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(54) **MODULAR SYSTEM FOR MAKING STRUCTURES AND PROCEDURE FOR SETTING-UP SAID MODULAR SYSTEM**

(57) There is provided a modular system for making structures, comprising a plurality of modules (2), each of which is defined by a beam comprising a plurality of faces (20), three mutually perpendicular barycentric axes (2a, 2b, 2c), so as to form an ordered triple, and at least one hole (22) extending parallel to at least one of the three barycentric axes (2a, 2b, 2c), at least one support (3) defining a pole extending along a main axis of extension (3a) and inserted in each of the holes (22) so that the modules (2) are arranged in sequence along the main axis of extension (3a) and constrained to the support (3), a foundation (1a) placed on a soil, an interface device (5) arranged within the foundation (1a) and configured to loosely constrain the support (3) at one end thereof, so that it can move at least along the axis (3a), adjustment means (6) suitable to allow the support (3) to be moved, on command, along the axis (3a) relative to the interface device (5), wherein the support (3) includes at least one block element (30) arranged at a free end of the support (3) and suitable to block the movement of the modules (2) along the axis (3a) in at least one direction, and wherein the adjustment means (6) compress the modules (2) between the interface device (5) and the block element (30) when the support (3) is moved toward said soil.

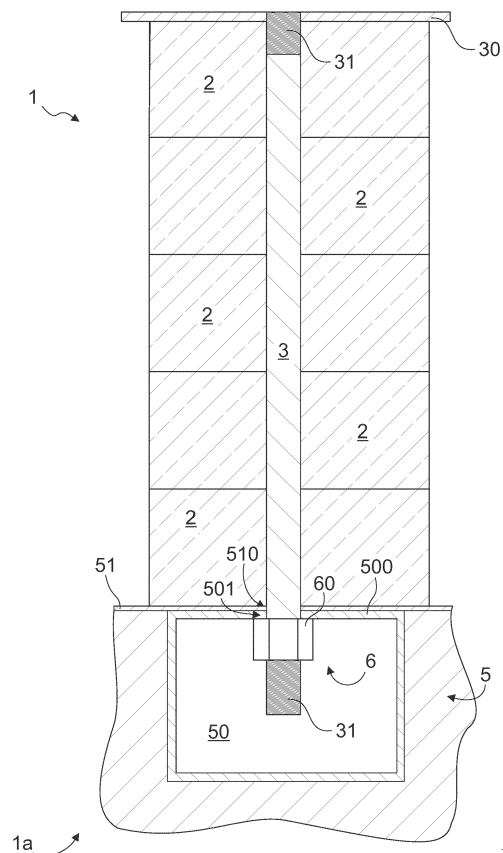


Fig. 8

Description

[0001] The present invention relates to a modular system for making structures and a procedure for setting up said modular system of the type specified in the preamble of the first claim.

[0002] In particular, the present invention relates to a modular system for making walls in the field of building structures such as, for example, houses.

[0003] As is known, structures of building structures, such as houses or residential buildings in general, usually comprise walls mainly consisting of masonry walls. These walls involve the use of wooden or metal posts suitable to allow the alignment of bricks and the consequent consolidation following concrete casting. All this can be done after setting the foundations of the structure, or above a foundation surface pre-aligned with the ground and formed by pouring concrete on the ground.

[0004] When these structures are made of wood, a first step comprises providing a concrete outer frame, followed by applying thereon wooden beams, topped by wooden panels, wherein the latter are joined to the beams by means of metallic walls.

[0005] However, other embodiments can be contemplated. For example, the wooden structure may be obtained through a plurality of wooden beams arranged so that frames are formed, on which wooden panels can be applied.

[0006] In any case, the above-described prior art has a few major drawbacks.

[0007] In particular, all the techniques for constructing wooden housing structures and the devices associated with these techniques are characterized by considerable assembly complexity.

[0008] In fact, the assembly of the structures or walls forces the builder to adopt important verification measures with regard to the alignment of the various components.

[0009] In addition, especially when the structure is made of solid wooden panels, the supply of the construction material needs large-sized means of transport suitable to allow safe transport in order to avoid damaging the wooden walls beforehand. Some embodiments described in patent applications US-A-5890332 and FR-A-1510037 are known in the current state of the art.

[0010] These applications describe structures comprising a modular plant including wooden bricks defining coupling means, typically abutments or guides within which constraint bars are available, which are suitable for the construction of masonry structures and elements.

[0011] Each of the patents, while specifying all the possible shapes in which the bricks can be made, describe a system that is laid on concrete foundations.

[0012] The above-mentioned technical solutions also have a few major drawbacks.

[0013] In particular, the wooden bricks are subject to deformation during the life cycle, and therefore the structures described are subject to releasing deformation

problems that can lead to the breakage of the parts themselves.

[0014] Moreover, the above solutions are not very robust, and therefore can hardly meet the requirements of the industry certifications that are necessary for the use of these structures.

[0015] In this context, the technical task underlying the present invention is to devise a modular system for making structures and a related setting-up procedure, which is capable of substantially obviating at least some of the above-mentioned drawbacks.

[0016] Within the scope of said technical task, a major object of the invention is to obtain a modular system for the construction of walls, which is simple to use during the assembly or setting up of walls.

[0017] Another major object of the invention is to provide a modular system suitable to allow proper construction of walls without the aid of additional support elements.

[0018] In addition, a further object of the invention is to provide a modular system, which enables an easier and safer supply of the parts making up the system.

[0019] Last but not least, a major object of the invention is to provide a system, which allows the deformations to which the wooden structures are subject to be reduced and enables sufficient efficiency and safety of the structure manufactured according to the procedure described.

[0020] The technical task and the specified objects are achieved by means of a modular system for making structures and a related setting-up procedure as claimed in appended claim 1.

[0021] Preferred technical solutions are set forth in the dependent claims.

[0022] The features and advantages of the invention will be apparent from the detailed description of preferred embodiments of the invention, with reference to the accompanying drawings, in which:

Fig. 1 shows a perspective view of a modular system for the construction of walls according to the invention;

Fig. 2 shows a module of a modular system according to the invention;

Fig. 3 shows a detail of a modular system according to the invention;

Fig. 4 shows a wall of a residential building made with a modular system according to the invention;

Fig. 5 shows a modular system according to the invention applied to a beam-partition configuration typical of ceilings;

Fig. 6 is an example of arch architecture made with a modular system according to the invention; and

Fig. 7a shows a curved wall made with a modular system according to the invention with rectangular parallelepiped beams;

Fig. 7b shows a curved wall made with a modular system according to the invention with curved beams;

Fig. 8 shows a front sectional view of a system according to the invention pointing out the foundation; **Fig. 9** is the detail of a box-like element of a system according to the invention in the open configuration; and **Fig. 10** shows a perspective view of a modular system for the construction of walls according to the invention including the foundation.

[0023] Herein, the measures, values, shapes and geometric references (such as perpendicularity and parallelism), when used with words like "about" or other similar terms such as "approximately" or "substantially", are to be understood as except for measurement errors or inaccuracies due to production and/or manufacturing errors and, above all, except for a slight divergence from the value, measure, shape or geometric reference with which it is associated. For example, these terms, if associated with a value, preferably indicate a divergence of not more than 10% from said value.

[0024] Furthermore, when used, terms such as "first", "second", "higher", "lower", "main" and "secondary" do not necessarily identify an order, a priority relationship or a relative position, but can simply be used to distinguish more clearly the different components from each other.

