

(19)



(11)

EP 3 406 815 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
28.11.2018 Bulletin 2018/48

(51) Int Cl.:
E04C 2/292^(2006.01) E04B 1/61^(2006.01)

(21) Application number: **18171281.1**

(22) Date of filing: **08.05.2018**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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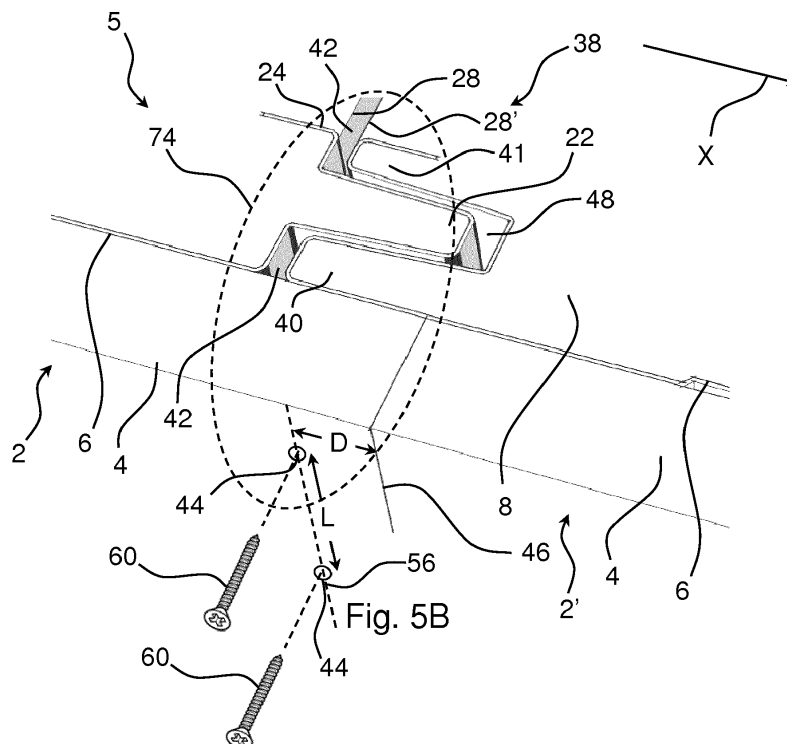
(30) Priority: **24.05.2017 DK PA201700314**

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(54) CONSTRUCTION SYSTEM

(57) A construction system (5) comprising two adjacent construction elements (2, 2') is disclosed. Each construction element (2, 2') comprises a core structure (3) comprising an insulation material (8) sandwiched between a first reinforcement structure (6) and a second reinforcement structure (6'). A first plate (4) is attached

to the first reinforcement structure (6) and a second plate (4') is attached to the second reinforcement structure (6'). The two adjacent construction elements (2, 2') are mechanically attached to each other by means of attachment members (44, 60, 68) in a region of overlap (74).



Description

Field of invention

[0001] The present invention relates to a construction system suitable for being used in building constructions. The present invention more particularly relates to a construction system that is easy to mount and eliminates the risk of rot and moulds growth.

Prior art

[0002] It is known to apply insulation materials sandwiched between metal reinforcement plate structures. These modules are typically called sandwich panels and may comprise expanded foam such as polyurethane (PUR) or polyisocyanurate (PIR) sandwiched between steel plates. In order to achieve the mechanical properties (load-bearing capacity) required to use these panels in building constructions (e.g. domestic buildings), it is necessary to manually attach plates to the steel plates. This process is time consuming, difficult to accomplish within small tolerances and requires highly skilled personnel.

[0003] Thus, there is a need for an improved construction system suitable for being used in building constructions. Accordingly, it is an object of the present invention to provide a construction system that reduces or even eliminates the above-mentioned disadvantages of the prior art. It is also an object of the present invention to provide a construction system, in which the adjacent construction elements are attached firmly to each other. It is furthermore an object to the invention to provide a fire-resistant construction system.

Summary of the invention

[0004] The object of the present invention can be achieved by a construction system as defined in claim 1. Preferred embodiments are defined in the dependent sub claims, explained in the following description and illustrated in the accompanying drawings.

[0005] The construction system according to the invention is a construction system comprising two adjacent construction elements, wherein each construction element comprises a core structure comprising an insulation material sandwiched between a first reinforcement structure and a second reinforcement structure, wherein a first plate is attached to the first reinforcement structure and wherein a second plate is attached to the second reinforcement structure, wherein the two adjacent construction elements are mechanically attached to each other by means of attachment members in a region of overlap.

[0006] Hereby, it is possible to provide a construction element having the load-bearing capacity required for using the construction element in building constructions including domestic buildings. Furthermore, there is no need to manually attach any plates to the construction

elements, since they are ready to be used without additional plates attached thereto. It is, however, possible to attach additional plates or structures (e.g. plasterboard) to the plates of the construction element if desired.

[0007] Accordingly, the mounting procedure is eased and can be done much faster by using the construction system according to the invention than the prior art panels. Besides, the adjacent construction elements can be firmly attached to each other. Furthermore, it is possible to provide a fire-resistant construction system.

[0008] Each construction element has a core structure comprising an insulation material sandwiched between a first reinforcement structure and a second reinforcement structure. The insulation material is preferably made of PUR or PIR.

[0009] The first plate is attached to the outside surface of the first reinforcement structure and the second plate is attached to the outside surface of the second reinforcement structure may be any suitable type of plate that can provide the required load-bearing capacity of the construction element. It is, however, preferred that the first plate and/or the second plate is made in a fire-resistant material.

[0010] By mechanically attaching the two adjacent construction elements to each other by means of attachment members in a region of overlap it is possible to provide a firm and reliable attachment of the adjacent construction elements.

[0011] By the term "region of overlap" is meant a region, in which there is overlap between adjacent construction elements. An overlap may be provided in a protruding structure of one of the construction elements is received by a corresponding receiving structure of the other construction element.

[0012] In one embodiment, the attachment members are screws or nails. It may be an advantage to apply attachment members, preferably screws or nails formed in a fire-resistant material or nails. Hereby, displacement of the adjacent construction elements due to high temperatures (e.g. during a fire) can be prevented. Accordingly, the invention provides a fire-resistant construction system.

[0013] It may be an advantage that the attachment members are arranged in a configuration extending along a zone being parallel to a joint of the adjacent construction elements, wherein the zone is arranged in a non-zero distance from the joint. Hereby, it is possible to ensure that the attachment members are inserted in areas, in which they penetrate a first structure of a first construction element and a first structure of a second adjacent construction element so that a firm attachment of the adjacent construction elements.

[0014] In one embodiment, said distance is in the range 3-50 mm. In one embodiment, said distance is in the range 5-30 mm, such as 6-20 mm. In one embodiment, the distance is approximately 10 mm.

[0015] It may be beneficial that the attachment members extend along a line extending parallel to the joint.

Hereby, the fixation of the adjacent construction elements can be eased. Furthermore, it can be ensured that the attachment members are inserted into the most optimum structures of the construction system.

[0016] It may be advantageous that the attachment members penetrate a first structure of a first construction element, a first structure of a second adjacent construction element and a second structure of a first construction element. Hereby, a reliable and firm attachment of the adjacent structures can be achieved.

[0017] It may be an advantage that the attachment members penetrate a first structure of a first construction element, a first structure of a second adjacent construction element, a second structure of a first construction element and a second structure of the second construction element. Hereby, an even more reliable and firm attachment of the adjacent structures can be achieved.

[0018] It may be an advantage that the first plate and/or the second plate are attached to the reinforcement structures by means of glue. The glue may preferably be an inorganic glue. The glue preferably comprises a ductile adhesive. The glue preferably ensures a degree of adherence (quality of adhering) equal or greater than the degree of adherence of the insulation material. Hereby, it is possible to avoid a thermal bridge between a mechanical attachment member (e.g. a screw or a nail) and the core structure of the construction element. The use of glue makes it possible to achieve a large contact surface and to prevent pockets of air between the reinforcement structures and the plates attached thereto.

[0019] It may be advantageous that the first plate and/or the second plate are attached to the reinforcement structures by means of mechanical attachment members. Hereby, the attachment process can be carried out in a fast manner. The mechanical attachment members may be screws, nails or corresponding mechanical structures provided in the reinforcement structures and the plates.

[0020] It may be beneficial that the first plate and/or the plate is a cement board. Hereby, it is possible to provide a construction element that has the required load-bearing capacity and at the same time is fire-resistant.

[0021] It may be an advantage that the insulation material comprises PUR or PIR. Hereby, it is possible to provide a construction element having a good insulation capacity and at the same time is relative stiff and does not take up a lot of space

[0022] Preferably the insulation material is made in PUR or PIR. It may be advantageous that the core structure is made by moulding an insulation material made in PUR or PIR between the reinforcement structures.

[0023] When the core structure has cured, it is possible to cut the core structure into construction elements having predefined dimensions. The plates may be attached to the core structure before or after the cutting process.

