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(54) **GABION**

(57) A construction system and method for setting up constructions with the appearance of gabions. The construction system comprises a plurality of stackable building blocks for setting up a supporting wall, a continuous wire mesh and anchoring elements for anchoring the wire mesh to the supporting wall, so that between the wire mesh and the supporting wall a gap is formed that

can be filled with loose rocks. The stackable building blocks have protrusions and recesses that fit inside each other, for positioning the building blocks on top of each other, and grooves at the top for receiving the anchoring elements. The anchoring elements have a gripping element, arranged for holding the wire meshes.

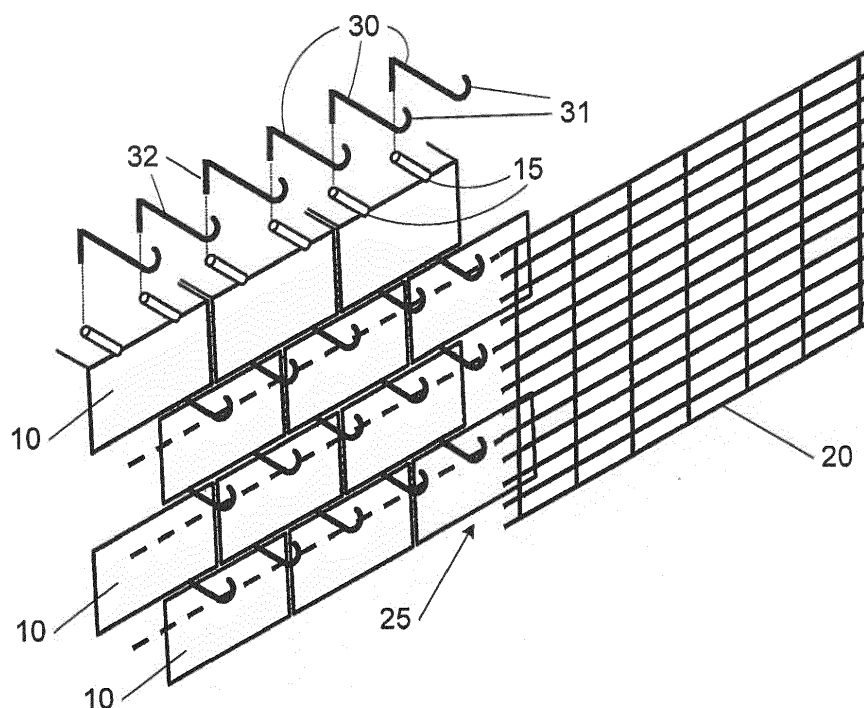


Fig. 1

Description

Technical field

[0001] The present invention relates to a construction system, and corresponding method, for setting up constructions with the appearance of gabions.

Background art

[0002] Gabions are known to the person skilled in the art. They are construction elements made from a wire mesh enclosing a certain volume, filled with loose rocks.

[0003] It is known that for constructions of large dimensions, such gabions by themselves are insufficiently sturdy to support the weight of the s, and that without additional measures, deformations of the wire mesh can occur and/or the construction can become unstable. Hence, it is known for large dimensions to provide a supporting wall, of which the visible face or faces are covered by means of wire meshes and loose rocks. This way, an appearance can be obtained where only the gabions are visible.

[0004] From FR2897375, a construction system is known for setting up constructions with the appearance of gabions, comprising a supporting wall constructed from stackable concrete building blocks. The building blocks are provided at the top and bottom with protrusions and recesses that fit inside each other, ensuring a correct positioning of the building blocks on top of each other. Each building block is provided at the front with a gabion, anchored into the material of the building block. This anchoring needs to be carried out during the casting of the concrete building blocks.

[0005] From FR2986252, a construction system is also known for setting up constructions with the appearance of gabions, comprising a concrete supporting wall and a continuous wire mesh secured to the supporting wall by means of anchoring elements. The concrete supporting wall is a unit of large dimensions, cast on-site out of concrete. In the front face of the concrete supporting wall, recesses are provided, having metal elements to which the anchoring elements are affixed. These metal elements need to be installed in a correct location in the formwork for the supporting wall before the casting process.

Definitions

[0006] As used herein, the term "top face" is intended to mean the face of a building block located at the top when used in a construction according to the invention.

[0007] As used herein, the term "bottom face" is intended to mean the face of a building block located at the bottom when used in a construction according to the invention.

[0008] As used herein, the term "longitudinal face" is intended to mean a face of a building block extending

between the top and bottom faces and, when used in a construction according to the invention, aligned along the longitudinal direction of the construction.

[0009] As used herein, the term "front longitudinal face" or "front face" is intended to mean the longitudinal face of a building block facing the wire mesh when used in a construction according to the invention.