[0025] Unless otherwise indicated, the measurements and data provided in this document are to be considered using International Standard Atmosphere ICAO (ISO 2533:1975).

[0026] With reference to the Figures, the modular system for making structures according to the invention is indicated as a whole by the numeral **1**.

[0027] The modular system **1** is preferably suitable to be used for the construction of housing structures **10**.

[0028] These housing structures **10** can therefore be houses, but the system **1** may advantageously also be used for different types of structures.

[0029] In general, the housing structure **10** comprises a sole **11** and a perimeter path **12**. The sole **11** preferably consists of the base of the housing structure **10** and is usually defined by the portion of the structure arranged above the foundations and extending along the entire development area of the housing structure **10**.

[0030] The perimeter path **12** preferably consists of the perimeter extending around the sole **11** and therefore defining the dividing line between the inside of the housing structure **10** and the outside.

[0031] The perimeter path **12** may also be defined as a portion suitable to define the shape of other architectural elements.

[0032] For example, the system **1** can also be used for making floors, comprising beams and partitions, as in Fig. 5, or arches. If the system **1** is suitable for making an arch, the perimeter path **12** can be defined by the arch support portions, as shown in Fig. 6.

[0033] Preferably, the system **1** allows the construction of walls **100**.

[0034] Therefore, the system **1** is mainly suitable to allow the construction of masonry portions external to a house or residential building **10** even in a continuous manner.

[0035] These walls **100** can be rectilinear, and therefore the perimeter path **12** can be rectilinear, or curved as in Figs. 7a and 7b, thus defining a curved perimeter path. The system **1** preferably comprises at least one module **2** and one support **3**. More conveniently, the system **1** comprises a plurality of modules **2** and supports **3**.

[0036] The modules **2** are preferably beams.

[0037] The term beam refers to a beam as defined in the beam theory, for example according to De Saint-Venant, namely a solid extending along a main direction of extension, also defined as the axis of the beam, and whose cutting sections are always perpendicular to the axis of the beam itself.

[0038] More conveniently, they are substantially in the shape of a right parallelepiped. Therefore, they form a brick shape.

[0039] The term right parallelepiped indicates a general shape, without considering any bevels or curvilinear connections that could be present along the edges.

[0040] More specifically, the modules **2** define a rectangular parallelepiped shape. However, for curvilinear walls **100**, ad hoc modules **2** can be used in a curvilinear beam configuration, as in Fig. 7b.

[0041] Moreover, the modules **2**, since they are beams, define a plurality of faces **20** and three barycentric axes **2a**, **2b**, **2c**.

[0042] The faces **20** preferably consist of the outer surfaces of the module **2**, and therefore are six in number.

[0043] The barycentric axes **2a**, **2b**, **2c** are perpendicular to each other and form an ordered triple. Since they are barycentric axes, they preferably meet at the barycentre.

[0044] The barycentre of the modules **2** is to be considered as the centre of mass and therefore geometrically represents the centre of the modules **2** regardless of the actual homogeneity of the internal volume and the mass distribution of the modules **2**.

[0045] For example, the barycentric axis **2a** can be tangent to the axis of the beam defining the modules **2**, whereas the axes **2b**, **2c** may define a section plane perpendicular to the axis of the beam and defining a cutting section.

[0046] The supports **3** are preferably poles extending along a main axis of extension **3a**. The main axis of extension **3a**, therefore, is preferably substantially the axis of extension of the pole. The latter can thus be cylindrical or tubular.

[0047] The main axis of extension **3a** is preferably rectilinear when the modules **2** define perimeter walls **100**, and are, for example, laid on a foundation. However, the main axis of extension **3a** may be curved, for example when they are suitable to create more complex shapes such as of the curvilinear type comprising arches, as in Fig. 6.

[0048] Preferably, the supports 3 are arranged along the perimeter path 12. They are preferably arranged so that the main axis of extension 3a is perpendicular to the sole 11. However, for curvilinear solutions, they may be perpendicular to the perimeter path 12 only in the vicinity of the portions, for example, resting on the sole 11.

[0049] In detail, the supports 3 can be constrained to the sole 11 along the perimeter path 12 according to various conventional methods.

[0050] They can be inserted within guides formed during the construction of the sole 11 and substantially consisting of holes.

[0051] Otherwise, the supports 3 can be secured to the surface defined by the sole 11 through well-known mechanical joints such as bolted or riveted supports or other elements.

[0052] Moreover, the supports 3 can also be constrained to modules 2. For example, the modules 2 may define the sole 11 and the perimeter path 12, and the supports 3 can be directly constrained to the modules 2.

[0053] The method of constraining the supports 3 is not relevant for the effects of the present system 1.

[0054] The modules 2 comprise at least one guide 21 and at least one hole 22.

[0055] The guide 21 preferably extends in a continuous manner along at least three of the faces 20. Furthermore, the guide 21 preferably extends parallel to at least one of the three barycentric axes 2a, 2b, 2c.

[0056] The hole 22 preferably extends parallel to at least one of the three axes 2a, 2b, 2c. In detail, the holes 22 are preferably suitable to house part of the support 3 so as to allow an orderly arrangement of the modules 2 along the perimeter path 12.

[0057] In addition, the modules 2 may comprise a plurality of holes 22, each of which is parallel to one of the barycentric axes 2a, 2b, 2c.

[0058] In particular, the modules 2, when they comprise a single hole 22, include the hole 22 at the centre of the ordered triple. However, the hole 22 could also be in another location.

[0059] Preferably, the modules 2, when they comprise a plurality of holes 22, include in turn a plurality of modules 2, each comprising a hole 22, in the same number as said holes 22 and arranged adjacently and in one piece so that the holes 22 define a predetermined mutual distance.

[0060] However, in this case too, the holes 22 could be spaced apart and positioned differently.

[0061] In addition, the holes 22 may be blind holes when, for example, the modules 2 are arranged adjacent to a foundation. In this case, the perimeter path 12 may also be directly defined by the path defined by the modules 2 on the foundation, and therefore the supports 3 can be directly constrained at least partly to said modules 2 where the holes 22 are located.

[0062] In this case, the modules 2 may be secured to the foundations by means of other insulating elements, for example metal plates, according to techniques al-

ready known in the current state of the art and used for common walls 100.

[0063] More conveniently, the holes 22 are through holes when the modules 2 are adjacent to other modules 2 and distributed in the inner portion of the wall 100, considering that the wall 100 extends perpendicular to the sole 11.

[0064] The modules 2 can also be rectilinear modules 2' or angular modules 2". Preferably, the rectilinear modules 2' are suitable to be arranged along a rectilinear portion of the perimeter path 12, whereas the angular modules 2" are suitable to be arranged along an angular portion of the perimeter path 12. The rectilinear modules preferably comprise at least one guide 21 extending in a continuous manner along each of the faces 20 and each parallel to a single barycentric axis 2a, 2b, 2c.

[0065] In particular, preferably, the guide 21 extends parallel to one of the barycentric axes 2a, 2b, 2c, for example the axis 2c, along opposite faces 20 and parallel to one of the barycentric axes 2a, 2b, 2c, for example the axis 2a, along a face 20 comprised between said opposite faces 20 so as to form a continuous path.

