(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 401 457 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.11.2018 Bulletin 2018/46

(51) Int Cl.:
E04B 2/08 *(2006.01)* *E04B 2/02* *(2006.01)*

(21) Application number: **18171830.5**

(22) Date of filing: **11.05.2018**

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

(30) Priority: **12.05.2017 IT 201700051977**

(71) Applicant: **Politecnico di Bari**
70126 Bari, BA (IT)

(72) Inventors:
- **MONTALBANO, Calogero**
  70126 Bari (IT)
- **CHIARANTONI, Carla**
  70126 Bari (IT)
- **PICCININNI, Francesco**
  70126 Bari (IT)

(74) Representative: **Conversano, Gabriele**
Laforgia, Bruni & Partners srl
Via Michele Garruba, 3
70122 Bari (IT)

(54) **MODULAR BUILDING BLOCK, IN PARTICULAR FOR CONSTRUCTION OF DIVIDING STRUCTURES OR FURNISHINGS**

(57) Modular building block (1), in particular for realizing partition structures or furniture, comprising mechanical fastening means (20, 21) for mutual dry connection to at least a second modular block (1), characterized in that said mechanical fastening means for mutual dry connection to at least a second modular block (1) comprise at least a hook (20) rotatably fastened to said modular block, and at least a hooking element (21) configured to be coupled with said at least one hook (20) of said at least one second modular block.

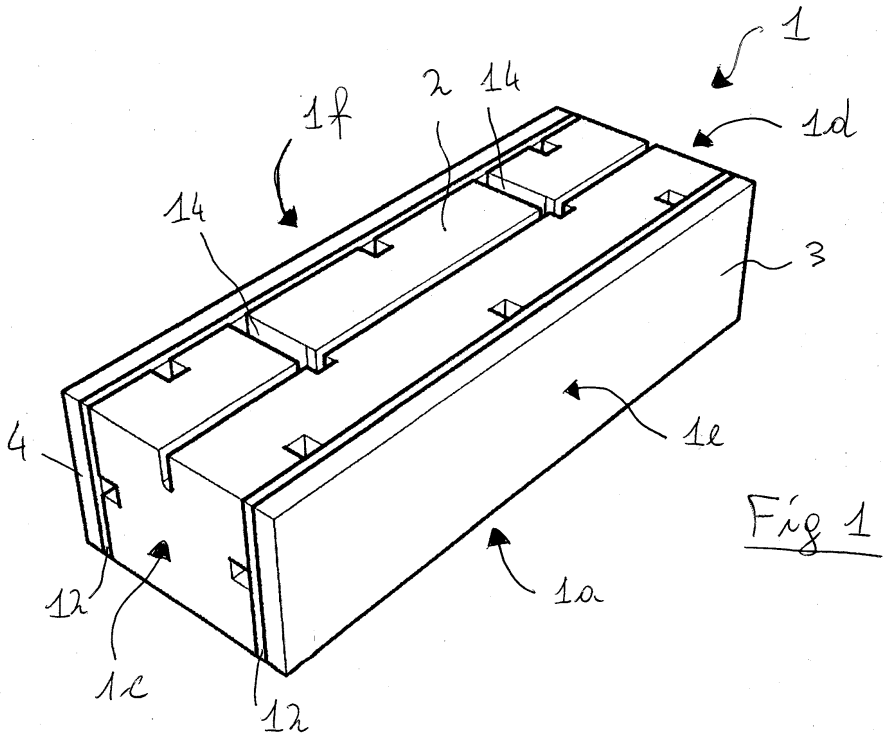


Fig 1

EP 3 401 457 A1

Description

[0001] The present invention relates to the field of living, industrial and commercial buildings. In particular, the field of the present invention relates to problems concerning interior spaces subdivision and design.

[0002] Partition structures for interior spaces are known, for example walls in traditional masonry. Anyway, the realization of a traditional wall requires long working times and some other finishing steps (as for example plastering, painting, surface finishing etc.) that increase working times further. The obtained structure is then hardly convertible or modifiable for other usage, and results to be little versatile. There are also known alternative faster solutions, such for example metal and plasterboard structures, and generally in light materials, that allow to modify quicker the inner configuration of an ambient. Also such solutions provide for other finishing steps (as for example painting, or the realization of the desired acoustic or thermal insulation, etc.), and have also lower functional features than the traditional masonry, for example they are not generally self-supporting, and they generally do not allow to fix pieces of furniture, wall-mounted furniture and similar structures. In addition, the possibility to house systems (for example cables and pipes) with such solutions is limited.

[0003] As above said, once the finishing steps of the known solutions are carried out, the aspect and functional features (such for example thermal, acoustic insulation etc.) are hardly modifiable, or in any case variable, unless long working is carried out.

[0004] Aim of the present invention is the solution of the drawbacks of the state of the art, and in particular the realization of a modular block which allows to realize simply and quickly a structure, in particular a partition structure, and which can be used as well for other kinds of structures as for example for the realization of furniture structures with interconnected modular elements. Yet, another aim of the present invention is the realization of a modular block, which allows the realization of a structure whose functional features (acoustic features, thermal insulation, system distribution etc.) besides being aesthetical, can be changed and adapted simply according to need.

[0005] Yet, another aim of the present invention is the realization of a structural block, which, even maintaining the above-described advantages, has good mechanical features.

[0006] These and other aims are reached by means of a modular block (element) according to claim 1. Other aspects/features of the modular blocks are described and/or claimed here in the dependent claims.

[0007] The present invention relates also to a structure, for example a partition structure for ambients, in particular a partition comprising a plurality of modular blocks according to the present invention. In addition, according to another aspect, the present invention relates also to a piece of furniture, for example a piece of kitchen furniture, a bookcase, a wardrobe, etc. in which the furniture structure is realized by means of a plurality of modular blocks according to the present invention.

[0008] The present invention relates also to the usage of a modular block according to the present invention, for the realization of furniture or construction of structures, as for example the ones for ambient subdivision. The modular building block, in particular for the realization of partitions or furniture, according to the present invention, comprises a main layer with structural function and at least an outer coating layer. It is to be noted right from the beginning that preferably the block is substantially shaped as a parallelepiped, or in any case shaped similarly to a parallelepiped. The modular block according to the invention comprises also mechanical fastening means for mutual dry connection to at least a second modular block. Advantageously, so the provision of the mechanical fastening means which allow mutual connection to at least a second modular block allows the blocks to be blocked to each other for realizing a structure, as for example a partition or a piece of furniture. Preferably, the mechanical dry fastening allows to obtain the modular blocks to be efficiently fastened to each other without the need to apply another material with structural bonding function, as for example epoxide glues, concrete material, etc.

[0009] Moreover, the modular block according to the present invention comprises at least a plurality of first coupling elements, arranged on at least part of the main layer surface, and at least a plurality of second coupling elements arranged on at least part of the surface of the at least one coating layer, or vice versa, the first coupling elements and the second coupling elements being configured to interact with each other so that a reversible coupling with each other is realized.

[0010] Generally, according to an aspect of the present invention, the first coupling elements are apt to receive or to hook at least part of at least one of said second coupling elements, or vice versa, so that a reversible coupling with each other can be realized.

[0011] For example, the first and the second coupling means can be configured substantially complementary to each other.

[0012] According to an aspect of the present invention, the first coupling elements form a plurality of seats for the second coupling elements, or vice versa, so that a reversible coupling with each other is realized.

[0013] It is to be noted right from the beginning that the word "seat" is used here to indicate at least a portion of the first coupling elements intended to receive or to hook at least part of at least one of said second coupling elements, or vice versa, so that a reversible coupling with each other can be realized.

[0014] It is to be noted that the above-cited reversible fastening is such that the coating layer can be coupled and so fastened to the main layer by coupling the first and second elements so to withstand to loads and stresses the module, and in particular the coating layer is sub-

jected to, thus avoiding its fastening to be removed and so the its undesired moving away, unless a predefined effort or stress value, which is generated when the coating layer is desired to be removed, is exceeded.

[0015] Advantageously, the provision of coupling elements apt to provide the reversible coupling of at least a coating layer with the main layer, allows the layers or coating panels to be changed quickly and simply, and so to obtain simply a modification of the aesthetic effect and in general the visual aspect, and/or to modify the mechanical and/or functional properties (as for example of thermal and/or acoustic insulation), by changing the coating layer to be fastened to the main layer according to need.

[0016] It is to be noted that in the following the term coating panel will refer also to the at least one coating layer, since according to an aspect of the invention, the thickness of such layer is reduced with respect to the other two dimensions, so to form a panel or plate element. According to an aspect of the invention, the thickness of the coating layer is between about 3 mm and about 2 cm, extremes comprised.

[0017] It is also to be noted that advantageously the modular block according to the invention can be used not only for building structures, for example partition structures in living, commercial or industrial spaces, but it can be used also for realizing furniture such for example kitchen furniture, built-in furniture, or for realizing furniture structures as bookcases, wardrobes etc.

[0018] It is also to be noted that, advantageously, the modular block according to the invention is handy and simple to be mounted thus guaranteeing high laying quickness in addition to high flexibility of usage both in living field, and so for subdivision, and generally for designing spaces, both in commercial and industrial field. In fact, the mechanical fastening means between blocks allow rapid assembly and disassembly, also in self-building, and without the support of any type of platforms or building yard equipment, for example partitions with total or partial floor height and like structures. Moreover, the thus obtained structures can be rapidly disassembled and assembled again for obtaining structures, other than the previous ones, and so for offering high versatility to the user who can so satisfy advantageously his own needs of high transformability and versatility of his own space. Generally, according to an aspect of the present invention, the mechanical fastening means for connecting a block to at least a second block, are of positive engagement kind, for example by coupling substantially complementary parts. According to an aspect of the present invention, the mechanical fastening means for mutual dry connection to at least a second modular block comprise a hook rotatably fastened to the modular block, preferably the main layer, and at least a hooking element configured to be coupled to the hook of at least a second modular block. An advantage of such configuration is that besides that the fastening of the modular blocks is guaranteed rapidly and simply and without using tools, it is also possible to create mechanical continuity between the blocks.

[0019] According to an aspect of the present invention, the fastening means are configured and arranged on the block so that the fastening is allowed by sliding, preferably by sliding along a direction parallel to the block surface (for example by the lower surface of a block sliding on the upper surface of another block), so to reach the fastening position. The fastening means arrangement and configuration is such that in the fastening position the two blocks are not allowed to move away in a direction orthogonal to the assembling direction, but the fastening is allowed to be removed by inverting the sliding direction with respect to the direction used to reach the fastening position.

[0020] According to an aspect of the present invention, a block comprises fastening means apt to be coupled with fastening means of at least a second block and to be in turn coupled with fastening means of a third block. For example, according to a possible embodiment, the block comprises at least a hook apt to be hooked to at least a hooking element, for example a rod, of a second block. Moreover, the first block comprises in turn at least a hooking element, for example a rod apt to be coupled with a hook arranged on a third block.

[0021] According to an aspect of the present invention, the fastening means can be associated to, or fastened to, or they themselves can comprise supporting means, for example metal supporting means, which allow to create structural continuity when the block is fastened to other blocks.