[0010] As used herein, the term "transverse face" is intended to mean a face of a building block extending between the top and bottom faces and, when used in a construction according to the invention, aligned along the depth direction of the construction.

[0011] As used herein, the term "width" is intended to mean a dimension measured in a direction parallel to the longitudinal faces and the top and bottom faces.

[0012] As used herein, the term "depth" is intended to mean a dimension measured in a direction perpendicular to the longitudinal faces.

[0013] As used herein, the term "height" is intended to mean a dimension measured in a direction perpendicular to the top and bottom face.

[0014] As used herein for the wire mesh, the term 'continuous' is intended to mean that the dimensions of the wire mesh are at least greater than the dimensions, i.e. the width and/or height, of the front face of one building block, and preferably greater than the dimensions of the front face of a plurality of building blocks.

Disclosure of the invention

[0015] It is a first aim of the present invention to provide a construction system, intended for setting up constructions with the appearance of gabions, with which said constructions can be set up in an easier way.

[0016] This first aim is achieved by means of the construction system according to the first independent claim.

[0017] It is a second aim of the present invention to provide an easier method for setting up constructions with the appearance of gabions.

[0018] This second aim is achieved by means of the method according to the second independent claim.

[0019] The invention relates to a construction system and a corresponding method, for setting up constructions with the appearance of gabions. The construction system comprises a plurality of stackable building blocks for setting up a supporting wall and means for setting up gabions on at least one face of the supporting wall. The stackable building blocks have a top and bottom face that are collectively provided with protrusions and recesses that fit inside each other, arranged for positioning the building blocks on top of each other. In the top face of the building blocks, grooves are provided, each extending inwardly from a front face of the building block and terminating in a hook-shaped portion. The means for setting up the gabions comprise at least one continuous wire mesh and anchoring elements for anchoring the wire mesh to the supporting wall, so that between the wire mesh and the supporting wall a gap is formed that can be filled with

loose rocks. The anchoring elements have at one end a gripping element, arranged for holding one of the wire meshes, and at another end a hook element, arranged to hook into the hook-shaped portion of one of the grooves in the top face of one of the building blocks.

[0020] The method according to the invention comprises the following steps:

- providing a plurality of stackable building blocks, wherein the stackable building blocks have a top and bottom face that are collectively provided with protrusions and recesses that fit inside each other, arranged for positioning the building blocks on top of each other, and wherein grooves are provided in the top faces of the building blocks, each extending inwardly from a front face of the building block and terminating in a hook-shaped portion;
- providing at least one continuous wire mesh;
- providing anchoring elements for anchoring the wire mesh to the supporting wall, so that between the wire mesh and the supporting wall a gap is formed that can be filled with loose rocks, wherein the anchoring elements have at one end a gripping element, arranged for holding one of the wire meshes, and at another end have a hook element, arranged to hook into the hook-shaped portion of one of the grooves in the top face of one of the building blocks;
- setting up a supporting wall by positioning the building blocks on top of each other, so that each of the protrusions and recesses of building blocks placed on top of each other fit inside each other;
- installing the anchoring elements in the grooves in the top face of the building blocks, wherein each hook element is hooked into the hook-shaped portion of the groove before the building blocks above it are put into place;
- installing the at least one continuous wire mesh to the grip elements of the anchoring elements;
- and filling the gap between the at least one continuous wire mesh and the supporting wall with loose rocks.

[0021] The construction system and the method according to the invention have the advantage that the anchoring elements or portions, which ensure the anchoring of the wire mesh or the gabions to the supporting wall, need not be installed in the material of the building blocks during the casting of the building blocks. According to the invention, the anchoring is ensured solely by separate anchoring elements hooking into the grooves in the top face of the building blocks, more specifically in the hook-shaped portions of the grooves. This allows both the manufacturing process and transport of the parts of the construction system according to the invention to be simplified: the building blocks can simply be cast in concrete without installing the anchoring elements or parts in the formwork; and the parts remain separate until the moment of setting up the construction. Furthermore, setting

up the construction itself can be simplified as well: the gabions are not attached to the building blocks beforehand, which increases the manageability and can eliminate the risk of unwanted deformations of the gabions by collisions.

[0022] Moreover, using the construction system according to the invention, constructions can be set up in which a number of grooves are left open, i.e., not in all grooves there is placed an anchoring element. These grooves remaining open can ensure drainage of water or moisture from between the building blocks.

[0023] Using the construction system according to the invention, constructions can furthermore be set up to which no gabions are installed. In that case, the grooves solely serve for draining water or moisture from between the building blocks.

[0024] In preferred embodiments of the invention, the protrusions are provided at the top face and the recesses at the bottom face of the building blocks. The protrusions and recesses are preferably frustoconical.