[0066] The angular modules 2" comprise at least one face 20 in which the guide 21 extends in a continuous manner parallel to two of the axes 2a, 2b, 2c so as to form an angle.

[0067] Thus, preferably, the angular modules 2" may comprise a guide 21 arranged parallel to the barycentric axis 2c, further extending along an adjacent face in the direction of the axis 2a, and subsequently of the axis 2b, and proceeding along a face 20 adjacent to the preceding ones in the direction of the axis 2c so as to form a continuous path.

[0068] The modules 2, 2', 2" preferably comprise at least one guide 21. More conveniently, they comprise two guides 21.

[0069] The guides 21 are preferably substantially grooves carved along the faces 20. The modules 2, 2', 2" are therefore preferably made of wood, and thus the guides 21 can be created by means of well-known, conventional and unconventional removal technologies.

[0070] In conclusion, the modules 2 can also comprise a guide 21 extending along four faces 20 in a continuous manner and so as to form a closed path.

[0071] In addition, the system 1 comprises connecting elements 4 suitable to operatively connect the modules 2.

[0072] These connecting elements 4 preferably comprise bars 40. The bars 40 are preferably insertable in at least part of the guides 21 and suitable to connect at least two adjacent modules 2.

[0073] Preferably, the bars 40 and the guides 21 are counter-shaped. In detail, the bars 40 are preferably strips, for example of wood, in the shape of a rectangular parallelepiped suitable to be included within the guides 21 of at least two of said adjacent modules. The bars 40 could also join or connect a plurality of modules 2, as in Fig. 3.

[0074] Preferably, the bars 40 extend along all the

guides 21 of each of the modules 2.

[0075] In addition, more conveniently, the bars 40 have a smaller width than the guides 21. Preferably, the guides 21 have a width of 1 cm and the bars 40 have a width at least 1 mm smaller.

[0076] In this way, it is possible to create curvilinear shapes and connect modules 2 that are only partially in contact with each other, as in the case of the arch shown in Fig. 6.

[0077] The system 1 also preferably comprises a foundation 1a.

[0078] The foundation 1a is preferably the portion supporting the sole 11. Therefore, preferably, the sole 11 of the housing structure 10 is superimposed on the foundation 1a. By "superimposed" it is meant that the sole 11 is physically one layer above the foundation 1a or is an upper face of the foundation 1a relative to the ground.

[0079] Furthermore, the foundation 1a can be a foundation 1a on the ground, as in common foundations, or it can be the foundation 1a of a raised floor or of an upper floor. Therefore, when the foundation 1a is said to be above the ground, it is meant that it is physically above it, but nothing is specified about whether it is immediately above it or above it, but at a certain distance from it.

[0080] In any case, the system 1 also comprises an interface device 5.

[0081] The interface device 5 is preferably arranged within the foundation 1a. Therefore, it could also be part of the foundation 1a itself.

[0082] The interface device 5 is preferably configured to loosely constrain the support 3. More specifically, the interface device 5 is configured to constrain the support 3 at one end of the support 3.

[0083] In fact, as the support 3 is a pole, in the most simple and common embodiment it defines at least two ends. In particular, the interface device 5 constrains the support 3 so that the support 3 can move at least along the main axis of extension 3a.

[0084] Preferably, moreover, the support 3 is constrained so as not to be movable in the plane defined by the sole 11.

[0085] The interface device 5 includes, in turn, at least one box-like element 50.

[0086] The box-like element 50 is a hollow container suitable to allow an internal space or volume to be separated from the external environment. It can be made in various shapes, sizes, and materials.

[0087] Preferably, the box-like element 50 has a regular shape, for example a parallelepiped shape, so as to facilitate the resting thereof on a flat surface.

[0088] In particular, preferably, the box-like element 50 has the shape of a parallelepiped with a square or rectangular base.

[0089] Also preferably, the box-like element is made of PVC.

[0090] The box-like element 50, as said, is arranged inside the foundation 1a. Therefore, it may be embedded within a building material.

[0091] Preferably, the foundation 1a includes a cast of concrete or cement. "Cast" refers to a common layer of building material poured into a controlled volume in order to create foundations or a support surface.

5 [0092] The box-like element 50 is thus preferably embedded within the concrete so as to be accessible from one direction only.

[0093] Preferably, the box-like element 50 defines an upper face 500. The upper face 500 is substantially a portion of the container, defined by the box-like element 50, which can be removed or even partially opened. Hence, it is a sort of removable cover or includes a window portion so as to allow access to the inside of the box-like element 50.

10 [0094] Therefore, the box-like element 50 is exclusively accessible from the upper face 500.

[0095] The upper face 500, moreover, comprises a housing hole 501.

[0096] The housing hole 501 is preferably a hole inside which the support 3 is housed. Therefore, the support 3 is substantially skewered inside the box-like element 50 through the housing hole 501. Preferably, the upper face 500 includes the housing hole 501 in a non-removable portion so as to allow, at the same time, access to the inside of the box-like element 50 and constraint of the support 3.

20 [0097] In addition to the above, preferably, the interface device 5 includes a coupling portion 51. Preferably, the coupling portion 51 is substantially a flat element arranged parallel to the ground and superimposed on part of the concrete. Therefore, for example, the coupling portion 51 can be a flat plate, for example made of metal, or a bar. Moreover, the coupling portion 51 preferably extends along the perimeter path 12 so as to create a sort of guide for supporting the modules 2.

25 [0098] Preferably, the coupling portion 51 also includes at least one coupling hole 510. The coupling hole 510 is substantially of the same type as the housing hole 501. Therefore, it is a hole inside which the support 3 is housed. In addition, since the coupling portion 51 is preferably superimposed on the box-like element 50, the coupling hole 510 is preferably superimposed on the housing hole 501.

30 [0099] The system 1 further comprises adjustment means 6.

[0100] The adjustment means 6 are preferably suitable to allow the support 3 to be moved on command. In particular, preferably, the adjustment means 6 are suitable to allow translation along the main axis of extension 3a of the support 3 relative to the interface device 5.

35 [0101] In this manner, the support 3 can be driven toward the ground or away from the ground through the adjustment means 6.

[0102] Advantageously, the adjustment means 6 perform another important function.

40 [0103] In particular, the adjustment means 6 compress the modules 2 arranged on the support 3.

45 [0104] In fact, preferably, the system 1 comprises at

least one support 3 inserted in each of the holes 22 of the modules 2 arranged thereon so that said modules 2 are arranged in sequence along the main axis of extension 3a and constrained to the support 3. In this way, each support 3 forms a sort of spit configuration.

[0105] In addition, each support 3 comprises a block portion 30.

[0106] The block portion 30 is preferably a portion arranged at a free end of the support 3 and suitable to block the movement of the modules 2 along the main axis of extension 3a in at least one direction. This block portion 30 is therefore arranged in the opposite position of the interface device 5.

[0107] Also preferably, the block portion 30 is removably constrained to the support 3 and can therefore be removed when it is desired to install modules 2 on the support 3. Preferably, the block portion 30 is a plate similar to the coupling portion 51 and suitable to preferably span several supports 3 at the perimeter path 12.

[0108] In this manner, and as shown in Fig. 8, the interface device 5, in particular the coupling portion 51 and the block portion 30 form a sandwich structure in which the modules 2 constitute layers interconnected by the support 3.

[0109] Therefore, the adjustment means 6 compress the modules between the interface device 5 and the block element 30 when the support 3 is moved toward the soil.

