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

(11) **EP 2 816 166 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
24.12.2014 Bulletin 2014/52

(21) Application number: **11878219.2**

(22) Date of filing: **20.12.2011**

(51) Int Cl.:
E04B 2/86 *(2006.01)* ***E04B 1/16*** *(2006.01)*
E04G 17/075 *(2006.01)* ***E04G 11/00*** *(2006.01)*
E04B 1/35 *(2006.01)*

(86) International application number:
PCT/ES2011/070888

(87) International publication number:
WO 2013/093128 (27.06.2013 Gazette 2013/26)

(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

(71) Applicant: **Elesdopa, S.L.**
18010 Granada (ES)

(72) Inventor: **JIMÉNEZ HORWITZ, Margarita**
E-08010 Granada (ES)

(74) Representative: **Urizar Anasagasti, José Antonio**
PTW International Inc.
Doctor Ulecia 8, local
28224 Pozuelo de Alarcón, Madrid (ES)

(54) **MODULE FOR BUILDING FAÇADES AND METHOD OF USE IN CONSTRUCTION**

(57) Module for building façades for any building or civil-engineering project with planar or curved surfaces of two or more walls of reinforced mortar or concrete, which comprises walls; connectors constructed *in situ*, or prefabricated with drills; connector and wall reinforcements; leaf supports with hollow cylinders or prisms, and a solid support with drills. Use of the building module involves placing the double-leaf or solid support; placing reinforcements for each wall alongside each face of the support; inserting the connector reinforcements into the hollow cylinders or prisms, or into drills; folding and overlapping the reinforcement pins; forming connectors and walls, casting concrete or mortar and packing hollow cylinders and prisms, or drills, and on both faces of said supports. Alternative methods involve the use of prefabricated connectors; application in cases without access to one face, against an embankment, and in façade reinforcements.

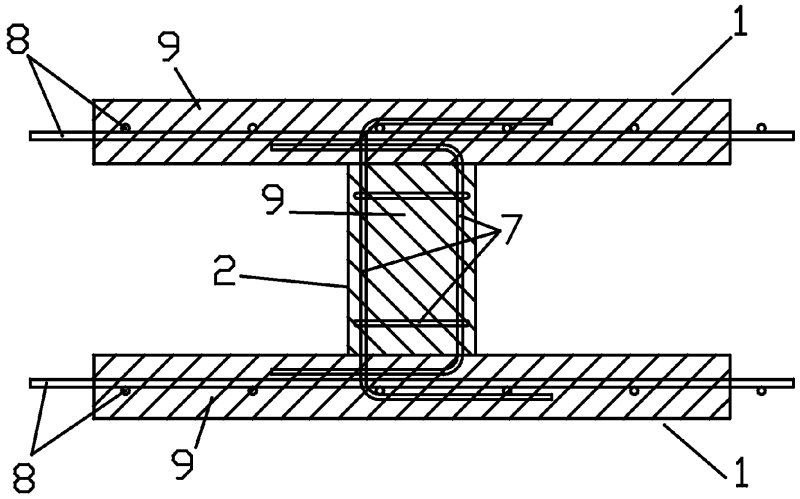

FIGURE 1

EP 2 816 166 A1

(Cont. next page)

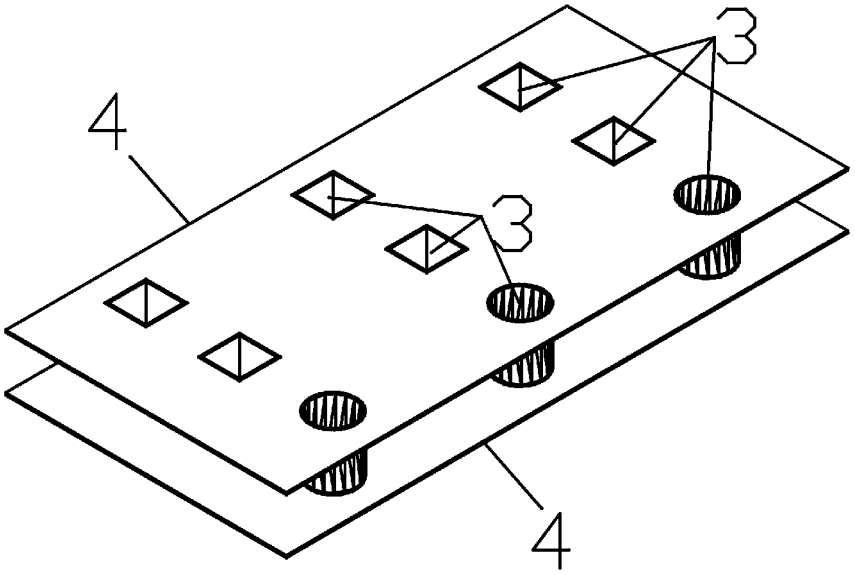

FIGURE 3

Description

OBJECT OF THE INVENTION

[0001] A general object of the invention is the design of a module to generate surfaces in a given construction capable of application in different areas of the construction sector, in edifices and in engineer works.