[0022] For example, according to a possible embodiment the hook of a block is fastened to at least a plate (or other supporting element, for example a rod) of the block, preferably a plate (or other element, for example a rod) extended in vertical direction. Preferably, such plate (or rod) is connected or fastened to the hooking element for another block, and in particular can be fastened to the rod intended to be hooked by a hook of another block. Preferably, the rod is extended in horizontal direction and is fastened to the plate (or rod), preferably vertical plate, the hook is fastened to. An advantage of such configuration is the possibility to create continuity between the blocks, thus creating a structural net (or cage) which increases response to stresses the structure formed by many blocks according to the invention fastened to each other is subjected to.

[0023] Referring back to the coupling elements of at least a coating layer with the main layer, according to an aspect of the present invention, the reversible coupling between the first and second coupling elements is of interference kind, also known as interlocking engagement.

[0024] In other words, the first and second coupling elements which interact with each other are arranged and/or configured so that once the respective coupling position to each other is reached, they are in contact and the interference generated between each other avoids their moving away, and so the decoupling of such ele-

ments, and so of the layers fastened thereby. Advantageously, the coupling between elements is of reversible kind, in other words, the interference allows to withstand to a predetermined maximum stress whose exceeding causes the coupling elements to be separated.

[0025] According to an aspect of the present invention, in order to realize the reversible coupling, at least a second coupling element is introduced in at least a first element, or at least a second element is introduced in the space between at least two first coupling elements.

[0026] In other words, according to an aspect of the present invention, in the reversible coupling position at least part of the first element is received in a second element, or an element is received in the space formed by at least two elements. So, according to an aspect of the invention, the seat intended to receive at least part of a second element is defined by the shape of a first element (or vice versa), or the seat is defined by the arrangement of two or more first elements (or vice versa) to form at least a seat between two or more coupling elements.

[0027] According to an aspect of the invention, the first and second coupling elements are of the "hook and loop" or "slidingly engaging fastener" or "touch and close" kind.

[0028] As it is known in the technique, in the hook and loop systems, as for example the Velcro, a plurality of elements substantially configured as a hook, is intended to be coupled, and in particular to be at least partially received in a plurality of seats defined by elements substantially configured as a ring or slot.

[0029] Other coupling systems are known in the technique with the phrase "slidingly engaging fastener" and in particular with the trade name Dual Lock or Duotec or Microplast. In such coupling systems a plurality of first elements having substantially the shape of a mushroom, is intended to interact with second elements shaped as mushroom as well, so that they can be mutually received in spaces, or seats, realized between two or more elements. Obviously, the shape of the elements can be changed according to needs.

[0030] Generally, the shape and arrangement of first and second elements to be coupled is such that a temporary deformation is generated (as for example it occurs in the pressure or snap-fit coupling systems) which allows two elements to be coupled, for example a head shaped as a mushroom between two other heads or more heads shaped as mushroom as well, so to determine the reversible coupling thereof.

[0031] According to an aspect of the present invention, the first and/or second coupling elements are fastened to the surface of the main layer or the coating layer, by means of adhesive. Advantageously, such realization allows an economic and simple fastening to be realized of the coupling elements to the module layers, still guaranteeing high sealing and fastening properties.

[0032] Generally, according to an aspect of the invention, the first and/or second coupling elements comprise a supporting surface, for example a supporting surface preferably in plastic material, which can be rigid or flexible. In the latter case, the flexible configuration allows then to bend the supporting surface in roll shape before usage.

[0033] The supporting surface and the coupling elements arranged on the same can be fastened to the main layer, or the coating one, of the modular block, as yet said by means of adhesive, which can be yet arranged on the supporting surface, which so can be self-adhesive, or can be arranged on the same at the laying.

[0034] Obviously, other alternative fastening methods, such for example welding, sewing, fastening by threaded means, etc. can be provided to fasten the coupling means (and in particular their supporting surface) to the main layer, or the coating layer, of the modular block, so that, according to the case, a greater or lower fastening reversibility is guaranteed, as a function of the next recycle steps of the single components of the block.

[0035] According to an aspect of the present invention, the first and second elements coupled with each other form a layer interposed between the at least one coating layer and the main layer. An advantage of such configuration is that in the mutual coupling position the coupling elements have reduced dimensions and are perfectly integrated in the modular block.

[0036] According to an aspect of the present invention, the first and/or second coupling elements (possibly provided with the supporting surface) are arranged on at least part of the surface of the main layer (or coating layer) so that they form one or more areas in which they are arranged, or can cover the whole surface of the main surface (or coating layer).

[0037] According to an aspect of the present invention, the modular block, and in particular the main layer, comprises at least a housing for the passage of systems and/or mechanical fastening means. For example, according to some possible embodiments the modular block, and in particular the main layer, comprises an inner empty space or inner space, and/or at least a trench (groove). For example it is possible to realize at least a lowered portion (or groove) of the outer surface of the main layer. Advantageously, the provision of an empty space, or recess, or trench intended for example to put in communication two surfaces of the modular block and in particular of the main layer, allows to obtain high tool availability according to need.

[0038] According to an aspect of the present invention the main layer is preferably realized in wood, concrete mixtures, preferably with variable density, or alveolar cardboard. Advantageously, the choice of such materials provides an optimum compromise between mechanical and structural features of the main layer and costs for its realization.

[0039] As yet said, according to an aspect, the modular block according to the invention, and in particular at least the main layer and/or at least a coating layer is realized so that it is provided with variable density. Preferably, the modular block is provided with variable density along at

least a direction, and preferably along at least a direction which joins two opposite faces of the block, preferably the faces opposite on at least one of which it is provided the coating layer. The block variable density can be obtained also by using layers in homogeneous but different material from other layers, so that even if each layer does not have variable density, the block as a whole is provided with variable density.

[0040] According to an aspect of the present invention, the coating layer is realized in wood, or laminar wood (and generally in wood materials, for example laminated woods), or laminated plastics, or glass fibre or polyurethane, or ceramic or glass or porcelain elements (tiles or mosaics).

[0041] Advantageously, thanks to the removability and so interchangeability of the coating layer, as yet said, the usage of such materials allows the possibility to modify the aesthetical and/or functional features (as for example the acoustic and/or thermal insulation) of the modular block and the structure realized therewith.

[0042] It is to be noted that object of the present invention is also a main layer for a modular building block comprising said main layer and at least a coating layer which can be reversibly coupled with the main layer, the main layer comprising a plurality of first coupling elements arranged on at least part of the surface of the main layer, apt to interact in usage with at least a plurality of second coupling elements arranged on at least part of the surface of the at least one coating layer, said first and said second coupling elements being configured to interact with each other so that a reversible coupling with each other is realized.

[0043] In addition, it is to be noted that object of the present invention is also a coating layer for a modular building block comprising a main layer and said coating layer which can be reversibly coupled with the main layer, said coating layer comprising a plurality of second coupling elements arranged on at least part of the surface of the coating layer, apt to interact in usage with at least a plurality of first coupling elements arranged on at least part of the surface of the at least one coating layer, said first and said second coupling elements being configured to interact with each other so that a reversible coupling with each other is realized.

[0044] What described and/or claimed here with reference to the modular block is applied also to the main layer and the coating layer which, as said, are the object of the present invention also if they are taken singularly and intended to be used in the realization of a modular block. In other words, the modular block can be seen as a system realized by the main layer and by at least a coating layer which can be coupled with each other by means of the above-described coupling elements.

[0045] In particular, it is to be noted that the features of the coupling elements described concerning the modular block are applied also to the main layer and the coating layer taken separately.

[0046] The present invention relates also to a method for realizing a structure, and in particular a partition structure, or a piece of furniture, by means of the step of fastening a plurality of modular blocks according to the invention to each other. The method comprises also the step of fastening at least a coating layer to the main layer, such step can be carried out before, after or at the same time with the step of fastening the blocks to each other, and in particular their main layers.

[0047] According to another aspect, it is also object of the present invention a modular building block comprising mechanical fastening means for mutual dry connection to at least a second modular block, wherein the fastening means comprise at least a hook rotatably fastened to the modular block and at least a hooking elements configured to be coupled with the hook of at least a second modular block. A structure realized by mutually fastening a plurality of such modular blocks is object of the present invention as well. Features of the fastening means here described and/or claimed can be referred also to a modular block according to this last aspect of the invention. Such modular block can have also features/aspects described and/or claimed in the Patent application WO214/177899, of the same applicant.

[0048] Other features and advantages of the present invention will be clear from the following description, provided as a way of not limiting example, with reference to the appended drawings, in which:

Figure 1 is a perspective view of a possible embodiment of a modular block according to the present invention;

Figure 2 is a section view of the block of figure 1;

Figures 3A e 3B show schematically a possible embodiment of the first and second coupling elements in not coupled position and in coupled position, respectively;

Figures 4A e 4B show schematically an alternative solution to the one of figures 3A e 3B;

Figure 5 is a perspective view of a possible embodiment of the mechanical fastening means of the modular block to at least another modular block;

Figure 6 is an enlarged front view of the mechanical fastening means of the modular block to at least another modular block, according to figure 5;

Figure 7 shows a perspective view of the main layer of a modular block according to an alternative embodiment of the present invention, in which the main layer is provided with housings to house cables or pipes or system elements;

Figure 8 shows schematically the fastening mode of a plurality of modular blocks (shown in section and without coatings) according to the present invention for realizing a structure;

Figure 9 is a perspective view of the structure of figure 8;

Figure 10 is an alternative structure to the one of figures 8 and 9 according to a different aspect of the present invention.

[0049] With reference to the figures, a modular block 1 (hereinafter also block 1) is provided with a main layer 2 and at least an outer coating layer 3, 4.

[0050] For easiness of description, hereinafter reference will be made to a "front", "side", "upper", "lower" surface of the block. Such orientation is the one immediately identifiable considering the block 1 in usage condition, so the lower surface 1a is the one facing the ground, the upper surface 1b the one opposite to the lower surface, the side surfaces 1c, 1d connect the lower surface 1a and the upper surface 1b to each and can be connected to other blocks, 1, the front surfaces 1e and the rear one If are the remaining two surfaces, which typically cannot be fastened to other blocks 1 and are visible (at least the front surface 1e) once the structure 100 formed by more blocks 1 coupled with each other is realized.

[0051] The above-described orientation is used analogously also for the single layers 2, 3, 4, 12 of the block 1.

[0052] Preferably, the main layer 2 is provided with two coating layers 3, 4 arranged on opposite surfaces of the main layer 2, as in the embodiment shown in figures.

[0053] The main layer 2, as yet said, has structural functions, i.e. it is apt to support stresses developing on the modular block 1 when used. Various materials can be used to realize the main layer 2 so that the needed mechanical features are provided. According to a possible embodiment, the main layer 2 is realized in laminar wood, i.e. wood made up of more overlapping elements to form a plurality of layers, so that it is provided with different density degrees and mechanical resistance. Possible alternative materials for the main layer 2 are for example alveolar cardboard, concrete or quarry re-assembled material.

[0054] In general, it is preferred to use a not homogeneous material, i.e. which has variable density along at least a direction.

