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(54) **WATERTIGHT WALL PANEL CONSTRUCTION**

WASSERDICHTE WANDPLATTENKONSTRUKTION

STRUCTURE DE PANNEAU DE PAROI ÉTANCHE À L'EAU

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DescriptionTECHNICAL FIELD

[0001] This invention relates to wall elements and to wall construction methods. The wall elements and methods are suited for constructing the walls of building structures, swimming pool walls, basement walls and other structures.

BACKGROUND OF THE INVENTION

[0002] In building construction, wall elements are used to conveniently create a delineated, multi-angular or circular structure within a relatively short period of time. In certain applications it is customary to cover these wall elements with several different materials in order to provide for a watertight seal. This watertight seal is for example especially useful when creating a structure for swimming pools and basements.

[0003] Known wall elements are disclosed for example in FR2492435(A1) and US3298883(A).

[0004] A disadvantage of currently known watertight wall elements useful in swimming pool and basement construction is the need of additional materials (e.g. liners and polyester coatings) effectuating said watertight seal of the entire structure. This is often a time-consuming and expensive process. Besides that, a disadvantage of some techniques is the difficulty to guarantee complete waterproofing when assembled on site.

[0005] It is accordingly not surprisingly that, when focusing on the construction of swimming pools, existing means for providing watertight constructions are typically based on prefabricated constructions assembled and tested for water tightness off site. Such prefabricated pools are, however, difficult to transport and difficult to install. This process is therefore an expensive and delicate procedure requiring a large quantity of time, focus and know-how.

[0006] Another disadvantage of currently known wall elements, to realize a watertight construction on site, resides in the connection between the adjacent wall elements. A large number of connectors (e.g. bolts and screws) is needed in order to connect all of the adjacent wall elements, which, again, is a time-consuming process. Finally, in order to provide for a sufficient amount of sturdiness, the wall elements are often quite thick and heavy, making transportation and manageability of such wall elements rather difficult.

[0007] Bearing in mind the foregoing disadvantages, there is still a need in the art for wall elements suitable for building watertight constructions which are easily transportable, easy to install and easy connectable and providing for a watertight

[0008] The present invention tackles these disadvantages, by providing a wall element being both solid and easily installable. Furthermore, the unique combination of the panel materials and shape provides for a seamless

watertight connection of the adjacent wall elements without the need of any connectors or additional sealing materials.

5 SUMMARY OF THE INVENTION

[0009] It is an object of the present invention to provide a wall element which is easily installable, and being capable of forming a seamless watertight connection between adjacent wall elements. This objective is accomplished by a product according to the present invention.

[0010] Said wall element being a composed panel, comprising a first panel and a second panel being connected to each other.

[0011] It is an advantage of embodiments of the present invention that no connectors are needed to connect the adjacent wall elements.

[0012] It is an advantage of embodiments of the present invention that a watertight connection between the adjacent wall elements can be established without the installment of any additional materials.

[0013] It is an advantage of embodiments of the present invention that the watertight connection between the adjacent wall elements can be established while equally providing a seamless connection.

[0014] It is an advantage of embodiments of the present invention that the first and second panel of a single wall element are connectable without the use of any additional connectors.

[0015] It is an advantage of embodiments of the present invention that the wall elements are slightly deformable.

[0016] Therefore, to achieve these advantages, in a first embodiment, the present invention relates to a wall element for use in building construction, the wall element comprising a first panel having a first side face, a second side face opposite said first side face, the second side face being attached to a first side face of a second panel. Said second panel having said first side face and a second side face opposite said first side face, wherein said first panel comprises a thermoplastic material and said second panel comprises a corrugated sheet material with at least one crest 17 and at least one corrugation 12, characterized in that said second panel further comprises a plurality of openings 10, wherein at least a first part of the plurality of openings 10A of said second panel is situated at the at least one crest of said corrugated sheet material such as to accommodate at least part of said thermoplastic material, thereby forming a connection between said first panel and said second panel.

[0017] In an embodiment, the at least one corrugation of said corrugated sheet material of the wall element is oriented vertically relative to the first panel when in upright position.

[0018] In another embodiment, the at least one corrugation of the wall element as defined herein comprises a flat surface.

[0019] In yet another embodiment, at least a second

part of the plurality of openings of the wall element according to the invention is distributed over the at least one corrugation of said corrugated sheet material.

[0020] In some embodiments of the present invention, the wall element further comprises at least one beam 14 and/or at least one wall brace 15.

[0021] In an embodiment, the at least one beam of the wall element according to the invention is mounted onto said second panel, thereby contacting at least part of the second part of the plurality of openings.

[0022] In a next embodiment, the at least one wall brace of the wall element as defined herein is mounted directly or indirectly onto the second panel.

[0023] In a second embodiment, the use of the wall element according to the invention as a swimming pool construction element is described.

[0024] In some embodiments, the wall element, when used as a swimming pool construction element, may be used as a floor panel of the swimming pool.

[0025] In some embodiments, the wall element, when used as a swimming pool construction element, may be used as an additional structure of the swimming pool (e. g. stairs).

[0026] In a third embodiment, a method of installing the wall element according to the invention is described, comprising putting straight said wall element, pouring a fluent hardenable construction mix at the side of the second panel, thereby allowing said second panel to be at least partially covered with said fluent hardenable construction mix.

[0027] In a preferred embodiment, the fluent hardenable construction mix of the method according to the invention is capable of leaking through the second part of the plurality of openings of the corrugated sheet material, thereby embedding at least part of the second panel in the fluent hardenable construction mix.

[0028] In another embodiment, the method of constructing the wall element according to the invention comprises heating at least part of the thermoplastic material and bringing into contact at least the first part of the plurality of openings of the second panel with the heated thermoplastic material of said first panel, said thermoplastic material forming a connection between said first panel and said second panel.

[0029] In yet another embodiment, the method of constructing the wall element according to the invention comprises that the at least one beam 14 of the method according to the invention is mounted onto said second panel 5 and the at least one wall brace 15 is mounted directly or indirectly onto said second panel.

[0030] In a following embodiment, the present invention provides a method of making a wall construction, said method comprises bringing into contact the adjacent first panels of the at least two wall elements and fusing at least part of the adjacent first panels by means of heating at least part of the thermoplastic material of the at least two wall elements.

[0031] In a further embodiment, the method of making

a wall construction is further characterized in that the connection between the at least two wall elements comprises a watertight connection.

