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(54) **Sound barrier along a public road or railway**

(57) Sound barrier in the open air along a without roofing provided road for car or train traffic, with a sound reflecting layer (1) and at the sound side of it a sound absorbing layer (2) and at the sound side of it a sound permeable layer (8) which allows passage of the from the source stemming sound substantially unhindered, which layer (8) is provided fold free and/or pre tensioned in the barrier, preferably overlaps with the to the main face of the barrier parallel side of the frame of the barrier, which barrier is designed to shield the living environment from the sound of vehicles at the road.

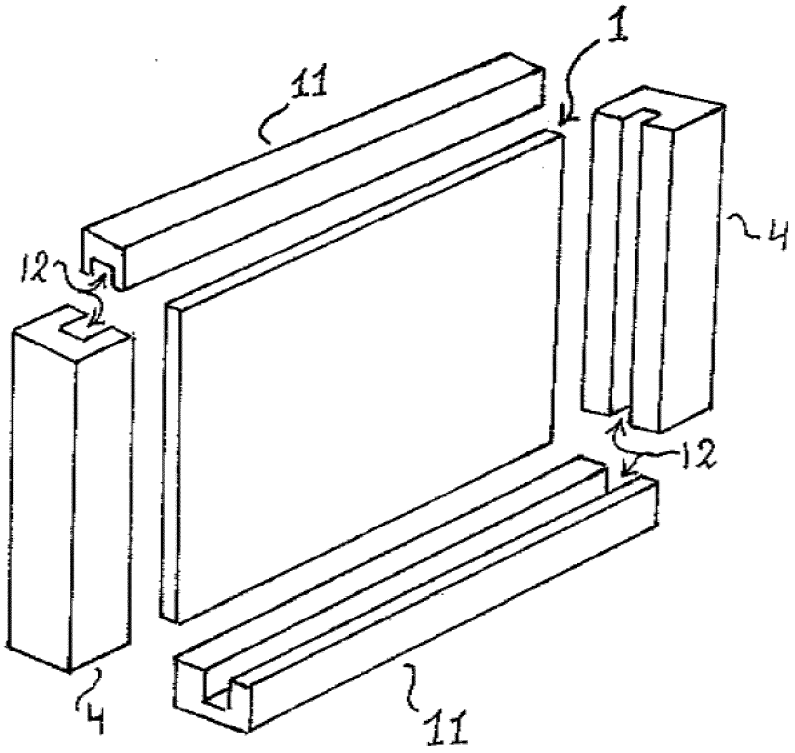

Fig. 6

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Description

[0001] Prior art sound barriers are e.g. disclosed in EP1081287A1, GB2258482, WO9812387A1, DE4416201A1 and DE8708808U1. The object of the sound barrier is to protect the environment from the sound of road traffic, particularly with speeds above 80 km/u. The barrier can extend several hundreds meters or more parallel to the road.

[0002] Research of TNO has shown that some sound barriers have detrimental effect to the sound load of the environment near a road. Thus the sound barrier increases the sound load.

[0003] The sound barrier according to the invention is characterized by the combination of simple assembly, elongated service free life, environmental friendly, appropriate recyclable of the parts, minimum use of materials, maximum use of wood, while the requirements of sound reduction or sound dampening are adequately met, to maximally protect the near environment from the traffic or train noises (the effect of this sound barrier is such that behind the barrier the sound from the road (80 dB at 10 meter from the road) is not above 54 dB) . The barrier provides a minimum weighted sound adsorption of 20 dB(A) and a weighted sound reduction of 30 dB(A). Also the sound of train traffic can effectively be reduced by the present barrier.

[0004] The barrier is constructed from identical cassettes (or: modules) next to each other. A cassette preferably has one or more of: at least 1 meter high and/or wide (in the operating position), at least 1 square meter surface of the main face, not more than 3 meter high and/or wide, not more then 3 square meter surface of the main face; rectangular. By locating cassettes above each other the desired height can be obtained. The cassettes are fixed with their side edges to upright columns anchored to the ground. These columns can be vertical or sloping. Thus a wall is made.

[0005] The modular construction allows prefabrication in controlled conditions within a construction building, which secures reproducibility.