[0055] The main layer 2, according to a possible aspect, can be provided with housings 5 to house for example pipes, electric cables, and in general system elements for a building. Various solutions are possible. As for example it is clear from the embodiment shown in figure 7, the main layer is provided with grooves 5 on part of its surfaces. Such grooves are preferably orthogonal to the surfaces edges, i.e. they extend along a main surface direction, even if different orientations are possible. Anyway, other kinds of recesses or inner empty spaces can be used to house parts of systems in alternative solutions with respect to what shown in figures.

[0056] As above-described, in the shown embodiment, the block 1 is provided with two coating layers 3, 4. For example, in a partition which allows the access and so to see both its own front and rear surfaces, the equal or different coating panels can be used to create visual effects and/or providing with different mechanical or insulating features the two surfaces of the modular block and so of the structure obtained by means of their fastening.

[0057] For easiness of description, it is now described the coating layer 3, even if the following description is applied to a general coating layer of the block 1, and so also to the coating layer 4. The modular block 1 is provided with at least a coating layer 3, arranged at a surface of the block 1 not intended to be coupled with another block 1. Considering the orientation in usage of the above-described block 1, the coating layer 3 is typically associated to the front surface of the block 1. In case of two coating layers 3, 4, as shown in figures, such layers are typically arranged at the front and rear surfaces of the block 1, i.e. the surfaces remaining visible to a user, when used. The coating layer 3 is typically provided with reduced thickness with respect to the main layer 2. According to a possible aspect the coating layer can be provided with thickness between 3 and 20 mm. As yet described, the coating layer 3 can have mainly aesthetical purposes or, as an alternative or in addition to the aesthetical purposes, it can have different functions, for example it can provide a thermal insulation, an acoustic insulation etc.

[0058] Therefore, according to some possible embodiments, the coating layer 3 can be realized with various materials, for example wood, laminated wood, laminated plastics, isothermal panels in glass fibre or polyurethane, tiles, or more generally ceramic, glass or porcelain elements etc.

[0059] According to the present invention the coating layer 3 and the block 1 can be provided with coupling elements 10, 11, apt to realize a reversible coupling between the two elements.

[0060] In particular, a plurality of first coupling elements 10 is arranged on at least part of a surface (as yet said, typically at least the front surface) of the main layer 2, and a plurality of second elements 11 is arranged on at least part of a surface of the coating layer 3. The coupling elements 10, 11 are configured so that they interact with each other to realize a reversible coupling between the same.

[0061] Generally, at least one between the first and second coupling elements 10, 11 forms a plurality of seats 10a, 11a for other coupling elements. In other words, according to a possible embodiment the first coupling elements 10 form seats 10a for the second coupling elements; according to another possible embodiment the second elements 11 form seats 11a for the first coupling elements 10, as shown for example in figures 4A e 4B; in another alternative, as in the embodiment shown for example with reference to figures 3A e 3B, the two conditions occurs at the same time, so that the first coupling elements 10 form seats 10a for the second coupling elements 11, and vice versa.

[0062] As for example shown in figures 3A - 3B, the seats 10a, 11a are configured so that they house at least part of the corresponding coupling means 11, 10 so that they are held (i.e. their moving away is avoided) in reversible way. The coupling is "reversible" since in order to decouple the seats 10a, 11a from the coupling elements 11, 10 it is needed to exert a force higher than a

certain threshold on them.

[0063] A typical example of coupling elements and respective seats is provided by the so called "hook and loop fasteners", for example commercialized by Velcro company. In such case, the first coupling elements are realized as a ring or slot (forming the above cited seats) and the second coupling elements are configured as a hook or anyway are formed in a shape apt to be introduced reversibly in a slot (or vice versa the first elements are hooks, and the second elements are rings). So, this kind of coupling distinguishes between coupling elements, which form a plurality of seats, and coupling elements, apt to enter (at least partially) such seats. A similar kind of coupling elements 10, 11 is shown in figures 4A e 4B.

[0064] Other fastening systems usable in the modular block according to the present invention are known as "slidingly engaging fastener" and provide that, in working condition, a first coupling element 10 is arranged in the space between at least two coupling elements 11 and vice versa. In other words, the spaces between the first coupling elements 10 form seats 10a for the second coupling elements 11, and at the same time the spaces comprised between the second coupling elements 11 form seats 11a for the first coupling elements 10. Typically, the first coupling elements 10 are provided with substantially the same shape as the second coupling elements 11, for example a mushroom configuration, as for example shown in figures 3A and 3B. Such solutions are known in the technique as "slidingly engaging fastener" and for example are produced with the trade name Duotec.

[0065] Generally, according to an aspect of the invention, the first coupling elements 10 are coupled by interference of parts with the second coupling elements 11, so that a reversible coupling between the two elements 10, 11 is guaranteed.

[0066] Instead, coupling between first coupling elements 10 and main layer 2 typically occurs by adhesive. The first coupling elements are in fact typically arranged on a substantially plane supporting surface 10b (typically in form of fabric or plastic material). The adhesive is typically arranged on the surface opposite to the one where the first coupling elements 10 are provided.

[0067] Generally, also coupling between coating layer 3 and second coupling elements 11 occurs by adhesive, suitably arranged on a support 11b (typically in form of fabric or plastic material) provided with the cited second coupling elements 11.

[0068] As above described, alternative methods can be used for fastening coupling elements to the respective surface, for example by means of a self-adhesive supporting surface, or for example by means of welding, sewing, fastening with threaded means, etc.

[0069] According to an aspect of the invention, the first and second coupling elements 10, 11 are fastened to respective surfaces of the main layer 2 and coating layer 3 so that another layer 12 is formed, interposed between each other.

[0070] In other words, the two coupling elements 10, 11, once joined with each other, form a layer 12 interposed between the main layer 2 and the coating layer 3, as for example shown in figure 1.

[0071] In such case, typically, the coupling elements 10, 11 are arranged so that they cover the most part of respective surfaces of the main layer 2 and coating layer 3, and typically so that they project therefrom. As yet said, the block 1 is provided with mechanical fastening means 20, 21 for allowing the dry connection to other blocks so that a structure 100 is formed, as for example shown in figure 7.

[0072] Various kinds of mechanical fastening means can be used, for example male-female coupling, interference fit, hooking systems, etc.

[0073] Such mechanical fastening means are typically realized in metal material, even if it is not excluded to be able to realize the mechanical fastening means 20, 21 in plastic material.

[0074] The mechanical fastening means 20, 21 are preferably configured so that they form a reversible fastening, i.e. so that they allow both coupling and decoupling of such means, so that at the beginning it is possible to fasten various blocks 1 to each other so that a substantially stable structure 100 is formed, and so that in the following it is possible to decouple the blocks 1 from each other, so that the cited structure 100 is disassembled, thus recovering the blocks 1. Preferably, the mechanical fastening means 20, 21 are coupled with the main layer 2 of the block 1. According to a possible embodiment, as in the example shown in figures 5 and 6, the mechanical fastening means 20, 21 comprise at least a hook 20 rotatably fastened to the block 1, and a hooking element 21 configured to interact with a hook 20 of another modular block 1. In the embodiment shown, the block 1 is provided with two hooks 20, both arranged inside the block 1 (see for example figure 2). Anyway embodiments with higher or lower quantity of hooks, possibly arranged in different positions with respect to what shown, are not excluded.

[0075] It is to be noted that a single hook 20 is now described, even if the following description is applied to a general hook of the modular block. Typically, the hook 20 is hinged to at least a supporting plate 20a, fastened in turn to the block 1. In the shown embodiment, as shown in detail in figure 6, the hook 20 in interposed between two supporting plates 20a, 20b. Typically, a rod 21 is introduced inside the modular block, and the supporting plate 20a is fastened in turn to a portion of the rod 21.

[0076] Generally, the modular block is provided with a seat 13 for the hook 20. Such seat 13 is typically a recess realized on the block 1 at the hook 20. According to a possible embodiment as for example shown in the figures, the seat 13 is so positioned inside the same. The seat 13 is configured so that, when the hook is introduced inside the seat 13 (see for example figure 2, or the upper block shown in figure 8), the hook 20 does not project from the rest of the block 1.

[0077] The block 1 comprises also a hooking element 21 apt to be fastened to the hook 20 of a different modular block 1. Typically, such hooking element is a rod 21, which crosses the block 1. In particular, in the shown embodiment, the rod 21 is introduced in the block 1.

[0078] Preferably, a single rod 21 is fastened to the support 20a of the hook 20 of the same block 1, and serves as hooking element for hooking another block. Therefore structural continuity between blocks is provided.

[0079] In particular, the hooks are preferably coupled with rods, which cross the blocks so that they form a "net" of elements fastened to each other, which develops in the structure 100. In particular, as above described, a single rod is fastened to the support 20b which brings the hook 20 of the same block, and serves as hook for hooking another modular block. In case of provision of more hooks on a single block, as shown in figures, a single rod 21 is preferably fastened to many supports 20b which bring many hooks 20 of the same block, and serves as hook for many hooks of another modular block 1. It is also not to be excluded the embodiment in which two different rods are used, one for allowing the fastening of a hook of a second module and the other one for connecting the hooks of the same module to each other.

[0080] The hook 20 is typically movable from a first rest position, in which preferably it does not project from the block 1, to a second position, in which typically it projects from the block so that it is coupled with the hooking element 21 of a different block 1.

[0081] Preferably, the hook 20, in the second position, i.e. the coupling position, projects from the lower surface of the block 1.

[0082] In such a way, according to a possible embodiment, the passage from the first to the second hook position is determined by the force of gravity.

[0083] In particular, when a block 1 rests on a surface, the hook is held inside its own seat by such surface. When there is no support under the hook 2, the hook 20 rotates in the second position, biased by the force of gravity. Anyway, embodiments are not excluded in which elastic means are associated to the hook 20, so that it is forced towards the second position, in which it can be coupled with the hooking element 21 of another block.

[0084] At the hooking element 21, it is disposed also a seat 14, for allowing the hook 20 of another block 1 to move, and in particular for allowing the rotation of such hook 20 between the first and second position. Such seat 14 is typically configured as a recess arranged on the block 1 at the hooking means 21.

[0085] As better described in the following, so the fastening between two blocks can occur by sliding a block on another block.

[0086] It is to be noted how the here described configuration of the fastening means 20, 21 can be used not only with modular blocks provided with a main layer coupled by means of coupling means with coating layers, but also with a general modular building block, as for example a modular block having the features described and/or claimed in the Patent application WO2014/177899, of the same applicant.

[0087] The modular block 1 is substantially configured as a parallelepiped. The block can have many dimensions. Preferred dimensions for the block are the following (considering the block frontally): width between 15 and 45 cm, height between 5 and 20 cm, depth between 9 and 15 cm.

[0088] In usage, a plurality of blocks 1 is coupled so that a structure 100 is formed.

[0089] With particular reference to figure 8, in which the blocks 1 are shown in section, so that it is allowed to see the behavior of the fastening means 20, 21, it is now described a possible fastening mode between a first block 1' and a second block 1" by means of fastening means 20, 21.