[0002] A second general object of the invention is a method using the module to generate surfaces in:

- General surfaces' construction procedure in which both faces of same can be accessed by operators and machinery
- Construction without access to one of the surface faces, as a surface attached to an excavation embankment or attached to a party wall or to a surface with one face towards void.
- Reinforcement of an existing vertical, horizontal, slanted surface or with curvature.
- Construction in situ of bearing walls, separation walls, pillars, floors, slabs, consoles, roofs, vaults, domes; construction of all types of previously mentioned surfaces in engineer works, and furthermore abutments, stacks and bridge boards, frames and vaults for highway and railway under-passes, walls and frames to channel rivers and ravines, liquid containment deposits, walls and crates for port docks, water reservoir dams.
- Construction of foundation slabs and contention walls and previously mentioned structures in the engineer work, as well as buried or semi-buried water containment deposits, gallery and tunnel revetments, and bridge abutments.
- Construction of prefabricated parts in shop to be assembled in situ as well as engineer works and edifices.

[0003] A particular object of the invention is the design of a module to generate surfaces that can be used in different areas of the construction sector, based on polymeric material solid mountings and in alternative materials to polymeric ones such as concrete blocs, ceramic elements' parts, and granular material.

[0004] A second particular object of the invention is the design of a module to generate surfaces that can be used in different areas of the construction sector based on polymeric material sheet mountings or an alternative to polymeric materials such as wooden boards, laminated wood, and wooden agglomerates, metallic ones; said sheets separated by prisms or hollow cylinders of polymeric materials; of wood, laminated wood, wooden agglomerates, metallic or carton.

[0005] A third particular object of the invention is the design of complementary parts of the module to generate surfaces such as connectors, wall armatures and connector armatures, based on concrete or cement mortar and steel respectively, and in alternative materials to steel as polymeric materials, other metals, glass and carbon fibers.

FIELD OF THE INVENTION

[0006] The invention is related to the design of an innovative module to generate surfaces and their parts, that can be used in diverse areas of the construction sector, both in edifices and engineer works, including not only the use of concrete poured into the mold, but also shooting concrete on laminar or solid support shot on mountings and using alternative materials to concrete or cement mortar in some of its parts. Additionally it aims to develop a method to apply said module in the generation of surfaces in the field of building construction and engineer works in different conventional structures.

BACKGROUND OF THE INVENTION

[0007] Use of concrete with steel bars goes back to the end of the XIX century to obtain a composite material having the characteristics of concrete as to its resistance to compression and those of steel, most of all regarding its tensile strength.

[0008] The structural concrete elements are fabricated preparing an enclosure by means of a mold known as formwork with the shape of the desired structural element. Steel armatures are placed in the inside of said mold in the areas and direction supporting traction when said element is overloaded, filling afterwards the enclosure with poured concrete and consolidating it by means of bar chopping or vibration. Once concrete sets in and hardens the mold is removed in the procedure known as stripping.

[0009] The different structural elements can also be prefabricated in shop so that once the concrete hardens they can be transported to the construction site. These prefabricated parts might be lightened boring holes inside them as is the case of hollow slabs. Before pouring of concrete previous tension can be applied to armatures as is the case of pre-stressed concrete parts, or said structural elements may have hollow ducts so that once they are placed in the construction site, cables or steel tendons can be introduced through them to tense them afterwards; an operation known as post-tensing.

[0010] However the need of well designed constructive elements built in situ or prefabricated in shop, thus simplifying work in diverse applications in the field of construction and also saving materials and labor with a resulting relevant economic effect, is increasingly evident.

[0011] Patent GB 2023215 of June 15, 1979 to Luddington Enterprises Ltd. discloses a constructive two-walled reinforced concrete element, built by projecting bars overlapping with the armature grills of the walls on a two-sheet support, separated by steel bars either horizontal or in a lattice pattern. However, the connection between the two walls is limited by its relatively weak mechanical resistance; it can only be used in surfaces

submitted to low stress as in buildings' closures or small bearing walls.

[0012] Document US 3982368 of December 18, 1974 to American Volkscastel International claims a two-walled shot concrete constructive element wherein the cavity between walls is achieved with a wavy carton support sheet. The claimed element has two connectors between walls made up of steel bars overlapping in the armatures of walls. There is another alternative wherein walls are braced by means of concrete partitions provided at a certain distance. The alternative in which bracing between walls is achieved by means of concrete partitions is the one presenting more rigidity, mostly in the direction of partitions while it is scarcely rigid if perpendicularly. The US 3982368 invention is designed for prefabricated panels that are assembled in the metallic frames through bolts to the forging borders. It is designed to build only flat surfaces submitted to low stress as in buildings' closures.