[0032] In a fourth embodiment, the invention relates to a kit for use in building construction, comprising a wall element according to the invention and a bottom surface liner connectable to the first panel of the wall element.

[0033] In a preferred embodiment, the kit for use in building construction according to the invention further comprises at least one beam.

[0034] In a preferred embodiment, the kit for use in building construction according to the invention further comprises at least one wall brace.

[0035] Also disclosed but not claimed is a method of constructing a watertight space, such as a swimming pool or a watertight basement, comprising a plurality of connected wall elements. In said disclosure, the wall elements may also be used as floor panels in the construction of the watertight space.

[0036] Particular and preferred embodiments of the invention are set out in the accompanying independent and dependent claims.

[0037] The above and other characteristics, features and advantages of the present invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings, which illustrate, by way of example, the principles of the invention. This description is given for the sake of example only, without limiting the scope of the invention. The reference figures quoted below refer to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0038]

Fig. 1 is a perspective view of a wall element, according to an embodiment of the present invention. Fig. 2 is a close up of an edge fragment of a wall element, according to an embodiment of the present invention.

Fig. 3 is a side view of a wall element, according to an embodiment of the present invention.

Fig. 4 is a side view of a wall element, according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0039] The present invention will be described with respect to particular embodiments and with reference to certain drawings, but the invention is not limited thereto but only by the claims. The drawings, as further described, are only schematic and nonlimiting. In the drawings, some of the elements may not be drawn to scale for illustrative purposes. The dimensions and the relative dimensions do not correspond to the actual reductions to practice of the invention.

[0040] Furthermore, the terms first, second, further

and the like in the description and in the claims are used for distinguishing between similar elements and not necessarily for describing a sequence, either temporally, spatially, in ranking or in any other manner. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other sequences than described or illustrated herein.

[0041] It is to be noticed that the term "comprising", used in the claims, should not be interpreted as being restricted to the means listed thereafter; it does not exclude other elements or steps. It is thus to be interpreted as specifying the presence of the stated features, integers, steps or components as referred to, but does not preclude the presence or addition of one or more other features, integers, steps or components, or groups thereof. Thus, the scope of the expression "a product comprising A and B" should not be limited to devices consisting only of components A and B. It means that with respect to the present invention, the relevant components of the product are A and B, and that further components such as C may be present.

[0042] Reference throughout this specification to "one embodiment" or "an embodiment" means that a particular feature, structure or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases "in one embodiment" or "in an embodiment" in various places throughout this specification are not necessarily all referring to the same embodiment.

[0043] Similarly, it should be appreciated that in the description of exemplary embodiments of the invention, various features of the invention are sometimes grouped together in a single embodiment, figure, or description thereof for the purpose of streamlining the disclosure and aiding in the understanding of one or more of the various inventive aspects. This method of disclosure, however, is not to be interpreted as reflecting an intention that the claimed invention requires more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive aspects lie in less than all features of a single foregoing disclosed embodiment. Thus, the claims following the detailed description are hereby expressly incorporated into this detailed description, with each claim standing on its own as a separate embodiment of this invention.

[0044] In the description provided herein, numerous specific details are set forth. However, it is understood that embodiments of the invention may be practiced without these specific details. In other instances, well-known methods, structures and techniques have not been shown in detail in order not to obscure an understanding of this description.

[0045] The following terms are provided solely to aid in the understanding of the invention. The terms "connection" and "being attached to" should be interpreted as describing an attachment between two elements (e.

g. first panel and second panel) which is preferably inseparable. Thus, the scope of the expression "an element A forming a connection with an element B" should be interpreted as an element A being preferably inseparably attached to element B.

[0046] As used herein, and unless otherwise specified, when a first element is being "mounted" onto a second element, it is meant that the first element is connected with the second element by using the usual connecting means (e.g. screws, bolts, vices, clamps, locks, brackets, pins) or welding techniques.

[0047] As used herein, and unless otherwise specified, the term "thermoplastic material" is meant to describe a material which is capable of becoming at least partially deformable when heated to a certain temperature and which solidifies upon cooling. Such thermoplastic materials may be for example: acrylic, acrylonitrile butadiene styrene, nylon, polylactic acid, polybenzimidazole, polycarbonate, polyether sulfone, polyoxymethylene, polyether ether ketone, polyetherimide, polyethylene, polyphenylene oxide, polyphenylene sulfide, polypropylene, polystyrene, polyvinyl chloride, polyvinylidene fluoride and teflon.

[0048] As used herein, and unless otherwise specified, when a first element is "fused" with second element, it describes the process of inseparably coupling the two elements by melting the materials of the elements together using high heat and subsequently cooling the materials, resulting in an inseparable connection between the at least two elements. Common techniques for such a fusing process include welding techniques.

[0049] As used herein, and unless otherwise specified, the term "hardenable construction mix" is meant to be a mixture of different substances (e.g. cement, sand, gravel, water) that can be molded and then hardens and adheres to other materials to interconnect them, such as for example concrete.

[0050] A first embodiment of the present invention relates to a wall element for use in building construction. The wall element comprises a first panel having a first side face, a second side face opposite said first side face, the second side face being attached to a first side face of a second panel and the second panel having the first side face and a second side face opposite said first side face.

[0051] As used herein, and unless otherwise specified, the term "panel" is meant to describe a flat sheet material having at least two sides and a minimal thickness of 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60 millimeters.

[0052] In some embodiments, the wall element may comprise an additional third panel having the same properties as the first panel 2, a side of the third panel being connected to the second side face of the second panel 5. The method of connecting the third and the second panel 5 may be similar to the connection between the first panel 2 and the second panel 5. The three panels together forming a sandwich panel.

[0053] In some embodiments, said additional third

panel may have deviating properties compared to the first panel 2 and the second panel 5.

[0054] In some embodiments, the second side face of the first panel 2 may be attached to the second side face of the second panel 5.

[0055] In some embodiments, the first side face of the first panel 2 may be attached to the second side face of the second panel 5.

[0056] In some embodiments, the first side face of the first panel 2 may be attached to the first side face of the second panel 5.

[0057] Said first panel 2 comprises a thermoplastic material and said second panel 5 comprises a corrugated sheet material with at least one crest 17, at least one corrugation 12 and a plurality of openings 10, wherein at least a first part of the plurality of openings of said second panel is situated at the at least one crest of said corrugated sheet material such as to accommodate at least part of said thermoplastic material, thereby forming a connection between said first panel and said second panel.