[0025] In preferred embodiments of the invention, the protrusions and recesses are arranged so that the building blocks fit on top of each other in different positions. The supporting wall is preferably set up with the building blocks in an offset bond, for example in stretching bond.

[0026] In preferred embodiments of the invention, the plurality of building blocks comprises a first set of building blocks and a second set of building blocks, wherein the building blocks of the first set have a double row of the protrusions and recesses, and wherein the building blocks of the second set have a depth which is substantially half of that of the building blocks of the first set and have a single row of the protrusions and recesses. With this preferred embodiment of the invention, the depth of the supporting wall can be chosen, for instance according to the expected lateral load. With this preferred embodiment of the invention, a supporting wall can also be built of which the depth up to a certain height is double that above it.

[0027] In preferred embodiments of the invention, the grooves extend in a direction perpendicular to the front face of the building blocks up to a distance from the front face of the building blocks, where the hook-shaped portion is located. The hook-shaped portion preferably comprises a downward directed hole or opening.

[0028] In preferred embodiments of the invention, the grooves are provided at both longitudinal faces, i.e., both at the front longitudinal face and the back longitudinal face of the building blocks. This allows constructions to be set up with gabions at both sides. Moreover, this preferred embodiment has the advantage that setting up the supporting wall is simplified, as the shape of the building blocks is the same at the front and back face, and therefore it doesn't matter which longitudinal face of the building blocks ends up at the front in the supporting wall. Furthermore, the grooves at the back of the supporting wall, when not used for receiving anchoring elements, can ensure drainage of water or moisture from between

the building blocks.

[0029] In preferred embodiments of the invention, the transverse faces of the building blocks are shaped in such a way at the top that when placing two building blocks against each other with their transverse faces facing, a groove is formed at the boundary between the two building blocks, in which one of the anchoring elements can be received.

Brief description of the drawings

[0030] The invention will hereafter be further elucidated by means of the following description and the appended figures.

Figure 1 shows a schematic perspective view of an embodiment of the construction system according to the invention.

Figure 2 shows a cross-section view of how the protrusions and recesses, in an embodiment of the construction system according to the invention, fit inside each other.

Figure 3 shows different aspects and details of a first building block of a construction system according to the invention.

Figures 4-6 show perspective views of other building blocks of a construction system according to the invention.

Modes for carrying out the invention

[0031] The present invention will hereafter be described with respect to particular embodiments and with reference to certain drawings, but the invention is not limited thereto and is only limited by the claims. The drawings presented here are only schematic and are non-limiting. In the drawings, the dimensions of some of the elements may be exaggerated, meaning that the elements in question are not drawn to scale, for illustrative purposes only. The dimensions and the relative dimensions do not necessarily correspond to actual reductions to practice of the invention.

[0032] Furthermore, terms such as "first", "second", "third" and the like in the description and in the claims are used for distinguishing between similar elements and not necessarily for indicating a sequential or chronological order. The terms are interchangeable under appropriate circumstances and the embodiments of the invention can operate in other sequences than those described or illustrated herein.

[0033] Moreover, the terms "top", "bottom", "over", "under" and the like in the description and the claims are used for descriptive purposes and not necessarily for indicating relative positions. The terms so used are interchangeable under appropriate circumstances and the embodiments of the invention described herein can operate in other orientations than those described or illustrated herein.

[0034] The term "comprising" and its derivatives, as used in the claims, should not be interpreted as being restricted to the means listed thereafter; it does not exclude other elements or steps. It should be interpreted as specifying the stated features, integers, steps or components as referred to, without however precluding the presence or addition of one or more additional features, integers, steps or components, or groups thereof. Thus, the scope of the expression "a device comprising means A and B" is not limited to devices consisting solely of components A and B. What is meant, by contrast, is that with respect to the present invention, the only relevant components are A and B.

[0035] The construction system shown in figure 1 is intended for setting up constructions with the appearance of gabions. The construction system comprises a plurality of stackable building blocks 10 for setting up a supporting wall and anchoring elements 30 and wire meshes 20 for setting up gabions on at least one face of the supporting wall. The stackable building blocks 10 have a top and bottom face 11, 12 that are collectively provided with protrusions 13 and recesses 14 which fit inside each other, arranged for positioning the building blocks on top of each other. In the top face of the building blocks, grooves 17 are provided, each extending inwardly from a front face 16 of the building block and terminating in a hook-shaped portion 17. The anchoring elements 30 are arranged for anchoring the wire mesh 20 to the supporting wall, so that between the wire mesh and the supporting wall a gap 25 is formed that can be filled with loose rocks. The anchoring elements 30 are provided at one end with a gripping element 31, arranged each for holding one wire of the wire meshes 20, and at another end with a hook element 32, arranged to hook into the hook-shaped portion 17 of one of the grooves 15 in the top face 11 of one of the building blocks 10.