[0024] It may be advantageous that the first reinforcement structure and/or the second reinforcement structure is made of metal. Hereby, it is possible to achieve a core

structure that is resistant to impacts and is suitable of getting additional plates attached to the reinforcement structures. The reinforcement structures may preferably be made in steel. In one embodiment according to the invention the reinforcement structures are made in stainless steel.

[0025] It may be beneficial that first reinforcement structure and/or the second reinforcement structure is shaped as corrugated plates. Hereby, it is possible to enhance the mechanical properties of the reinforcement plates. By applying corrugated plates, it is possible to enhance the bending stiffness and torsional rigidity of the plates.

[0026] Preferably, the first reinforcement structure and/or the second reinforcement structure is made as a trapezoid plate.

[0027] It may be beneficial that the construction element comprises a first end portion and a corresponding second end portion, wherein the first end portion comprises one or more protruding structures configured to be received by corresponding receiving structures provided in the second end portion.

[0028] Hereby, it is possible to engagingly connect the adjacent end portions of construction elements according to the invention. Accordingly, it is possible to join adjacent construction elements in an easy manner.

[0029] It may be an advantage that the construction element comprises a first end portion and a corresponding second end portion, wherein the second end portion comprises one or more male portions configured to be received by corresponding female portions provided in the first end portion. Hereby, it is possible to engagingly connect the adjacent end portions of construction elements according to the invention. Accordingly, it is possible to achieve an even stronger connection of adjacent construction elements.

[0030] It may be advantageous that the construction element comprises a plane end portion. Hereby, it is possible to use the construction element to build a corner structure. E.g. a corner structure of a domestic building such as a family house.

[0031] It may be beneficial that the construction element comprises a cutaway provided in the top portion of the construction element. Hereby, it is possible to supportingly arrange a wall plate in the cutaway. Thus, it is possible to attach rafters of a roof construction to the wall plate.

[0032] It may be beneficial that the cutaway portion is configured to receive a box-shaped elongated wall plate.

[0033] The cutaway portion may have a box-shaped geometry having a longitudinal axis that extends parallel to the longitudinal axis X of the construction element.

[0034] It may be an advantage that the construction element is constructed in such a manner that a gap is provided between the insulation material of adjacent construction elements when the construction elements bear against (abut) each other. Hereby the risk for damage during storing and transport can be reduced.

Description of the Drawings

[0035] The invention will become more fully understood from the detailed description given herein below. The accompanying drawings are given by way of illustration only, and thus, they are not limitative of the present invention. In the accompanying drawings:

- Fig. 1A shows a schematic, cross-sectional view of a construction element according to the invention in a non-assembled configuration, in which the inner plate and outer plate have not yet been attached to the sandwiched core structure;
- Fig. 1B shows a schematic, cross-sectional view of the construction element shown in Fig. 1A in an assembled configuration;
- Fig. 2A shows a schematic, perspective top view of a first construction element attached to a second construction element to form a corner portion;
- Fig. 2B shows a schematic, top view of two construction elements according to the invention attached to each other and hereby constitution a corner portion;
- Fig. 3A shows a schematic, perspective view of a first end portion of a construction element according to the invention;
- Fig. 3B shows a schematic, perspective of a reinforcement structure of a construction element according to the invention;
- Fig. 4A shows a schematic, perspective view of a top portion of a construction element according to the invention;
- Fig. 4B shows a schematic, perspective top view of two joint construction elements of a construction system according to the invention;
- Fig. 5A shows a schematic, perspective view of the connection portion of a connection system according to the invention;
- Fig. 5B shows a close-up view of a portion of the connection system shown in Fig. 5A;
- Fig. 6A shows a schematic top view of a construction element according to the invention;
- Fig. 6B shows a schematic top view of a construction system according to the invention provided with additional plates;
- Fig. 7A shows a perspective view of construction system according to one embodiment of the invention;
- Fig. 7B shows a close-up view of a portion of the construction system shown in Fig. 7A;
- Fig. 8A shows a cross-sectional view of a portion of a construction system according to one embodiment of the invention;
- Fig. 8B shows a cross-sectional view of a portion of a construction system that basically corresponds to the one shown in Fig. 8A and

Fig. 8C shows a construction system according to one embodiment of the invention.

Detailed description of the invention

[0036] Referring now in detail to the drawings for the purpose of illustrating preferred embodiments of the present invention, a construction element 2 of the present invention is illustrated in Fig. 1A.

[0037] Fig. 1A illustrates a schematic, cross-sectional view of a construction element 2 of a connection system according to the invention, wherein the construction element 2 is in a non-assembled configuration. The construction element 2 comprises a core structure 3 comprising an insulation material 8 sandwiched between a first reinforcement structure 6 and a second first reinforcement structure 6'. The first reinforcement structure 6 is attached to the opposite side of the insulation material 8 than the second reinforcement structure 6'. The insulation material 8 may be an expanded foam such as PUR or PIR.

[0038] As it can be seen in Fig. 1A, the construction element 2 comprises a core structure 3, a first plate 4 (inner plate) and a second plate 4' (outer plate) that have not yet been attached to the sandwiched core structure 3.

[0039] In Fig. 1B, however, the first plate 4 and the second outer plate 4' that are attached to the sandwiched core structure 3. Accordingly, Fig. 1B illustrates a schematic, cross-sectional view of the construction element 2 shown in Fig. 1A in an assembled configuration.

[0040] The first plate 4 and the second outer plate 4' are preferably made of a fire-resistant material. Such fire-resistant material may be a cement board comprising cement and reinforcing fibres. It is possible to replace one of the plates 4, 4' with a plate made in another material. However, in a preferred embodiment according to the invention the construction element 2 comprises a core structure 3, a first cement board plate 4 (inner plate) and a second cement board plate 4' (outer plate), wherein both the first plate 4 and the second plate 4' have been attached to the sandwiched core structure 3.

[0041] It may be an advantage to glue the first plate 4 and the second plate 4' to the sandwiched core structure 3. The glue may preferably be a flexible and ductile glue. Alternatively, the first plate 4 and the second plate 4' can be attached to the sandwiched core structure 3 by means of mechanical attachment elements.

[0042] The first reinforcement structure 6 and the second reinforcement structure 6' are corrugated plates. In a preferred embodiment according to the invention the first reinforcement structure 6 and the second reinforcement structure 6' are steel plates. Preferably steel trapezoid plates 6, 6'. By applying corrugated plates 6, 6' it is possible to enhance the bending stiffness and torsional rigidity of the plates 6, 6'.

[0043] As shown in Fig. 1B, a plurality of spaces 10, 10' are provided between the reinforcement structures 6, 6' and the plates 4, 4' attached thereto.

[0044] The plates 4, 4' are attached to only the outwardly facing plane structures of the reinforcement structures 6, 6'. Accordingly, a portion of the reinforcement structures 6, 6' is not in contact with the plates 4, 4'.

[0045] The core structure 3 can be manufactured by using a lamination process, e.g. a PUR laminating line in which PUR or PIR is injected into a space defined by two steel reinforcement structures. Afterwards, when the PUR or PIR has hardened, the product may be cut into predefined modules (core structures). Hereafter, the plates 4, 4' can be attached to the modules (core structures) and the construction element is ready to be used. It may be an advantage to provide end portions having specific (e.g. matching) geometries to make it easy and safe to transport, store and join the modules (core structures).

[0046] The construction element 2 according to the invention may be used in building constructions. The use of construction elements 2 according to the invention may reduce the construction time and ease the mounting process. Furthermore, since the construction elements 2 can be made in inorganic material, the risk of rot and moulds growth on building materials may be reduced or even eliminated.

[0047] The thickness T_3 of the insulation material 8 is larger than the thickness T_2 of the plates 4, 4'. Furthermore, the thickness T_2 of the plates 4, 4' is larger than the thickness T_1 of the reinforcement structures 6, 6'.

[0048] In one embodiment according to the invention the thickness T_3 of the insulation material 8 is in the range 100-400 mm, preferably 150-300 mm such as approximately 200 mm, whereas the thickness T_2 of the plates 4, 4' is approximately 5-30 mm, preferably 10-20 mm such as 6 mm. The thickness T_1 of the reinforcement structures 6, 6' may be in the range 3-30 mm, preferably 5-10 mm such as 6 mm.

[0049] Fig. 2A illustrates a schematic, perspective top view of a first construction element 2 attached to a second construction element 2'. The construction forms a corner portion 12. The first construction element 2 comprises an insulation material 8 sandwiched between two metal reinforcement plates 6, 6' that preferably are made of corrugated steel. A boxed-shaped outer cement board plate 4 is glued to the outside surface of the reinforcement plate 6, whereas another boxed-shaped outer cement board plate 4 is glued to the outside surface of the other reinforcement plate 6'.

[0050] The first construction element 2 comprises a first end portion 16 shaped to engage with a corresponding end portion shaped as the second end portion 18 of the second construction element 2'. The first construction element 2 comprises a second plane end portion 20 provided in the opposite end than the first end portion 16.

[0051] The second construction element 2' comprises a plane end portion 20 provided in the opposite end than the second end portion 18. The plane end portion 20 abuts the plate 4' of the first construction element 2.

