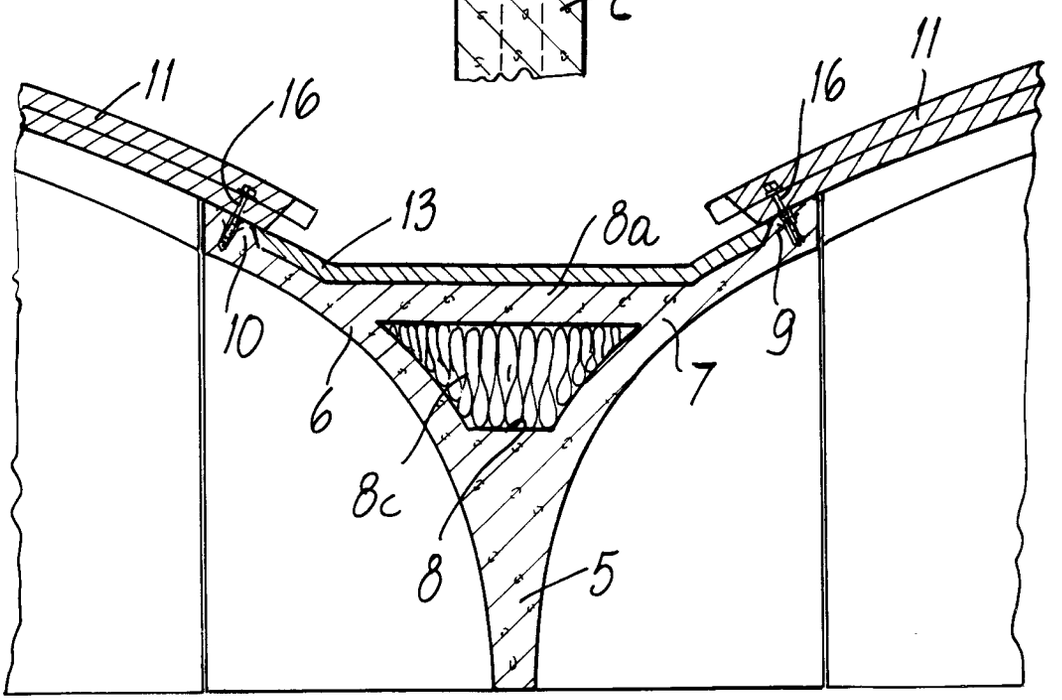

Fig. 11

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 92 11 0986

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X Y	EP-A-0 250 020 (DLC S.R.L.) * column 2, line 40 - column 3, line 30; figures 1-5,10 *	1,3-8, 10,11 2,9	E04B7/10 E04B7/12
X	DE-U-9 014 654 (RDB NORD S.P.A.) * page 10, line 4 - line 19; figures 1,3-5,7,8 *	1,3-7, 10,11	
Y A	FR-A-2 514 803 (G. BARACCHI) * page 3, line 4 - page 4, line 38; figures *	2,9 1,4-7, 10,11	
Y A	FR-A-2 654 134 (LARCO S.B. S.P.A.) * page 3, line 23 - page 5, line 14; figures *	12,13 1,4-7	
Y	FR-A-2 652 111 (RDB S.P.A.) * page 4, line 10 - page 5, line 32; figures 1-5 *	12,13	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			E04B B28B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	05 OCTOBER 1992	RIGHETTI R.

CATEGORY OF CITED DOCUMENTS

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