[0013] Document DE 19520082 of June 1, 19955 to Bitttscheidt, Norbert, Datteln, discloses a double-walled prefabricated concrete double-walled lost formwork to build vertical packed concrete walls *a posteriori.* Formwork is not recuperated as in traditional procedures. The proposed system aims to build solid concrete walls instead of hollow ones. It is useful only in vertical surfaces, needing a significant amount of concrete.

[0014] Thus the need of an innovative solution having adequate rigidity in all directions, able to be used in the construction of any surface, even those requiring high resistance requirements as to stress. It should equally be versatile enough so it can be used in the construction of prefabricated panels as Perriin's, but also to build in situ any surface or edifice; building any surface even with curvature as in vaults, domes or any warped surface, allowing for variable separation between walls allowing adaptation in each spot according to required stress level of said spot.

DESCRIPTION OF THE INVENTION

Features of the present surface generating module

[0015] The surface generating module of the invention used in a given construction has some features previously mentioned providing at the same time state of the art inventive, novel features. By means of repetition, the surface generating module of the invention generates the full structure.

[0016] In the first place, contrary to normally used art in structure design wherein said structures are made up of linear elements, the ones built according to the invention are made up of elements of a mainly superficial character. Superficial dimensions of surfaces built using the surface generating module of the invention are clearly superior as to their thickness.

[0017] At the same time the concept of formwork to configure an enclosure in which concrete is poured disappears, using in this case a mounting to shoot concrete or mortar on both faces of same. The mounting is not necessarily removed but left inlayed in the surface. Thus it results in a very light element for surface building wherein concrete or mortar is placed only in areas of compression stress originated by structure loading and to cover steel bars supporting tensile stresses.

[0018] The surface generating module of the invention enables construction of all types of structural elements and shapes, either superficial ones as slabs, floor slabs, floors, brackets, vaults, water deposits, contention reinforced walls, bearing walls, closures, partitions, bridge boards, as well as linear structural elements as pillars, bridge piers, beams, girders; also volumetric structural forms as gravity dams o vault dams for water reservoirs.

[0019] The present surface generation module comprises at least two concrete or mortar walls, although they can also be made of reinforced cement mortar, coupled by connectors at a certain distance, which are generally of the same material, or of polymeric material; metallic, wooden; carbon fibers reinforced resin, glass fibers reinforced resin; or any other type of material with sufficient mechanical strength according to requirements of the constructive object to be built.

[0020] As main innovative feature of the surfaces' generating module of the invention is the fact that it increases the inertia momentum of a surface regarding its medium plane, separating walls inwardly without increasing construction material requirements, as is the case of formwork concrete elements, wherein to increase momentum of inertia, thickness of surface has to be increased generating more material consumption, labor and time. Thus, the present element provides very resistant structures with a much lower use of resources. Structures built applying this invention are much more resistant to seismic movement strains. All of this results in an important saving of resources, rendering a significant applicability and an important economic effect.

Building procedure

[0021] The following method can be applied to build a surface for any construction using the present surface generating module when using a solid mounting.

a) Preparation of support as to dimensions and location of surface to be built. The support should be made up of light material, easily moldable, cut and drilled.

b) Drills are bored in said support with the dimensions and shapes of connectors used to join the walls. Drill section coincides with that of the future connector and its depth with connector's length.

c) Armatures are introduced through drills of future connectors. Armatures carry pins to overlap with wall armatures.

d) Armatures are attached and fixed to each face of support of each future wall.

e) Pins of connectors' armatures are folded and overlapped or welded with armatures of walls.

f) Once all armatures are placed and overlapped on the support and said support is correctly placed according to the shape of the surface, concrete or mortar is shot beginning by filling drills and thus forming connectors, then

g) Concrete or mortar is shot against one of the support faces covering armature and providing required thickness, thus forming one of the walls.

h) Concrete or mortar is shot on the other face of the support covering the corresponding armature, forming the second wall.

[0022] If the surface generating module is three-walled, operations previously described are repeated except folding of connector armature's pins in the face wherein third wall is to be built. Next a second support is attached to the wall already built with drills facing salient pins of connectors so that pins, once the second support is placed, protrude through its drills. Next armatures of second wall are placed. Protruding armatures of connectors are folded and overlapped with those of the third wall and concrete or mortar is shot beginning by filling drills of second support, and next on seen face of second support, covering armatures and thus forming the third wall. If said generating module of the invention has more walls the operation is repeated until completion of all walls.