[0052] The second construction element 2' comprises

an insulation material 8 sandwiched between two metal reinforcement plates 6, 6', preferably corrugated steel reinforcement plates 6, 6'. A boxed-shaped outer cement board plate 4 is glued to the outside surface of the reinforcement plate 6, whereas another boxed-shaped outer cement board plate 4 is glued to the outside surface of the other reinforcement plate 6'.

[0053] The first construction element 2 and the second construction element 2' are angled 90 degrees relative to each other. A bracket 14 like the one shown in Fig. 2A may be attached to the inside plates 4' of the first construction element 2 and the second construction element 2' for improving the mechanical strength of the corner portion 12. The bracket 14 may be screwed or nailed into the construction elements 2, 2' or alternatively attached by means of glue.

[0054] Fig. 2B illustrates a schematic, top view of two construction elements 2, 2' according to the invention attached to each other and hereby constitution a corner portion 12.

[0055] The first construction element 2 comprises an insulation material 8 sandwiched between two metal reinforcement plates 6, 6'. A boxed-shaped outer cement board plate 4 is attached to the outside surface of the reinforcement plate 6, whereas another boxed-shaped outer cement board plate 4 is glued to the outside surface of the other reinforcement plate 6'.

[0056] The first construction element 2 comprises a plane end portion 20 abutting the inside portion of the outer plate 4 of the second construction element 2'.

[0057] The second construction element 2' comprises a plane end portion 20 that abuts the plate 4' of the first construction element 2.

[0058] The second construction element 2' comprises an insulation material 8 sandwiched between two steel reinforcement plates 6, 6'. A boxed-shaped outer cement board plate 4 is glued to the outside surface of the reinforcement plate 6, whereas another boxed-shaped outer cement board plate 4 is glued to the outside surface of the other reinforcement plate 6'.

[0059] Fig. 3A illustrates a schematic, perspective view of a first end portion 16 of a construction element 2 according to the invention. It can be seen that the construction element 2 comprises an insulation material 8 provided at the inside of a steel trapezoid plate 6. The steel trapezoid plate 6 is provided with an end section comprising a protruding structure having a conical shape (being thinnest at the distal end) and an L-shaped portion 24 extending in extension of the protruding structure 22. A receiving portion 32 is provided next to the protruding structure 22.

[0060] A cement board 4 is attached to the protruding outside surfaces of the trapezoid plate 6. The attachment may be carried out by using glue or mechanical attachment means (such as nails or screws). The end portion of the cement board 4 is aligned with the distal portion of the protruding structure 22. A cavity 30 is provided in the insulation material 8 at the end portion 16. A plane

portion 28 is provide next to the cavity 30. The cavity 30 is configured to receive a corresponding male portion 36 (see Fig. 5A).

[0061] Fig. 3B illustrates a schematic, perspective of a section of a reinforcement structure 6 corresponding to the one shown in Fig. 3A. The reinforcement structure 6 comprises front portions 62 (that abut the outer plate shown in Fig. 3A) provided between rear portions 64 (that are not in contact with the outer plate shown in Fig. 3A) extending parallel to the portions 62. Connection structures 66, 66' connects adjacent front portions 62 and rear portions 64.

[0062] Fig. 4A illustrates a schematic, perspective view of a top portion of a construction element 2 according to the invention. The construction element 2 comprises an insulation material 8. A cutaway portion 58 is provided in the top portion of the insulation material 8, preferably made an expanded foam such as PUR or PIR. The cutaway portion 58 is configured to receive a wall plate (not shown) onto which the rafter of a roof construction can be attached.

[0063] The cutaway portion 58 has a box-shaped geometry having a longitudinal axis that extends parallel to the longitudinal axis X of the construction element 2. The construction element 2 has a transversal axis Y and a lateral axis Z.

[0064] The construction element 2 comprises a core structure having an insulation material 8 sandwiched between a first reinforcement structure 6 and a second first reinforcement structure 6', wherein the first reinforcement structure 6 is attached to the opposite side of the insulation material 8 than the second reinforcement structure 6'. The reinforcement structures 6, 6' are preferably made of corrugated steel plates.

[0065] The first plate 4 and the second plate 4' are preferably made of a fire-resistant material, preferably cement board. The construction element 2 comprises a first end portion 16 and a second end portion 18. The first end portion 16 is configured and shaped to engage with the corresponding second end portion 18 of the second construction element 2.

[0066] Fig. 4B illustrates a schematic, perspective top view of a construction system 5 according to the invention. The construction system 5 comprises two joint construction elements 2, 2'. Each of the two joint construction elements 2, 2' basically corresponds to the one shown in Fig. 4A, however, no cutaway portion 58 is provided in the construction elements 2, 2'.

[0067] The first construction element 2 comprises a first end portion and a second end portion 18, whereas the second construction element 2' comprises a first end portion 16 and a second end portion. The first end portion of the first construction element 2 abuts the second end portion of the second construction element 2'. The first construction element 2 and the second construction element 2' are joint in a joint portion 36 comprising a joint 46 extending along the transversal axis Y of the construction elements 2, 2'. The longitudinal axis X and the lateral

axis Z of the construction elements 2, 2' are shown.

[0068] It can be seen that both construction elements 2, 2' comprise an insulation material 8 sandwiched between two corrugated steel reinforcement plates 6, 6' and plates 4, 4' attached to the outside surface of the reinforcement plates 6, 6'. The construction elements 2, 2' are joint in a joint portion 34 that comprises a joint 46 extending along the transversal axis Y of the construction element 2'.

[0069] Fig. 5A illustrates a schematic, perspective view of the joint portion 34 comprising a connection portion 38 of a construction system 5 comprising two adjacent construction elements 2, 2'. Each construction element 2, 2' comprises an insulation material 8 sandwiched between two reinforcement plates 6, 6'. Plates made of cement boards 4, 4' are attached to the outside of the reinforcement plates 6, 6'.

[0070] The joint portion 34 comprises a joint 46 extending along the transversal axis (extending perpendicular to the longitudinal axis X and the lateral axis Z) of the construction element 2'. The adjacent end portion of the construction elements 2, 2' constitute the joint portion 34.

[0071] The end portion of the first construction element 2 is provided with female structures 30 shaped as arced cavities. The adjacent end portion of the second construction element 2' comprises corresponding male portions 36 shaped as arced protruding elements.

[0072] The end portion of the first construction element 2 comprises plane portions 28 corresponding to matching plane portions 28' of the adjacent end portion of the second construction element 2'. A portion connection portion 38 is surrounded by a dotted ellipse. A close-up view of this portion is shown in Fig. 5B.

[0073] It can be seen that a part of the connection portion 38 is made by a protruding portion 22 having a conical geometry. The protruding portion 22 is made as an extension of a steel trapezoid plate 6 of the first construction element 2. The protruding structure 22 has its smallest thickness at its distal end. An L-shaped portion 24 extends in extension of the protruding structure 22. A receiving portion is provided next to the protruding structure 22 and a protruding element 40 of the second construction element 2' has been received by the receiving portion. Accordingly, a small gap 42 is provided between the two adjacent construction elements 2, 2'. The gap may be approximately 2-60 mm, preferably 3-40 mm, such as 5-30 mm.

[0074] The second construction element 2' is provided with a receiving structure 48 configured to receive the protruding structure 22 of the first construction element 2. The end portion of the first construction element 2 comprises plane portions 28 corresponding to matching plane portions 28' of the adjacent end portion of the second construction element 2'.

[0075] While the plates 4 of the construction elements 2, 2' abut each other, the geometry of the adjacent end portions prevents the end portions of adjacent construc-

tion elements 2, 2' to get into physical contact with each other. Accordingly, the construction detail protects the end portions from being damaged due to contact with the corresponding end portion.

[0076] Attachment members 44 are used to fix the two adjacent construction elements to each other. The attachment members 44 may be screws, nails or other mechanical means suitable for fixing the adjacent end portions of the construction elements 2, 2' to each other. The attachment members 44 are arranged in a configuration extending along a line 56 parallel to the joint 46. The line 56 is, however, displaced a distance D from the joint 46.

[0077] Fig. 6A illustrates a schematic top view of a construction element 2 according to the invention. The construction element 2 comprises an insulation material 8 sandwiched between a first reinforcement structure 6 and a second reinforcement structure 6'. A first plate 4 is glued to the outside surface of the first reinforcement structure 6, whereas a second plate 4' is glued to the outside surface of the second reinforcement structure 6'. The construction element 2 comprises a first end portion 16 provided with two cavities 30, receiving portions 32 and protruding structures 22. The construction element 2 comprises a second end portion 18 provided with two male portions 36, receiving structures 48 and protruding structures 22'.

[0078] Fig. 6B illustrates a schematic top view of a construction system 5 comprising two joint construction elements 2, 2' provided with additional plates 52, 52', 54, 54'. Each construction element 2, 2' corresponds to the one shown in Fig. 6A. The two construction elements 2, 2' have been joint and the joint portion 34 shows that the abutting end portions of the adjacent construction elements 2, 2' have engaging geometries.