[0090] As yet said, the coupling between a first block 1' and a second block 1", arranged on the first one, can occur by means of simple sliding the second block 1" on the first block 1', along a direction perpendicular to the front surface of the first block 1', so that the lower surface of the second block 1" is overlapped on the higher surface of the first block 1'.

[0091] In fact, at the beginning of such sliding, the hook 20 of the second block is held in the seat 13 of the second block, since supported by the upper surface of the first block (see the position of the hook of the first block, up in the structure of figure 7) . After the hook 20 of the second block arrives at the seat 14 of the first block 1', it is rotated downwards, i.e. falls in the seat 14. Another sliding of the second block causes the hook 20 of the second block 1" to be engaged with the hooking means 21 of the first block 1'.

[0092] It is to be noted how in a possible variant, the seat 14 is extended so that the hook 20 always remains in the second coupling position, i.e. at the beginning it is not supported by the first block 1' in the seat 13 of the second block 1" . The above described operations are repeated in series with other blocks 1 so that a structure 100 is formed, as for example a partition.

[0093] The blocks can be overlapped according to many methods. For example, by aligning them the one on the other one, by making the lower and upper surfaces of two overlapped blocks coincide as shown in figures 8 and 9; according to a possible alternative they can be offset-overlapped as in figure 10, so that a greater side extension of the structure 100 is allowed.

[0094] Generally, by suitably positioning the blocks 1 it is so possible to obtain a partition, or for example by providing suitable spaces in the structure 100 other pieces of furniture such bookcases, wardrobes etc.

[0095] The coating layer 3 (or the coatings layers 3, 4) is applied to the respective block 1 by coupling the elements 10, 11 with each other, as above described.

[0096] Such operation can be carried out in different times, and generally before beginning the construction of the structure 100 or at the end of the same (possibly

also during the construction operations of the structure 100).

[0097] Once the structure 100 is completed, it is possible to release (i.e. "to tear") the coating 3 from the main layer 2 (also when the block 1 is parte of the structure 100) and to replace it with a different coating, according to needs.

[0098] It is further possible to disassemble the various blocks from the structure 100, by sliding the block 1 in the opposite direction with respect to the assembly one, i.e. releasing the hook 20 from the hooking means 21, or more generally, decoupling the mechanical fastening means 20, 21 from each other.

[0099] According to a preferred but not limiting embodiment, shown in the appended figures 11 to 13, in order to make the fastening between the various blocks more efficient and to avoid little sliding of the ones on the other ones due to vibrations, each modular block can comprise, in its main layer, at least a notch (15) provided in the upper surface and at least a notch provided in the lower surface. Said notches are also provided with an outwards opening on one of the side surfaces of the block, which will allow the introduction of an outlet key or other tool, whose functioning is described soon. Yet, more preferably, each block comprises at least two notches realized in the upper part and two in the lower part. The positioning of the notches (15) is such that, when two blocks are assembled as shown in figures 9 and 10, the lower notches of the upper block coincide with the upper ones of the lower block.

[0100] In each one of the notches provided in the upper surface of each block it is introduced an element (15-a) subjected to an elastic force, configured so that it can move vertically between a first rest position, in which said element projects from the upper surface of the block, and a second compressed position, in which said element does not project from said upper surface. Preferably but not limitingly, said element subjected to an elastic force is a pin biased by a helical spring.

[0101] In assembly step said element (15-a) is compressed to raise the edge of the upper block up to its vertical alignment with the lower block. In this position, the notches of the upper block are aligned with the ones of the lower block, thus allowing the elastic element to raise the element which will be positioned inside the notch provided on the lower surface of the upper block.

[0102] In the disassembly step the introduction of a key or other tool through the outwards opening on one of the side surfaces, allows to lower the pin thus allowing the upper block to slide on the lower block.

[0103] According to another not limiting embodiment, the coating layer (3), still being valid what said concerning the fastening means to the main layer, comprises elements with projecting shapes and/or openings intended to particular applications as a function of the ambient the wall is intended to. As a way of example said coating layer can comprise shelves, clothes hangers, frames for pictures or paintings, clocks, lightening devices.

Claims

1. Modular building block (1), in particular for realizing partition structures or furniture, comprising mechanical fastening means (20, 21) for mutual dry connection to at least a second modular block (1),
characterized in that
said mechanical fastening means for mutual dry connection to at least a second modular block (1) comprise at least a hook (20) rotatably fastened to said modular block, and at least a hooking element (21) configured to be coupled with said at least one hook (20) of said at least one second modular block.

2. Modular block according to claim 1,
characterized in that said at least one hook (20) is movable from a first rest position, in which it does not project from said block (1), to a second position, in which it projects from said block (1) so that it can be coupled with the hooking element (21) of said at least one second modular block.

3. Modular block according to claim 1 or 2, further comprising at least a supporting plate (20a) fastened to said block (1) and at least a rod (21) introduced inside that block (1),
characterized in that said at least one hook (20) is hinged to said at least one plate (20a) and **in that** said supporting plate (20a) is fastened in turn to a portion of the rod (21).

4. Modular block according to any one of the preceding claims, further comprising at least a seat (13) for said at least one hook (20) configured so that, when said at least one hook (20) in introduced inside said at least one seat (13) the hook (20) does not project from said block (1) .

5. Modular block according to any one of the preceding claims, comprising a main layer (2) and at least an outer coating layer (3, 4), and comprising also at least a plurality of first coupling elements (10), arranged on at least part of the surface (1e, 1f) of the main layer (2), and at least a plurality of second coupling elements (11) arranged on at least part of the surface of the at least one coating layer (3), said first coupling elements (10) and said second coupling elements (11) being configured to interact with each other so that a reversible coupling with each other is realized.

6. Modular block according to claim 5, wherein the reversible coupling between said first coupling elements (10) and said second coupling elements (11) is of interference fit kind.

7. Modular block according to claim 5 or 6, wherein in order to realize said reversible coupling, at least a second coupling element (11) is introduced in at least

a first element (10), or said at least one second element (11) is introduced in the space between at least two first coupling elements (10).

8. Modular block according to any one of claims 5 to 7, wherein said first coupling elements (10) and/or said second coupling elements (11) are fastened to said surface of the main layer (2) or the coating layer (3) by adhesive.

9. Modular block according to any one of claims 5 to 8, wherein said first and second elements (10, 11) coupled with each other form a layer interposed between said at least one coating layer (3) and said main layer (2).

10. Modular block according to any one of claims 5 to 9, wherein said main layer (2) comprises at least a housing (5, 13, 14) for the passage of systems and/or said mechanical fastening means (20, 21) .

11. Modular block according to any one of claims 5 to 10, **characterized in that** said main layer (2) is realized in wood or its composites, plastic, cardboard or alveolar cardboard, or concrete mixture, such materials having preferably variable density.

12. Modular block according to any one of claims 5 to 11, wherein said at least one coating layer (3) is realized in wood materials, or laminated plastics, glass fibre or polyurethane, tiles, or ceramic, glass or porcelain elements.

13. Modular block according to any one of the preceding claims, **characterized in that** said mechanical fastening means comprise at least a notch (15) provided in the upper surface and at least a notch provided in the lower surface, said notches being also provided with an outwards opening on one of the side surfaces of said block, and being configured so that, when two blocks are assembled, the lower notches of the upper block coincide with the upper ones of the lower block, and **in that**
in each one of the notches provided in the upper surface it is introduced an element (15-a) subjected to an elastic force, configured so that it can move vertically between a first rest position, in which said element projects from the upper surface of the block, and a second compressed position, in which said element does not project from said upper surface.

14. Modular block according to any one of the preceding claims, **characterized in that** said coating layer (3) comprises elements with projecting shapes, as shelves, clothes hangers, frames for pictures or paintings, clocks, lightening devices.

