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(54) Title: WALL ELEMENT

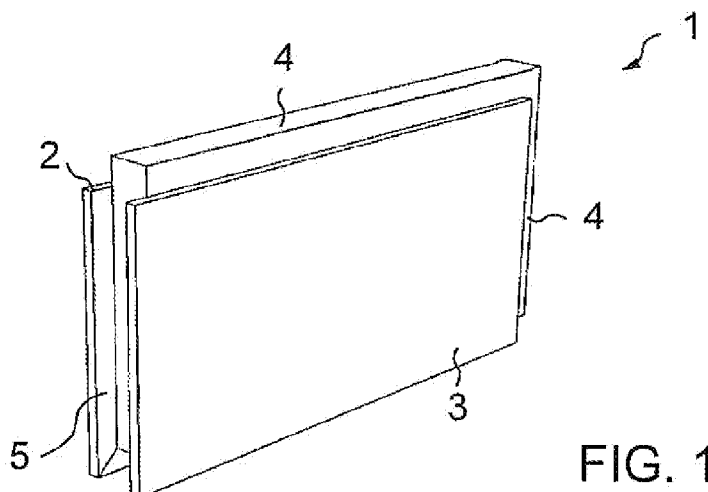


FIG. 1

(57) Abstract: The present invention relates to a wall element (1) comprising: a first plate (2), a second plate (3) and an insulation material layer arranged between the first and the second plates, and a rabbet (4, 5) arranged on the edge of the wall element. In order to provide a wall element that is easy to use there is arranged a rabbet (4, 5) on all edges of the wall element (1) and in order to provide a wall element that bears at least itself said rabbet (4, 5) is provided from the first plate (2) and the second plate (3) to a separate support frame consisting of one or more parts, which are placed on all edges of the wall element (1).

WALL ELEMENT

FIELD OF THE INVENTION

[0001] This invention relates to a wall element which may be utilized in assembling a wall or a part of a wall in a building.

DESCRIPTION OF PRIOR ART

[0002] Previously is known a wall element comprising a first plate and a second plate and an insulation material layer sandwiched between these plates. In upper and lower edges of this wall element there is arranged a rabbet, for instance, a female rabbet in the lower edge and a male rabbet in the upper edge. In this wall element consisting of steel sheets, the rabbets are provided by shaping the ends of the steel sheets. Hence, a wall of a building may be assembled by superimposing a plurality of these wall elements such that the rabbets of the upper and lower edges become against one another. In lateral direction, the wall elements are mounted against one other such that the lateral edges without rabbets are placed against one another. The superimposed and the adjacent wall elements are secured to separate vertical columns that bear the wall consisting of wall elements and keep the ends of the adjacent wall elements in place against one another.

[0003] The above prior art wall element has a drawback that it is cumbersome to use in construction, and moreover, the wall element limits the shaping of a wall.

[0004] In practice, at the joint of the adjacent wall elements there is needed a vertical column to which the adjacent wall elements are secured for being supported and for keeping their ends arranged against one another in place. Consequently, the mounting locations of the vertical columns determine the sizes of the required wall elements and all wall elements have to be dimensioned such that they extend between two vertical columns. To cover the joints between the adjacent wall elements there is necessary to provide vertical mouldings that greatly affect the appearance of the wall. Because the size of the wall elements is dependent on the locations of the vertical columns, as described above, openings for windows and doors, as required in the building, have to be cut in finished wall elements on the construction site, or customized during manufacture.

SUMMARY OF THE INVENTION

[0005] The object of the present invention is to solve the above-described problem and to provide a wall element the utilization of which is more flexible and more economical and which allows greater freedom to shape the appearance of the wall in a desired manner. This is achieved by a wall element of independent claim 1.