[0006] The selection of the solid wood type and the mentioned dimensions and quality of the several layers of the cassette offers, in an embodiment, a surprisingly good sound dampening at minimum weight, thus minimum material consumption and maximum life.

[0007] A cassette can be viewed as a relative thick plate, thus has a relatively small thickness compared to its length and width (the length and width provide the main face of the cassette), and has preferably the following design: the core parallel to the main face is provided by an air tight layer, similar to a plate, solid wood wit a length and width substantially equal to that of the cassette. This core layer is at one or both sides covered by a coherent cover layer, similar to a plate, with sound absorbing properties, of compressed fibers, e.g. mineral wool or rock wool, preferably covered with a finish cloth, e.g. geo textile or a woven or non woven or felt of (e.g. mineral) fibers, e.g. of glass. Across it the outer layer extends provided by identical solid wood latten mutually extending parallel at (preferably identical) mutual distance and substantially the complete height of the cassette. Thus the outer layer is air permeable and through the outer layer the cover layer or, if present, the finish cloth, is visible. All above mentioned layers extend parallel to the main face of the cassette and these layers are stacked in thickness direction of the cassette.

[0008] Preferably the core layer and the cover layers are tightly fitted in a solid wood, preferably rectangular, frame providing the boarder of the cassette in length and width. Preferably the core layer projects at two, preferably all four, opposite sides of the cassette beyond the cover layers such that the cassette along said edges has a centrally in the thickness located, substantially said complete edge covering, lip which preferably tightly fits within an edge recess or groove of the frame. The tight fit secures the required air tightness and/or offers the possibility of simple fabrication.

[0009] Preferably the outer layer and/or finish cloth overlaps with the parallel to the main face located side of the frame and is preferably fixed to it. Of the outer layer preferably all latten are merely with the outer ends fixed to the frame and are loose between it. The finish cloth has preferably merely the edge regions, preferably all four edge regions, fixed to the cassette and is loose between it. Preferably the outer layer and/or finish cloth is by mechanical mounting means fixed to the frame and more preferably the finish cloth is with the same mounting means fixed to the frame. The finish cloth is preferably free of folds and/or under pre tension fixed to the frame; and/or evenly along the length of the edge region fixed to the frame. The positioning and/or manner of fixation of the outer layer and/or finish cloth secures to keep the structure sufficient dry and/or increase the flexural rigidity of the structure for loads perpendicular to the main face of the cassette (e.g. wind load). The wrinkle free and/or pre tensioned finish cloth contributes to the flexural rigidity of the cassette for loads perpendicular (transverse to) the main face. Even with heavy rains no water penetrates beyond the wrinkle free and/or pre tensioned finish cloth, such that core layer and cover layer remain dry and maintain their acoustic property. And in this manner water is prevented from collecting in the lower part of the cassette, such that rot in the lower part of the frame and mold and moss growth in the lower part of the cover layer is prevented.

[0010] Preferably the cassette is designed identical at both sides of the core layer, such that the core layer provides the symmetry face of the cassette. The core layer can be provided by stacked boards, possibly with veer en groove.

[0011] The solid wood of the cassette (one or more of frame, core layer, outer layer, or all parts of the cassette different from the cover layer and finish cloth) is preferably pine or softwood treated with acid, e.g. acetic acid (e.g. treated according to EP2242624) or heat between

150 and 200 degrees Celsius in oxygen free and/or moist rich environment (Finnforest Ikipuu Oy, Hammaslahti, Finland, or Plato International BV, Arnhem, Netherlands) to preserve and convert it into lumber- or construction or building timber of good quality. E.g. wood sold as Accoya or Plato, or similar type, quality and preserving treatment.

[0012] Preferably one or more of the layers of the cassette have the following dimensions (in millimeter): core layer thick between 30 and 55, such as approximately 45; cover layer thick between 35 and 60, such as approximately 50; latten of the outer layer thick between 25 and 40, such as approximately 32, width between 30 and 55, such as approximately 45, spacing between 30 and 55, such as approximately 45, or spacing equal to lat width; finish cloth thick at least 0,1 or 0,5 and/or maximum 3, e.g. approximately 1 or 1,5.