[0079] The joints 46 of the plates 4, 4' are arranged in a distance from the joints 54, 54' of the plates 50, 50', 52, 52', respectively. The plates 50, 50', 52, 52' may be attached to the plates 4, 4' by any suitable attachment means, such as mechanical attachment members (e.g. screws or nails) or glue. The plates 50, 50', 52, 52' may be plasterboard, metal sheets, cement boards or other suitable plates.

[0080] Fig. 7A illustrates a perspective view of a construction system 5 according to one embodiment of the invention. Fig. 7B illustrates a close-up view of a portion of the construction system 5 shown in Fig. 7A. The construction system 5 comprises two adjacent construction elements 2, 2' each comprising a core structure comprising an insulation material 8 sandwiched between a first reinforcement structure 6 and a second reinforcement structure 6'. A first plate 4 is attached to the first reinforcement structure 6 and wherein a second plate 4' is attached to the second reinforcement structure 6'.

[0081] The two adjacent construction elements 2, 2' are mechanically attached to each other by means of screws 60 provided in a region of overlap 74. The screws 60 may be covered by a cover member 70 configured to

be attached to the top surface of the screw 60. The construction system 5 comprises two connection portions 38, 38', in which a protruding structure 22 in one of the construction elements 2, 2' is received by a corresponding receiving portion of the adjacent construction element 2, 2'. The protruding element 22 is provided next to a protruding element 40 that is received by a receiving portion. A small gap 42 is provided between the two adjacent construction elements 2, 2'.

[0082] Fig. 8A illustrates a cross-sectional view of a portion of a construction system 5 comprising two adjacent construction elements 2, 2' that are mechanically attached to each other by means of a nail 70. Fig. 8B illustrates a cross-sectional view of a portion of a construction system 5 that basically corresponds to the one shown in Fig. 8A and comprises two adjacent construction elements 2, 2' that are mechanically attached to each other by means of a screw 60.

[0083] The construction systems 5 shown in Fig. 8A and in Fig. 8B comprise two adjacent construction elements 2, 2'. The first construction element 2 comprises a plane portion 28 arranged next to an arced portion 29. Likewise, the second construction element 2' comprises a plane portion 28' arranged next to an arced portion 29'. A gap 42 is provided between the plane portions 28, 28' and the arced portions 29, 29'.

[0084] The second construction element 2' comprises a protruding element 22 provided next to a protruding element 40 of the first construction element 2. The protruding element 40 is received by a receiving portion of the second construction element 2', wherein the protruding element 22 is received by a corresponding receiving element of the first construction element 2.

[0085] In Fig. 8A, the nail 70 penetrates a plate 4 of the first construction element 2, the protruding element 40 of the construction element 2, the protruding element 22 of the second construction element 2' and a portion (the insulation material 8) of the first construction element 2 arranged in a longer distance from the plate 4 than the protruding element 22 of the second construction element 2'. In Fig. 8B, the screw 60 penetrates the plate 4 of the first construction element 2, the protruding element 40 of the construction element 2, the protruding element 22 of the second construction element 2' and a portion of the insulation material 8 of the first construction element 2 arranged in a longer distance from the plate 4 than the protruding element 22 of the second construction element 2'. Tape 72 has been attached to the plate 4 of the second construction element 2'. The tape 72 covers the screw 60. The screw 60 and nail 70 are inserted into the connection portion 38 in a distance D from the joint 46 of the constructions elements 2, 2'.

[0086] Fig. 8C illustrates a construction system 5 according to one embodiment of the invention. The construction system 5 comprises two adjacent construction elements 2, 2' like the one shown in Fig. 8A and Fig. 8B. It can be seen that a screw 60 is being inserted into a region of overlap 74 of the construction system 5.

List of reference numerals

[0087]

2, 2'	Construction element
3	Core structure
4, 4'	Plate
5	Construction system
6, 6'	Reinforcement structure
8	Insulation material
10, 10'	Space
12	Corner portion
14	Bracket
16	First end portion
18	Second end portion
20	Plane end portion
22, 22'	Protruding structure
24	L-shaped portion
26	Edge portion
28, 28'	Plane portion
29, 29'	Arched portion
30	Cavity
32	Receiving portion
34	Joint portion
36	Male portion
38, 38'	Connection portion
40	Protruding element
42	Gap
44	Attachment member
46	Joint
48	Receiving structure
50, 50', 52, 52'	Plate
54, 54'	Joint
56	Line
58	Cutaway portion
60	Screw
62	Front portion
64	Rear portion
66, 66'	Connection portion
68	Nail
70	Cover member
72	Tape
74	Region of overlap
T ₁ , T ₂ , T ₃	Thickness
X	Longitudinal axis
Y	Transversal axis
Z	Lateral axis
D	Distance
L	Distance

Claims

1. A construction system (5) comprising two adjacent construction elements (2, 2'), wherein each construction element (2, 2') comprises a core structure (3) comprising an insulation material (8) sandwiched between a first reinforcement structure (6) and a sec-

ond reinforcement structure (6'), wherein a first plate (4) is attached to the first reinforcement structure (6) and wherein a second plate (4') is attached to the second reinforcement structure (6'), **characterised in that** the two adjacent construction elements (2, 2') are mechanically attached to each other by means of attachment members (44, 60, 68) in a region of overlap (74).

2. A construction system (5) according to claim 1, **characterised in that** the attachment members (44, 60, 68) are arranged in a configuration extending along a zone being parallel to a joint (46) of the adjacent construction elements (2, 2'), wherein the zone is arranged in a non-zero distance (D) from the joint (46), wherein said distance (D) is in the range 3-50 mm.
3. A construction system (5) according to claim 1 or 2, **characterised in that** the attachment members (44, 60, 68) extend along a line (56) extending parallel to the joint (46).
4. A construction system (5) according to one of the preceding claims, **characterised in that** the attachment members (44, 60, 68) penetrate:
- a first structure (4) of a first construction element (2);
 - a first structure (42) of a second adjacent construction element (2') and
 - a second structure (22) of a first construction element (2);
5. A construction system (5) according to claim 4, **characterised in that** the attachment members (44, 60, 68) penetrate a second structure (41) of the second construction element (2');
6. A construction system (5) according to one of the preceding claims, **characterised in that** the first plate (4) and/or the second plate (4') are attached to the reinforcement structures (6, 6') by means of glue.
7. A construction system (5) according to one of the preceding claims, **characterised in that** the first plate (4) and/or the second plate (4') are attached to the reinforcement structures (6, 6') by means of mechanical attachment members.
8. A construction system (5) according to one of the preceding claims, **characterised in that** the first plate (4) and/or the second plate (4') is a cement board (4, 4').
9. A construction element (2, 2') according to one of the preceding claims, **characterised in that** the insulation material (8) comprises PUR or PIR.

10. A construction system (5) according to one of the preceding claims, **characterised in that** the first reinforcement structure (6) and/or the second reinforcement structure (6') is made of metal.
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11. A construction system (5) according to claim 10, **characterised in that** first reinforcement structure (6) and/or the second reinforcement structure (6') is shaped as a corrugated plate.
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12. A construction system (5) according to one of the preceding claims, **characterised in that** the construction element (2, 2') comprises a first end portion (16) and a corresponding second end portion (18), wherein the first end portion (16) comprises one or more protruding structures (22) configured to be received by corresponding receiving structures (48) provided in the second end portion (18).
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13. A construction system (5) according to one of the preceding claims, **characterised in that** the construction element (2, 2') comprises a first end portion (16) and a corresponding second end portion (18), wherein the second end portion (18) comprises one or more male portions (36, 22') configured to be received by corresponding female portions (30, 48) provided in the first end portion (16).
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14. A construction system (5) according to one of the preceding claims, **characterised in that** the construction element (2, 2') comprises a plane end portion (20).
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15. A construction system (5) according to one of the preceding claims, **characterised in that** the construction element (2, 2') comprises a cutaway (58) provided in the top portion of the construction element (2, 2').
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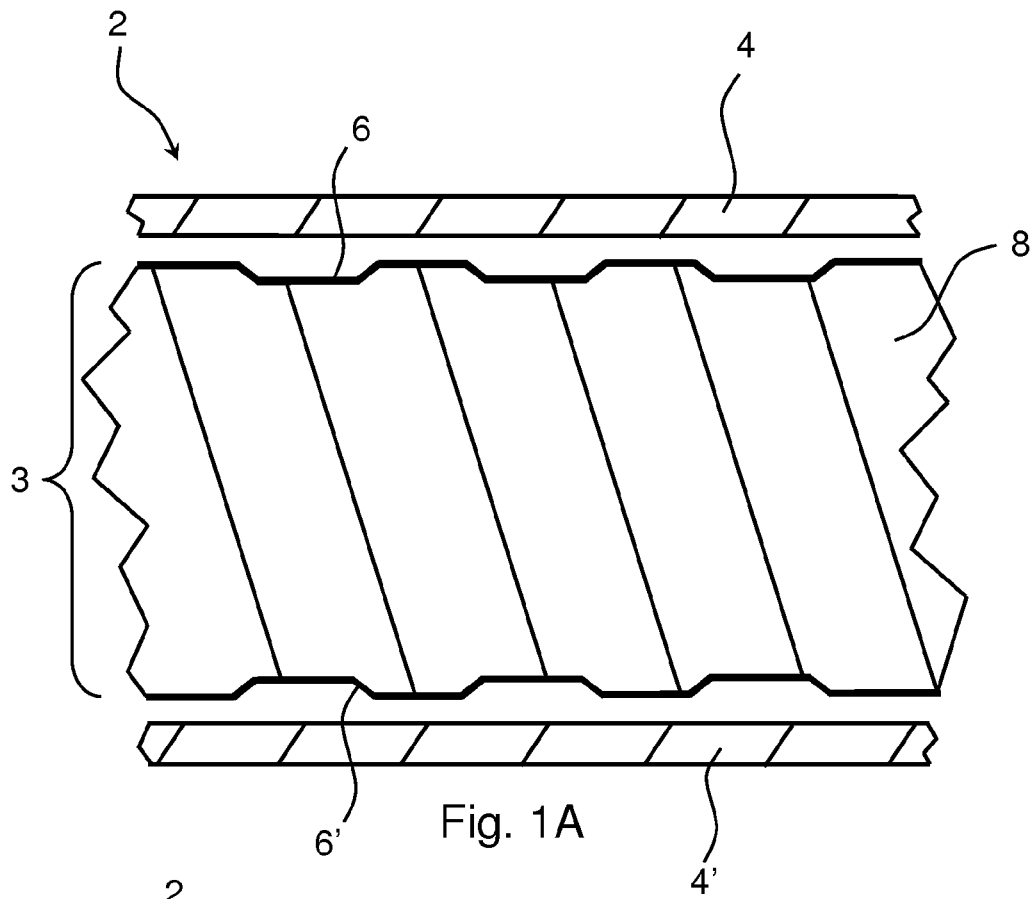