[0023] Alternatively, connectors can be prefabricated in shop instead of in situ as previously described. In this case, these are cylinders or prisms of reinforced concrete or mortar with two or four parallel drills close to both bases of said elements. Once in the construction site they are introduced in the support drills. Wall armatures are placed at both faces of support and tied bars overlapping armatures of future walls are introduced through connectors' drills. Tied bars introduced in connectors should be impregnated with resin so that they adhere to said concrete or mortar of connector's drill along contact surface. Once all prefabricated connectors and armatures of both walls have been placed, concrete or mortar is shot on one face of the support, thus forming the first wall and afterwards concrete or mortar is shot on the other face of the support thus forming the second wall.

[0024] Instead of solid as previously described, support can also be made up of two sheets of selected material, separated at a certain distance and hollow inside. Both sheets have facing drills and cylinders or hollow prisms going from a sheet drill to the opposite one. Once double-sheet support is made with specified dimensions of the surface to be built, armatures of future connectors are introduced through the cylinders or hollow prisms. Future walls' armatures are placed in each external face of the support , folding armature pins of connectors, overlapping them with armatures of both walls, casting concrete or mortar beginning by filling cylinders or prisms and next casting concrete or mortar in turns on one face of the support and then on the other.

[0025] In the void between walls diverse conduits as water pipes or electrical tubing can be installed. Also if this space is vertical the surface can be filled with soil and used to plant flowers. If horizontal, the void between walls might be filled with gravel to increase load which could be appropriate in floor slabs or other types of structural elements. Separation between walls of the present generating module of the invention may be variable. Said walls can present any curvature. Before hardening of concrete or mortar begins, if necessary, it can be trimmed, trowelled or given corresponding superficial finish to each wall.

[0026] It is also possible to make up a surface according to the invention when there is no access to one of the surfaces to be built, by preparing a first support without drill with the shape of the future surface; this first support can even be the embankment of an excavation and if so, a first wall armature and connectors' armatures are placed in this support. Next concrete or mortar is shot thus forming the first wall; afterwards a second support is attached to this first wall, being said support solid or of double-sheet. Drills of this second support are arranged so that when attaching same to the already built wall, connectors' armatures are introduced through the drills protruding from them. Next armatures of second wall are placed, folding and overlapping pins of connectors' armatures of second wall casting concrete or mortar, filling drills and covering armatures of second wall, thus finishing same.

[0027] When the generating module of the second wall of concrete or mortar of the invention is to be used as reinforcement of an existing structure, instead of demolishing said wall and building a new one whether it is damaged or deteriorated, or a change of use is desired to increase for example, its loading capacity; the reinforcement method is as follows:

a) First the structure is tubbed so that work can be carried out safely since the edification proper acts as support for casting of concrete or mortar.

b) According to reinforcement design, a series of drills are bored in all the surfaces to be reinforced.

c) Connectors' armatures are introduced through these drills

d) Next, armatures corresponding to each wall of designed armature are fixed in each face of surface to be reinforced.

e) Connectors' armature pins are folded in each face of the surface, overlapping them with corresponding armatures placed in each wall.

f) Concrete or mortar is shot beginning by filling drills thus forming connectors, next concrete or mortar is shot on one face of the surface, covering existing armature thus forming first wall

g) Next, concrete or mortar is shot on second wall of the surface thus finishing second wall.

[0028] Alternatively, connectors can be prefabricated

in situ for this reinforcement application. In this case, the work method is similar, but introduction of connectors' armatures and pins folding is substituted by introduction of prefabricated connectors and tied bars impregnated with adherent resin through drills having prefabricated connectors in both bases, overlapping these tied bars with armatures of respective wall. Finally concrete or mortar is shot on both faces.

[0029] Thus former construction is embedded in the double wall formed by said reinforcement.

Applications of the generating module of the invention.

[0030] Industrial application of the surface generating module for double or multiple concrete or mortar walls focuses mostly on building construction and in engineer works. All types of structural elements, surfaces and architectural forms used in constructions and engineer works can be built with same.

[0031] The surface generating module of the invention enables construction of: foundation slabs, basement walls, load walls, closure walls, separating walls of spaces, pillars, beams, girders, drop forgings, and all types of covers, brackets, vaults, domes, etc.

[0032] Besides the ones previously mentioned, applications of the surface generating module of the invention in engineer works include: construction of water storage deposits, soil containment walls, enclosures for maritime port barriers, abutments, stacks and aqueduct and viaduct bridge boards, gravity dams o vault dams as water reservoirs, revetment of tunnels and galleries and in general, forming of any structure or part of same.