[0013] The frame provides preferably a with the opening outwardly directed C-profile along two opposite edges of the cassette, between the legs of which the column is tightly fitted. This C profile is preferably of solid wood. The legs of this C are preferably separate parts, e.g. boards, mounted at both sides of the web profile. This detail design is also convenient for fixation of the (possibly pre tensioned) finish cloth at the in the in the main face of the cassette provided side of the frame.

[0014] The latten of the outer layer preferably extend vertical in the operating position of the cassette. Apart from the cover layer, the finish cloth and the mounting means, such as glue of nails, the cassette is preferably completely from solid wood. According to an embodiment the latten are extended at one of the upper and lower side beyond the frame, such that the latten of the one cassette cover the frame of the cassette there above or below, if the barrier is made from superposed cassettes.

[0015] The latten each have preferably a rectangular or square cross section, possibly with rounded or beveled edges.

[0016] For the finish cloth preferably one or more of the following applies: a woven or fabric or felt; sufficient air permeable and/or mesh width to hardly or not reflect sound; at least 50 and/or maximum 300 gram per square meter, e.g. 100, 150, 180 or 190; weave pattern and/or mesh width comparable to mosquito screen, screen cloth or glass fiber wall covering; tensile proof; substantially thinner, e.g. at least 10 or 15 times thinner compared to the cover layer; a single layer woven; flat or straight weave, in other words substantially equal warp and weft threads per unit area; thickness and/or tensile strength of the warp and weft threads substantially equal; made from two separate, individual layers of preferably different strength and/or material and/or weave density, e.g. acoustic transparent cloth (e.g. technical textile woven) combined with gaze, e.g. mosquito screen of preferably metal such as RVS, the gaze most outward. Preferably the difference in weave density is based on mesh width which preferably differs at least 10%. Technical textile woven appears for the naked eye typically as closed such as the cloth of a shirt. The gaze preferably offers important resistance to cutting.

[0017] The cover layer is preferably at least 35 kilogram per cubic meter, e.g. between 45 and 55, possibly at least 70, 80 or 100.

[0018] Preferably the finish cloth, or one or more or all parts of the cassette is treated, preferably impregnated, with fire proof agent, preferably coated by a water repellant agent, e.g. which contains nano parts, e.g. to prevent or delay washing of the fire proof agent.

[0019] Example, without limitation, refer to the drawing:

Fig. 1 and 2 show a cross section;
Fig. 3 a perspective;
Fig. 4 and 5 an application;
Fig. 6 an exploded view;
Fig. 7 a front view;
Fig. 8 a cross section;
Fig. 9 a detail; and
Fig. 10 and 11 alternative cassettes.

[0020] Fig. 1 and 2 show a cross section from above of parts of a single, separate cassette, and, respectively, two adjoining cassettes, supported by a common, vertical column. Parts: core layer 1, cover layer 2, latten 3 of outer layer, frame 4, lip 6 of core layer 1, legs 5 of C-profile (separate boards), column 7, finish cloth 8.

[0021] Fig. 3 shows a perspective of the cassette of fig. 1, the cassette in the operating position and viewed against the outer layer, thus against a main face.

[0022] Fig. 4 shows a sound barrier from two cassettes next to each other, supported by three columns.

[0023] Fig. 5 shows a sound barrier from two cassettes next to each other and four cassettes above each other, thus eight cassettes in total, supported by three columns.

[0024] Fig. 4 and 5 are perspective views.

[0025] Fig. 6 shows in perspective view the beams 4 and 11 of the frame, and the core layer 1 exploded. The beams 4, 11 are provided with a groove 12 in which the edge of the core layer 1 fits. The beams 4 fit between the beams 11, as fig. 7 (seam 14) shows more clearly.

[0026] Fig. 7 shows in front view the frame from the beams 4, 11, and the finish cloth 8 onto it. Some of the latten 3 of the outer layer are shown. The edge regions 13 of the cloth 8 overlap with the to the main face parallel side of the beams 4, 11. Screws 9 are applied to fix the cloth 8, the latten 3 and the boards 5. Also of a variant the latten 33 are shown which at the lower side of the cassette extend beyond the beam 11 (at the top of fig. 7 the latten 33 of the superposed cassette are shown in dashes). The cloth 8 is wrinkle free pulled tight attached to the frame in the areas of overlap with the frame.