[0058] In some embodiments, said first panel may have different dimensions compared to the second panel.

[0059] In some embodiments, the second panel may comprise a plurality of corrugations spaced apart from each other by a plurality of crests.

[0060] In some embodiments, the plurality of openings may be evenly distributed across the entire second panel.

[0061] In some embodiments, the at least first part of the plurality of openings may be situated at a part of the at least one crest.

[0062] In some embodiments, the at least first part of the plurality of openings may be situated at a certain amount of the plurality of crests. Said certain amount being a minimum of 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60, 70, 80 percent of the plurality of crests.

[0063] In some embodiments, only part of the at least first part of the plurality of openings may accommodate at least part of said thermoplastic material. Said "only part" of the at least first part of the plurality of openings being a minimum of 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60, 70, 80 percent.

[0064] In preferred embodiments, the at least one crest may comprise a flat surface.

[0065] As used herein, and unless otherwise specified, the term "corrugated sheet material" is meant to represent a sheet material having at least two sides and a minimal thickness of 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60 millimeters, which is shaped so as to define at least one crest and at least one corrugation.

[0066] As used herein, and unless otherwise specified, the term "crest" is meant to be a part of the corrugated sheet material that lies aside of a corrugation.

[0067] As used herein, and unless otherwise specified, the term "corrugation" is meant to be a part of the corrugated sheet material that lies aside of a crest and being the part that protrudes out of the face of the corrugated sheet material comprising said crest.

[0068] In a second embodiment of the present invention, the at least one corrugation of the corrugated sheet material is oriented vertically relative to the first panel when in upright position.

5 **[0069]** In some embodiments, the at least one corrugation may be oriented horizontally relative to the first panel when in upright position.

[0070] In some embodiments, the wall element may not be in an upright position when installed, but may be for example used as a floor element, the second panel of the wall element being for example embedded in a fluent hardenable construction mix. As used herein, and unless otherwise specified, when the wall element is in "an upright position", it is meant that the wall element is positioned perpendicularly relative to the surface upon which it rests.

[0071] In a third embodiment of the present invention, the at least one corrugation of the second panel comprises a flat surface.

20 **[0072]** In some embodiments, the at least one corrugation may be of trapezoidal shape.

[0073] In some embodiments, the at least one corrugation may be of re-entrant shape.

25 **[0074]** In some embodiments, the at least one corrugation may be of rectangular shape.

[0075] In some embodiments, the at least one corrugation may be of squared shape.

[0076] In some embodiments, the at least one corrugation may be of triangular shape.

30 **[0077]** In some embodiments, the at least one corrugation may be of curved shape, not comprising a flat surface.

[0078] A fourth embodiment of the present invention relates to at least a second part of the plurality of openings of the wall elements being situated at the at least one corrugation of said corrugated sheet material.

35 **[0079]** In some embodiments, the at least second part of the plurality of openings may be situated at a plurality of corrugations of the corrugated sheet material.

40 **[0080]** In some embodiments, the at least second part of the plurality of openings may be situated at a certain amount of the plurality of corrugations of the corrugated sheet material. Said certain amount being a minimum of 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60, 70, 80 percent of the plurality of corrugations.

[0081] A fifth embodiment of the present invention relates to at least one beam being mounted onto the second panel of the wall element, more specifically being mounted on at least part of the surface of the corrugations.

50 **[0082]** Said "at least part" of the surface of the corrugations being a minimum of 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60, 70, 80 percent.

[0083] In some embodiments, the at least one beam may be mounted on at least part of the second part of the plurality of openings 10B.

55 **[0084]** This is especially useful when using the usual connecting means (e.g. screws, bolts, vices, clamps, locks, brackets, pins) to connect at least part of the sec-

ond part of the plurality of openings with the at least one beam.

[0085] Said "at least part" of the second part of the plurality of openings being a minimum of 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60, 70, 80 percent.

[0086] In some embodiments, the at least one beam may be mounted on at least part of the at least one crest of the second panel.

[0087] Said "at least part" of the at least one crest of the second panel being a minimum of 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60, 70, 80 percent.

[0088] In some embodiments, a plurality of beams may be mounted onto the second panel of the wall element.

[0089] In some embodiments, the at least one beam may be mounted directly onto the second side face of the first panel of the wall element.

[0090] In some embodiments, the at least one beam may be mounted parallel relative to the at least one corrugation, being at least partially mounted on the at least one crest of the second panel. "At least partially" mounted on the at least one crest of the second panel meaning a minimum of 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60, 70, 80 percent.

[0091] A sixth embodiment of the present invention relates to at least one wall brace being mounted directly or indirectly onto the second panel of the wall element.

[0092] In some embodiments, the at least one wall brace may be mounted onto the at least one beam while the beam is mounted on the second panel of the wall element.

[0093] In some embodiments, the at least one wall brace may be mounted on at least part of the surface of at least one corrugation of the second panel.

[0094] Said "at least part" of the surface of the at least one corrugation being a minimum of 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60, 70, 80 percent.

[0095] In some embodiments, the at least one wall brace may be mounted on at least part of the at least one crest of the second panel.

[0096] Said "at least part" of the at least one crest being a minimum of 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60, 70, 80 percent.

[0097] In some embodiments, the at least one wall brace may be mounted partially on at least part of the at least one corrugation and partially on at least part of the at least one crest of the second panel,

[0098] Said "at least part" of the at least one corrugation being a minimum of 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60, 70, 80 percent.

[0099] Said "at least part" of the at least one crest being a minimum of 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60, 70, 80 percent.

[0100] In some embodiments, the at least one wall brace may be mounted on at least part of the second part of the plurality of openings 10B.

[0101] This is especially useful when using the usual connecting means (e.g. screws, bolts, vices, clamps, locks, brackets, pins) to connect at least part of the sec-

ond part of the plurality of openings with the at least one wall brace.

[0102] Said "at least part" of the second part of the plurality of openings being a minimum of 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60, 70, 80 percent.

[0103] In a seventh embodiment of the present invention, a use of the wall element as a swimming pool construction element is described.

[0104] In some embodiments, the wall element may be used for constructing the swimming pool walls of a swimming pool bowl.

[0105] In some embodiments, the wall element may be used for constructing watertight basements.

[0106] In some embodiments, the wall element may be in an upright position.

[0107] In some embodiments, the wall element may be used as a floor element, being embedded in the fluent hardenable construction mix and connected with the wall element which is in an upright position. The connection being a watertight connection, established by heating and fusing the first panels of the wall element used as a floor element and the first panel of the wall element in an upright position.