[0110] As already said, the upper face 500 is at least partially removably constrained to the box-like element 50, meaning that it can be removed or have portions that can be opened, so as to allow access to the adjustment means 6 when the upper face 500 is at least partially removed from the box-like element 50.

[0111] In conclusion, the support 3 can comprise at least one threaded portion 31.

[0112] The threaded portion 31 is preferably a portion suitable to allow external objects to be constrained thereto. The support 3 can therefore comprise two threaded portions 31 arranged at the two ends so as to allow the constraint of the block portion 30 and the adjustment means 6, respectively, as well as, possibly, of part of the interface device 5.

[0113] Preferably, the adjustment means 6 comprise a retention device 60.

[0114] The retention device 60 is preferably configured to be coupled to the threaded portion 31.

[0115] Moreover, it is coupled thereto so as to allow the support 3 to move along said main axis of extension 3a relative to the box-like element 50. This mechanism preferably operates, in particular, when the retention device 60 and the threaded portion 31 are moved relative to one another.

[0116] An example of this type is a common bolt that can be screwed so as to subject the support 3 to a tensile force and compress the modules 2.

[0117] In detail, preferably, the adjustment means 6 are arranged inside the box-like element 50 and the upper face 500 is at least partially removably constrained to

said box-like element 50 so as to allow access to the adjustment means 6 when the upper face 500 is at least partially removed from the box-like element 50.

[0118] Therefore, the system 1 may provide a kit for making walls 100.

[0119] The kit for making walls 100 can therefore comprise a plurality of box-like elements 50, a plurality of supports 3, a plurality of adjustment means 6, and a plurality of modules 2, in particular the rectilinear 2' and angular modules 2" with one or more holes 22. Moreover, the kit may also comprise modules 2 with holes 22 at different mutual distances so as to make them interchangeable and provide perimeter paths 12 with different lengths.

[0120] The operation of the system 1, previously described in structural terms, is as follows.

[0121] The foundation 1a comprised of the interface devices 5 and the adjustment means 6 is made. In particular, the concrete is poured so as to fill the spaces not occupied by the interface devices 5.

[0122] Furthermore, the coupling portion 51 is positioned so as to provide the perimeter path 12.

[0123] Once the supports 3 are constrained along the perimeter path 12, the modules 2 can be arranged along the perimeter path 12 following the procedure described below.

[0124] In short, the modules 2 can be "inserted" on the supports 3 and constrained to the adjacent modules by means of the connecting elements 4.

[0125] The invention comprises, as mentioned, a new method of assembling a wall 100. This method comprises the modular system 1 and, in particular, preferably defines the arranging, pouring, constraining, installing, positioning, compressing and repetition steps, together or separately.

[0126] Preferably, in the arranging step, a plurality of box-like elements 50 are positioned in the foundation 1a so that the box-like elements 50 are arranged at predetermined points

[0127] Preferably, in the arranging step, the box-like elements 50 are arranged along at least part of the perimeter path 12. In particular, they may be arranged so that the supports 3 are then arranged along at least part of the perimeter path 12 at a distance equal to the predetermined distance provided by the modules 2.

[0128] In the pouring step, concrete is preferably poured into the foundation 1a until the free surface of the concrete is aligned with the upper face 500.

[0129] In the constraining step, the supports 3 are constrained to the box-like elements 50. Therefore, they are substantially inserted inside the coupling hole 510 and inside the housing hole 501.

[0130] In the installing step, preferably, the modules 2 are installed along at least part of the perimeter path 12 so as to form a first layer of modules 2, which completely cover the perimeter path portion 12. This installation is possible thanks to the holes 22 and the supports 3.

[0131] Preferably, the modules in this first layer com-

prise at least one guide 21 spanning three faces 20.

[0132] In the positioning step, preferably, the connecting elements 4 are positioned along the totality of the guides 21. Before, after, simultaneously, or alternatively, the block elements 30 may also be positioned.

[0133] In particular, preferably, in the positioning step, a block element 30 is positioned on each of the supports 3 so as to block the modules 2 along at least one direction, and in particular one way.

[0134] Preferably, in the compressing step, access is allowed into the box-like elements, or in any case to the adjustment means 6, and each of the supports 3 is moved toward the soil so as to compress the modules 2.

[0135] Lastly, if a repetition step is present, the installing and positioning steps are repeated in order to provide a plurality of layers of modules 2 superimposed on the first layer, so as to form one or more walls 100.

[0136] Preferably, the modules used in these steps comprise at least one guide 21 along four faces 20. The wall 100 may be a single wall, otherwise angular walls 100 can also be made. Preferably, these walls are made of wood.

[0137] The modular system for making structures and the related setting-up procedure 1 according to the invention achieve important advantages.

[0138] In fact, it is very easy to use during the assembly and setting up of the manufacturing process.

[0139] Furthermore, the supports 3 and the connecting elements 4 are sufficient to ensure proper installation of the modules 2, and therefore no auxiliary tools or supports are required.

[0140] The supply of the parts making up the system is also much simpler than what happens normally with housing structures made, at least in part, of wood.

[0141] Therefore, the support elements 4 can prevent the passage of wind along the whole extent of the wall 100 and insulate the internal structure from it unlike what normally happens with wooden constructions which must make use of additional materials.

[0142] In conclusion, the structure made by means of the interface device 5 and the adjustment means 6 allows the wall 100 constructed with the system 1 to be solid, and the deformations to which the wooden structures are subject to be reduced, so as to guarantee sufficient efficiency and safety of the structure itself.

[0143] The invention is susceptible of variations falling within the scope of the inventive concept as defined by the claims.

[0144] For example, as already mentioned, the amount of holes 22 as well as the predetermined distances between them can change.

[0145] In principle, thanks to the implementation simplicity, it is also possible to provide a plurality of modules 2 without holes 22, the which holes 22 are formed during the construction of the wall 100 so as to make the system 1 even more versatile.

[0146] In addition, the system 1 can be adapted to a plurality of different architectural forms. It is possible to

create curved walls, arches, apses, etc., optionally positioning filling material between the modules 2 when they are not perfectly aligned.

[0147] The connecting elements 4 may also have different shapes in order to allow easier connection between adjacent modules 2. For example, they could be bars comprising sharp-edged points and assume a square configuration, or have curvatures.

[0148] Furthermore, they could comprise shims or fillers suitable to be inserted between adjacent modules 2 when the latter are not perfectly aligned, i.e. when the adjacent faces 20 do not adhere continuously to each other, as in Fig. 7a. Moreover, the box-like elements 50 may include a plurality of interface holes 501 and therefore can be suitable to constrain more than one support 3. For example, the interface device 5 may comprise a single, continuous box-like element 50 defining the perimeter path 12.

[0149] In conclusion, the block elements 30 could all be in one piece, for example included in a plate, extending along at least part of the perimeter path 12.

[0150] In this context, all details are replaceable by equivalent elements, and the materials, shapes and dimensions may be any materials, shapes and dimensions.