Fig. 1A

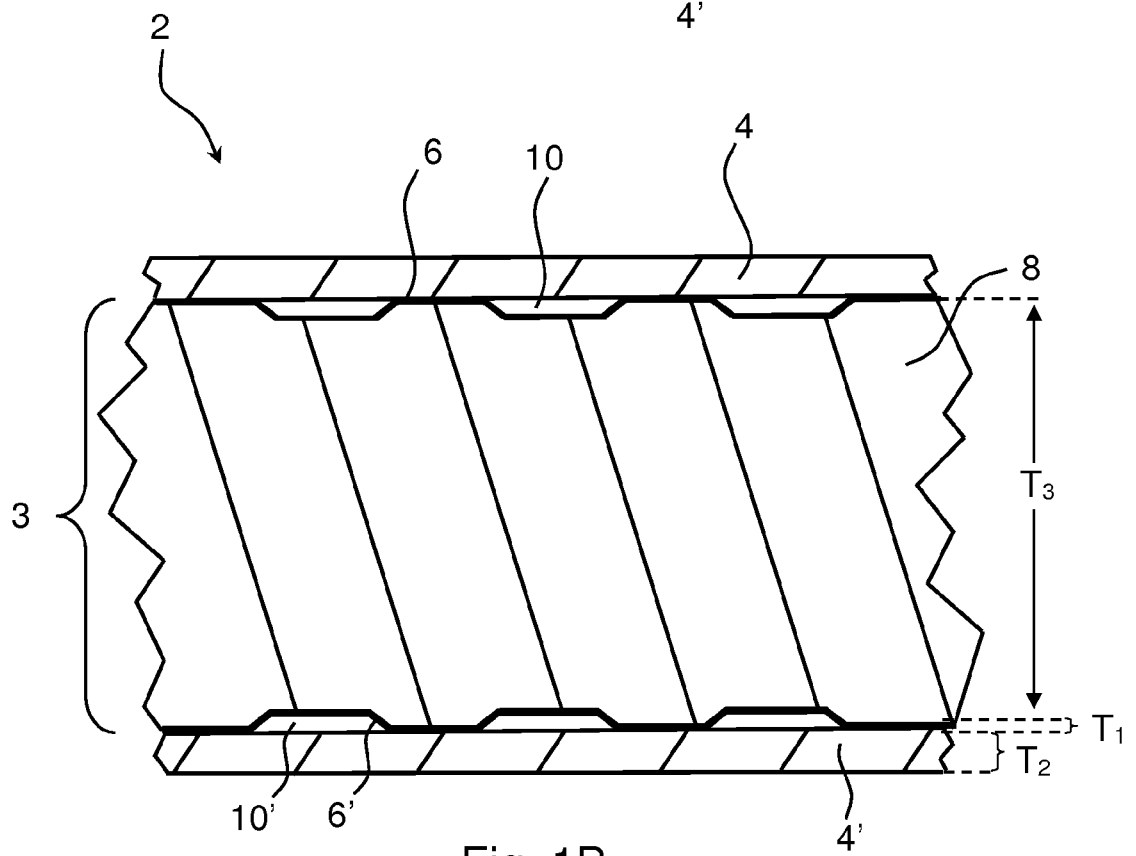
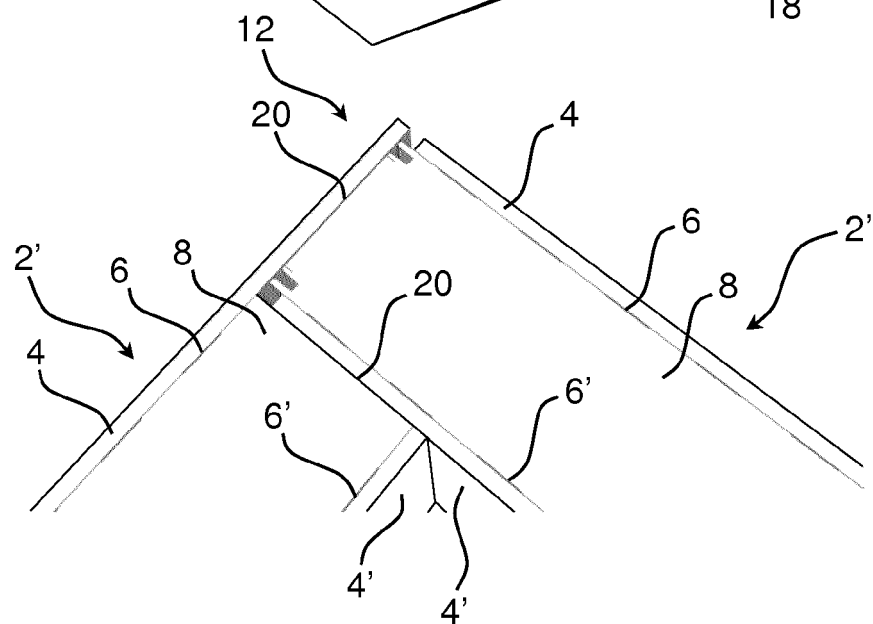
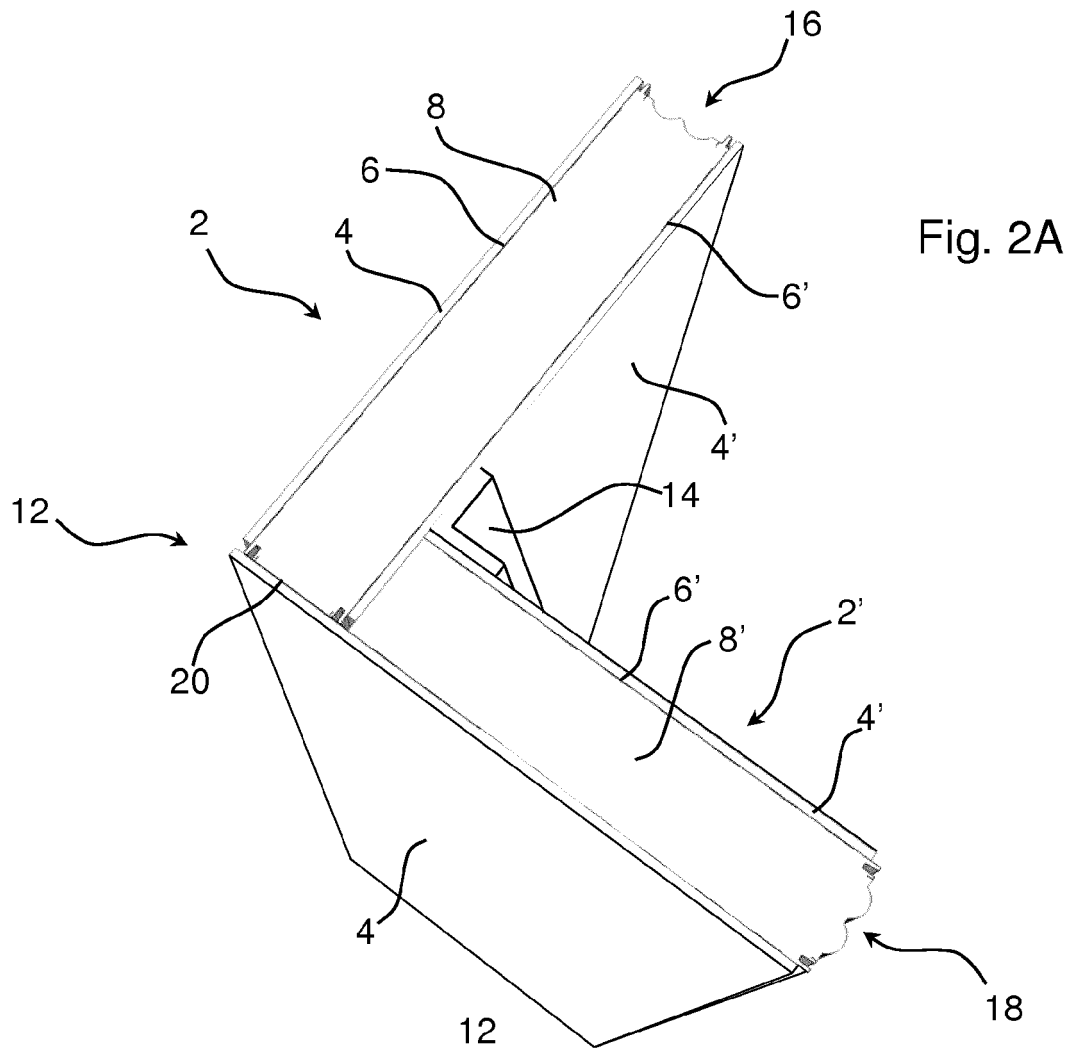