[0027] Fig. 8 shows an exploded view from above, similar to fog. 1, the location of the cloth 8 is more clear now.

[0028] Fig. 9 shows in the view of fig. 1 an alternative assembly of the beam 4, from separate parts 41, 42 and 43, which also provides the groove 12.

[0029] Fig. 10 and 11 show in the view of fig. 1 an

alternative embodiment of the cassette. The cover layer 2, latten 3 and cloth 8 are absent at the one side of the core layer 1. In fig. 11 the groove 12 is replaced by an in two adjoining sides of the beam 4 provided edge recess.

[0030] The drawing, the specification and the claims contain several features in combination. The skilled person will appreciate them also individually and combine them to further embodiments.

Claims

1. Sound barrier in the open air along a without roofing provided road for car or train traffic, with a sound reflecting layer (1) and at the sound side of it a sound absorbing layer (2) and at the sound side of it a sound permeable layer (8) which allows passage of the from the source stemming sound substantially unhindered, which layer (8) is provided fold free and/or pre tensioned in the barrier, preferably overlaps with the to the main face of the barrier parallel side of the frame of the barrier, which barrier is designed to shield the living environment from the sound of vehicles at the road.

2. Barrier according to claim 1, the to the main face parallel core is provided by an air tight layer, similar to a plate, solid wood with a length and width substantially equal to that of the cassette, this core layer is at one or both sides covered with a coherent cover layer, similar to a plate, with sound absorbing properties, of compressed fibers, e.g. mineral wool or rock wool, preferably coated with a finish cloth, e.g. geo textile or a woven or non woven or felt of (e.g. mineral) fibers, e.g. glass fibers, covered by an outer layer provided by identical solid wood latten which extend with (preferably identical) spacing mutually parallel and extend substantially the complete height of the cassette.

3. Barrier according to claim 1 or 2, the core layer and the cover layers are received, preferably tight fit, in a solid wood, preferably rectangular, frame providing the boarder of the cassette in the length and width, possibly the core layer projects at two, preferably all four, opposite sides of the cassette beyond the cover layers such that the cassette along said edges has a centrally in the thickness located, substantially said complete edge covering, lip which preferably tightly fitting is received in an edge recess or groove of the frame.

4. Barrier according to claim 1, 2 or 3, the outer layer and/or finish cloth overlaps with the parallel to the main face extending side of the frame and is preferably fixed to it; and/or from the outer layer all latten are merely with the outer ends fixed to the frame and between these ends are loose.

5. Barrier according to any of the preceding claims, of the finish cloth merely the edge regions, preferably all four edge regions, are fixed to the cassette and is there between loose; and/or the outer layer and the finish cloth is fixed to the frame by the same mounting means.

6. Barrier according to any of the preceding claims, the frame provides a with the opening outward directed C-profile along two opposite edges of the cassette, between the legs of which the column can be received with tight fit, this C-profile is preferably of solid wood, the legs of this C are preferably separate parts, e.g. boards, mounted at both sides of a web profile.

7. Barrier according to any of the preceding claims, the latten of the outer layer extend vertical in the operating position of the cassette; and/or apart from the cover layer, the finish cloth and the mounting means, such as glue of nails, the cassette is completely made from solid wood.

8. Barrier according to any of the preceding claims, the latten are extended at one of the upper and lower side beyond the frame, such that the latten of the one cassette cover the frame of the cassette there above or below, if the barrier is made from superposed cassettes.

9. Barrier according to any of the preceding claims, the latten each have a rectangular or square cross section, possibly with rounded or beveled edges.

10. Barrier according to any of the preceding claims, the finish cloth is made from separate, individual layers of preferably different strength and/or material and/or weave density, e.g. acoustic transparent cloth (e.g. technical textile woven) combined with gaze, e.g. mosquito screen of preferably metal such as RVS, the gaze most outward.