[0033] With the present generating module of the invention any type of conventional elements can be built in the areas of in shop prefabricated reinforced concrete parts to be carried and placed in engineer works, including self carrying panels, floors, pillars and stacks, girders, slabs, etc.. These parts can have any required form or dimension.

[0034] The present element is quite useful as a reinforcement system of damaged structures whether in buildings or in different engineer works.

DESCRIPTION OF THE DRAWINGS

[0035]

Figure 1 presents the generating module of concrete or mortar double wall of the invention

Figure 2 presents a perspective of a fragment of the surface (support omitted) built using the generating module of the invention

Figure 3 presents the double-sheet support with nine prisms or hollow cylinders corresponding to the fragment of the surface illustrated in Figure 2.

Figure 4 presents an alternative type of support, a solid support with nine drills in the support corresponding to the fragment of the surface in Figure 2.

Figure 5 shows a schematic plant view of the fragment of the surface of Figure 2.

Figure 6 illustrates two details of sections represented in Figure 5 wherein a solid support is also represented.

Figure 7 illustrates details of Figure 6 in case of double-sheet support

Figure 8 illustrates a perspective of all armatures of the fragment of the surface of Figure 2, including armatures of both walls and those of the nine connectors.

Figure 9 represents a plant view of armatures of Figure 8.

Figure 10 illustrates three connectors of sections of Figure 5, with their armatures and both walls with their corresponding armatures.

Figure 11 represents bracing of the two walls by means of connectors prefabricated of concrete or reinforced mortar according to the invention.

Figure 12 illustrates the typical reinforcement method of an existing surface.

PREFERRED EMBODIMENTS

Generating module of the invention

Embodiment No.1. Components of the generating module.

[0036] Figure 1 presents the concrete or mortar two-walled surface generating module of the invention, illustrating orientation of the element capable of assuming any possible direction, illustrating as well walls 1 and connector 2 joining said walls 1, and armatures 7 of connector and corresponding armatures 8 of said walls 1; also indicating concrete or mortar 9 as the material used in this generating module. In vertical or slanted surfaces casting is used to fix in place concrete or mortar 9. In horizontal or less inclined surfaces fixing in place can also be accomplished by pouring.

[0037] Figure 2 provides additional information showing in perspective a facade fragment built with the generating module of the invention. The figure only illustrates concrete or mortar elements 9, omitting the support, either a double-sheet one 4 or solid (see Figures 3 and 4). The two walls 1 and three connectors 2 are visible, while remaining six connectors 2 are hidden by the upper wall.

Embodiment No. 2. Types of support s

[0038] Figure 3 presents the double-sheet support 4 corresponding to surface fragment shown in Figure 2, comprising two sheets 4, separated by nine prisms or hollow cylinders 3; illustrating as well the nine upper bases of prisms or hollow cylinders 3, inner part of the six hollow prisms 3 and three hollow cylinders is visible, sticking out outer part of three hollow cylinders 3.

[0039] Figure 4 presents another type of support corresponding to surface fragment represented in Figure 2, in this case a solid support 5, showing the nine drills 6 bored in solid support 5 wherein six of them are prism shaped while the remaining three are cylindrical.

Embodiment No. 3. Connectors

[0040] For a better understanding of the invention, Figure 5 presents a schematic plant view of surface fragment of Figure 2. It presents two sections, section AB not cutting any connector 2 and section CD cutting three connectors 2. Section AB rifling shows concrete or mortar 9 area cut by the section; only two walls 1 of the surface fragment were cut in this case. Rifling of section CD shows this section cuts concrete or mortar of the two walls 1 and three connectors 2.

[0041] Figure 6 shows more detailed information of the two-walled generating module of the invention, presenting two details of section AB and CD of Figure 5 when using a solid support 5. The first detail corresponding to section AB of Figure 5 illustrates how said section AB does not cut through concrete or mortar 9 of connector 2 but instead cuts completely through solid support 5 also affecting walls 1. The first detail corresponding to section CD shows how said section CD cuts concrete or mortar 9 of connector 2.

[0042] For the same detailed information of the double-walled generating module 1, Figure 7 illustrates two details of sections AB and CD of Figure 5 when using a double-sheet support 4 of the invention. First detail corresponds to section AB that does not cut connector 2, showing double-sheet 4. Second detail corresponds to section CD that cuts connector 2, showing double-sheet 4 and hollow prism 3.

Embodiment No. 4. Armatures

[0043] Figure 8 illustrates a perspective of all armatures of surface fragment of Figure 2, showing both armatures 8 of all walls and also armatures 7 of the nine connectors 2.

[0044] An additional view of armatures shows in Figure 9 a plant view of Figure 8 representing armatures 8 of the upper wall 1 and armatures 7 of the nine connectors 2.