Fig. 1B



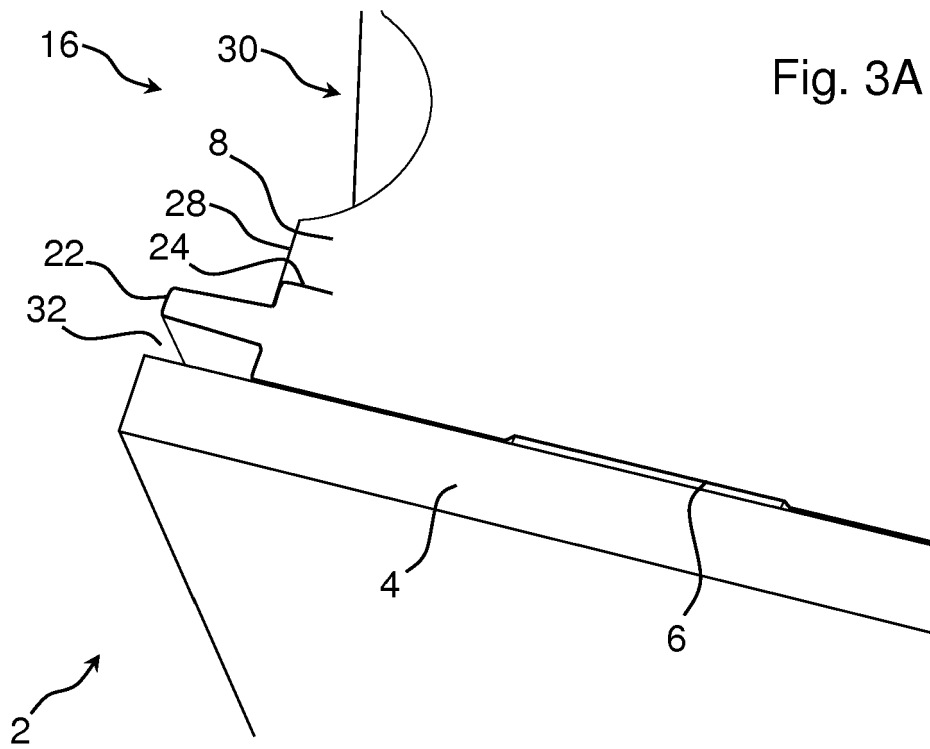


Fig. 3A

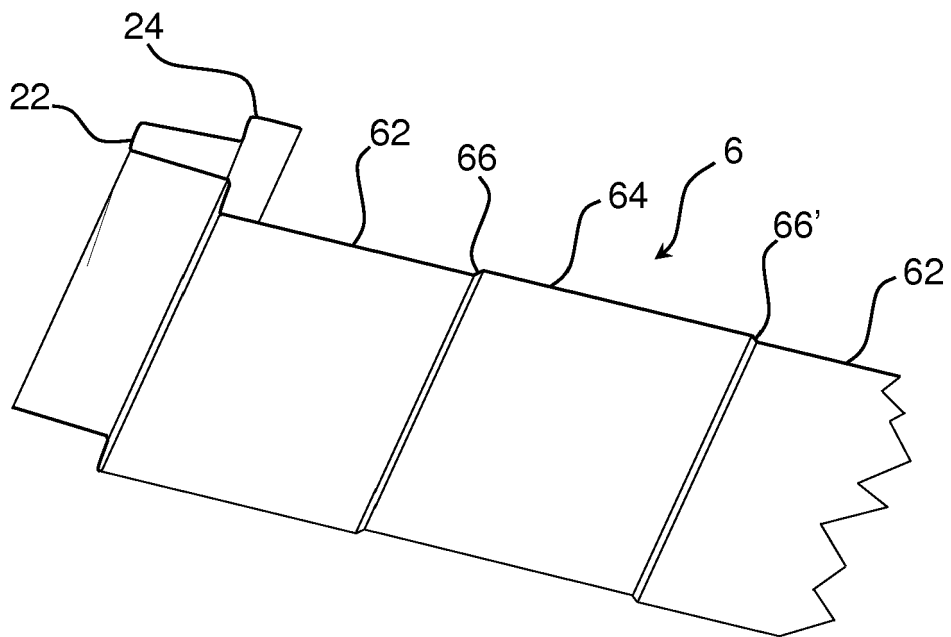
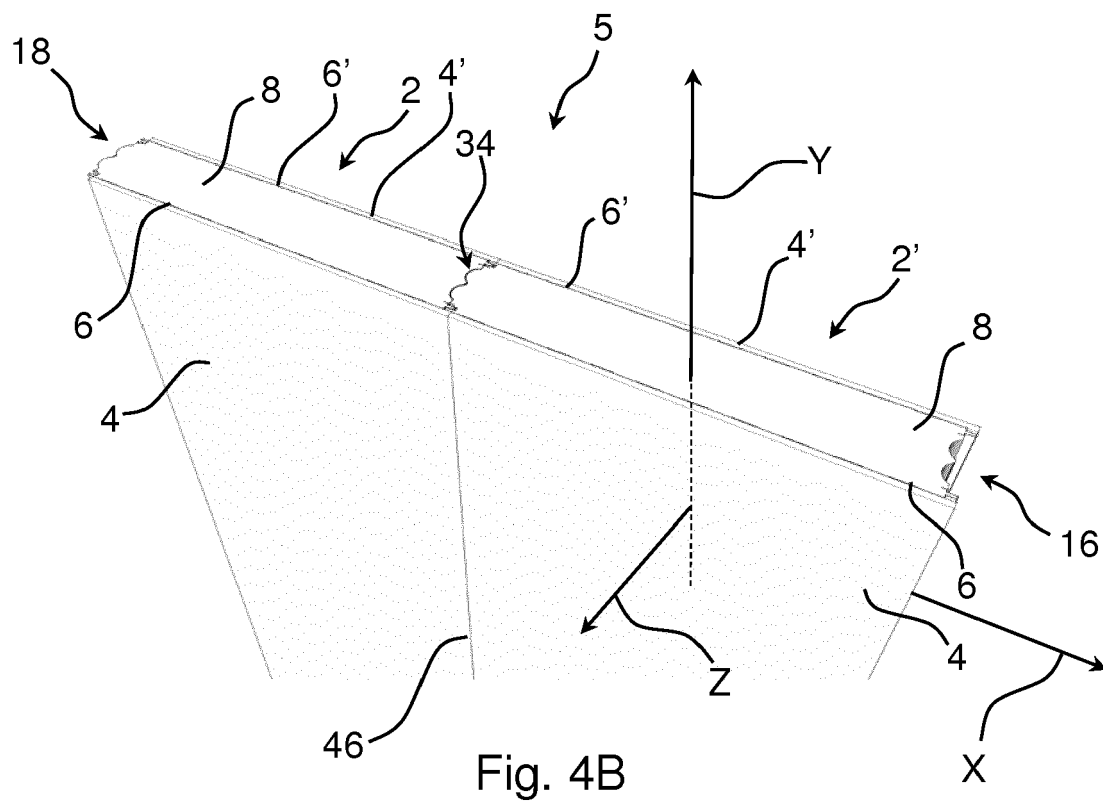