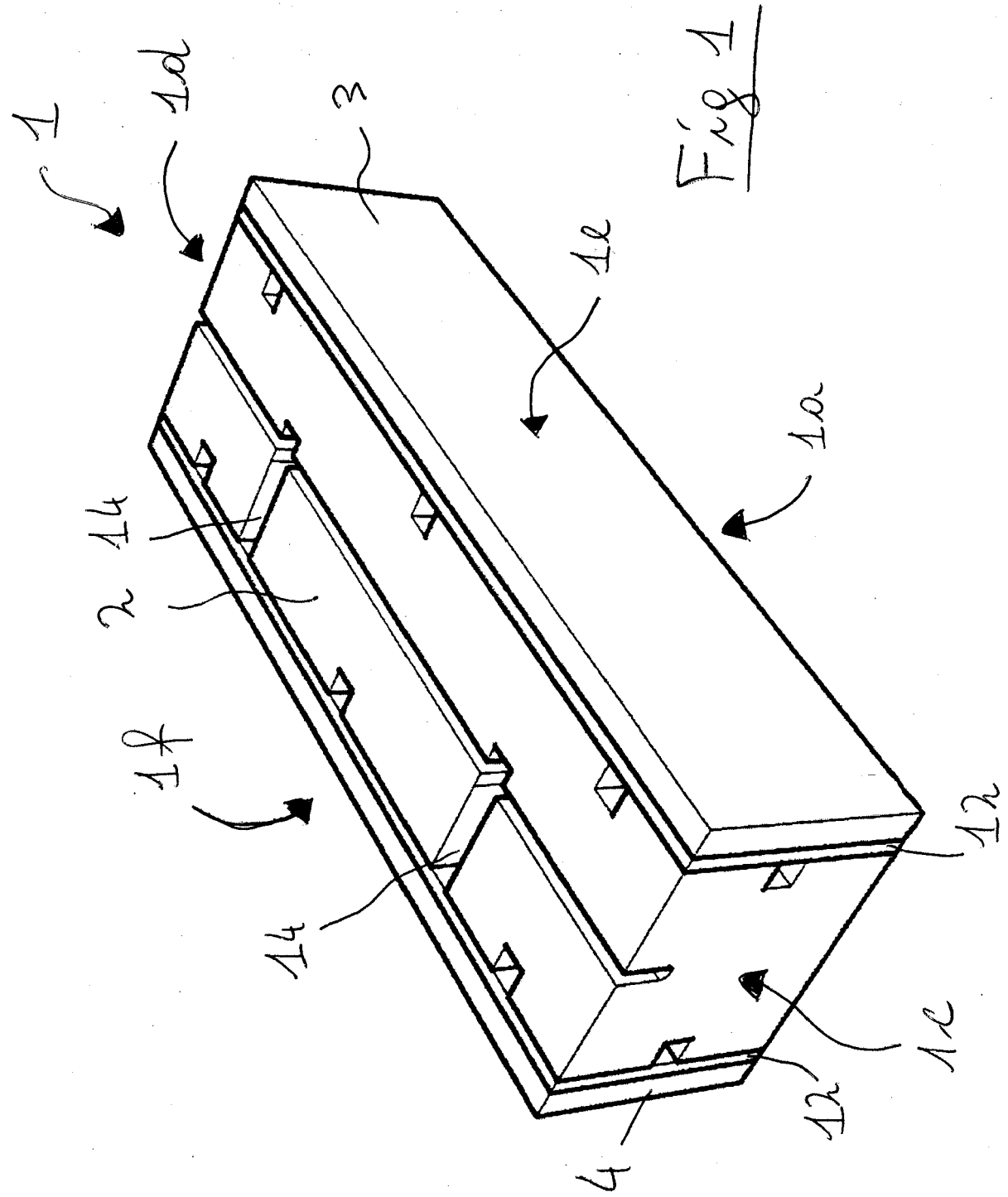
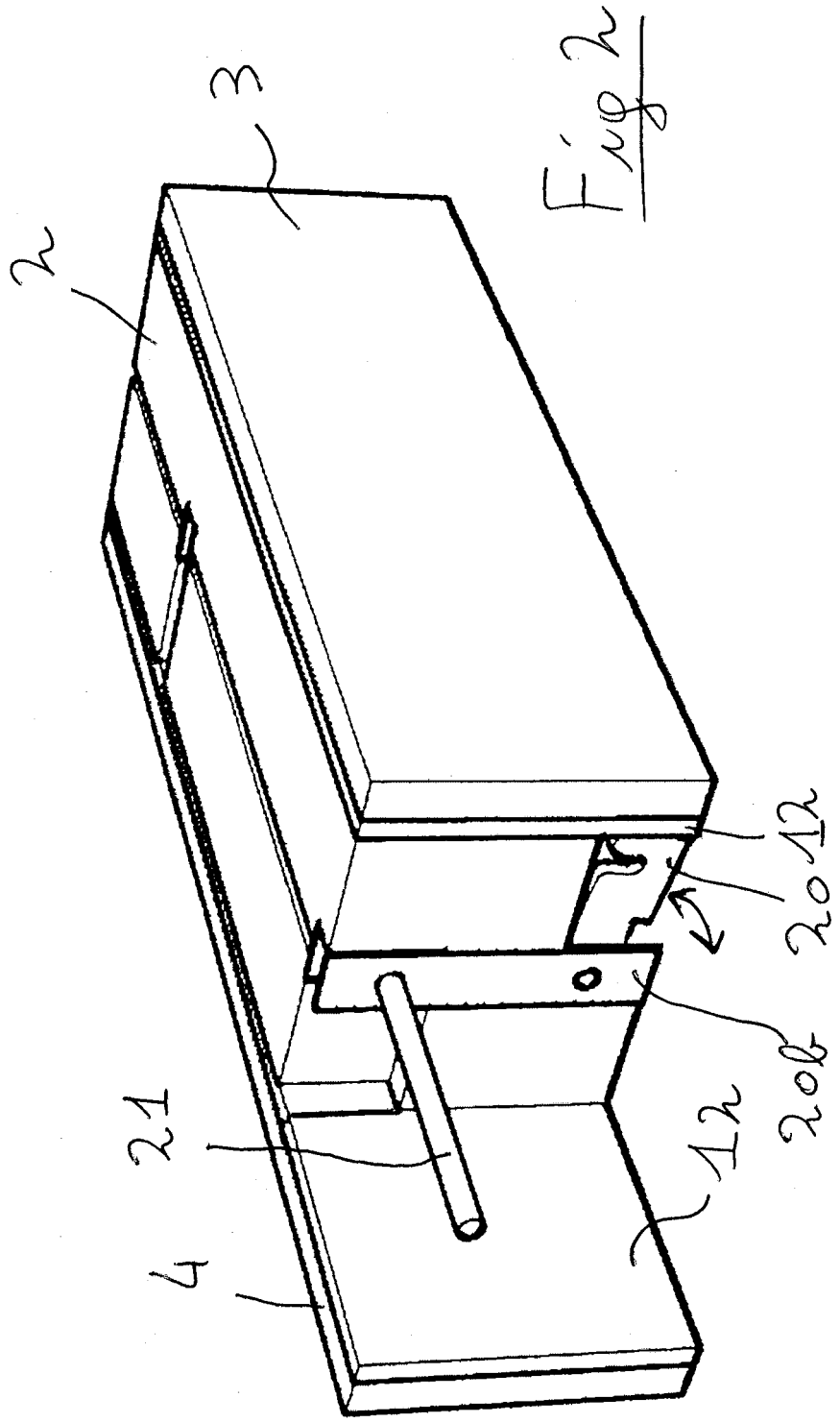