[0006] The invention utilizes a support frame that is separate from a first and a second plate and that consists of one or more parts arranged on all edges of the wall element. Thanks to the support frame, the wall element becomes at least self-bearing, i.e. it is capable of bearing, in addition to itself, at least the weight of a wall element or wall elements arranged thereon. By manufacturing the support frame of metal, plastic or composite material, it is possible to provide a wall element that is dimensionally accurate, weather-resistant and sturdy.

[0007] In the support frame there is also formed a rabbet for all edges of the wall element. Thus, at the joints between the adjacent wall elements there will be no need for vertical columns to keep in place the edges of wall elements arranged against one another, nor mouldings. Because separate vertical columns are not needed to support the wall elements, either, the end result will be a solution in which the size of the wall elements may vary more freely than before to provide a desired shape for the wall. Along with the wall elements of various sizes it will also be possible to provide the required window and door openings in the wall by employing elements of appropriate sizes, whereby the number of openings to be produced by cutting on the construction site or during manufacture can be minimized.

[0008] Preferred embodiments of the wall element in accordance with the invention are disclosed in the attached dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] In the following the invention will be described in greater detail, by way of example, with reference to the attached drawings, in which

Figure 1 shows a first embodiment of a wall element;

Figures 2 and 3 illustrate a support frame;

Figure 4 illustrates parts of the wall element;

Figures 5 and 6 illustrate how to form walls out of wall elements;

Figure 7 illustrates a corner joint between wall elements; and

Figure 8 illustrates how to form a wall out of wall elements.

DESCRIPTION OF AT LEAST ONE EMBODIMENT

[0010] Figure 1 shows a first embodiment of a wall element 1. The wall element 1 of Figure 1 includes a first plate 2, a second plate 3 and an insulation material layer 10 sandwiched between the plates (Figure 4).

[0011] On all edges of the wall element 1 there is provided a rabbet arrangement, whereby in the example of Figure 1 on the upper edge and right edge there is arranged a male rabbet 4, and on the lower edge and left edge a female rabbet 5. The wall element 1 may thus be connected on all sides to another similar element such that the male rabbets and the female rabbets hold the opposite edges in place. Between the wall elements, at the male rabbet-and-female rabbet joints, it is possible to arrange sealing material so as to provide a tight wall.

[0012] The positioning of the rabbets, as shown in Figure 1, such that identical rabbets meet in the corners (male rabbets 4 in the upper right corner and female rabbets 5 in the lower left corner) is advantageous in the sense that in that case it is possible to use the wall element of Figure 1 in the horizontal position as shown in Figure 1, or alternatively in the vertical position, in which it is rotated 90 degrees from the position of the figure. In that case, irrespective of the position, the wall element may be turned such that there is always a right match in the right location. However, it is always conceivable, in accordance with the invention, that identical rabbets are on the opposite edges of the wall element, or that there are wall elements of two types, i.e. such where all rabbets are female rabbets and such where all rabbets are male rabbets.

[0013] Figures 2 and 3 illustrate a support frame that may be utilized in the wall element of Figure 1.

[0014] In the case of Figure 2 it is assumed that a support frame made of plastic or composite material is concerned. The composite material may then include, for instance, glass fibre, carbon fibre, aramid fibre, polymer fibre or other suitable fibre material. In that case the support frame may be fabricated by utilizing pultrusion, whereby it is possible to provide a continuous profile that may be subsequently cut into pieces of appropriate size, or alternatively partly cut and bent at suitable points.

[0015] In the case of Figure 2 the support frame consists of multiple parts, i.e. it includes two support frame parts 6, which are provided with male rabbets 4, and two support frame parts 7, which are provided with female rabbets 5. In connection with the assembly of the wall element 1 the support frame parts 6 and 7 may be interconnected, for instance, by screwing, riveting or gluing. Alternatively, if the first plate 2 and the second plate 3 to be used are sufficiently sturdy, the support frame parts 6 and 7 need not be interconnected, but it will suffice that they are secured to the first plate 2 and the second plate 3, for instance, by screwing, riveting, gluing or using some other known and applicable securing methods.