[0108] The first panels are "heated" to a minimum of 60, 70, 80, 90, 100, 110, 120, 130, 150, 200 °C.

[0109] In an eight embodiment of the present invention, a method of installing the wall element is described, comprising putting straight said wall element, pouring a fluent hardenable construction mix at the side of the second panel, thereby allowing said second panel to be at least partially covered with said fluent hardenable construction mix.

[0110] In some embodiments, the fluent hardenable construction mix may cover the entire second panel.

[0111] In some embodiments, soil may be used for pouring at the side of the second panel.

[0112] In a ninth embodiment of the present invention, the fluent hardenable construction mix is capable of leaking through the second part of the plurality of openings of the corrugated sheet material, thereby embedding at least part of the second panel in the fluent hardenable construction mix. In order for the fluid hardenable construction mix to be capable of leaking through the plurality of openings, it needs to meet certain requirements (e.g. being sufficiently deformable and fluid)

[0113] In some embodiments, at least part of the first part of the plurality of openings may accommodate at least part of the fluent hardenable construction mix.

[0114] In some embodiments, the fluent hardenable construction mix may fill the entire corrugated sheet material.

[0115] As used herein, and unless otherwise specified, the term "leaking through" is used to describe the passage of a first material into an opening (e.g. a trough hole, puncture) of a second material.

[0116] In a following embodiment of the present invention, the method of constructing the wall element comprises heating at least part of the thermoplastic material

of the first panel and bringing into contact the at least first part of the plurality of openings of the second panel with the heated thermoplastic material of said first panel, said thermoplastic material thereby forming a connection between said first panel and said second panel.

[0117] At least part of the thermoplastic material of the first panel is "heated" to a minimum of 60, 70, 80, 90, 100, 110, 120, 130, 150, 200 °C.

[0118] In some embodiments, at least part of the second side face of the first panel may be heated and brought into contact with at least part of the first part of the plurality of openings and/or at least part of the second part of the plurality of openings of the second panel.

[0119] When at least part of both the first and the second part of the plurality of openings is brought into contact with the second side face of at least two first panels 2, a sandwich panel is created wherein the corrugated sheet material is located between said two first panels 2.

[0120] In some embodiments, a connection between said first panel and said second panel may be achieved when at least part of the thermoplastic material has leaked through at least part of the first part of the plurality of openings of the corrugated sheet material.

[0121] Said "at least part" of the first part of the plurality of openings of the corrugated sheet material being a minimum of 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60, 70, 80 percent.

[0122] A further embodiment of the present invention relates to the method of constructing the wall element, wherein the at least one beam is mounted onto said second panel and the at least one wall brace is mounted directly or indirectly onto said second panel.

[0123] In some embodiments, the at least one beam may be mounted onto said second panel by means of connectors (e.g. screws, bolts, vices, clamps, locks, brackets, pins).

[0124] In some embodiments, the at least one beam may be mounted onto said second panel by means of welding techniques.

[0125] In some embodiments, a plurality of beams may be mounted onto said second panel, being spaced apart from each other in a generally parallel manner.

[0126] In some embodiments, the at least one beam may be mounted perpendicularly relative to the at least one corrugation of the second panel.

[0127] In some embodiments, the at least one beam may be mounted parallel relative to the at least one corrugation of the second panel.

[0128] In some embodiments, the at least one wall brace may be mounted onto the at least one beam.

[0129] In some embodiments, the at least one wall brace may be mounted onto the second panel.

[0130] In a twelfth embodiment of the present invention, the method of making a wall construction is described, comprising bringing into contact the adjacent first panels of the at least two wall elements and fusing at least part (e.g. the sides (18)) of the adjacent first panels by means of heating at least part of the thermoplastic material of the adjacent first panels, thereby forming a

connection between the at least two wall elements.

[0131] In some embodiments, a side 18 of the first panel 2 of a first wall element 1 may be fused with the first side face 3 of the first panel 2 of a second wall element 1.

5 **[0132]** In some embodiments, a side 18 of the first panel 2 of a first wall element 1 may be fused with the second side face of the first panel 2 of a second wall element 1.

[0133] In some embodiments, the first wall element 1 may be at an angle relative to the second wall element 1, while both wall elements are fused, in order to create an angled wall construction.

[0134] As used herein, and unless otherwise specified, the term "side" of a first panel is meant to describe a left, right, upper or bottom edge of the first panel.

10 **[0135]** In a following embodiment of the present invention, the method of connecting at least two wall elements is described, wherein the connection between the at least two wall elements comprises a watertight connection.

[0136] In some embodiments, the first panels 2 of at least two wall elements 1 are connected by being placed aside from each other, being brought into contact with each other and then being fused.

[0137] In some embodiments, the watertight connection between the at least two wall elements may be achieved by means of welding techniques.

[0138] In a next embodiment of the present invention, a kit for use in building construction is described, comprising the wall element and a bottom surface liner connectable to the first panel of the wall element.

20 **[0139]** As used herein, and unless otherwise specified, when a first panel of a wall element is "connectable" to a bottom surface liner, the connection is established by means of fusing, such as for example welding techniques.

30 **[0140]** In some embodiments, the bottom surface liner may be connected to a side of the first panel of the wall element.

[0141] In some embodiments, the bottom surface liner may be a watertight liner.

40 **[0142]** In some embodiments, the bottom surface liner may be a swimming pool liner.

[0143] In some embodiments, the bottom surface liner may be a flexible liner.

45 **[0144]** In some embodiments, the bottom surface liner may be a thermoplastic sheet material.

[0145] In a fifteenth embodiment of the present invention, the kit for use in building construction further comprises the at least one beam.

[0146] In a fifteenth embodiment of the present invention, the kit for use in building construction further comprises the at least one wall brace.

55 **[0147]** We now refer to Fig. 1, showing a perspective view of a wall element 1 in accordance with the present invention. The wall element 1 comprises a first panel 2 with a first side face 3 and a second side face 4 opposite said first side face 3. The first panel 2 further comprises at least two sides 18 forming the edges of the first panel 2. The first panel 2 comprises a thermoplastic material.