[0036] As shown in figure 1, the placement of the anchoring elements 30 is carried out in the grooves 15 in the top face of the building blocks, wherein each time the hook element 32 is hooked into the hook-shaped portion 17 of the groove 15, before the building blocks above it are put into place. Installing the at least one continuous wire mesh 20 to the grip elements 31 of the anchoring elements 30 and filling the gap 25 with loose rocks isn't carried out until the supporting wall is finished. This has the advantage that the anchoring elements 30 needn't yet be installed into the material of the building blocks during the casting of the building blocks 10. According to the invention, the anchoring is ensured solely by separate anchoring elements 30 hooking into the grooves 15 in the top face of the building blocks, more specifically in the hook-shaped portions of the grooves. This allows both the manufacturing process and transport of the parts of the construction system according to the invention to be simplified: the building blocks 10 can simply be cast in concrete without installing the anchoring elements or parts in the formwork; and the parts remain separate until the moment of setting up the construction. Furthermore,

setting up the construction can itself be simplified as well: the gabions are not attached to the building blocks 10 beforehand, which increases the manageability and can eliminate the risk of unwanted deformations of the gabions by collisions.

[0037] In the preferred embodiments of the invention shown, the protrusions 13 are provided at the top face 11 and the recesses 14 at the bottom face 12 of the building blocks. This may however equally be done the other way around, or protrusions and recesses can be provided both at the top and bottom, as long as the building blocks fit on top of each other.

[0038] In the preferred embodiments of the invention shown, the protrusions 13 and recesses 14 are arranged so that the building blocks fit on top of each other in different positions. This allows the building blocks to be placed on top of each other in an offset bond, preferably in stretching bond. The protrusions 13 and recesses 14 are preferably frustoconical. The protrusions 13 and recesses 14 are preferably mutually complementary, with minimal tolerance, as shown in figure 2.

[0039] The anchoring of the wire meshes 20 to the ground can be carried out in any way known to the person skilled in the art, for example by drilling holes in the foundation / floor plate on which the building blocks rest, in which holes a first row of anchoring elements is subsequently installed by means of a chemical anchoring. Finishing the supporting wall at the top can for instance be carried out by means of covering blocks, which are provided with matching recesses 14 (and/or protrusions 13, depending on the embodiment) at the bottom and are flat at the top.

[0040] The building blocks 10 of the preferred embodiments of the invention shown are preferably made of concrete, preferably concrete cast by means of a corresponding mold. Therein, recesses are preferably provided in the transverse faces 21 of the building blocks to compensate for tolerances as a result of the manufacturing process. It was found that these transverse faces of the building blocks often take on a somewhat convex shape due to "sagging" of the concrete. This convexity can be compensated by providing the recesses, so that the seam between the building blocks at the front (and at the back) upon placement against each other can remain minimal.

[0041] According to the invention, this recess is furthermore also used to provide a groove with a hook-shaped portion at the boundary between two building blocks, for receiving an anchoring element. To this end, at opposing ends of the building blocks, the transition 22 from top face to transverse face is shaped complementary to the anchoring elements; the raised edge 23 along the above-mentioned recess in the transverse faces 21 then forms the hook-shaped portion, behind which the anchoring element can be hooked.

[0042] In the embodiments of figures 3-6, the grooves 15, 18 are provided on both longitudinal faces, i.e., both at the front longitudinal face and at the back longitudinal

face of the building blocks. This allows constructions to be set up with gabions at both sides. This preferred embodiment has the further advantage that setting up the supporting wall is simplified, since the shape of the building blocks is the same at the front and back face, and therefore it doesn't matter which longitudinal face of the building blocks ends up at the front in the supporting wall. Furthermore, the grooves at the back of the supporting wall, when not used for receiving anchoring elements, can ensure drainage of water or moisture from between the building blocks. At the front, too, a number of grooves can be left open, i.e., not in all grooves there is installed an anchoring element. These grooves remaining open can ensure drainage of water or moisture from between the building blocks.

[0043] The collection of building blocks of figures 3-6 constitutes a first set of building blocks (fig. 3-4) and a second set of building blocks (fig. 5-6), wherein the building blocks of the first set have a double row of protrusions and recesses, and wherein the building blocks of the second set have a depth which is substantially half of that of the building blocks of the first set and have a single row of protrusions and recesses. With this combination of building blocks, the depth of the supporting wall can be chosen, for instance according to the expected lateral load. With this preferred embodiment of the invention, a supporting wall can also be built of which the depth up to a certain height is double that above it.