[0016] In the case of Figure 3 it is assumed that a support frame made of metal, such as steel or aluminium, is concerned. An alternative is a support frame made of profiled thin metal, whereby the wall thickness of the steel sheet used may be, for instance, 0.5 to 10 mm.

[0017] Also in Figure 3 it is assumed, by way of example, that a multiple-part support frame is concerned, the support frame including support frame parts having a male rabbet 4' and support frame parts having a female rabbet 5'. The male rabbets and female rabbets may be fabricated in the support frame, for instance, directly by extruding of aluminium, or alternatively, for instance, by forming a steel sheet, whereby roll forming or edging may be applicable, for instance.

[0018] In the case of Figure 3, the support frame is provided with openings 8 intended to prevent creation of cold bridges, i.e. to reduce heat leakages through the wall element from one side of the wall element to the other. Corresponding openings may also be utilized in the embodiment of Figure 2.

[0019] In the examples of Figures 2 and 3 it is shown that the cross section of the support frame is mainly C-shaped, which contributes to obtain a rigid support frame in relation to the weight, and additionally, a space for insulation material, which at least in the case of the male rabbet profiles extends inside the support frame. However, the C-shape is not necessary, but the support frames having some other cross sections may also be utilized.

[0020] Unlike in the exemplary cases of Figures 2 and 3, it is also conceivable that the support frame is embossed so as to increase its rigidity.

[0021] Figure 4 illustrates parts of the wall element 1 shown in Figure 1, for instance. The support frame, whose support frame parts 6 and 7 are

here shown interconnected, by way of example, is arranged in place on top of the first plate 2 in the figure. In accordance with Figure 4, the insulation material layer 10 to be arranged inside the support frame may consist of mineral wool, rock wool or polyurethane plate, for instance. Instead of a plate, it is alternatively possible to use insulation material that is injected into place, such as polyurethane foam. In the case of Figure 4, a second plate 3 is on top of the support frame and the insulation material layer 10. The first and the second plates may be secured to the support frame, and optionally also to the insulation layer, by screwing, riveting or gluing, for instance. In the embodiment of Figure 4, the support frame 6 and 7 is thus placed at least partly between the first plate 2 and the second plate 3 on all edges of the wall element. In all embodiments, however, the support frame need not be located between the first and the second plates, but the plates may be arranged inside the support frame, if only the support frame is shaped to allow this kind of mounting.

[0022] Depending on the intended use of the wall element, the plate materials may vary and there may be more plates than what is shown in Figure 4. Applicable plate materials for the inner surface of the wall element include gypsum boards, chipboards, wood panels and metal sheets (e.g. steel sheets). On the outer surface of the wall element, in turn, it is possible to use a metal sheet (e.g. steel sheet) or wood panel, for instance. In case an external wall element is concerned, the wall element may include a wind shield board and a vapour barrier. The number of plates secured to the wall element may thus be more than two. At least one of the plates in the wall element (e.g. the steel sheet) may be shaped to enhance load-bearing capacity.

[0023] At least one of the first and the second plates may also be made of flexible material. The material concerned may then be a plastic sheet, such as PVC (polyvinyl chloride) or a gauze-type fibrous fabric that may be stored wound on a roll, until the plate material is unrolled in connection with manufacturing.

[0024] In accordance with the invention, the wall element is at least self-bearing. i.e. it is capable of bearing, apart from itself, at least the weight of a wall element or wall elements arranged on top of it. However, with appropriate dimensioning and selection of materials of the support frame and/or the plates it is possible to provide a wall element that bears, in addition to itself and the wall elements arranged on top of it, also other parts of the building. In that

case, these other parts of the building may include one or more intermediate floors and roof structures.

[0025] Figures 5 and 6 illustrate how to form walls constructed of wall elements.