Fig 1

Fig 2



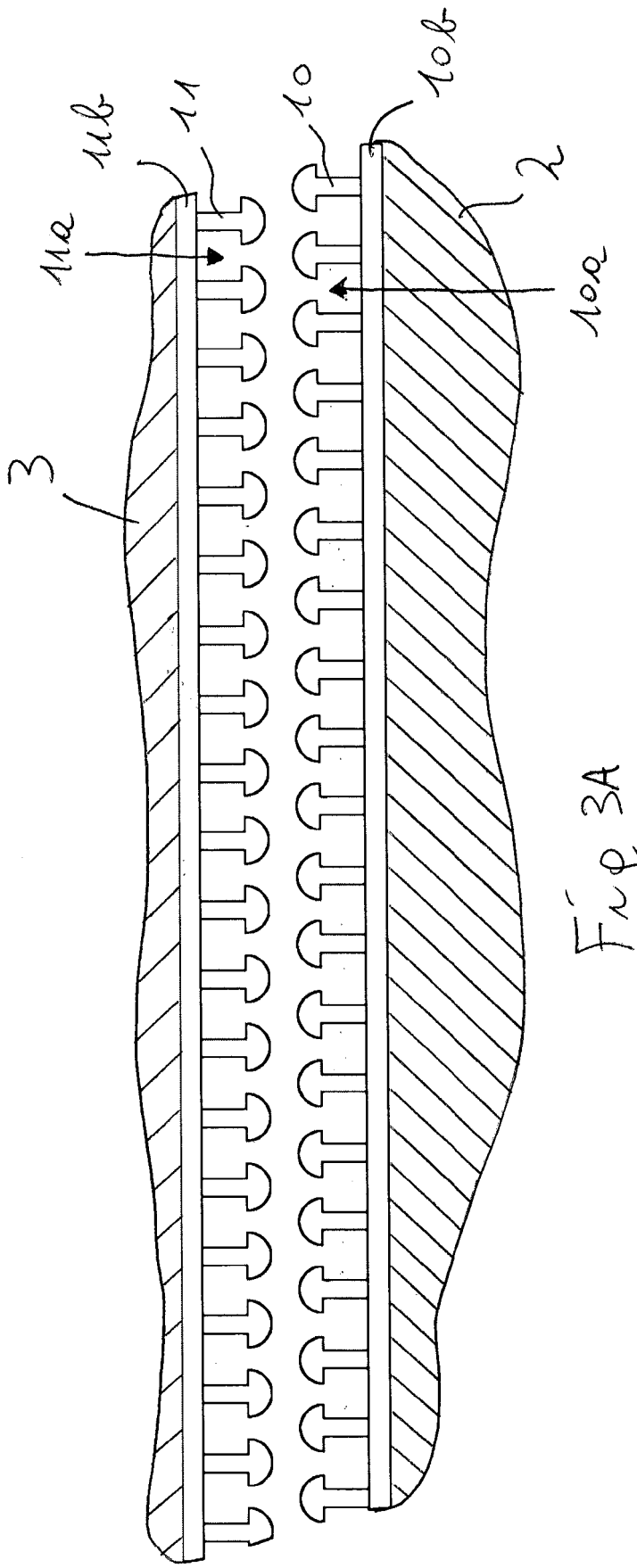


Fig 3A

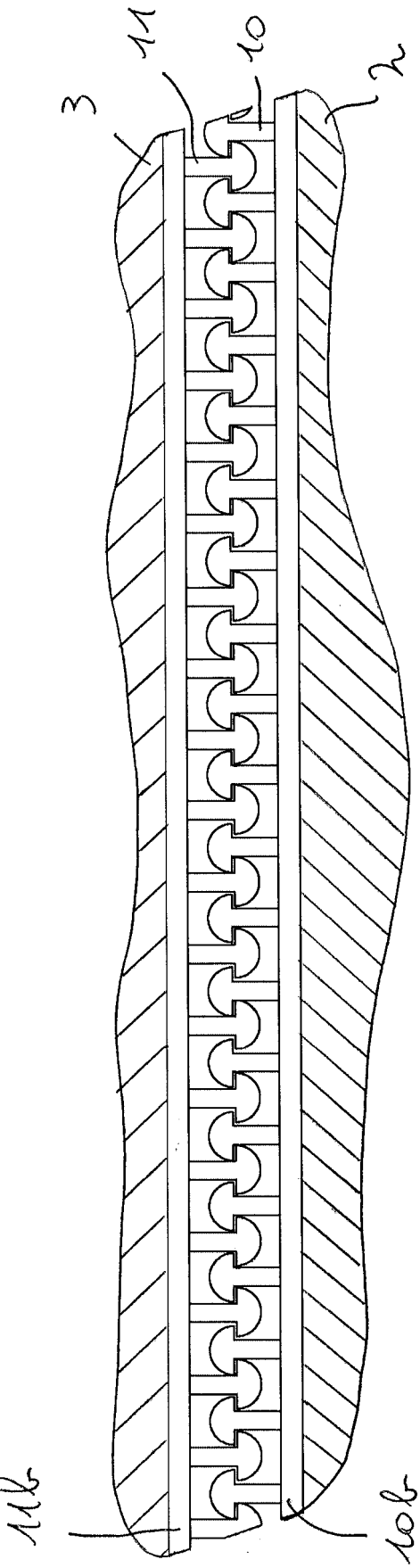


Fig 3B

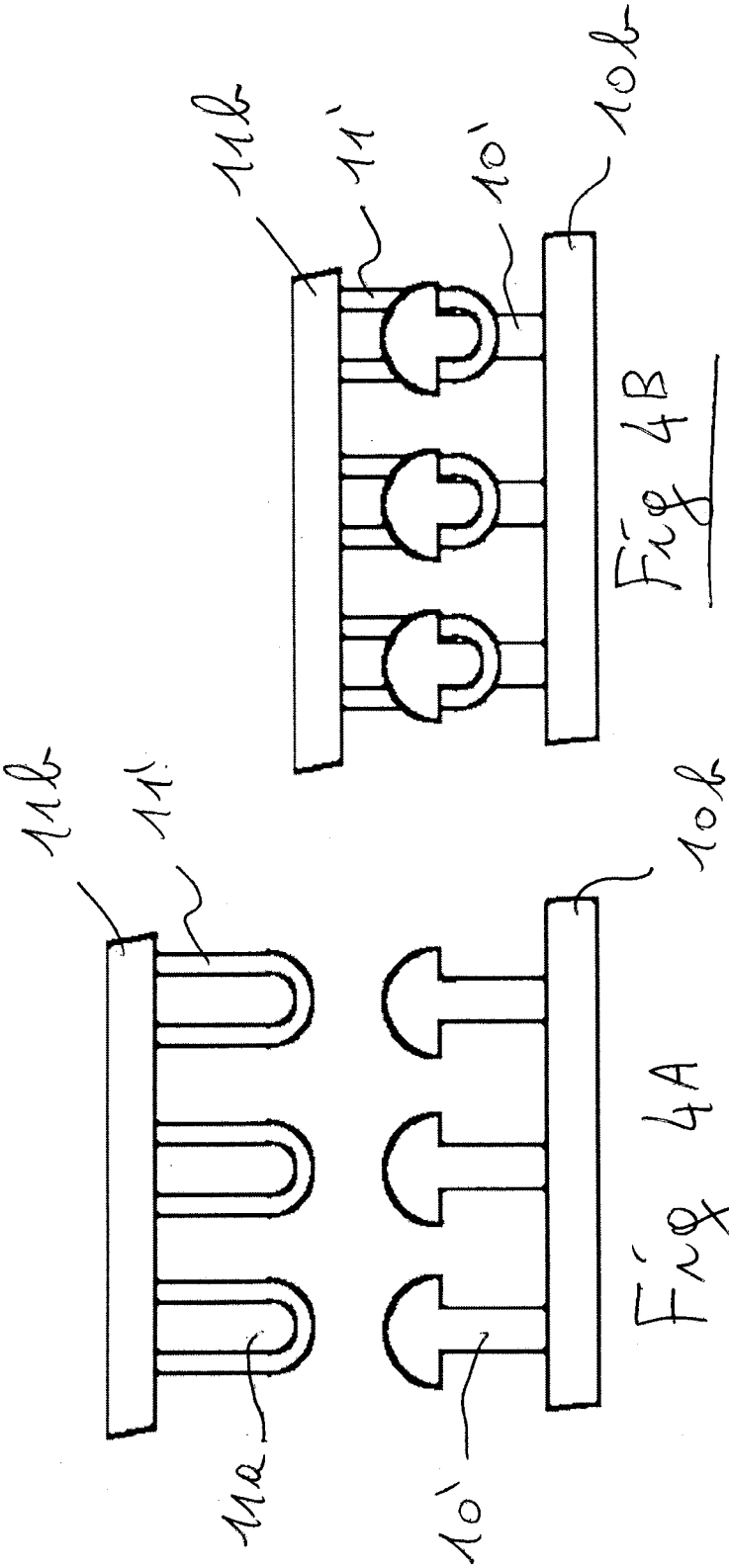


Fig 4B

Fig 4A

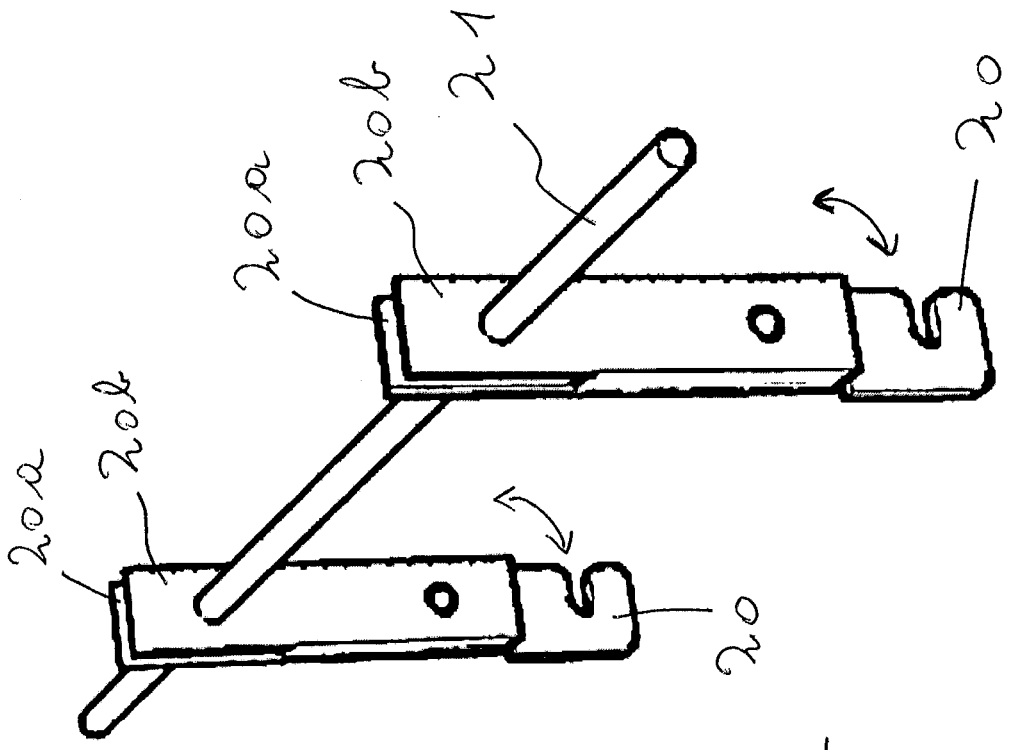


Fig 5

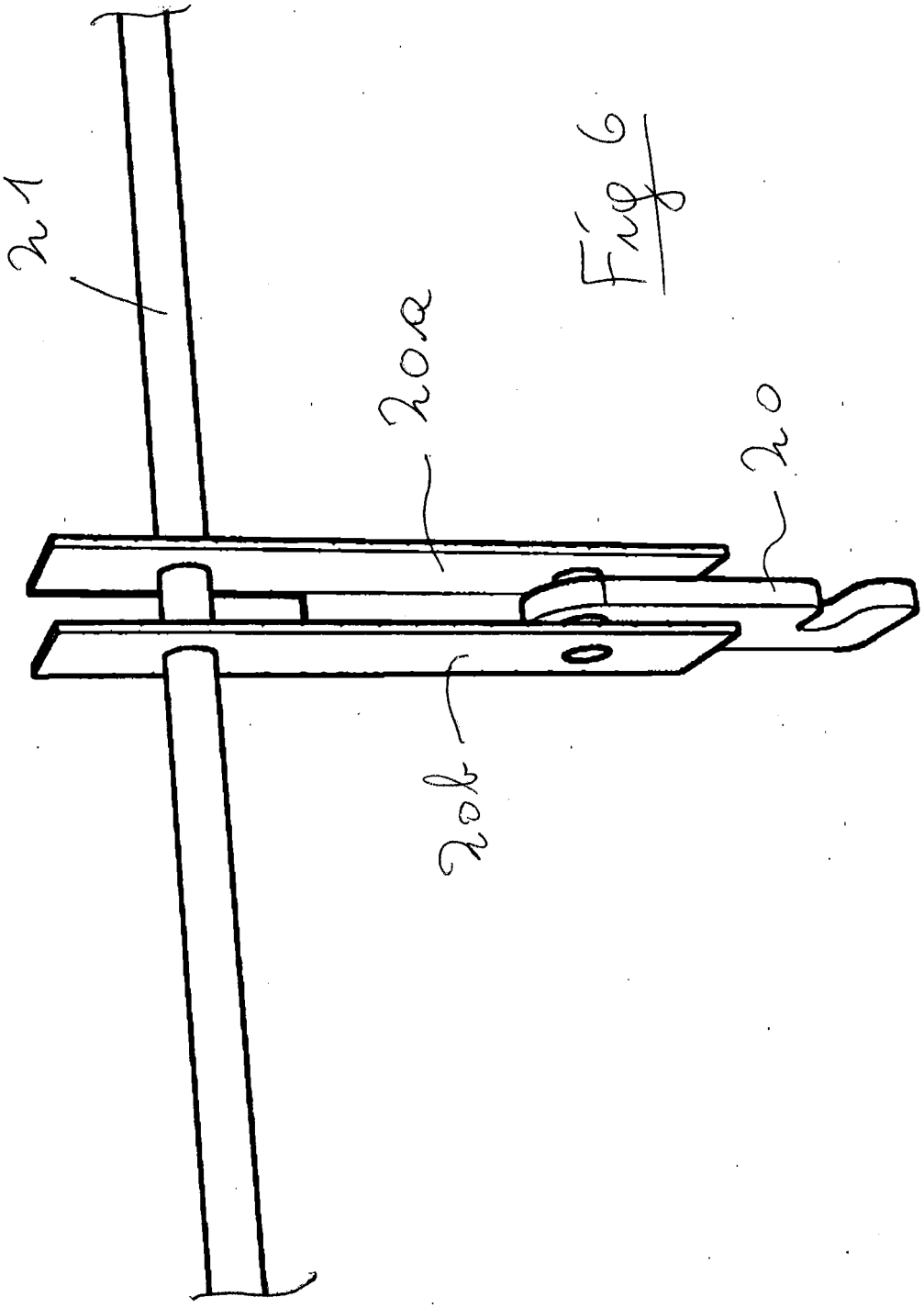
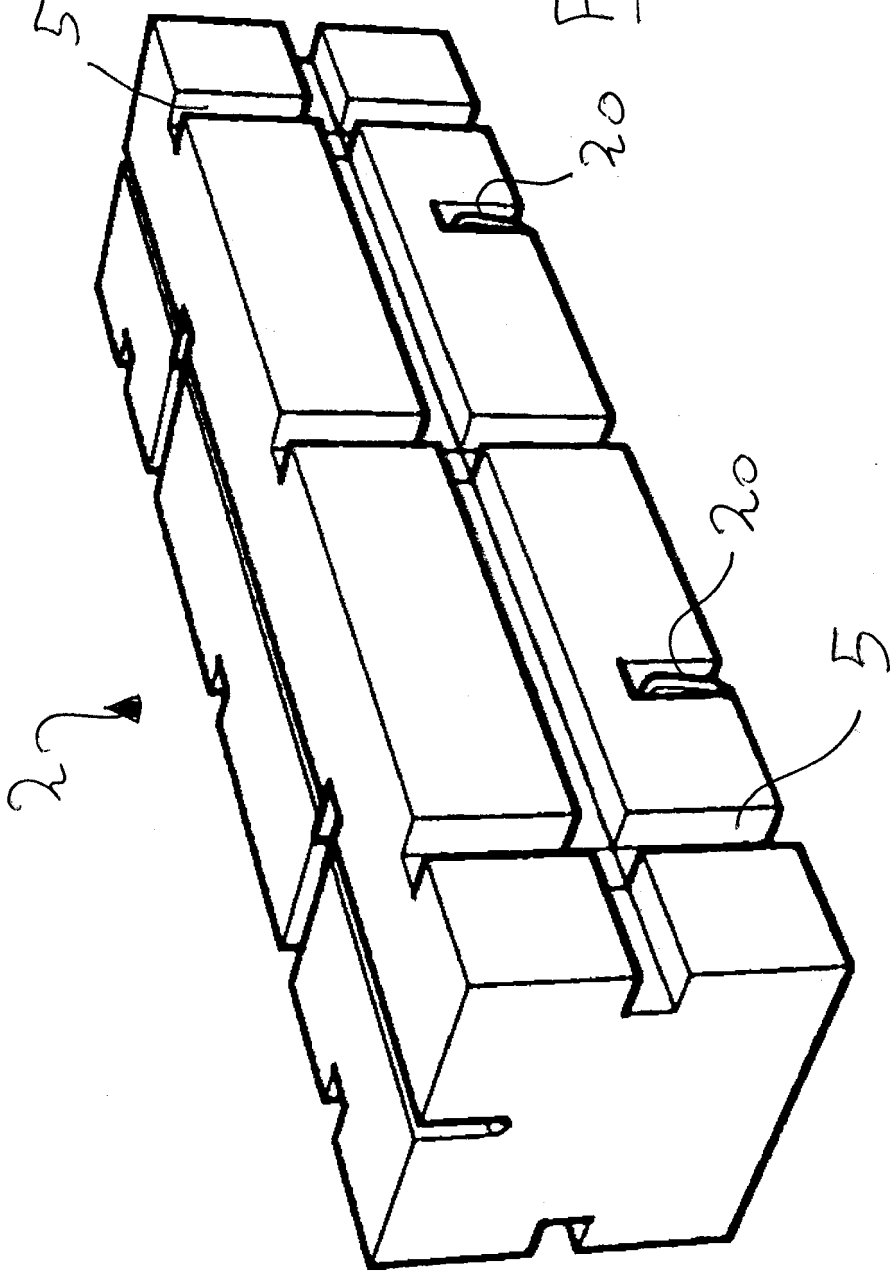