The thermoplastic material is capable of becoming a deformable, viscous liquid when applying high heat (e.g. 150°C). The connection of at least two first panels 2 of at least two wall elements 1 comprising said thermoplastic material may be a seamless watertight connection. In order to achieve this connection, at least part of the adjacent first panels 2 are fused by first bringing into contact the first panels 2 of the at least two wall elements 1, heating at least part of the thermoplastic material of the at least two wall elements 1 and retaining the contact between the first panels 2 of the at least two wall elements 1 at least until the thermoplastic material is cooled down entirely. The resulting connection comprises a watertight and seamless connection. This makes that the connection is invisible and therefore, the first side face 3 surface of the first panels 2 of the interconnected adjacent wall elements 1 are deliverable as a finished, watertight surface.

[0148] The second side face 4 of the first panel 2 is attached to a first side face 6 of a second panel 5. The second panel 5 has a first side face 6 and a second side face 7 opposite said first side face 6.

[0149] We now refer to Fig. 2 and fig. 3, figure 2 showing a close up of an edge fragment of a wall element 1, according to an embodiment of the present invention and figure 3 showing a side view of a wall element 1, according to an embodiment of the present invention. The second panel 5 comprises a corrugated sheet material with at least one crest 17, at least one corrugation 12 and a plurality of openings 10. The corrugated sheet material preferably comprises a plurality of corrugations 12 with a plurality of crests 17 defined between the plurality of corrugations 12 and in this embodiment the plurality of corrugations 12 are preferably oriented vertically relative to the first panel 2 when the wall element is in upright position. The upright position of the plurality of corrugations 12 allows the wall element 1 to be slightly deformed in order to create a bended wall element 1, which may be useful as a corner wall element for a swimming pool wall for example.

[0150] The at least one corrugation 12 preferably comprises a flat surface such that the flat surface 14A of the at least one beam 14 is able to contact the flat surface of the at least one corrugation 12. The at least one crest 17 preferably comprises a flat surface which contacts at least part of the second side face 4 of the first panel 2. The plurality of openings 10 are preferably spread across the second panel 5, such that at least a first part of the plurality of openings 10A is situated at the at least one crest 17 of said corrugated sheet material and at least a second part of the plurality of openings 10B is situated at the at least one corrugation 12 of said corrugated sheet material. The thermoplastic material of the second side face 4 of the first panel 2 and at least a first part of the plurality of openings 10A of the second panel 5 form a connection when said first panel 2 and said second panel 5 are brought into contact, the thermoplastic material is heated and capable of at least partially leaking through

at least the first part of the plurality of openings 10A and when the contact is retained at least until the thermoplastic material is cooled down entirely. This connection has the advantage of not needing any additional connectors. Because of the easy connection process between the first panel 2 and the second panel 5, the construction of the wall element 1 may be established in a factory or even on-site.

[0151] The at least one corrugation 12 is preferably of trapezoidal shape 121, defining a flat surface for mounting the at least one beam 14. The trapezoidal shape 121 of the at least one beam 14 provides additional firmness for the wall element 1, while the flat surface allows the montage of the at least one beam 14.

[0152] The at least one beam 14 is mounted onto the second panel 5 of the wall element 1, thereby contacting the flat surface of the at least one corrugation and consequently at least some of the second part of the plurality of openings 10B.

[0153] Preferably, a number of beams 14 is mounted onto the second panel 5. The at least one beam 14 may comprise a straight beam 14 covering at least the entire width of the second panel 5. Besides that, the at least one beam 14 may be mounted perpendicularly relative to the at least one corrugation 12 of the second panel 5. The beams 14 being mounted perpendicularly relative to the at least one corrugation 12 in order to provide additional firmness for the wall element 1. When the at least one corrugation 12 is oriented vertically, the at least one beam 14 provides additional support in the horizontal direction. When the at least one corrugation 12 is oriented horizontally, the at least one beam 14 provides additional support in the vertical direction.

[0154] When the wall element 1 is an upright position, at least one wall brace 15 may be mounted indirectly to said second panel 5. Preferably, several wall braces 15 are mounted indirectly to said second panel 5. The at least one wall brace 15 may comprise a first part 150 mounted vertically onto said at least one beam 14 and a second part 151 being angled relative to the first part 150 and being connected with the first part 150. The first panel 2, the second panel 5, the at least one beam 14 and the at least one wall brace 15 together forming a wall element 1 being capable of standing in an upright position. Furthermore, a bottom surface liner 16 may be connected to the first panel 2 of the wall element 1. The bottom surface liner 16 may be preferably connected to the bottom side 180 of the first panel 2. The connection between the bottom surface liner 16 and the wall element 1 being established by bringing into contact the bottom surface liner 16 with the first panel 2 of the wall element 1, heating at least part of the bottom surface liner 16 and at least part of the first panel 2 and retaining the contact between the bottom surface liner 16 and the first panel 2 of the wall element 1 at least until the thermoplastic material is cooled down entirely. The resulting connection being a watertight and seamless connection. The advantage of the easy installment of said bottom surface liner 16 is the

possibility of creating a watertight bottom surface liner 16 connected to a plurality of interconnected wall elements 1, thereby defining a construction which is usable for example for constructing a swimming pool bowl.

[0155] We now refer to Fig. 4, showing a side view of a wall element, according to an embodiment of the present invention. The wall element 1 being in an upright position. The plurality of corrugations 12 of the second panel 5 being oriented vertically. A plurality of beams 14 being mounted onto said second panel 5 of the wall element 1. A plurality of wall braces 15 being mounted indirectly to the second panel 5 of the wall element 1. Said plurality of wall braces 15 being mounted onto the plurality of beams 14. Said plurality of wall braces 15 thereby contacting all of the plurality of beams 14. Said plurality of beams 14 covering the entire width of the second panel 5.