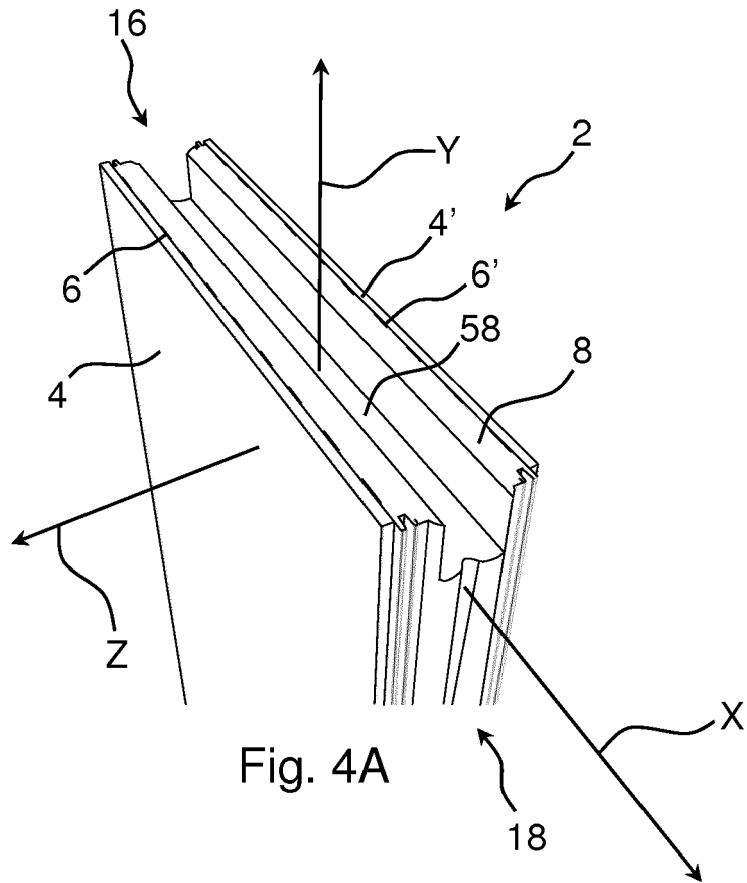
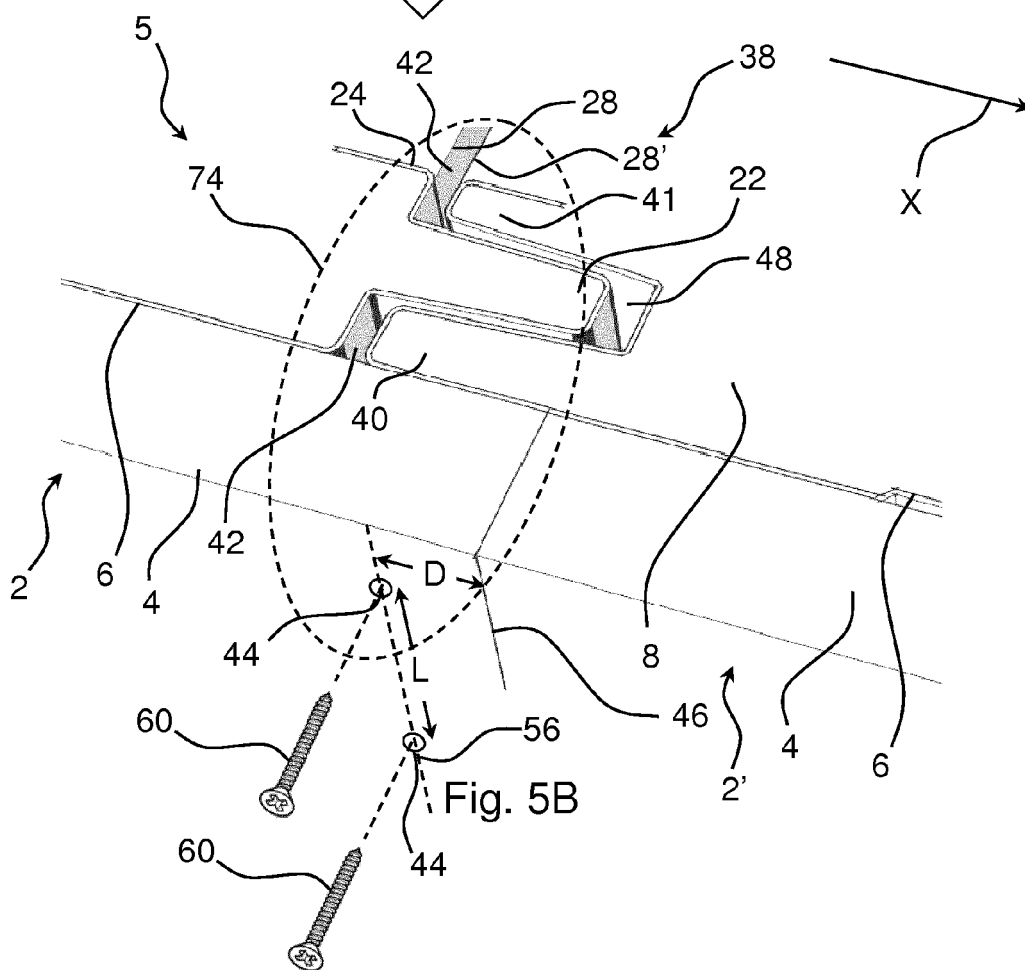
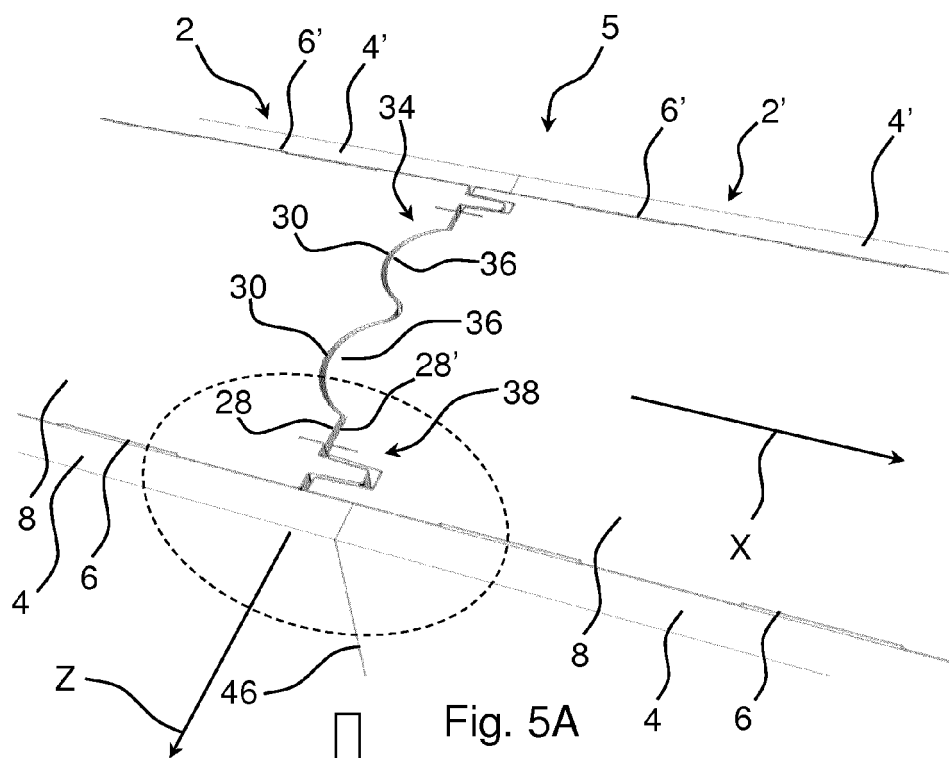
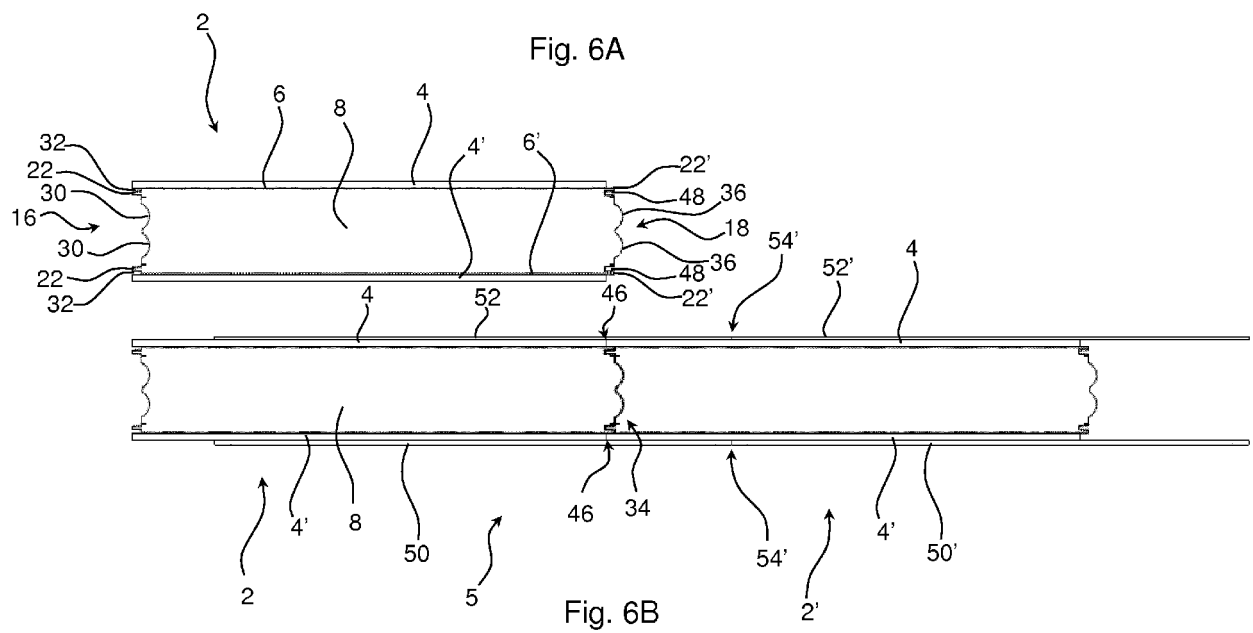