[0026] Figure 5 shows three wall elements of Figure 1, of which the leftmost is turned to be in vertical direction and two elements on the right to horizontal direction. It appears from Figure 5 that the height h and the width w of the rectangular wall element 1 are selected in this example such that the height h of the wall element 1 equals to the width w of one or more similar wall elements, or that the width w of the wall element equals to the height h of one or more similar wall elements. The height refers here to the length of the longer edges of the rectangular wall element and the width refers to the length of the shorter edges.

[0027] Because the wall element 1 is provided with rabbets on all edges as described above in Figure 1, the vertically placed wall element may be connected to horizontally turned elements by means of the rabbets without having to use mouldings over the joints. No separate columns for bearing the elements are needed either, because the wall elements 1 are at least self-bearing, i.e. in addition to themselves, they bear at least the weight of the wall element or wall elements arranged on top of them. In addition thereto, appropriate dimensioning of the wall elements enable them to bear also intermediate floors and roof structures of the building, whereby a load-bearing wall element is concerned.

[0028] Figure 6 illustrates a part of a building assembled of wall elements. By utilizing wall elements that are provided with rabbets on all sides, mutually different in size, and turned mutually to different positions, it is possible to provide openings required in a building for windows and doors, for instance, whereby it will not be necessary to cut openings for them on the construction site. Consequently, installation work on the construction site becomes considerably easier and faster.

[0029] Figure 7 illustrates a corner joint between wall elements. It is possible that despite the load-bearing capability of the wall element at some points the wall elements are to be secured to the vertical columns. In that case, for instance, in the corner of two walls it is possible to utilize a corner column 12 of Figure 7, to which the wall elements 1 are connected by means of rab-

bets and thereafter they are secured to the corner column by screwing, for instance.

[0030] Figure 8 illustrates how to form a wall constructed of wall elements. In the case of Figure 8, a rectangular wall element has modular dimensions such that the height h of the wall element is a multiple of a basic module of predetermined measurement, and the width w of the wall element is a multiple of the same basic module of predetermined measurement. In other words, if the predetermined measurement of said basic module is 100 mm, for instance, the height h of the element is, for instance, 300 mm, 600 mm, 1200 mm...4800 mm, etc., and correspondingly, the width w of the element may be 300 mm or 600 mm, for instance.

[0031] The above-mentioned modular dimensioning permits great freedom of using wall elements of mutually different sizes in the wall assembly, as appears in Figure 8. Thus, the appearance of the wall is not dependent on the locations of the vertical columns or on the mouldings, which need not necessarily be utilized, thanks to rabbets on all sides. In addition, this allows mass production of wall elements, because wall elements need no longer be customized and produced to fit a particular use.

[0032] It is described above, by way of example, that the wall element is rectangular. This is not necessary, however, but it is also conceivable that the wall element is fabricated to have some other shape. An alternative is to replace a single rectangular wall element by two triangular wall elements, whose outer dimensions, when interconnected through rabbets, equal to the outer dimensions of said single rectangular wall element.

[0033] It is to be understood that the above description and the relating figures are only intended to illustrate the present invention. It will be obvious to a person skilled in the art that the invention may be modified and changed in a variety of ways without deviating from the scope of the invention.