[0044] The grooves 15 are preferably located between the protrusions 13 and extend preferably in a direction perpendicular to the front face of the building blocks 10 up to a distance from the front face of the building blocks, where the hook-shaped portion is located. The hook-shaped portion preferably comprises a downward directed hole or opening.

Claims

1. A construction system for setting up constructions with the appearance of gabions, comprising a plurality of stackable building blocks (10) for setting up a supporting wall and means (20, 30) for setting up gabions on at least one side of the supporting wall, wherein the stackable building blocks have a top and bottom face (11, 12) that are collectively provided with protrusions (13) and recesses (14) that fit inside each other, arranged for positioning the building blocks on top of each other, **characterized in that** grooves (15) are provided in the top face of the building blocks, each extending inwardly from a front face (16) of the building block and terminating in a hook-shaped portion (17), **in that** the means for setting up the gabions comprise at least one continuous wire mesh (20) and anchoring elements (30) for anchoring the wire mesh to the supporting wall, so that between the wire mesh and the supporting wall a gap (25) is formed that can be filled with loose rocks,

- wherein the anchoring elements (30) have at one end a gripping element (31), arranged for holding one of the wire meshes, and at another end a hook element (32), arranged to hook into the hook-shaped portion (17) of one of the grooves (15) in the top face (11) of one of the building blocks (10). 5
2. The construction system according to claim 1, **characterized in that** the protrusions are provided at the top face and the recesses at the bottom face of the building blocks. 10
 3. The construction system according to claim 1 or 2, **characterized in that** the protrusions are frustoconical. 15
 4. The construction system according to any of the previous claims, **characterized in that** the protrusions and the recesses are provided such that the building blocks fit on top of each other in different positions. 20
 5. The construction system according to any of the previous claims, **characterized in that** the plurality of building blocks comprises a first set of building blocks, having a double row of protrusions and recesses, and a second set of building blocks, of which the depth is substantially half of that of the building blocks of the first set and having a single row of protrusions and recesses. 25
 6. The construction system according to any of the previous claims, **characterized in that** the grooves extend in a direction perpendicular to the front face of the building blocks up to a distance from the front face of the building blocks, where the hook-shaped portion is located. 30
 7. The construction system according to any of the previous claims, **characterized in that** the hook-shaped portion of the grooves comprises a downward directed hole or opening. 35
 8. The construction system according to any of the previous claims, **characterized in that** additional grooves (18) are provided in the top face of the building blocks, each extending inwardly from a back face (19) of the building block, and also arranged for receiving the anchoring elements. 40
 9. The construction system according to any of the previous claims, **characterized in that** the transverse faces of the building blocks are shaped in such a way at the top that when placing two building blocks against each other with the transverse faces facing each other, a groove is formed at the boundary between the two building blocks, in which one of the anchoring elements can be received. 45
 10. A method for setting up a construction with the appearance of gabions, comprising the following steps:
 - providing a plurality of stackable building blocks (10), wherein the stackable building blocks have a top and bottom face (11, 12) that are collectively provided with protrusions (13) and recesses (14) that fit inside each other, arranged for positioning the building blocks on top of each other;
 - setting up a supporting wall by positioning the building blocks on top of each other, so that each of the protrusions and recesses of building blocks placed on top of each other fit inside each other; and
 - installing means (20, 30) for setting up gabions at at least one side of the supporting wall; **characterized in that** grooves (15) are provided in the top face of the building blocks, each extending inwardly from a front face (16) of the building block and terminating in a hook-shaped portion (17);
 - and **in that** installing the means for setting up gabions comprises the following steps:
 - providing at least one continuous wire mesh (20);
 - providing anchoring elements (30) for anchoring the wire mesh to the supporting wall, so that between the wire mesh and the supporting wall a gap (25) is formed that can be filled with loose rocks, wherein the anchoring elements (30) have at one end with a gripping element (31), arranged for holding one of the wire meshes, and at another end a hook element (32), arranged to hook into the hook-shaped portion (17) of one of the grooves (15) in the top face (11) of one of the building blocks (10);
 - installing the anchoring elements (30) in at least some of the grooves (15) in the top face of the building blocks, wherein each hook element (32) is hooked into the hook-shaped portion (17) of the groove before the building blocks above it are put into place;
 - installing the at least one continuous wire mesh (20) to the grip elements (31) of the anchoring elements; and
 - filling the gap between the at least one continuous wire mesh and the supporting wall with loose rocks.
 11. The method according to claim 10, **characterized in that** the protrusions and recesses are arranged so that the building blocks fit on top of each other in different positions; and that the supporting wall is set up with the building blocks in an offset bond with respect to each other, preferably in stretching bond. 55