Claims

1. A wall element (1) for use in building construction, the wall element (1) comprising:
 - a first panel (2) having a first side face (3), a second side face (4) opposite said first side face (3), the second side face (4) being attached to a first side face (6) of a second panel (5);
 - said second panel (5) having said first side face (6) and a second side face (7) opposite said first side face (6);
 - wherein said first panel (2) comprises a thermoplastic material and said second panel (5) comprises a corrugated sheet material with at least one crest (17) and at least one corrugation (12); **characterised in that** said second panel (5) further comprises a plurality of openings (10);
 - wherein at least a first part of the plurality of openings (10A) of said second panel (5) is situated at the at least one crest (17) of said corrugated sheet material such as to accommodate at least part of said thermoplastic material, thereby forming a connection between said first panel (2) and said second panel (5).
2. The wall element (1) of claim 1, wherein the at least one corrugation (12) of said corrugated sheet material is oriented vertically relative to the first panel (2) when in upright position.
3. The wall element (1) of claim 2, wherein said at least one corrugation (12) comprises a flat surface.
4. The wall element (1) of anyone of claims 1 to 3, wherein at least a second part of the plurality of openings (10B) is situated at the at least one corrugation (12) of said corrugated sheet material.
5. The wall element (1) of anyone of claims 1 to 4, wherein at least one beam (14) is mounted onto said second panel (5), thereby contacting at least some of the second part of the plurality of openings (10B).
6. The wall element (1) of anyone of claims 1 to 4, wherein at least one wall brace (15) is mounted directly or indirectly onto the second panel (5).
7. The use of the wall element (1) of anyone of claims 1 to 6 as a swimming pool construction element.
8. A method of installing the wall element (1) according to anyone of claims 1 to 7, comprising putting straight said wall element (1), pouring a fluent hardenable construction mix (11) at the side of the second panel (5), thereby allowing said second panel (5) to be at least partially covered with said fluent hardenable construction mix (11).
9. A method according to claim 8, wherein the fluent hardenable construction mix (11) is capable of leaking through the second part of the plurality of openings (10B) of the corrugated sheet material, thereby embedding at least part of the second panel (5) in the fluent hardenable construction mix (11).
10. A method of constructing the wall element (1) according to claim 1, comprising heating at least part of the thermoplastic material and bringing into contact at least the first part of the plurality of openings (10A) of the second panel (5) with the heated thermoplastic material of said first panel (2), said thermoplastic material forming a connection between said first panel (2) and said second panel (5).
11. A method according to claim 10, wherein the at least one beam (14) is mounted onto said second panel (5) and the at least one wall brace (15) is mounted directly or indirectly onto said second panel (5).
12. A method of making a wall construction, said method comprising bringing into contact the adjacent first panels (2) of at least two wall elements (1) according to claim 1 and fusing at least part of the adjacent first panels (2) by means of heating at least part of the thermoplastic material of the at least two wall elements (1), thereby forming a connection between the at least two wall elements (1).
13. The method according to claim 12, wherein the connection between the at least two wall elements (1) comprises a watertight connection.
14. A kit for use in building construction, comprising a wall element (1) as described in anyone of claims 1 to 4, and a bottom surface liner (16) connectable to the first panel (2) of the wall element (1).

15. The kit of claim 14, further comprising at least one of the list comprising: the at least one beam (14) according to claim 5 or the at least one wall brace (15) according to claim 6.

Patentansprüche

1. Ein Wandelement (1) zur Verwendung im Hochbau, wobei das Wandelement (1) Folgendes umfasst:

- eine erste Platte (2) mit einer ersten Seitenfläche (3), einer zweiten Seitenfläche (4) gegenüber der ersten Seitenfläche (3), wobei die zweite Seitenfläche (4) an einer ersten Seitenfläche (6) einer zweiten Platte montiert ist (5);

- die zweite Platte (5) einer ersten Seitenfläche (6) und eine zweite Seitenfläche (7) gegenüber der ersten Seitenfläche (6) umfasst;

wobei die erste Platte (2) ein thermoplastisches Material umfasst und die zweite Platte (5) ein geriffeltes Plattenmaterial mit mindestens einem Kamm (17) und mindestens einer Riffelung (12); **dadurch gekennzeichnet, dass** die zweite Platte (5) ferner eine Vielzahl von Öffnungen (10) umfasst;

wobei zumindest ein erster Teil der Vielzahl von Öffnungen (10A) der zweiten Platte (5) mindestens am Kamm (17) des geriffelten Plattenmaterials angeordnet ist, um zumindest einen Teil des thermoplastischen Materials aufzunehmen und damit eine Verbindung zwischen der ersten Platte (2) und der zweiten Platte (5) zu bilden.

2. Das Wandelement (1) nach Anspruch 1, wobei mindestens eine Riffelung (12) des geriffelten Plattenmaterials in aufrechter Position relativ zur ersten Platte (2) vertikal ausgerichtet ist.

3. Das Wandelement (1) nach Anspruch 2, wobei mindestens eine Riffelung (12) eine flache Oberfläche umfasst.

4. Das Wandelement (1) nach einem der Ansprüche 1 bis 3, wobei mindestens ein zweiter Teil der Vielzahl von Öffnungen (10B) an mindestens einer Riffelung (12) des gewellten Plattenmaterials angeordnet ist.

5. Das Wandelement (1) nach einem der Ansprüche 1 bis 4, wobei mindestens ein Profilträger (14) auf der zweiten Platte (5) montiert ist, wodurch mindestens ein Teil des zweiten Teils der Vielzahl von Öffnungen (10B) berührt wird.

6. Das Wandelement (1) nach einem der Ansprüche 1 bis 4, wobei mindestens eine Wandstrebe (15) direkt oder indirekt an der zweiten Platte (5) montiert ist.

7. Verwendung des Wandelements (1) nach einem der Ansprüche 1 bis 6 als Schwimmbecken-Bauelement.

8. Verfahren zum Installieren des Wandelements (1) nach einem der Ansprüche 1 bis 7, wobei das Wandelement aufgerichtet (1) und ein fließfähiges, aushärtbares Baustoffgemisch (11) neben die zweite Platte (5) gegossen wird, wodurch die zweite Platte (5) zumindest teilweise mit dem fließfähigen, aushärtbaren Baustoffgemisch (11) bedeckt ist.

9. Verfahren nach Anspruch 8, wobei das fließfähige, aushärtbare Baustoffgemisch (11) durch den zweiten Teil der Vielzahl von Öffnungen (10B) des geriffelten Plattenmaterials durchsickern kann, wodurch zumindest ein Teil der zweiten Platte (5) in das fließfähige, aushärtbare Baustoffgemisch (11) eingebettet wird.

10. Verfahren zum Errichten des Wandelements (1) nach Anspruch 1, wobei mindestens ein Teil des thermoplastischen Materials erhitzt und mindestens der erste Teil der Vielzahl von Öffnungen (10A) der zweiten Platte (5) mit dem erhitzten thermoplastischen Material der ersten Platte (2) in Kontakt gebracht wird, wodurch das thermoplastische Material eine Verbindung zwischen der ersten Platte (2) und der zweiten Platte (5) herstellt.

11. Verfahren nach Anspruch 10, wobei mindestens ein Profilträger (14) auf der zweiten Platte (5) montiert und mindestens eine Wandstrebe (15) direkt oder indirekt auf der zweiten Platte (5) montiert wird.