CLAIMS

1. A wall element (1) comprising:
a first plate (2), a second plate (3) and an insulation material layer (10) arranged between the first and the second plates, and
a rabbet (4, 5; 4', 5') arranged on the edge of the wall element,
c h a r a c t e r i z e d i n
that a support frame (6, 7) is made of metal, plastic or composite material,
that on all edges of the wall element (1) there is arranged a rabbet (4, 5; 4', 5') and
that in order to provide an at least self-bearing wall element said rabbet (4, 5; 4', 5') is provided from the first plate (2) and the second plate (3) to the separate support frame (6, 7) consisting of one or more parts (6, 7) that are arranged on all edges of the wall element (1).
2. The wall element of claim 1, c h a r a c t e r i z e d i n that said wall element (1) is an external wall element including a wind shield board and a vapour barrier.
3. The wall element of claim 1 or 2, c h a r a c t e r i z e d i n that at least one of said first (2) and second (3) plates is made of flexible material.
4. The wall element of any one of claims 1 to 3, c h a r a c t e r i z e d i n that at least the first or the second plate (2, 3) is made of a steel sheet, a gypsum board or a wood panel.
5. The wall element of any one of claims 1 to 4, c h a r a c t e r i z e d i n that the rectangular wall element (1) has modular dimensions such that the height (h) of the wall element is a multiple of a basic module having a predetermined measurement, and the width (w) of the wall element is a multiple of the same basic module having a predetermined measurement.
6. The wall element of any one of claims 1 to 4, c h a r a c t e r i z e d i n that the height (h) and the width (w) of the rectangular wall element are selected such that the height (h) of the wall element equals to the width (w) of one or more similar wall elements or that the width (w) of the wall element equals to the height (h) of one or more similar wall elements.
7. The wall element of any one of claims 1 to 6, c h a r a c t e r i z e d i n that the rectangular wall element (1) is provided with male rabbets (4;4') on two edges and female rabbets (5; 5') on two edges.

8. The wall element of claim 7, characterized in that the male rabbets (4; 4') are arranged on edges that meet in the corner of the wall element.

9. The wall element of any one of claims 1 to 6, characterized in that the male rabbets (4; 4') are arranged on all edges, or correspondingly the female rabbets (5; 5') are arranged on all edges.

10. The wall element of any one of claims 1 to 9, characterized in that at least the first (2) or the second (3) plate is secured to the support frame by screwing, riveting or gluing.

11. The wall element of any one of claims 1 to 10, characterized in that the support frame (6, 7) is made of profiled thin sheet.

12. The wall element of any one of claims 1 to 11, characterized in that the support frame (6, 7) is embossed to increase its rigidity.

13. The wall element of any one of claims 1 to 12, characterized in that the support frame (6, 7) is provided with openings (8) in order to reduce heat leakages from one side of the wall element to the other.

14. The wall element of any one of claims 1 to 13, characterized in that the insulation material layer (10) comprises mineral wool, rock wool or urethane.

15. The wall element of any one of claims 1 to 14, characterized in that the wall element (1) is load-bearing, whereby it bears, in addition to itself and the wall elements arranged on top of it, also other parts of the building.

16. The wall element of any one of claims 1 to 15, characterized in that the support frame (6, 7) protrudes at least partly between the first and the second plates (2, 3) on all edges.

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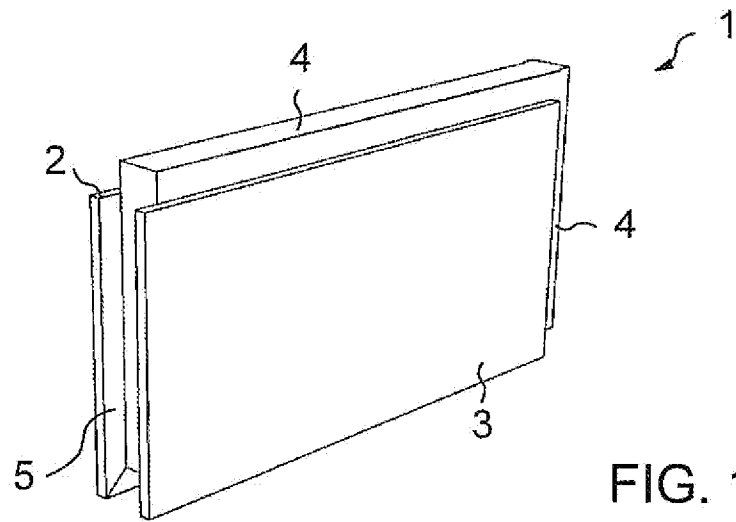