Claims

1. A modular system (1) for making structures, comprising:
 - a plurality of modules (2), each of which is defined by a beam comprising a plurality of faces (20), three mutually perpendicular barycentric axes (2a, 2b, 2c), so as to form an ordered triple, and at least one hole (22) extending parallel to at least one of said three barycentric axes (2a, 2b, 2c),
 - at least one support (3) defining a pole extending along a main axis of extension (3a) and inserted in each of said holes (22) so that said modules (2) are arranged in sequence along said main axis of extension (3a) and constrained to said support (3),
 - a foundation (1a) placed on a soil,
 - an interface device (5) arranged within said foundation (1a) and configured to loosely constrain said support (3) at one end of said support (3), so that said support (3) can move at least along said main axis of extension (3a), and **characterised in that** it comprises
 - adjustment means (6) suitable to allow said support (3) to be moved, on command, along said main axis of extension (3a) relative to said interface device (5),
 - said support (3) including at least one block element (30) arranged at a free end of said support (3) and suitable to block the movement of

- said modules (2) along said main axis of extension (3a) in at least one direction, and
- said adjustment means (6) compressing said modules (2) between said interface device (5) and said block element (30) when said support (3) is moved toward said soil.
2. The system (1) according to claim 1, wherein said foundation (1a) includes a concrete casting and said interface device (5) includes at least one box-like element (50) embedded in said concrete so as to be exclusively accessible from an upper face (500) of said box-like element (50) relative to said soil, said upper face (500) including at least one housing hole (501) inside which said support (3) is housed.
 3. The system (1) according to at least one of the preceding claims, wherein said interface device (5) includes a substantially flat coupling portion (51) arranged parallel to said soil and superimposed on part of said box-like element (50) and part of said concrete, said coupling portion (51) including at least one coupling hole (510) inside which said support (3) is housed, superimposed on said housing hole (501).
 4. The system (1) according to at least one of the preceding claims, wherein said adjustment means (6) are arranged inside said box-like element (50) and said upper face (500) is at least partially removably constrained to said box-like element (50) so as to allow access to said adjustment means (6) when said upper face (500) is at least partially removed from said box-like element (50).
 5. The system (1) according to at least one of the preceding claims, wherein at least part of said support (3) comprises a threaded portion (31) and said adjustment means (6) comprise at least one retention device (60) configured to be coupled to said threaded portion (31) and allow said support (3) to move along said main axis of extension (3a) relative to said box-like element (50) when said retention device (60) and said threaded portion (31) are moved relative to one another.
 6. The system (1) according to at least one of the preceding claims, suitable for making walls (100) of a housing structure (10) defining a sole (11) and a perimeter path (12), said sole (11) being superimposed on said foundation (1a) and comprising a plurality of said supports (3) arranged along at least part of said perimeter path (12) and housed in said holes (22) so as to also allow an orderly arrangement of said modules (2) along said perimeter path (12), and a plurality of connecting elements (4) suitable to operatively connect said modules (2), wherein said modules (2) comprise at least one guide (21) extending in a continuous manner along at least three of said faces (20) parallel to at least one of said three barycentric axes (2a, 2b, 2c), and said connecting elements (4) are insertable in at least part of said guides (21) and suitable to connect at least two of said adjacent modules (2).
 7. The system (1) according to at least one of the preceding claims, wherein said modules (2) comprise rectilinear modules (2') suitable to be arranged along a rectilinear portion of said perimeter path (12) and angular modules (2'') suitable to be arranged along an angular portion of said perimeter path (12), said rectilinear modules (2') comprising at least one guide (21) extending in a continuous manner along each of said faces (20), each parallel to only one of said barycentric axes (2a, 2b, 2c), and said angular modules (2'') comprising at least one face (20) in which said guide (21) extends in a continuous manner parallel to two of said barycentric axes (2a, 2b, 2c).
 8. The system (1) according to at least one of the preceding claims, wherein said modules (2) comprise two of said guides (21).
 9. The system (1) according to at least one of the preceding claims, wherein said modules (2) comprise a plurality of said holes (22), each parallel to one of said barycentric axes (2a, 2b, 2c).
 10. The system (1) according to at least one of the preceding claims, wherein said guide (21) extends along four of said faces (20) in a continuous manner and so as to provide a closed path.
 11. The system (1) according to at least one of the preceding claims, wherein said modules (2) comprising one of said holes (22) include said hole (22) at the centre of said ordered triple and said modules (2) comprising a plurality of holes (22) comprise a plurality of said modules (2), each comprising one of said holes (22), in the same number as said holes (22) and arranged adjacently and in one piece so that said holes (22) define a predetermined mutual distance.
 12. The modular system (1) according to at least one of the preceding claims, wherein said connecting elements (4) comprise bars (40) shaped complementarily to said guides (21), said bars (40) being strips in the shape of a rectangular parallelepiped, suitable to be partly included within said guides (21) and having a width equal to twice the depth of said guides (21) so as to be equally included within said guides (21) of at least two of said adjacent modules (2).
 13. The modular system (1) according to at least one of the preceding claims, wherein said bars (40) extend

along all the guides (21) of each of said modules (2).

14. A method of assembling a wall (100) including a system (1) according to at least one of the preceding claims, **characterised in that** it comprises the steps of: 5

- arranging a plurality of box-like elements (50) in said foundation (1a) at predetermined points arranged along said perimeter path (12), 10
- pouring concrete into said foundation (1a), until the free surface of said concrete is aligned with said upper face (500),
- constraining said supports (3) to said box-like elements (50), 15
- installing said modules (2) on said supports (3),
- positioning a block element (30) on each of said supports (3) so as to block said modules (2) along at least one direction, and in particular one way, 20
- compressing said modules (2) by moving each of said supports (3) toward said soil through said adjustment means (6).

15. A kit for making walls (100) comprising a modular system (1) according to at least one of the preceding claims, and **characterised in that** it comprises a plurality of box-like elements (50), a plurality of supports (3), a plurality of adjustment means (6) and a plurality of modules (2) in the shape of a rectangular parallelepiped extending differently along one of said barycentric axes (2a, 2b, 2c), said modules (2) comprising rectilinear (2') and angular modules (2'') with one or more of said holes (22), said holes (22) being at different mutual distances and said modules being interchangeable so as to provide said perimeter paths (12) with different lengths. 25 30 35