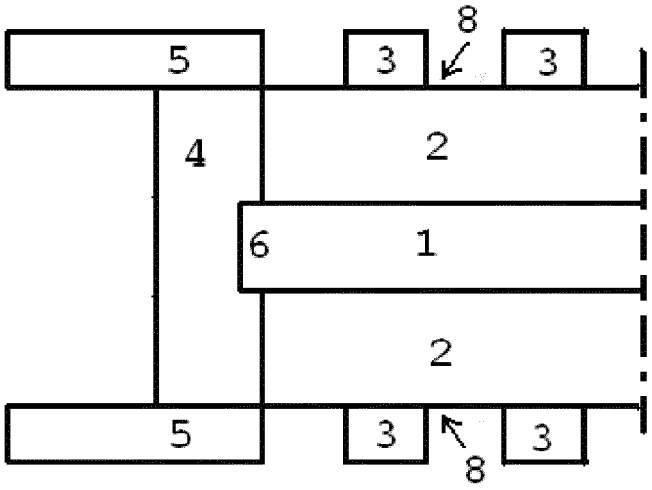

Fig. 1

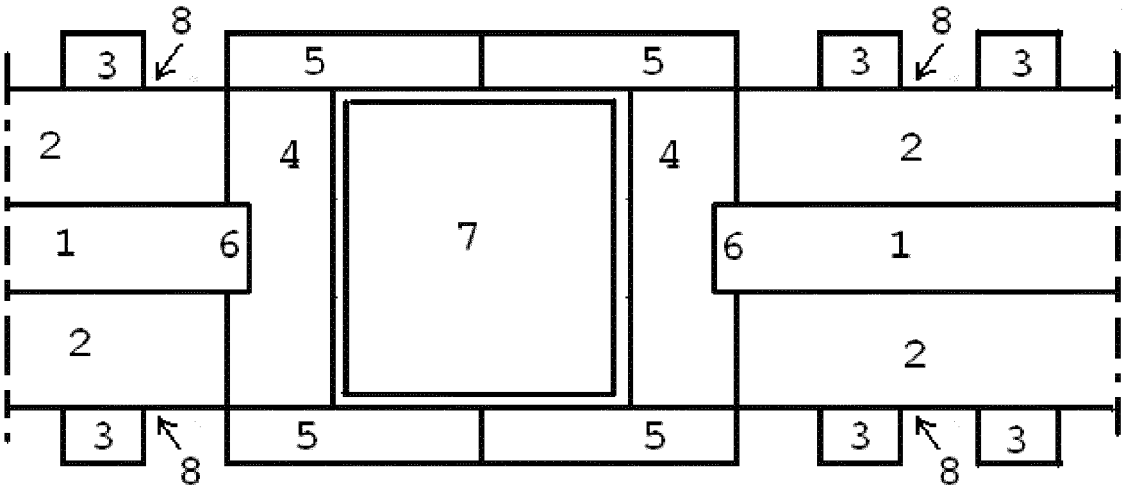

Fig. 2

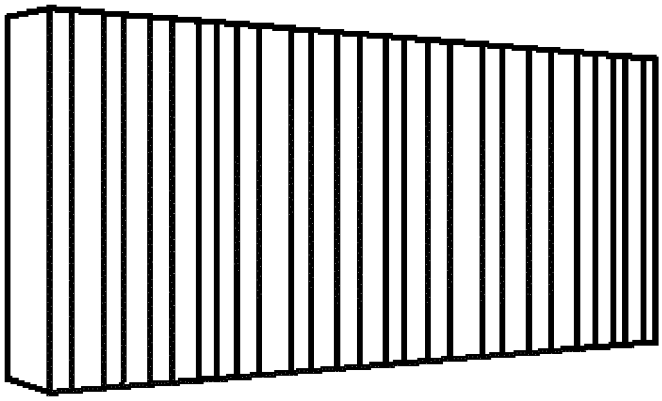

Fig. 3

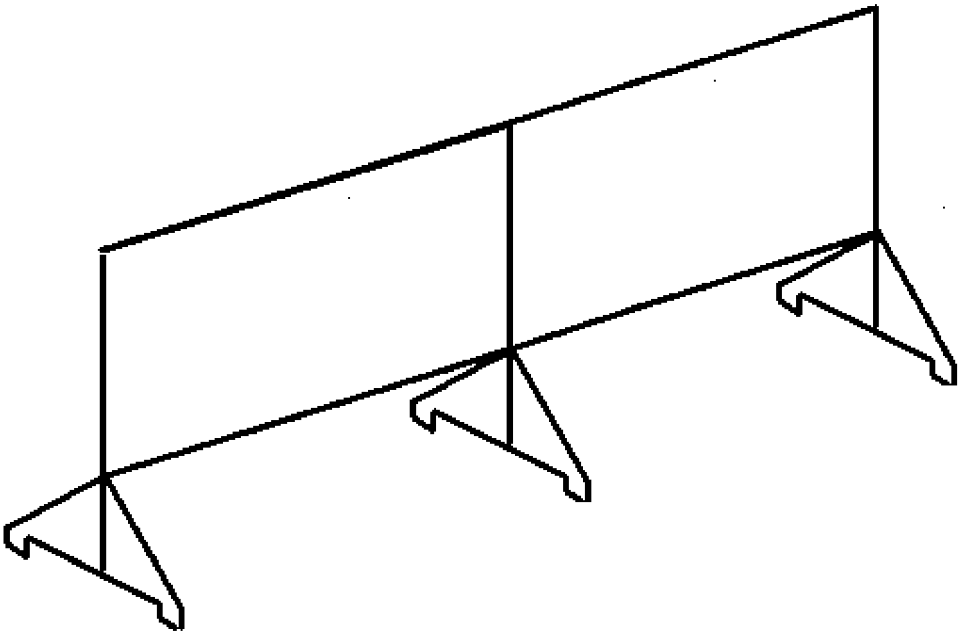

Fig. 4

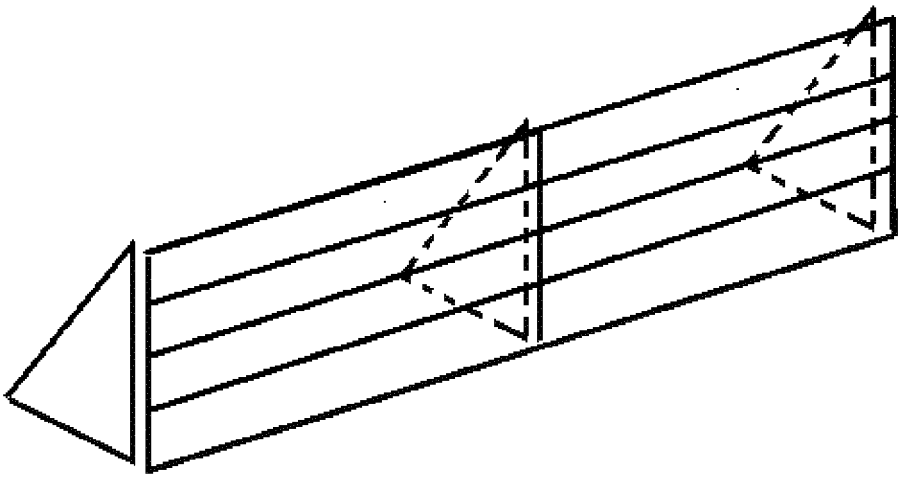