FIG. 1

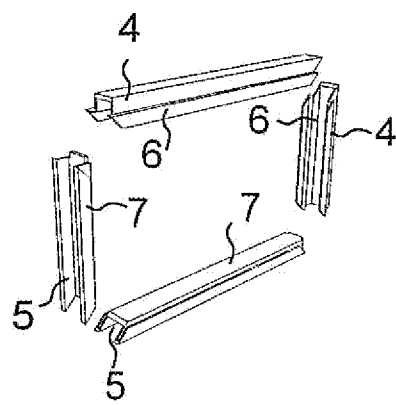


FIG. 2

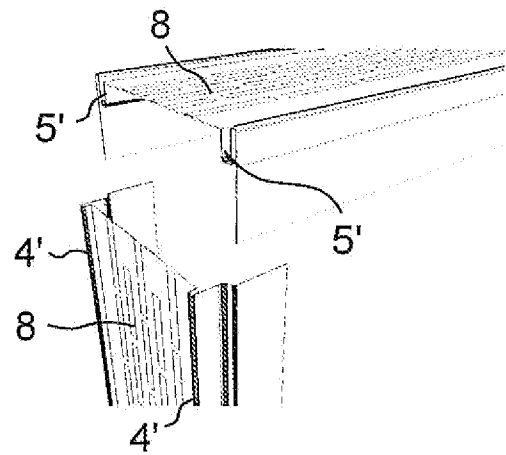


FIG. 3

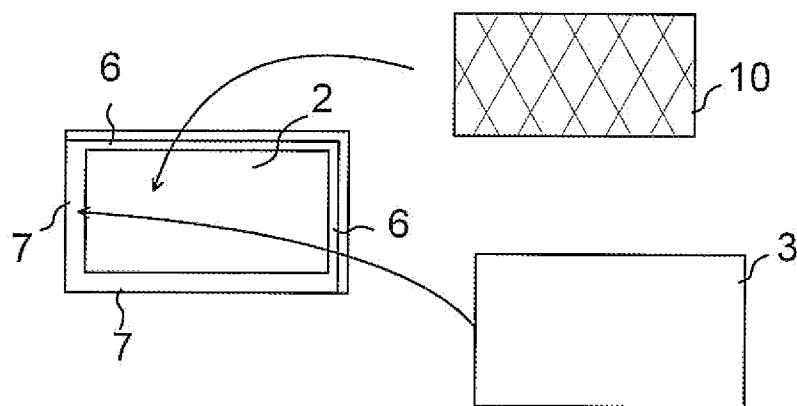


FIG. 4

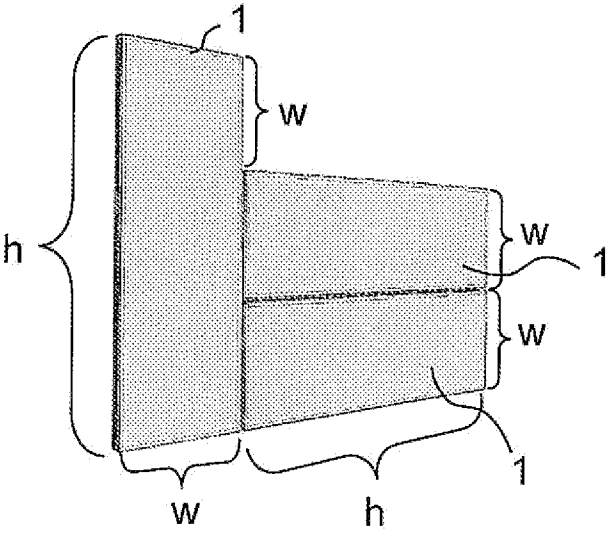


FIG. 5

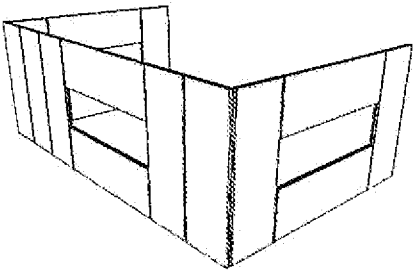


FIG. 6

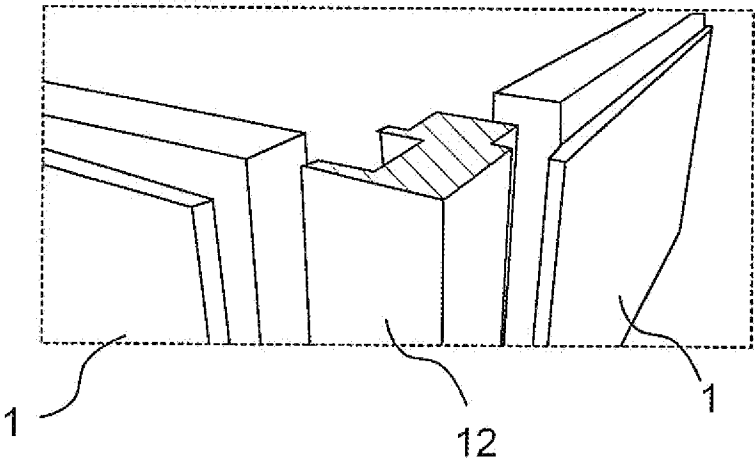


FIG. 7

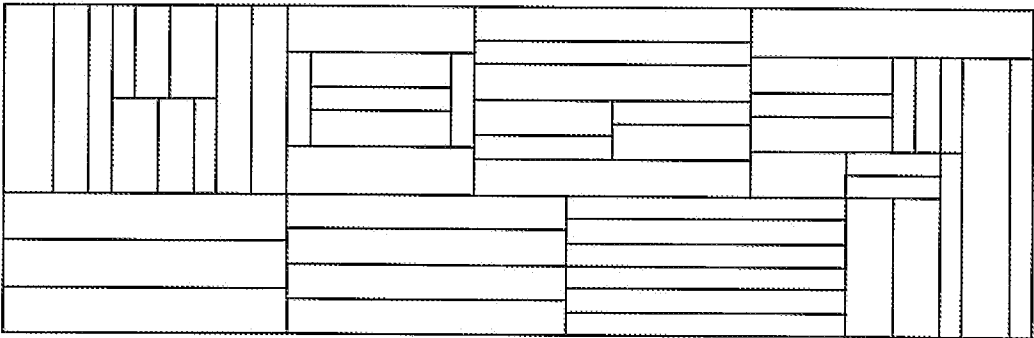


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI2010/050193

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: E04C, B32B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
FI, SE, NO, DKElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3529393 A (WILKINS WILLIAM BURDETTE) 22 September 1970 (22.09.1970) whole document, particularly column 3, lines 24-68 and fig. 4-6	1-16
Y	WO 9600334 A1 (RECORD GRANT C et al.) 04 January 1996 (04.01.1996) whole document, particularly pages 6-7 and fig. 1-6	1-16
Y	GB 762464 A (GEORGE KENDRICK FINDLAY) 28 November 1956 (28.11.1956) whole document, particularly page 2, lines 1-11 and fig. 1-3	1
Y	US 2008168735 A1 (GUEVREMONT CLEMENT) 17 July 2008 (17.07.2008) whole document, particularly paragraphs [0057], [0075]-[0077] and fig. 2-3	1
Y	US 4360553 A (LANDHEER HUGO A J) 23 November 1982 (23.11.1982) whole document, particularly column 2 and fig. 1-2, 8	1-16



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search

08 June 2010 (08.06.2010)

Date of mailing of the international search report

11 June 2010 (11.06.2010)

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INTERNATIONAL SEARCH REPORT

International application No.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 3207413 A1 (GLOCKENSTEIN KARL) 21 October 1982 (21.10.1982) whole document, particularly pages 5, 7 and fig. 1-6	1

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
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