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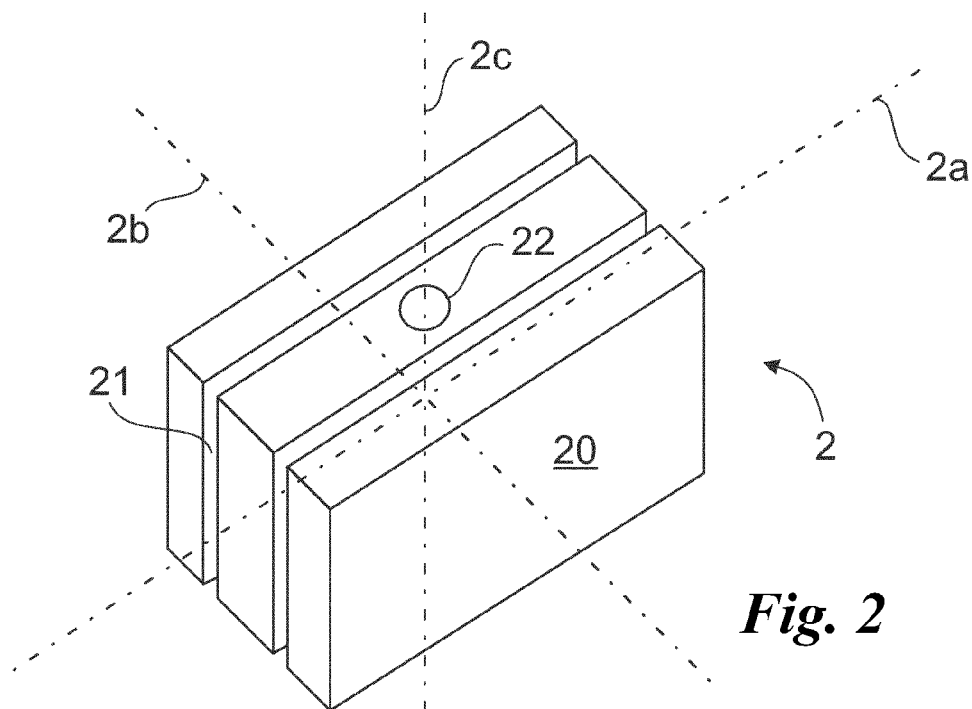
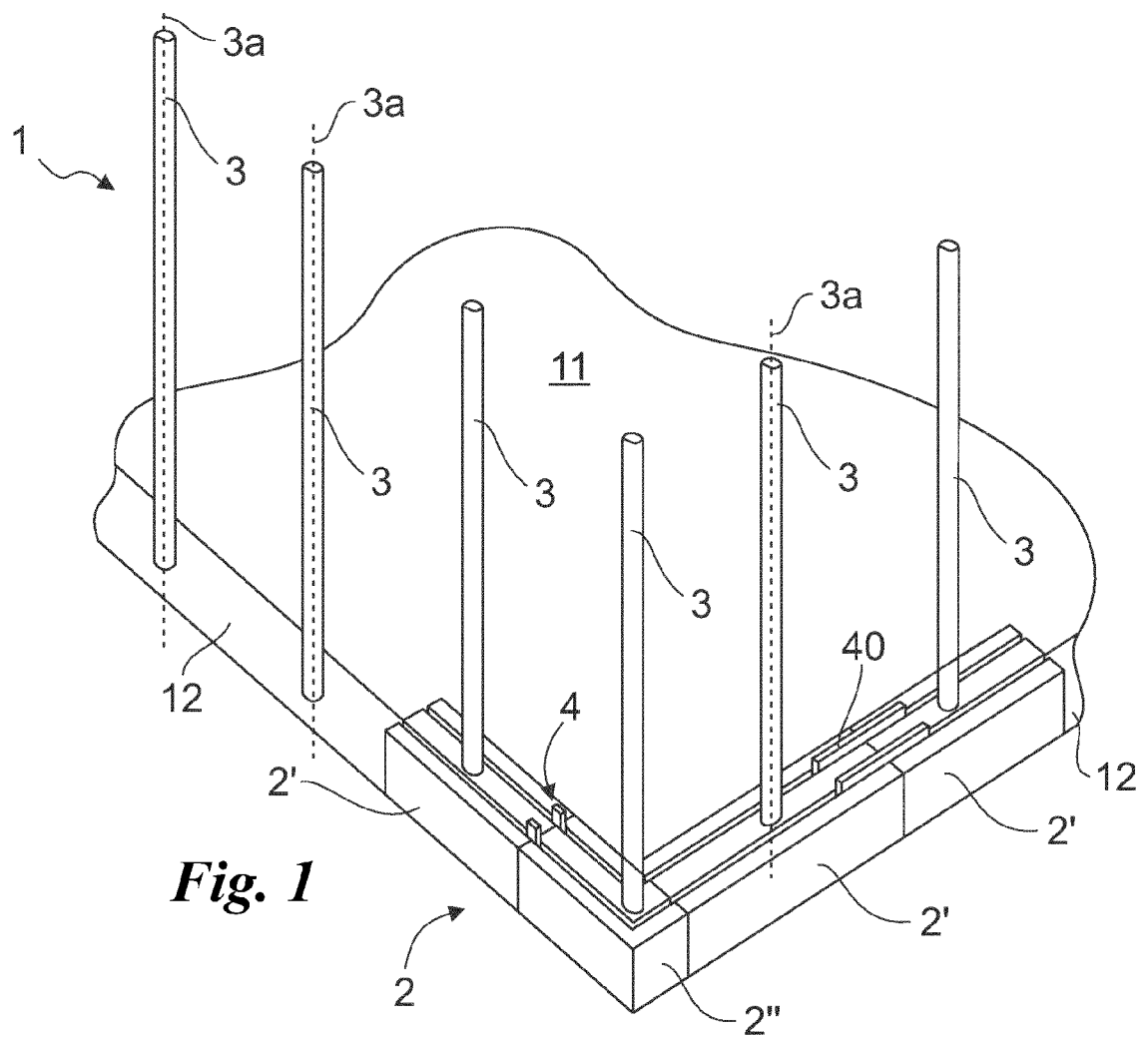


Fig. 3

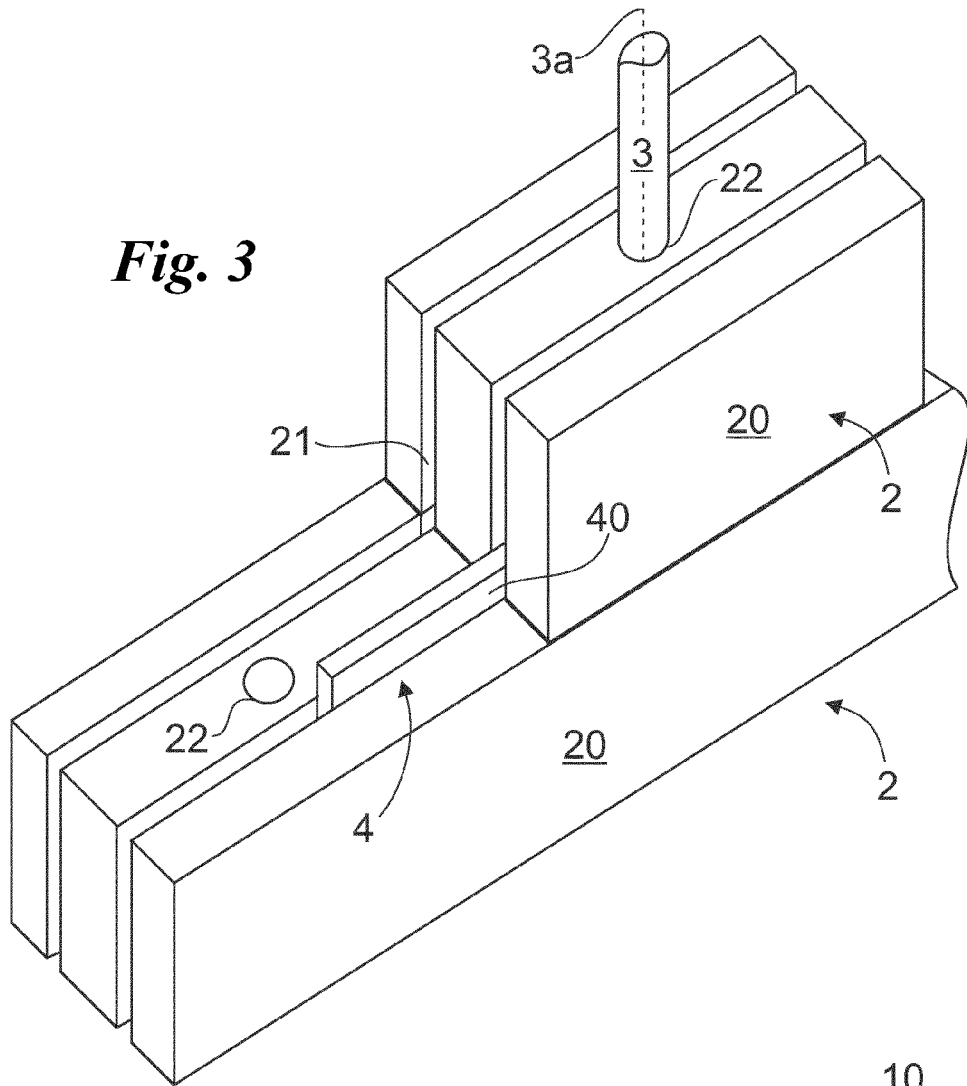
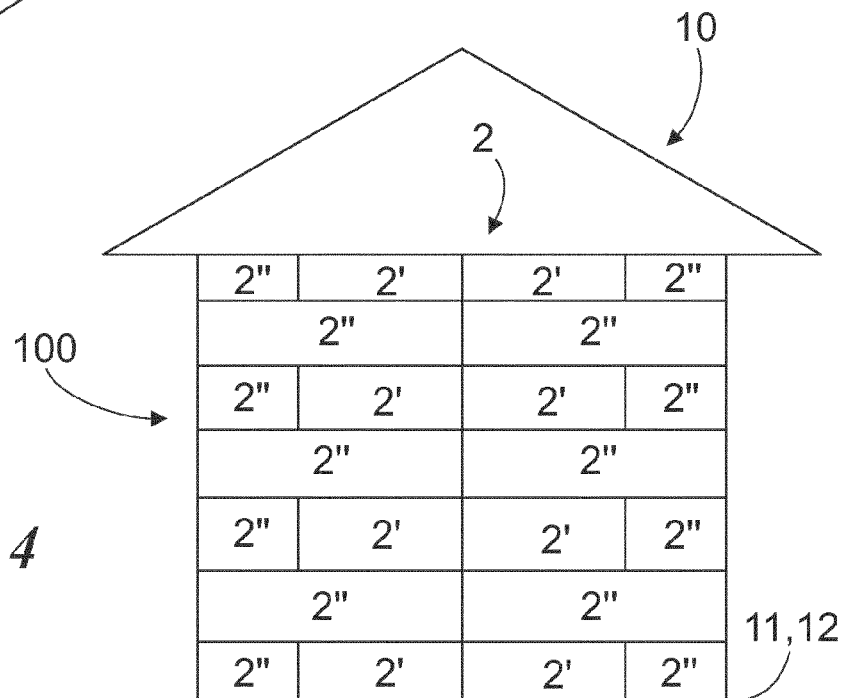