12. Verfahren zur Errichtung einer Wandkonstruktion, wobei dieses Verfahren Folgendes umfasst: die benachbarten ersten Platten (2) von mindestens zwei Wandelementen (1) werden nach Anspruch 1 in Kontakt gebracht und mindestens ein Teil der benachbarten ersten Platten (2) werden mittels Erhitzen zumindest eines Teils des thermoplastischen Materials von mindestens zwei Wandelementen (1) miteinander verschmolzen, wodurch eine Verbindung zwischen mindestens zwei Wandelementen (1) entsteht.

13. Verfahren nach Anspruch 12, wobei die Verbindung zwischen mindestens zwei Wandelementen (1) eine wasserdichte Verbindung umfasst.

14. Ein Bausatz zur Verwendung im Hochbau, umfassend ein Wandelement (1) nach einem der Ansprüche 1 bis 4 und ein Bodenabdichtungssystem (16), das mit der ersten Platte (2) des Wandelements (1) verbindbar ist.

15. Der Bausatz nach Anspruch 14, umfassend mindes-

tens eine Liste umfassend: mindestens einen Profilträger (14) nach Anspruch 5 oder mindestens eine Wandstrebe (15) nach Anspruch 6.

Revendications

1. Élément de mur (1) destiné à une utilisation dans la construction de bâtiment, l'élément de mur (1) comprenant :
 - un premier panneau (2) présentant une première face latérale (3), une seconde face latérale (4) opposée à ladite première face latérale (3), la seconde face latérale (4) étant fixée à une première face latérale (6) d'un second panneau (5) ;
 - ledit second panneau (5) présentant ladite première face latérale (6) et une seconde face latérale (7) opposée à ladite première face latérale (6) ;
 dans lequel ledit premier panneau (2) comprend un matériau thermoplastique et ledit second panneau (5) comprend un matériau en tôle ondulée avec au moins une crête (17) et au moins une ondulation (12) ; **caractérisé en ce que** ledit second panneau (5) comprend en outre une pluralité d'ouvertures (10) ;
 dans lequel au moins une première partie de la pluralité d'ouvertures (10A) dudit second panneau (5) est située au niveau d'au moins une crête (17) dudit matériau en tôle ondulée de manière à recevoir au moins une partie dudit matériau thermoplastique, formant ainsi une liaison entre ledit premier panneau (2) et ledit second panneau (5).
2. Élément de mur (1) selon la revendication 1, dans lequel la au moins une ondulation (12) dudit matériau en tôle ondulée est orientée verticalement par rapport au premier panneau (2) lorsqu'elle est en position verticale.
3. Élément de mur (1) selon la revendication 2, dans lequel au moins une ondulation (12) comprend une surface plane.
4. Élément de mur (1) selon l'une quelconque des revendications 1 à 3, dans lequel au moins une seconde partie de la pluralité d'ouvertures (10B) est située au niveau de la au moins une ondulation (12) dudit matériau en tôle ondulée.
5. Élément de mur (1) selon l'une quelconque des revendications 1 à 4, dans lequel au moins un faisceau (14) est monté sur ledit second panneau (5), entrant ainsi en contact avec au moins une portion de la seconde partie de la pluralité d'ouvertures (10B).
6. Élément de mur (1) selon l'une quelconque des revendications 1 à 4, dans lequel au moins un support de mur (15) est monté directement ou indirectement sur le second panneau (5).
7. Utilisation de l'élément de mur (1) selon l'une quelconque des revendications 1 à 6 comme élément de construction de piscine.
8. Procédé d'installation de l'élément de mur (1) selon l'une quelconque des revendications 1 à 7, comprenant la pose droite dudit élément de mur (1), le coulage d'un mélange de construction fluide durcissable (11) sur le côté du second panneau (5), permettant ainsi audit second panneau (5) d'être au moins partiellement recouvert dudit mélange de construction fluide durcissable (11).
9. Procédé selon la revendication 8, dans lequel le mélange de construction fluide durcissable (11) est capable de fuir à travers la seconde partie de la pluralité d'ouvertures (10B) du matériau en tôle ondulée, intégrant ainsi au moins une partie du second panneau (5) dans le mélange de construction fluide durcissable (11).
10. Procédé de construction de l'élément de mur (1) selon la revendication 1, comprenant le chauffage d'au moins une partie du matériau thermoplastique et la mise en contact d'au moins la première partie de la pluralité d'ouvertures (10A) du second panneau (5) avec le matériau thermoplastique chauffé dudit premier panneau (2), ledit matériau thermoplastique formant une liaison entre ledit premier panneau (2) et ledit second panneau (5).
11. Procédé selon la revendication 10, dans lequel le au moins un faisceau (14) est monté sur ledit second panneau (5) et le au moins un support de mur (15) est monté directement ou indirectement sur ledit second panneau (5).
12. Procédé de fabrication d'une construction murale, ledit procédé comprenant la mise en contact des premiers panneaux adjacents (2) d'au moins deux éléments de mur (1) selon la revendication 1 et la fusion d'au moins une partie des premiers panneaux adjacents (2) au moyen du chauffage d'au moins une partie du matériau thermoplastique des au moins deux éléments de mur (1), formant ainsi une liaison entre les au moins deux éléments de mur (1).
13. Procédé selon la revendication 12, dans lequel la liaison entre les au moins deux éléments de mur (1) comprend une liaison étanche.
14. Kit destiné à une utilisation dans la construction de bâtiment, comprenant un élément de mur (1) tel que

décrit selon l'une quelconque des revendications 1 à 4, et un revêtement de surface inférieur (16) raccordable au premier panneau (2) de l'élément de mur (1).

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- 15.** Kit selon la revendication 14, comprenant en outre au moins l'un de la liste comprenant : le au moins un faisceau (14) selon la revendication 5 ou le au moins un support de mur (15) selon la revendication 6.