Fig 6

Fig 7



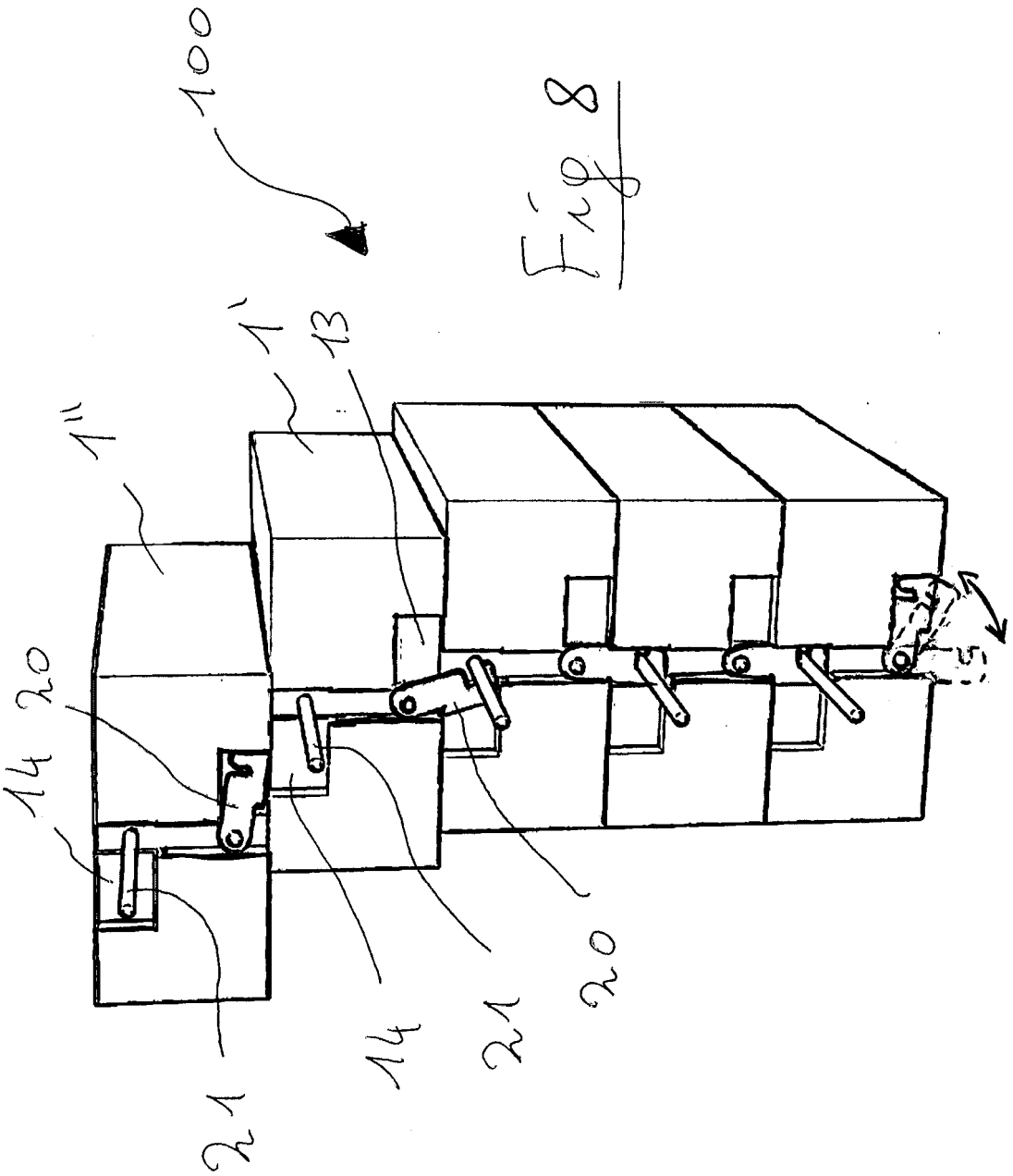


Fig 8

Fig 9

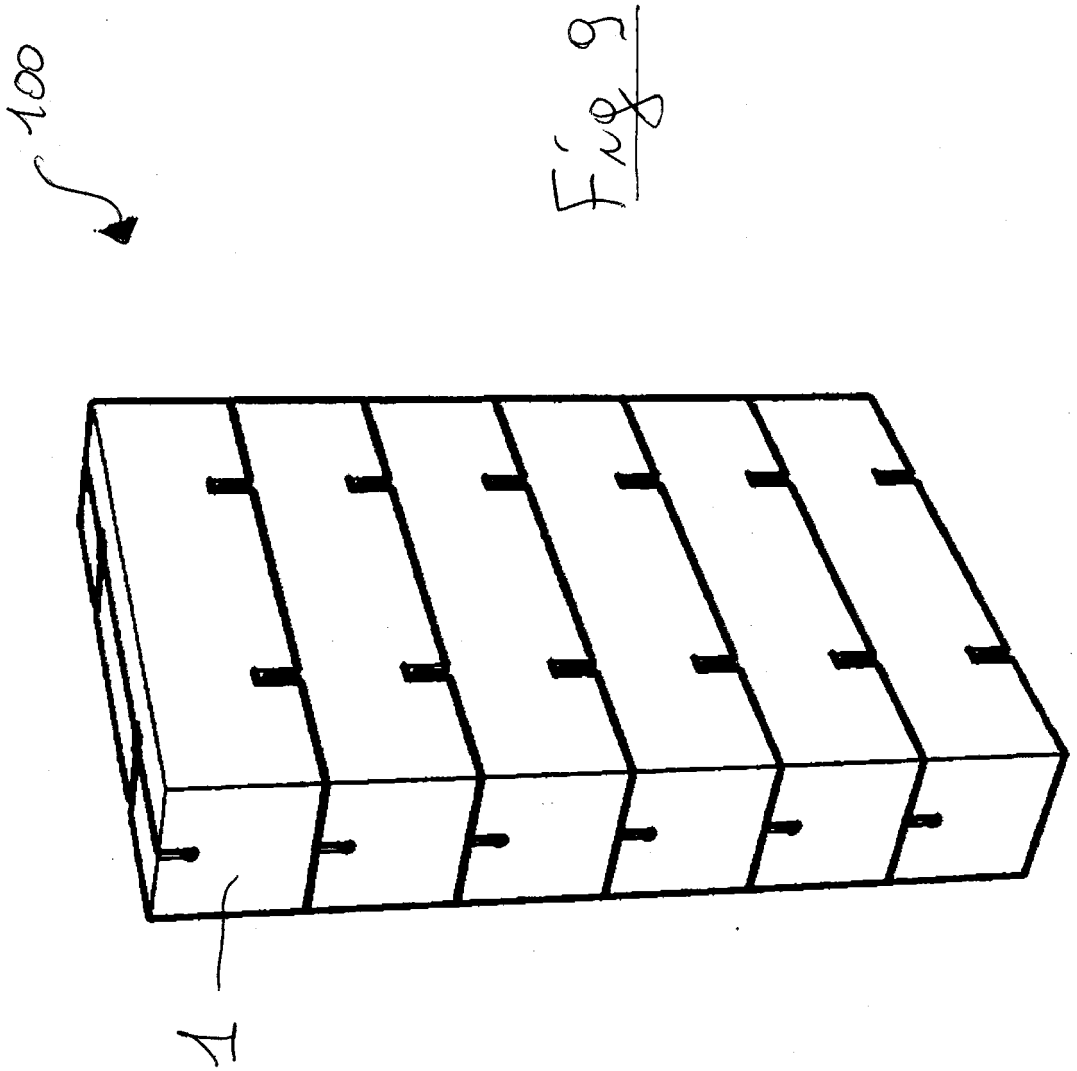
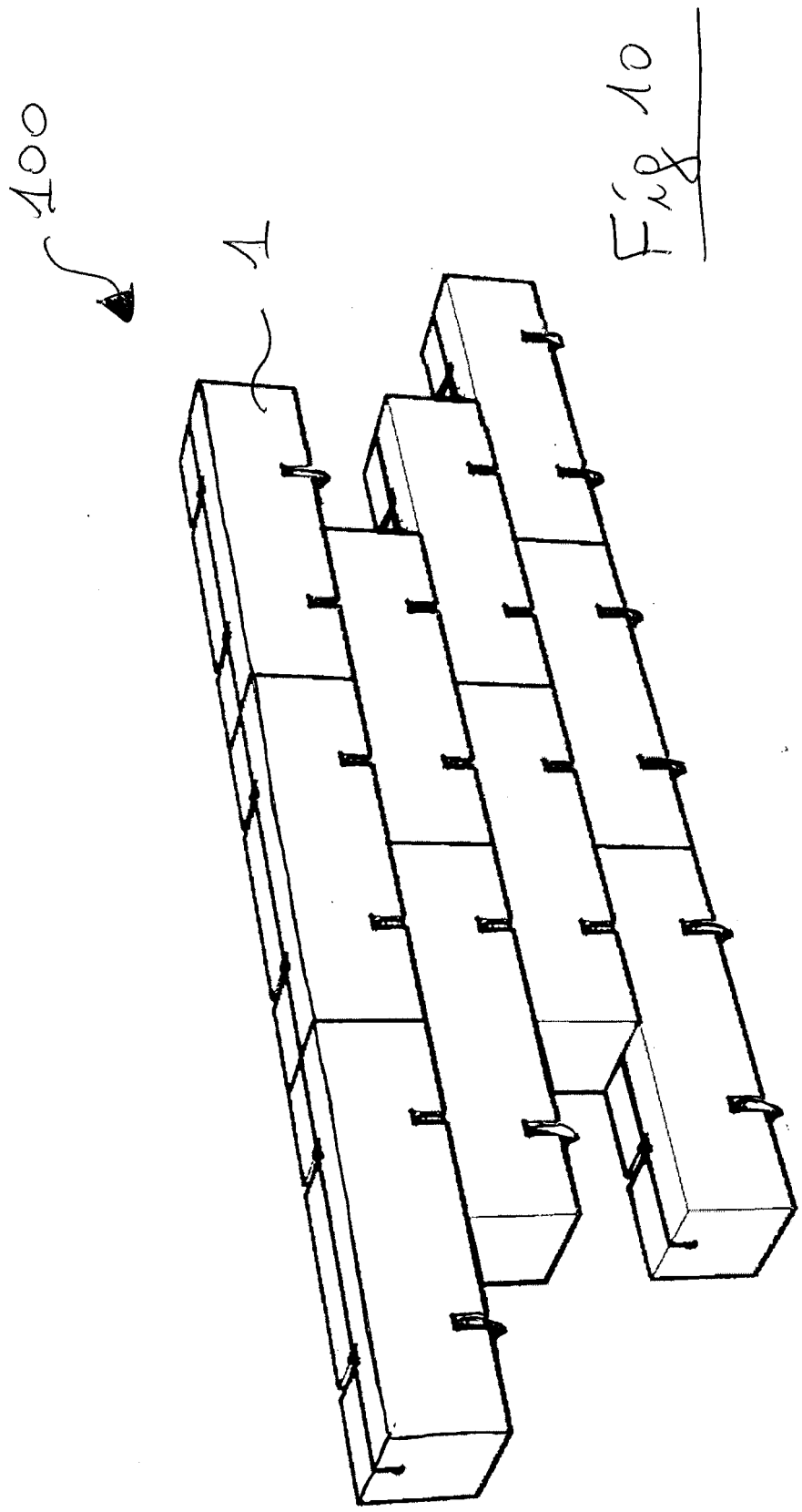