Fig. 3B







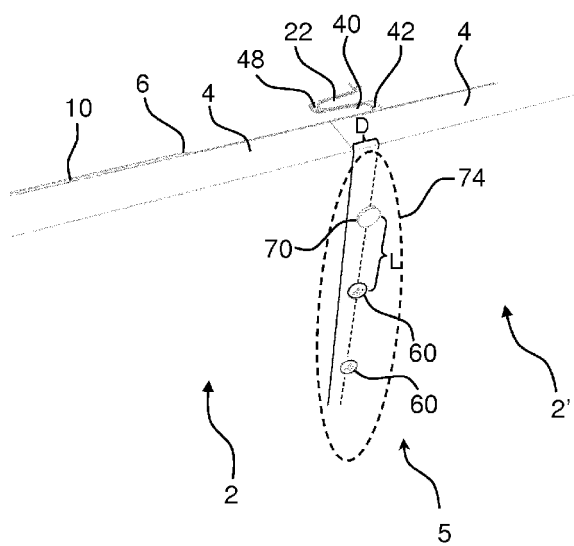


Fig. 7A

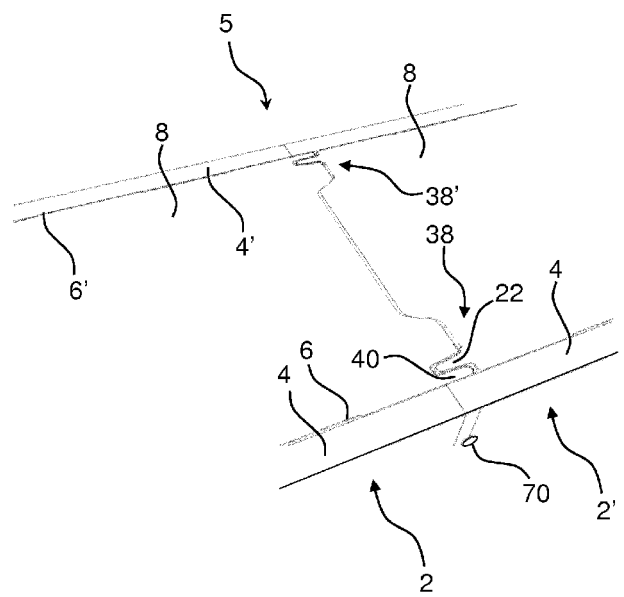


Fig. 7B

Fig. 8A

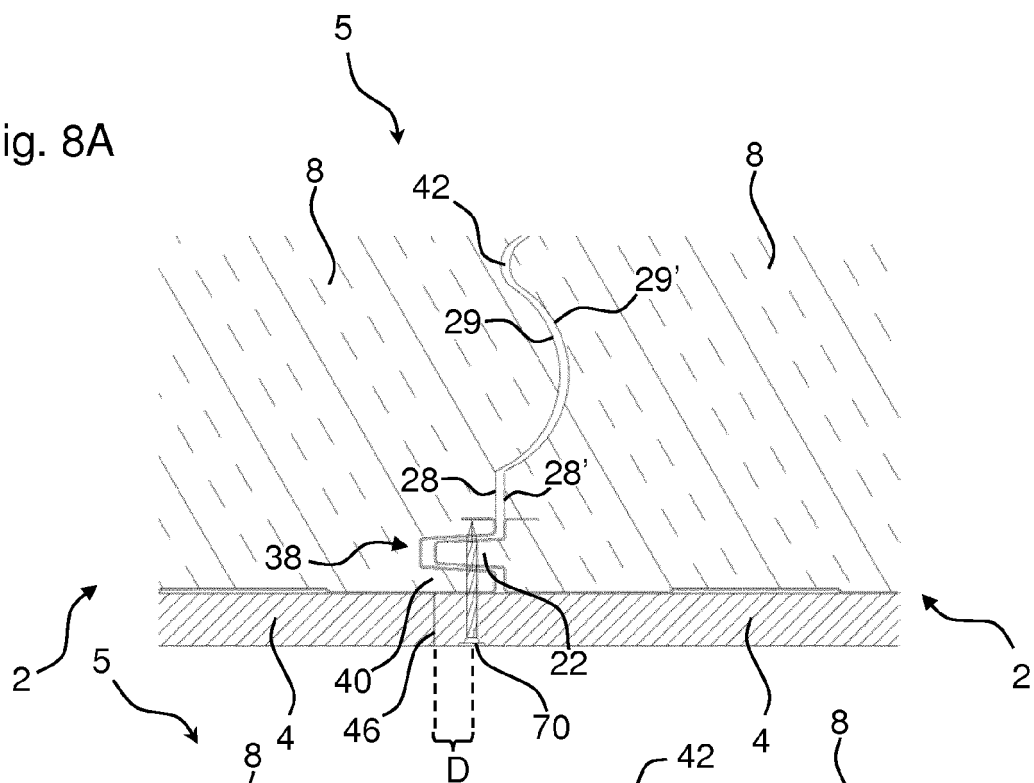


Fig. 8B

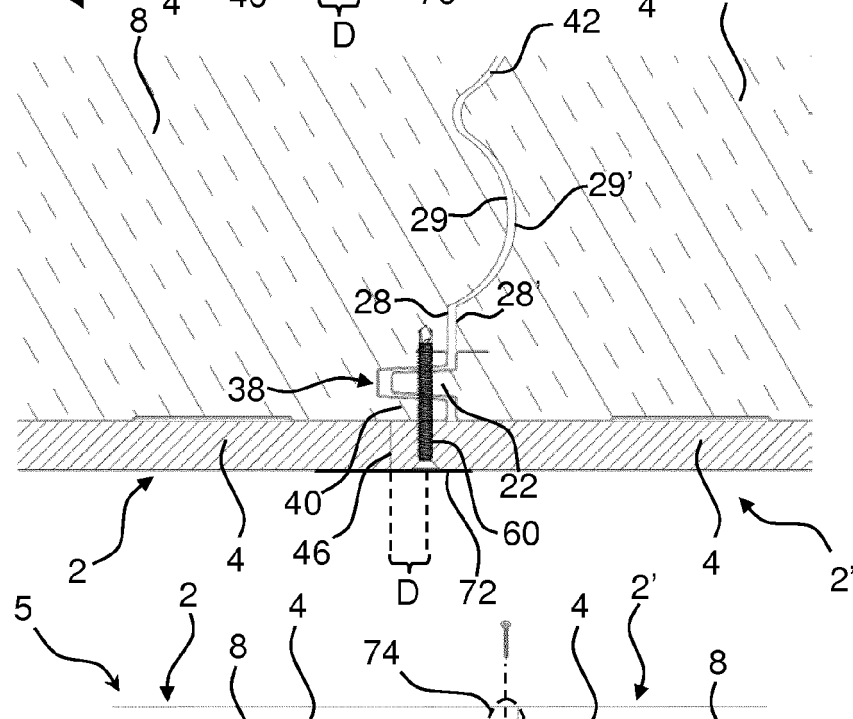
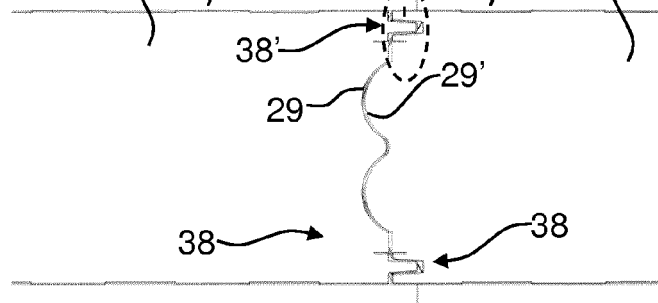


Fig. 8C





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Application Number
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A	FR 2 678 304 A1 (FOURGEAUD MONIQUE [FR]; BERGER MICHEL [FR]) 31 December 1992 (1992-12-31) * page 5, line 5 - page 7, line 23; figures *	1	
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 18 September 2018	Examiner Stern, Claudio
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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