Fig. 5

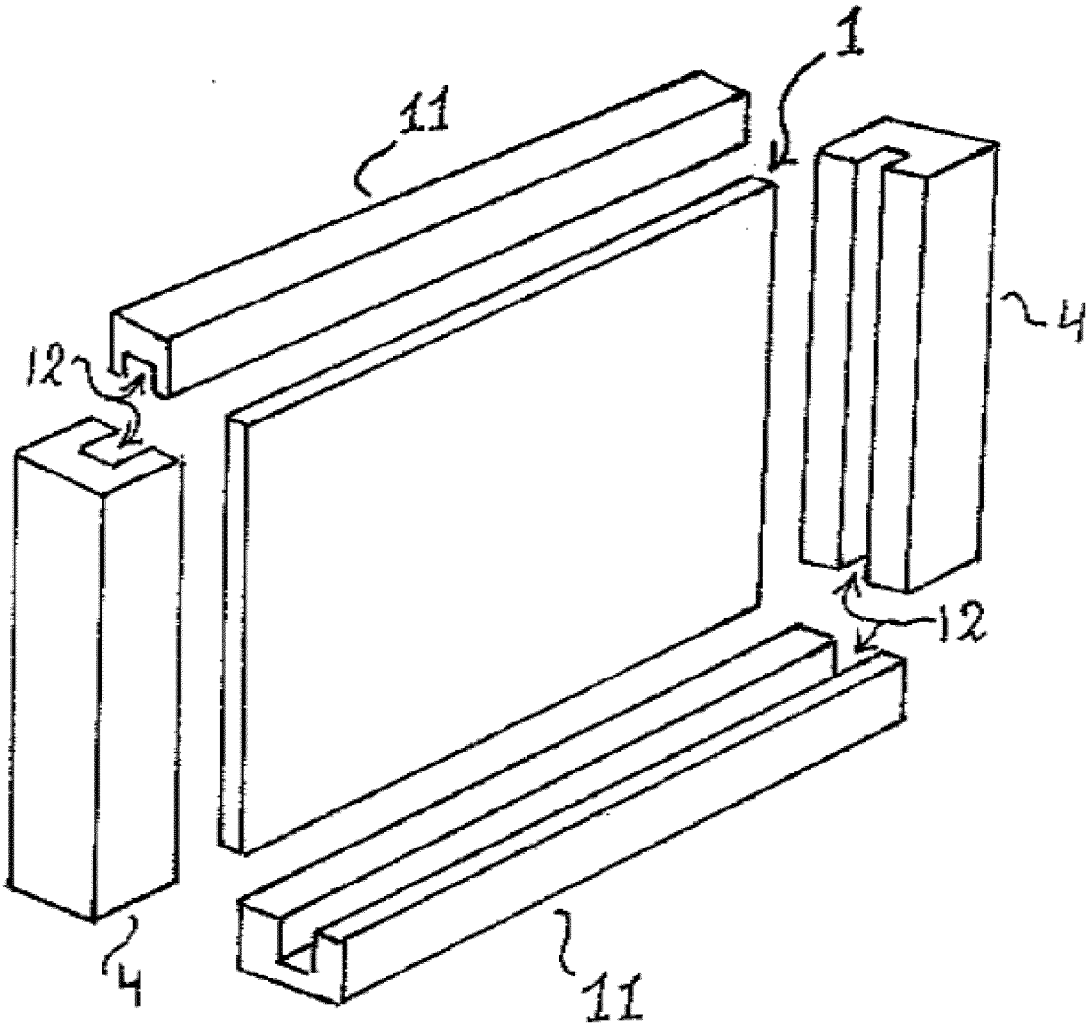

Fig. 6

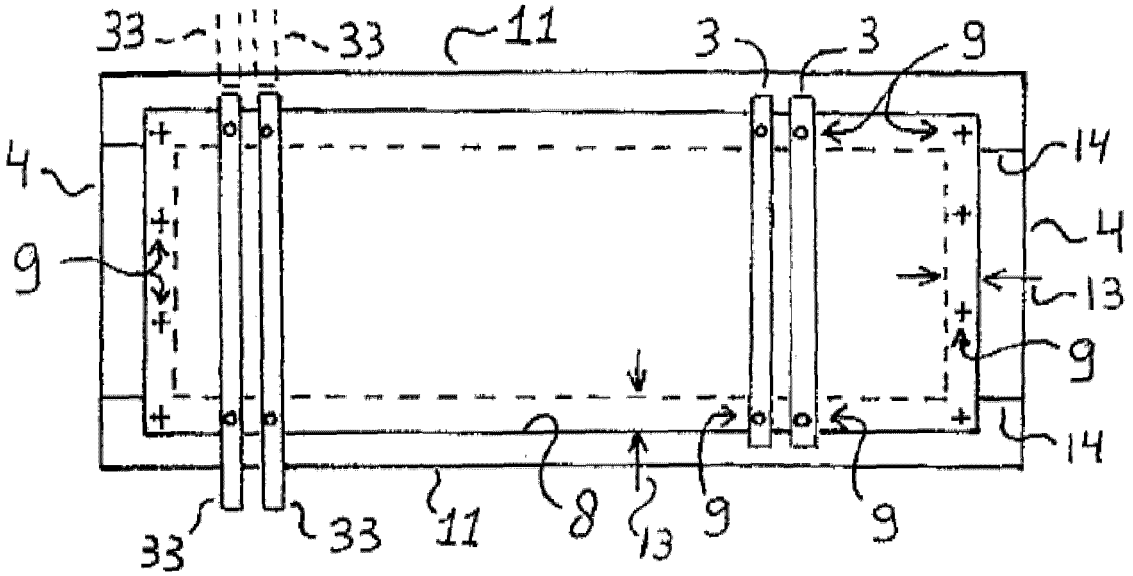

Fig. 7

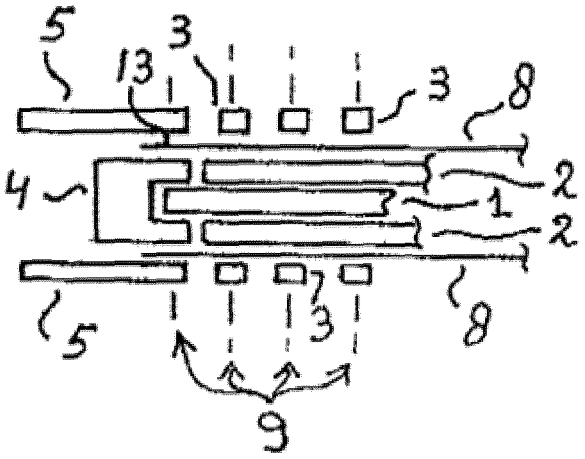

Fig. 8

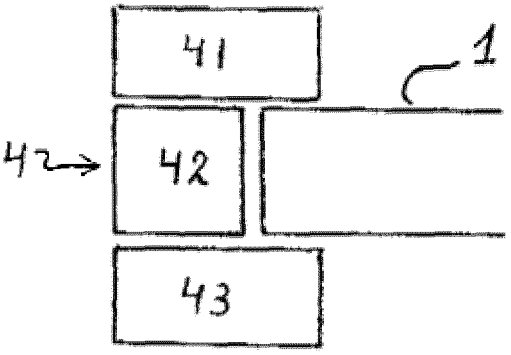