[0045] Figure 10 represents the three connectors 2 of sections of Figure 5. Lower detail shows armatures 7 of connectors 2 and armatures 8 of walls 1. Upper drawing of this figure shows disposition of armatures 7 and 8 respectively providing a strong coupling between the two walls 1 by means of said connectors 2. The figure also shows concrete or mortar 9 materials of walls 1.

Embodiment No.5. Reinforced concrete or mortar prefabricated connectors

[0046] Coupling of walls 1 of generating module by means of reinforced concrete or mortar prefabricated connectors 10 is shown in Figure 11. Prefabricated connector 10, that might be cylindrical or prism shaped, is represented - in this case - in the light hand side detail of said figure, having close to each of its two bases at least two drills 14 parallel to them. Once the double-sheet 4 or solid support 5 has been placed, each prefabricated connector 10 is introduced through hollow cylinders or prisms 3 if said support is of double-sheet 4 or through drills 6 if it is solid 5. Next armatures 8 of the two walls 1 are fixed in place introducing tied bars 11 through drills 14 of both bases of the prefabricated connector 10, impregnating previously with resin 12 each bound bar 11 in the contact area between said bound bar 11 and corresponding drill 14 of prefabricated connector 10; said resin 12 guarantees adherence between tied bars 11 and prefabricated connector 10. Concrete or mortar 9 is then cast on both faces of the support, either two-walled 4 or solid 5, thus forming said generating module of the invention.

Embodiment No. 6. Reinforcement of existing surface

[0047] Method of reinforcement of existing surface 13 with the generating module of the invention is illustrated in Figure 12. Surface 13 can have a vertical, horizontal or slanted position, also with curvature. If necessary, it is first tubbed so that following operations are safe. Next drills 6a are bored in surface 13 according to reinforcement design, then armatures 7 of connectors 2 are introduced through said drills 6a. Armatures 8 of the two future walls 1 of reinforcement are attached to each face of surface 13. Next pins of armatures 7 of connectors 2 are folded overlapping them with armatures 8 of walls 1. Finally concrete or mortar 9 is cast beginning by filling drills 6a thus forming connectors 2, casting concrete or mortar 9 continues on one face of surface 13 and then on the other, thus finishing reinforcement by means of the generating module of the invention. Once concrete or mortar 9 is cured and sufficiently aged to provide necessary resistance tubbing is removed from the structure.

Generating module usage method

Embodiment No. 7. General method

[0048] General building method is as follows: placing support, either of double-sheet 4 or solid 5 with shape and dimensions of the whole surface of the construction to be built or part of it. Armatures 8 of each wall are attached to each face of the mounting, armatures of connectors 7 are introduced through prisms or hollow cylinders 3 of mounting if same is of double-sheet 4 or through drills 6 if solid; pins of longitudinal armatures of connectors are folded and overlapped to armatures 8 corresponding to each wall 1. Concrete or mortar 9 is shot packing prisms or hollow cylinders 3 if mounting is double-sheet 4 or drills 6 if it is solid 5, thus forming connectors 2. The casting of concrete or mortar 9 on one face

of the mounting and then on the other continues until achieving required thickness in each wall 1. If generating module of the invention to be used is three-walled 1 the same method is followed as previously explained except folding pins of armatures 7 of connectors 2 in the face of mounting 4 or 5 where third wall is to be formed. Once concrete or mortar 9 of second wall 1 is shot then second mounting is attached to same so that unfolded pins of connectors pass through hollow prisms or cylinders 3 of second mounting if this is of double-sheet 4 or through drills 6 if it is solid 5, placing then armatures 8 of third wall 1. Pins of connectors 2 are folded overlapping them with armatures 8 of third wall 1 filling prisms 9 or hollow cylinders 3 of second mounting with concrete or mortar if said mounting is double-sheet 4 or drills 6 of second mounting 5 if solid, then shooting concrete or mortar 9 on seen face of said second mounting 4 or 5, completing third wall 1. If generating module of surfaces has more walls the method is repeated until completion of all of them. Before concrete or mortar sets in, it can be trimmed or trowelled if certain smoothness is needed in the seen face of any wall 1.

Embodiment No. 8. Method without access to one of the surface faces

[0049] Construction method if there is no access to one of the faces of the surface is as follows: a common mounting, not of the invention, is placed with no drills, with shape and dimensions of the surface to be built. Armatures of first wall 8 and armatures of connectors 7 are placed casting concrete or mortar 9 forming first wall 1; a second mounting, of double-sheet 4 or solid 5 is attached with prisms or hollow cylinders 3 in the first case or with drills 6 in the second case so that longitudinal armatures 7 of connectors 2 pass through said hollow prisms or cylinders or drills; armatures of second wall are attached to this second mounting, folding and overlapping pins of longitudinal armatures of connectors 7 to armatures of second wall 8, filling with concrete or mortar 9 hollow prisms or cylinders 3 in the first case or drills 6 in the second case thus forming connectors 2, casting of concrete or mortar 9 continues on seen face of mounting thus forming second wall 1.