Fig 10



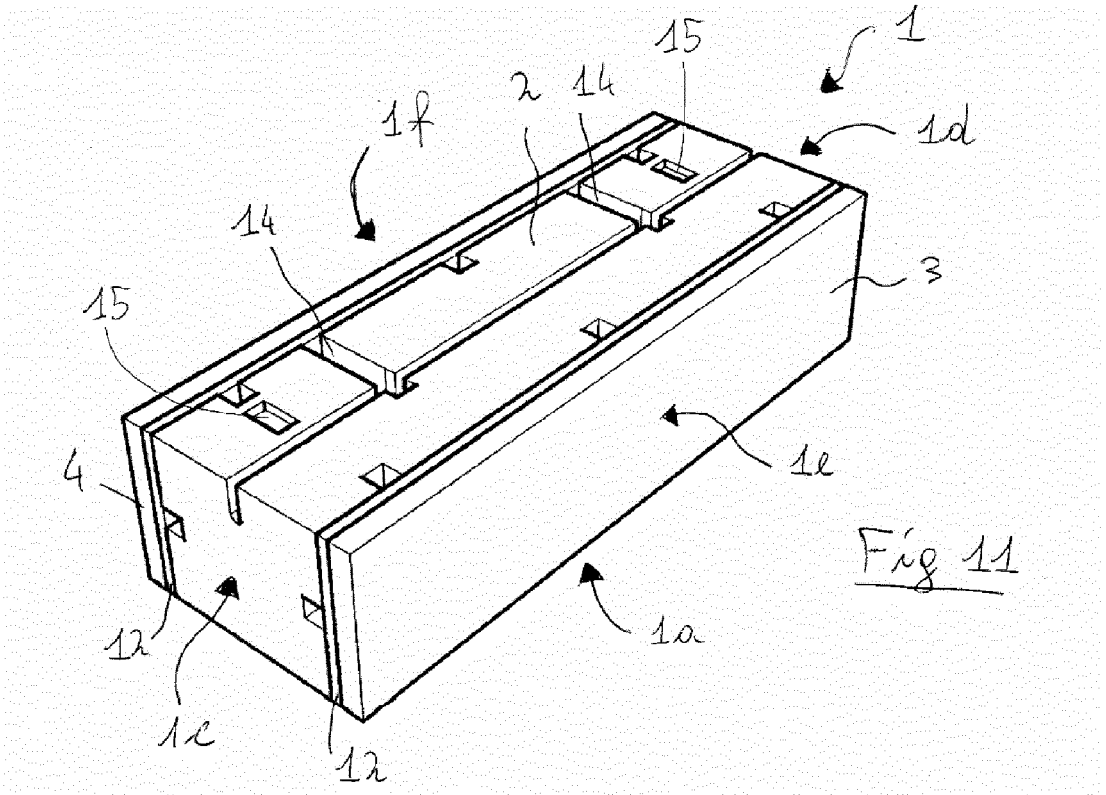


Fig 11

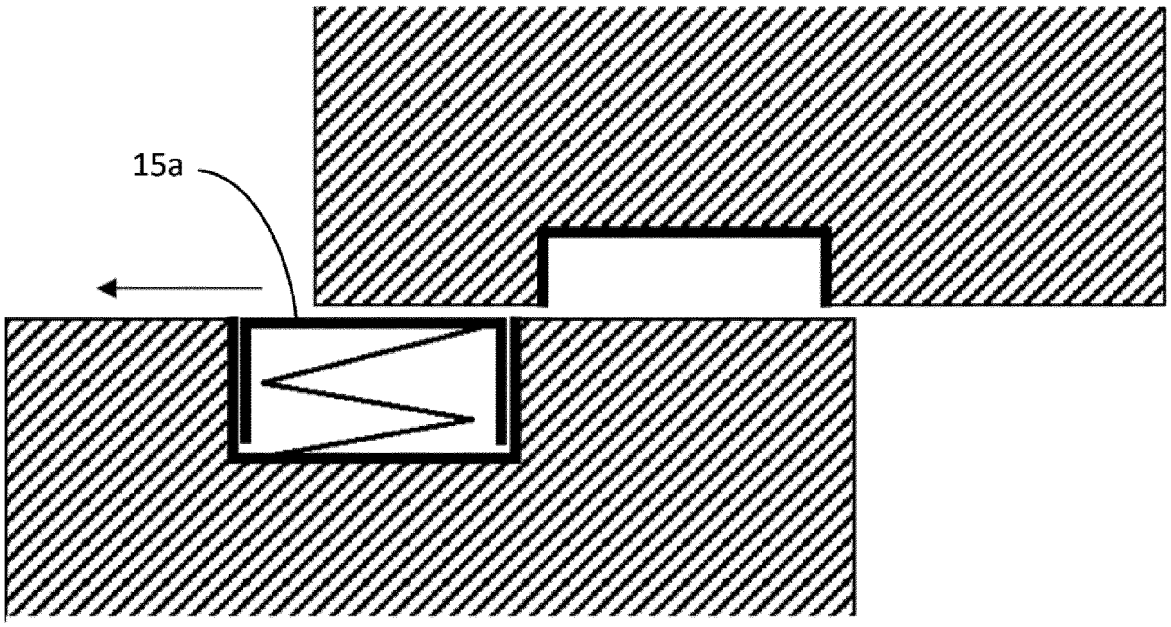


Fig. 12

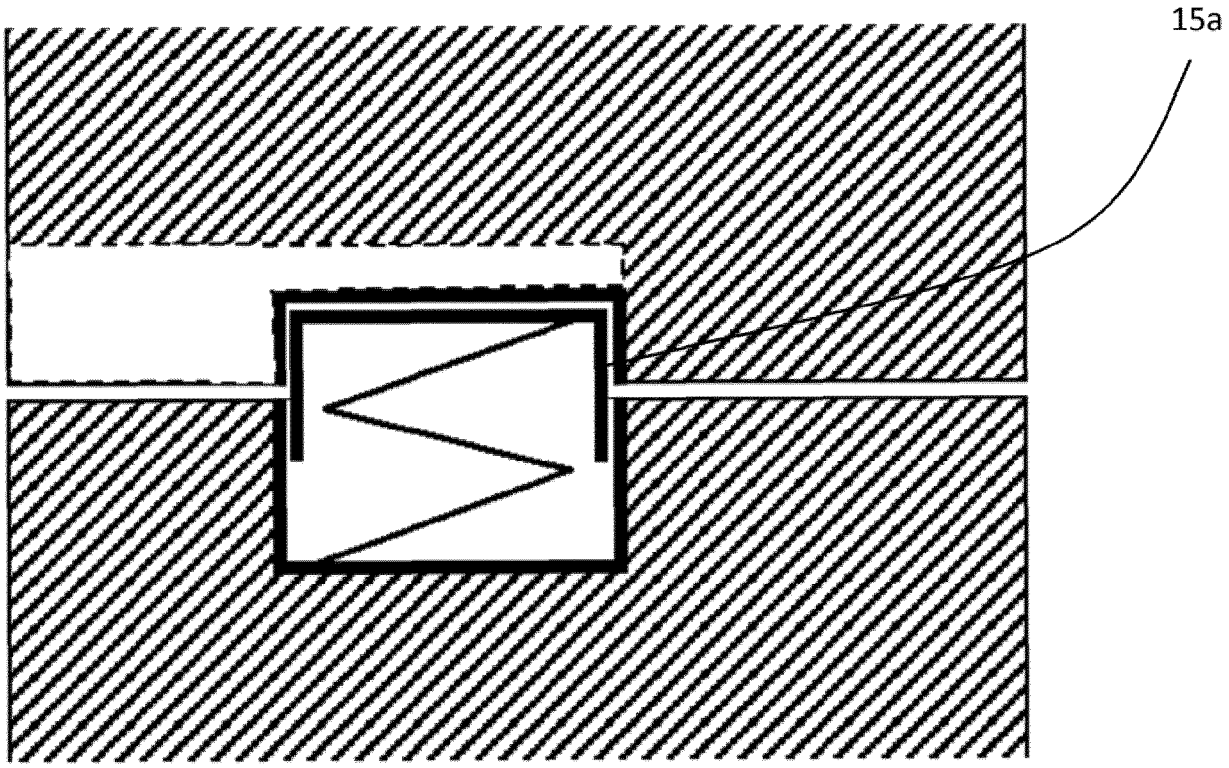


Fig. 13

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 18 17 1830

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 749 182 C (STARRBAU G M B H) 9 April 1953 (1953-04-09) * abstract; figures 1-5, 8, 9 * -----	1-14	INV. E04B2/08 ADD. E04B2/02
A	EP 2 679 739 A2 (UNIV DO MINHO [PT]) 1 January 2014 (2014-01-01) * paragraph [0022] - paragraph [0058]; figures 1, 2 * -----	1-14	
A	US 6 513 296 B1 (BADEN STEFFEN [DE]) 4 February 2003 (2003-02-04) * abstract; figures 1-5 * -----	1-14	
A,D	EP 2 992 146 A1 (POLITECNICO DI BARI [IT]) 9 March 2016 (2016-03-09) * the whole document * -----	1-14	

TECHNICAL FIELDS SEARCHED (IPC)
E04B
E04C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	20 June 2018	Couprie, Brice

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 18 17 1830

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

20-06-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 749182 C	09-04-1953	NONE	
EP 2679739 A2	01-01-2014	EP 2679739 A2	01-01-2014
		PT 106412 A	30-12-2013
US 6513296 B1	04-02-2003	DE 19923080 A1	07-12-2000
		EP 1063434 A2	27-12-2000
		US 6513296 B1	04-02-2003
EP 2992146 A1	09-03-2016	CA 2911100 A1	06-11-2014
		EP 2992146 A1	09-03-2016
		WO 2014177899 A1	06-11-2014

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 214177899 A **[0047]**
- WO 2014177899 A **[0086]**