Fig. 9

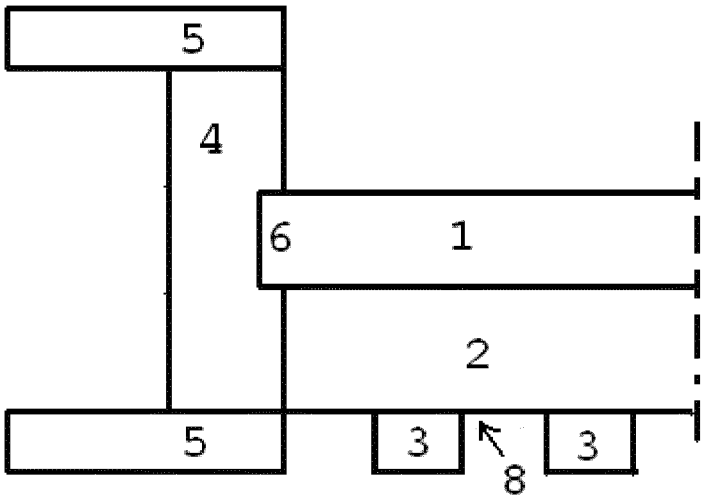

Fig. 10

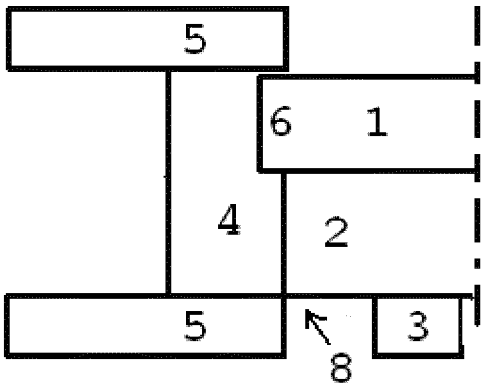

Fig. 11

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EUROPEAN SEARCH REPORT

Application Number
EP 14 17 3245

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E01F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	22 October 2014	Kremsler, Stefan

CATEGORY OF CITED DOCUMENTS

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