Embodiment No. 9. Construction method of surface attached to an excavation embankment or to an existing surface.

[0050] Construction method when a surface is attached to an excavation embankment or to an existing surface is as follows: Armatures of first wall 8 and armatures of connectors 7 are attached to excavation embankment or existing surface. Concrete or mortar is cast on embankment or on existing surface covering armatures of wall 8, thus completing first wall 1. A double-sheet 4 or solid 5 mounting is attached so that longitudinal armatures of connectors 7 pass through hollow prisms or cylinders 3 if the mounting is of double-sheet 4 or through drills 6 if it is solid 5, armatures of second wall 2 are placed, folding and overlapping longitudinal armatures of connectors 7 with those of second wall 8. Concrete or mortar 9 is shot filling hollow prisms or cylinders 3 or drills 6, depending on type of mounting used, thus forming connectors 2, shooting of concrete or mortar 9 continues on seen face of mounting thus completing second wall 1.

Embodiment No. 10. Method with prefabricated connectors

[0051] In this case the method to build a surface is as follows: Mounting of double-sheet 4 or solid 5 is placed with shape and dimensions of all or part of the edification surface to be built. Armatures of each wall 8 are attached to each face of mounting, introducing prefabricated connectors 10 through hollow prisms or cylinders 3 if the mounting is of double-sheet 4 or through drills 6 if solid 5; tied bars 11 impregnated with resin 12 in their central area are introduced through drills 14 having prefabricated connectors in both bases. If walls 1 needed a second armature grill 8 said second grills 8 are placed in each face of mounting. Concrete or mortar 9 is shot on both faces of mounting, of double-sheet 4 or solid 5 until completion of thickness required for each wall 1.

Embodiment No.11. Method to reinforce a surface

[0052] Method to reinforce an existing surface 13, either vertical, horizontal, slanted or with curvature is as follows: if necessary it is tubbed in the first place so that following operations are sufficiently safe. Drills 6a are bored in said surface 13 according to reinforcement design, armatures of connectors 7 are introduced through said drills 6a; armatures of the two walls 8 are attached to each face of surface 13, folding pins of armatures of connectors 7 overlapping them with those of walls 8. Concrete or mortar 9 is shot beginning by filling drills 6a thus forming connectors 2, casting concrete or mortar 9 continues on one face of said surface 13 and then on the other face thus finishing both walls 1. Once concrete or mortar 9 is cured and sufficiently aged to achieve necessary resistance tubbing of the structure is removed.

Embodiment No. 12. Alternative reinforcement method using prefabricated connectors

[0053] Method to reinforce an existing surface 13 vertical, horizontal or slanted and with curvature is as follows: if necessary it is tubbed in the first place so that following operations are sufficiently safe. Drills 6a are bored in said surface 13 according to reinforcement design; armatures of walls 8 are attached to each face of said surface 13 and prefabricated connectors 10 are introduced through said drills 6a; tied bars 11 impregnated with resin 12 in their central area are introduced through drills 14 having prefabricated connectors in both bases,

placing if the case, second armature grills 8 of walls 1. Concrete or mortar 9 is cast on both faces of surface to be reinforced 13 until completion of desired thickness of each wall 1. Once concrete or mortar 9 is cured and sufficiently aged to achieve necessary resistance tubbing of the structure is removed.

SUMMARY

[0054] Thus the present invention provides inventive, novel features as to state of the art. The invention develops the present generating module having rigidity in all directions enabling its use in the construction of any surface no matter the stress it may be subject to. The generating module of the invention is much more versatile than any preceding one as to state of the art since it can be used to make prefabricated panels as Perrin's but also can be directly used in construction works to build any of their parts. Surfaces might have curvatures as is the case of vaults, cupules or any other paddled surface, wherein separation between walls as well as their thickness can be variable allowing adaptation in any spot to required stress level of same. A low caloric conductivity material may be selected to construct the mounting, thus bestowing heat isolation features on the surface constructed according to the invention. Furthermore, structures built applying this invention are much more resistant to strains provoked by seismic movement than conventional ones.