Fig. 4



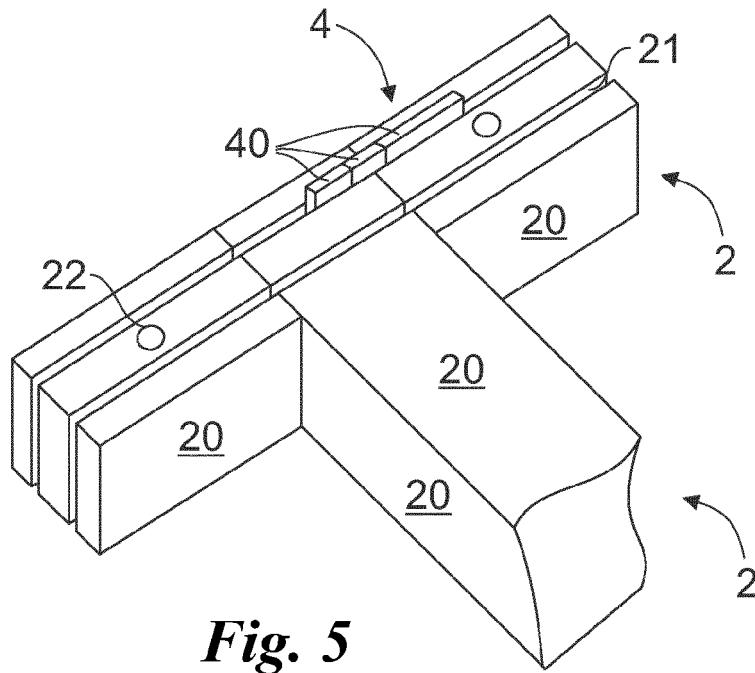


Fig. 5

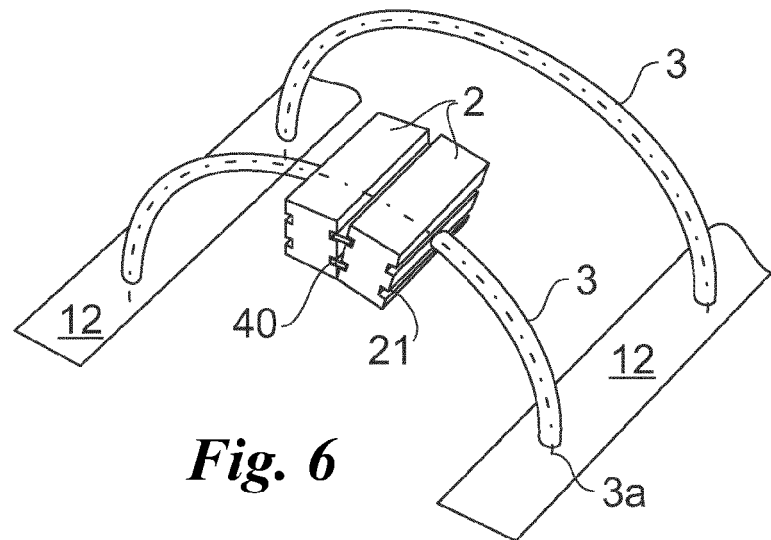


Fig. 6

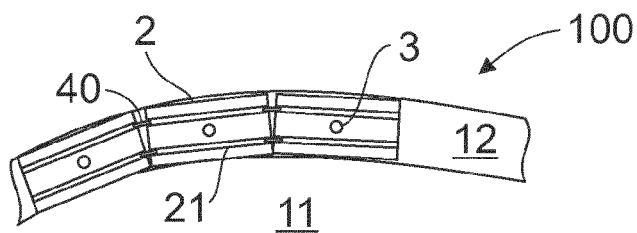


Fig. 7a

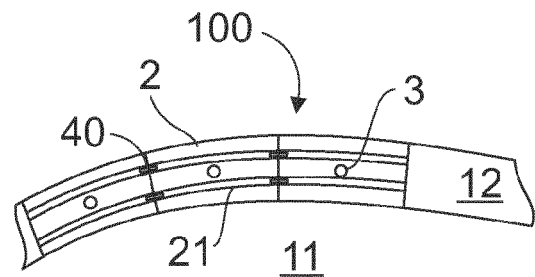


Fig. 7b

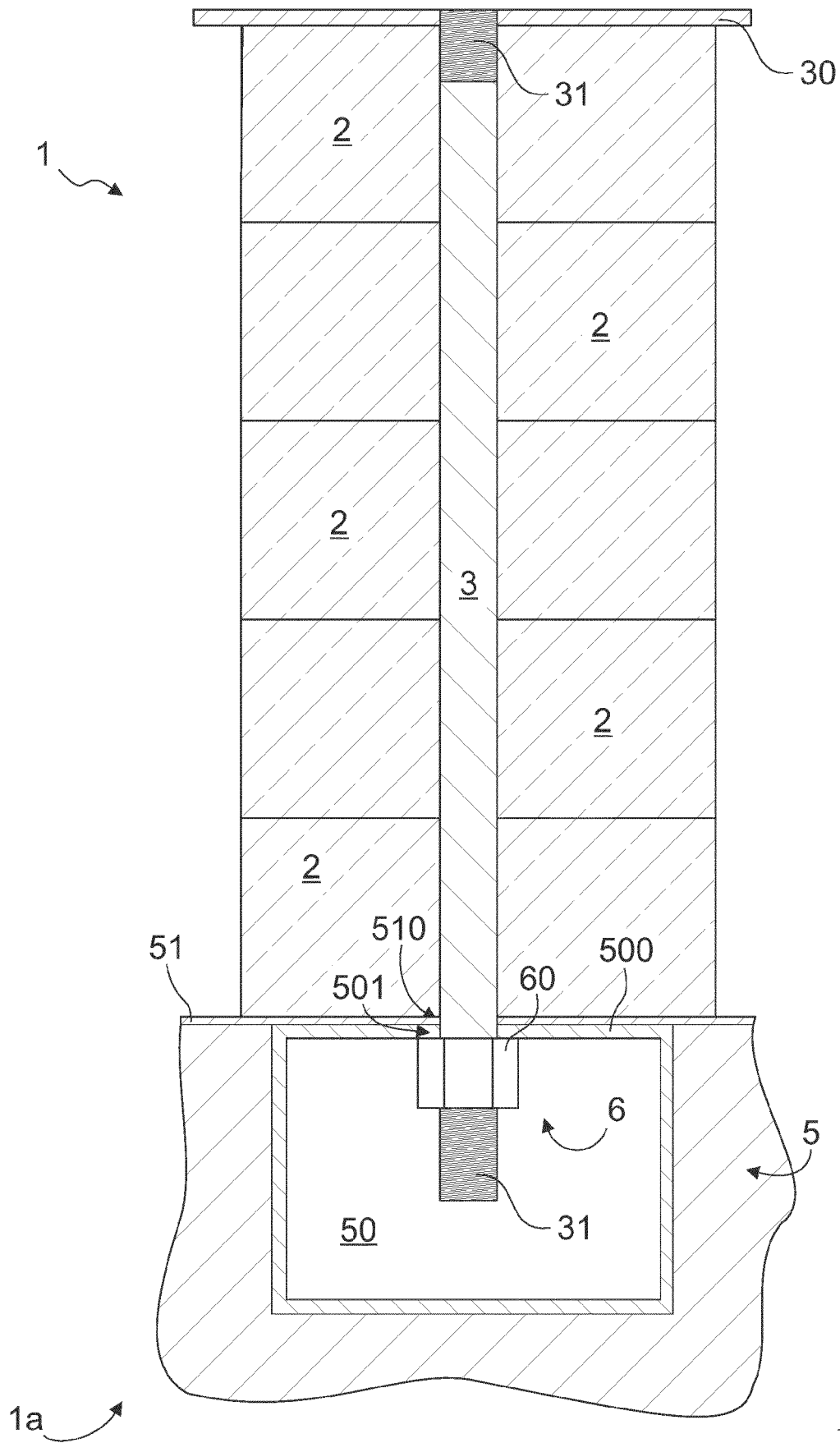


Fig. 8