12. The method according to claim 10 or 11, **characterized in that** the plurality of building blocks comprises a first set of building blocks and a second set of building blocks, wherein the building blocks of the first set have a double row of protrusions and recesses, and wherein the building blocks of the second set have a depth which is substantially half of that of the building blocks of the first set and have a single row of protrusions and recesses; and **in that** the supporting wall is built with building blocks from the first set up to a predetermined height, and with building blocks from the second set above that.
13. The method according to any of claims 10-12, **characterized in that** additional grooves (18) are provided in the top face of the building blocks, each extending inwardly from a back face (19) of the building block, and also arranged for receiving the anchoring elements (30).
14. The method according to claim 13, **characterized in that** the method comprises the following additional steps:
- installing the anchoring elements (30) in at least some of the additional grooves (18) in the top face of the building blocks, wherein each hook element (32) is hooked into the hook-shaped portion (17) of the groove before the building blocks above it are put into place;
- installing at least one additional wire mesh (20) to the gripping elements (31) of the anchoring elements at the back of the supporting wall; and filling the gap behind the supporting wall, between the at least one continuous wire mesh and the supporting wall, with loose rocks.
15. The method according to any of claims 10-14, **characterized in that** some of the grooves (15) and, if present, the additional grooves (18) are left open.
16. The method according to any of claims 10-15, **characterized in that** the transverse faces of the building blocks are shaped in such a way at the top that when placing two building blocks against each other with their transverse faces facing each other, a groove is formed at the boundary between the two building blocks, in which one of the anchoring elements can be received; and **in that** in each case, one of the anchoring elements is installed in said groove.