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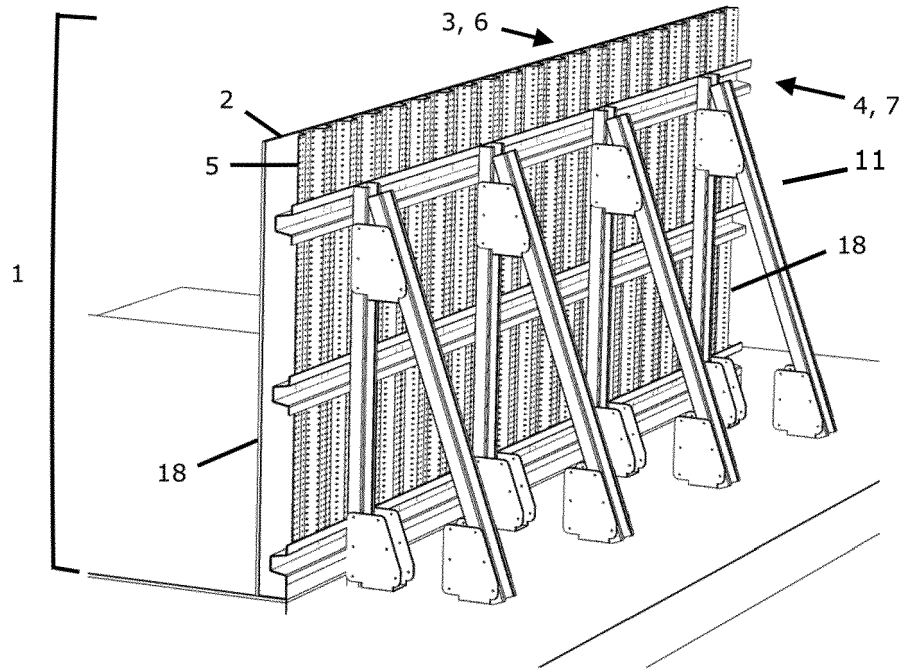


FIG. 1

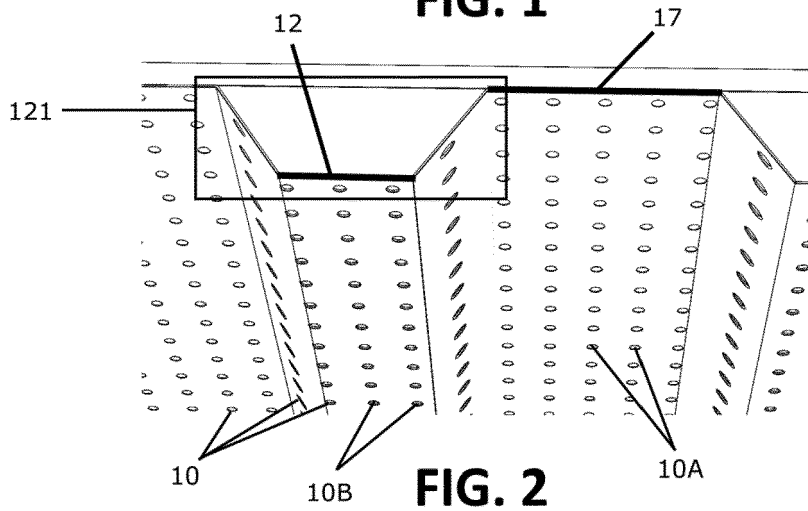
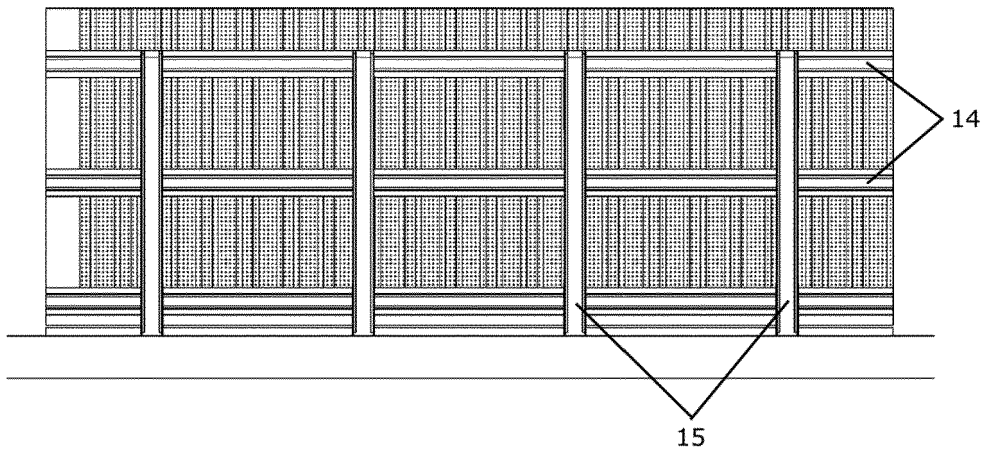
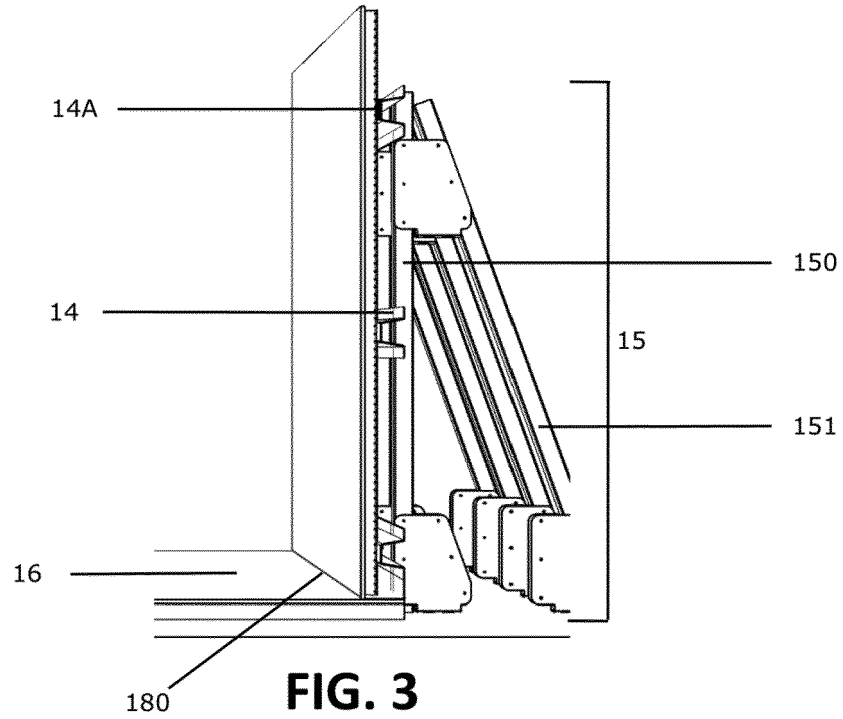


FIG. 2



REFERENCES CITED IN THE DESCRIPTION

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