Fig. 9

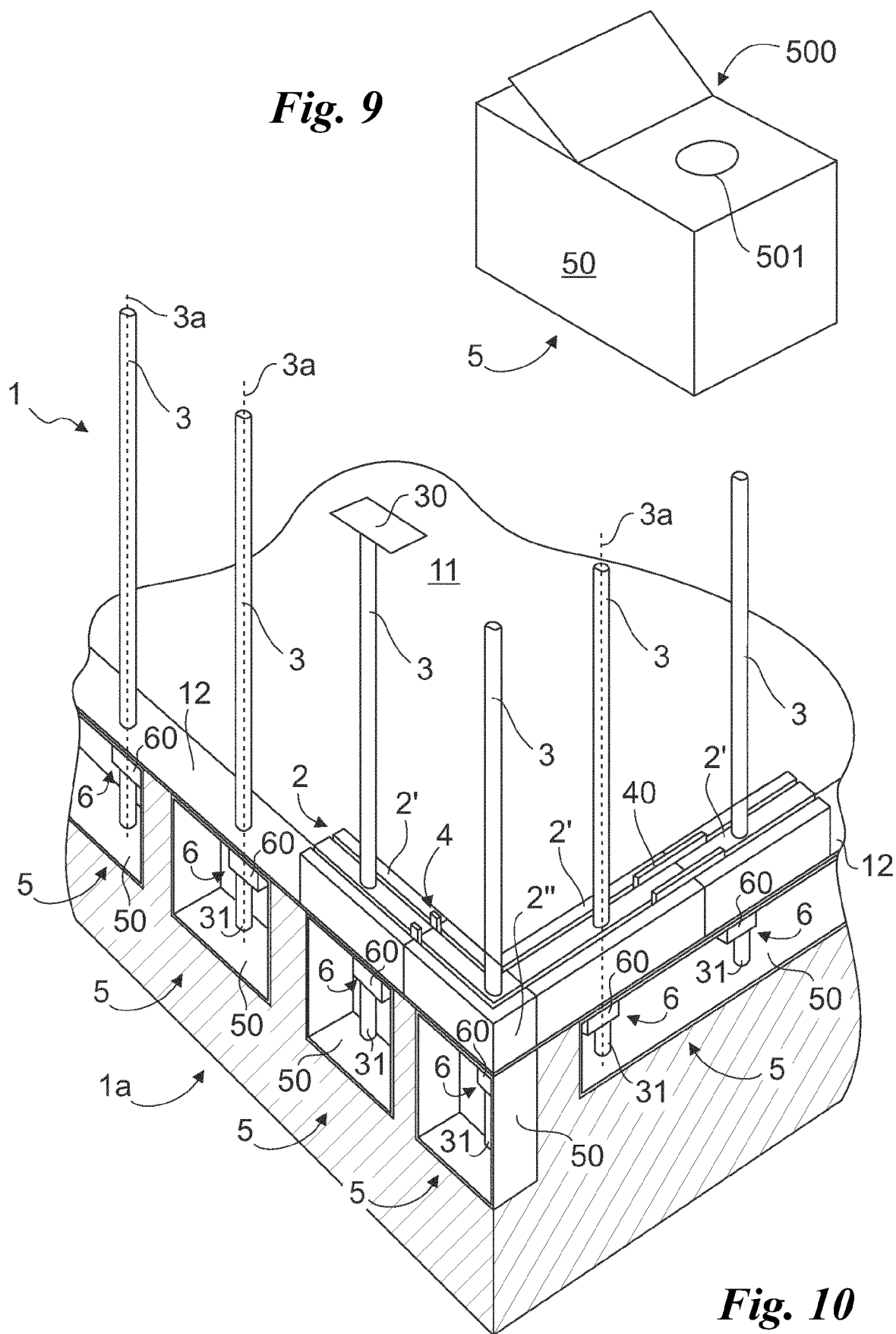


Fig. 10



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Place of search The Hague		Date of completion of the search 12 April 2019	Examiner Couprie, Brice
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