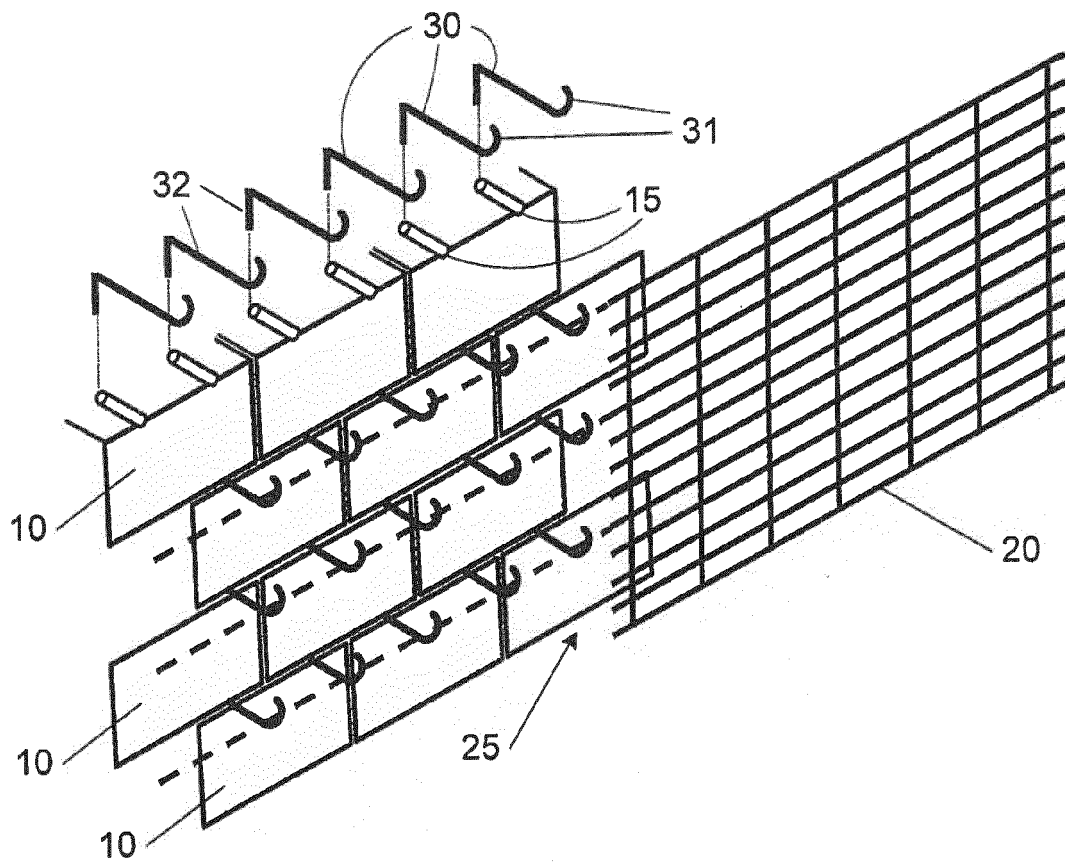


Fig. 1

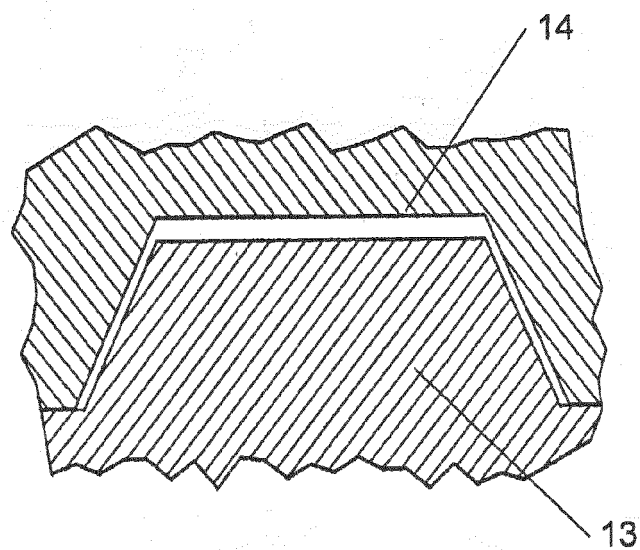


Fig. 2

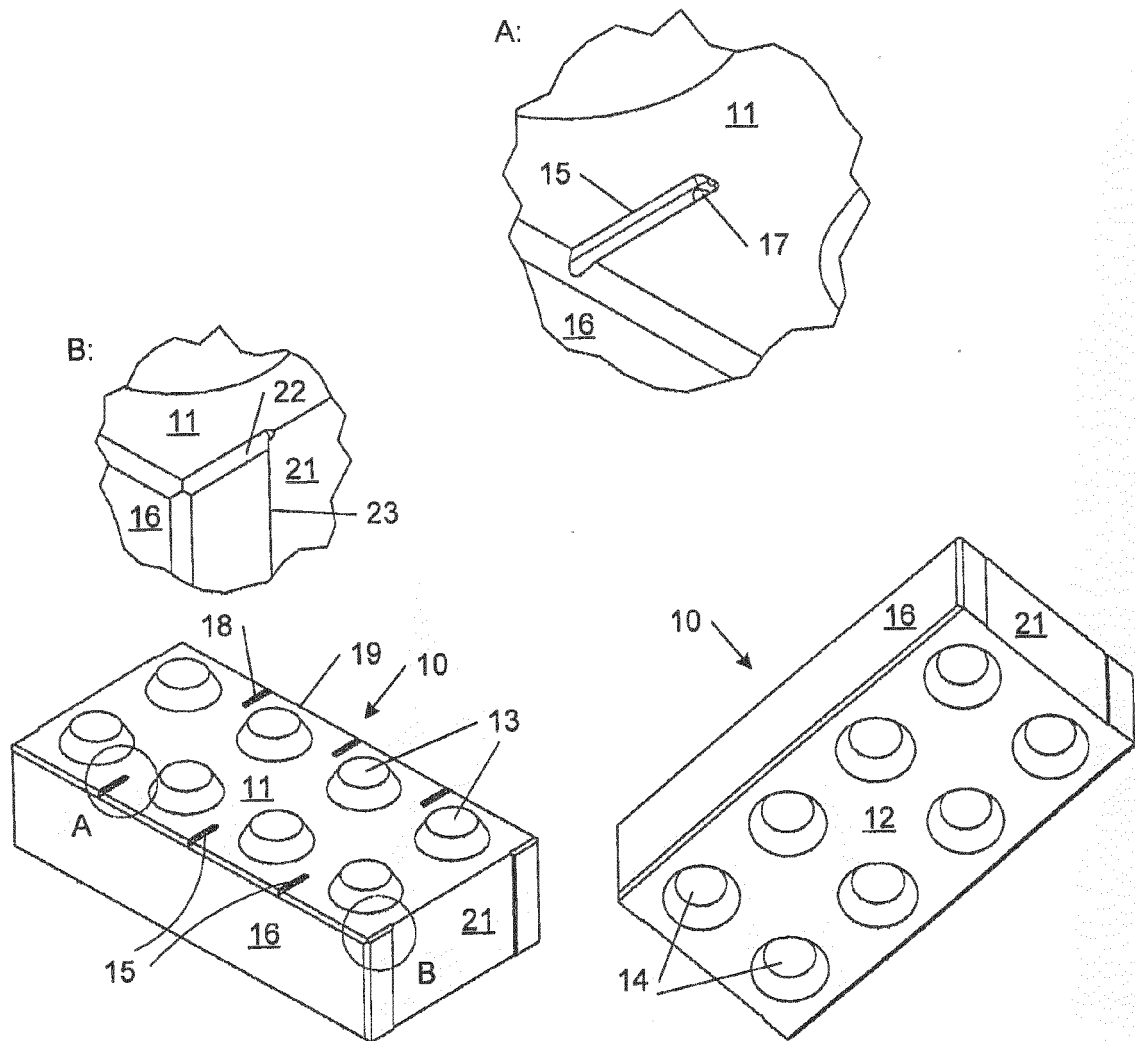


Fig. 3

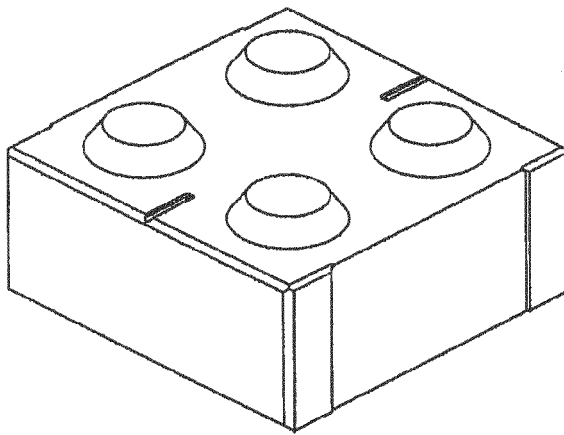


Fig. 4

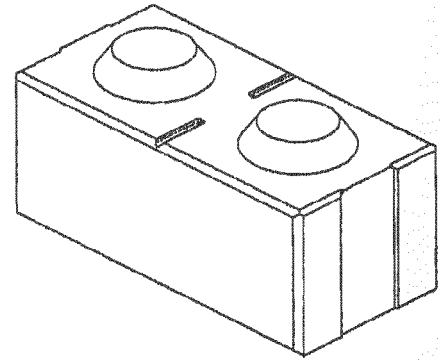


Fig. 5

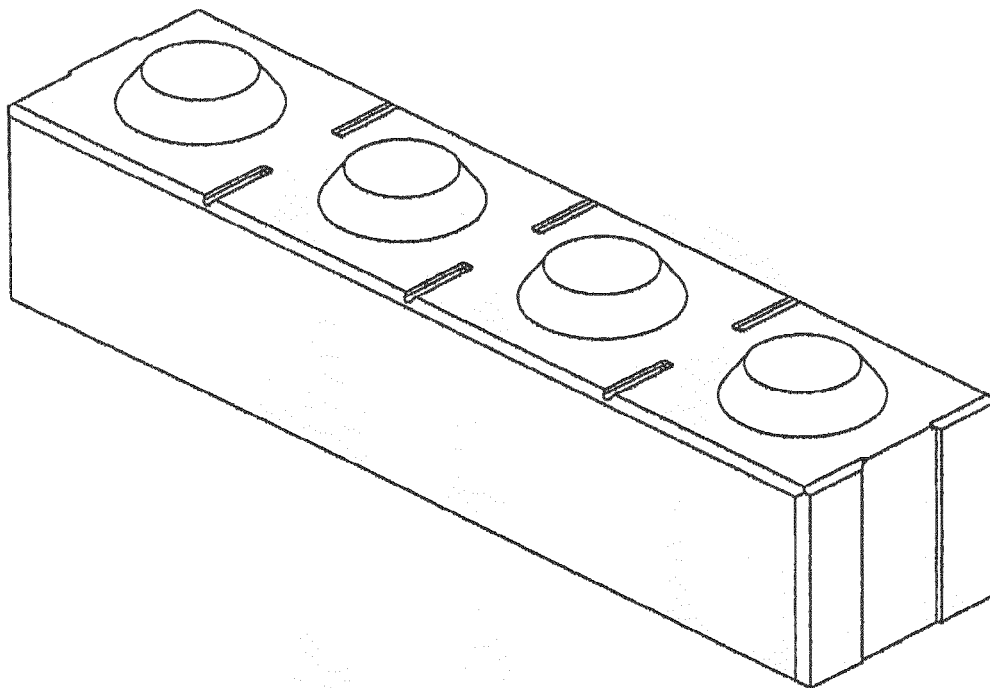


Fig. 6



EUROPEAN SEARCH REPORT

Application Number
EP 15 19 0006

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	FR 2 897 375 A1 (GIRARD SOPREVA SOC PAR ACTIONS [FR]) 17 August 2007 (2007-08-17) * the whole document *	1-16	INV. E02D29/02
Y	FR 2 986 252 A1 (CHAPSOL [FR]) 2 August 2013 (2013-08-02) * the whole document *	1-16	
			TECHNICAL FIELDS SEARCHED (IPC)
			E02D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 1 February 2016	Examiner Geiger, Harald
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 15 19 0006

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2897375	A1	17-08-2007	NONE

FR 2986252	A1	02-08-2013	NONE

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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

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