Claims

1. Module to generate flat or curved surfaces, such as plates, foundation slabs, forged floors, roofs, vaults, domes, floor slabs, brackets, vaults, water deposits, contention reinforced walls, bearing walls, enclosures, partitions, bridge boards, as well as linear structural elements as pillars, bridge piers, beams, girders; also volumetric structural forms as gravity dams o vault dams for water reservoirs, comprising walls (1); connectors built in situ (2) or prefabricated connectors (10); armatures (7) of said connectors (2) and (10), and armatures (8) of said walls (1); mounting sheets (4) with hollow cylinders or prisms (3) and solid mounting (5); drills (6) of its solid mountings (5) and drills (14) of said prefabricated connector (10).

2. Module to generate surfaces to any kind of structural shapes according to claim 1 comprising at least two walls (1) coupled or inwardly braced through said connectors built in situ (2) or prefabricated connectors; said walls (1) and said connectors built in situ (2) or prefabricated (10) are made of reinforced concrete or reinforced cement mortar (9); wherein said concrete or mortar (9) is placed through shooting or pouring.

3. Module to generate surfaces to any kind of structural shapes according to claim 1 and 2, wherein the mounting (5) for the concrete or mortar shooting (9) is solid with drills (6) for the connectors fabricated in situ (2) or for the prefabricated connectors (10); and because said solid mounting (5) is made of polymeric material, concrete blocks, ceramic pieces, granular material or any other with enough tensile strength for said solid mounting (5) for the constructive element to be built.

4. Module to generate surfaces to any kind of structural shapes according to claim 1 and 2 , **characterized in that** the mounting for the mortar or concrete shooting (9) is comprised of two sheets (4) provided with facing hollows and the inner spaces between said two sheets (4) is void, said sheets (4) spaced by prisms or hollow cylinders (3) having the same width that the sheet hollows to place said connectors (2) built in situ or prefabricated (10); and **in that** said sheets (4) hollow prisms or cylinders (3) of the support are comprised of tables; boards; laminated boot and wooden or cardboard agglomerates; polymeric material reinforced or not with fiberglass, polymeric or carbon; metallic material; or another material with enough tensile strength for the laminated mounting (4) of the constructive element to be built.

5. Module to generate surfaces to any kind of structural shapes according to claim 1, characterized that in the armatures (8) in its wall (1) comprise a single or double steel bar grill; and the armatures (7) of the connectors (2) comprise steel bars, in a first longitudinal configuration and in a second transversal enclosure configuration and wherein said connectors (2), and said armatures (8) and said walls (1) are made of polymeric material, metallic; fiberglass, carbon fiber, vegetal fiber, or any material with enough tensile strength to build the constructive element.

6. Module to generate surfaces to any kind of structural shapes according to claim 1 and 5 **characterized in that** the armature pins (7) of longitudinal configuration of connectors (2) are inwardly or outwardly folded.

7. Module to generate surfaces to any kind of structural shapes according to claim 1 and 2 **characterized in that** it has two or more reinforced concrete or mortar walls tied by prefabricated connector that are made of polymeric material; metallic wood; carbon fiber, with reinforced resin by glass fiber; or any other kind of material with enough tensile strength for the constructive element to be built.

8. A method for using a module to generate surfaces for any kind of structural shapes according to claims 1 and 7 consisting of the following steps:

a) Place the double metallic sheet mounting (4) or solid (5) with the shape of the whole surface and dimensions to be built.
b) Attach each wall armature (8) to each face of said double sheet mounting (4) or solid (5).
c) Introduce the armatures (7) of the connectors (2) through the hollow prisms or cylinders (3) of said double sheet mounting (4), or through the drills (6) of said solid mounting (5).
d) Fold and overlap the longitudinal armature pins (7) of the connectors (2) to the corresponding armatures (8) of each wall (1).
e) Form connectors (2) shooting concrete or mortar (9) and reinforcing the hollow prisms or cylinders (3) of the double sheet mounting (4), or the drills (6) of the solid mounting (5);
f) Shoot concrete or mortar (9) on one face of said double sheet mounting (4), or solid (5), and subsequently on to the other face until reaching the required thickness in each face (1);
g) Trim or trowel before concrete or mortar (9) sets in if a certain smoothness is needed in the seen face of any wall (1)

9. A method for using a module to generate surfaces for any kind of structural shapes for three or more wall according to claims 1 to 8, **characterized in that** it is used the method of claim 8 except step (d) wherein the armature pins are not folded (7) of the connectors (2) of the face of said double laminated mounting (4) or solid (5), on which said third wall will be built (1); and upon the concrete or mortar shooting (9) over the second wall (1),a second double laminated mounting (4) or solid (5) is attached (1) to said second wall (1) so that not folded pins of said connectors (2) are introduced through the hollow prisms or cylinders (3) of the second double laminated mounting (4) or through the drills (6) of the second solid mounting (5) and subsequently the armatures are placed (8) of said third wall (1); afterwards the armature pins are folded (7) of said connectors (2) overlapping them with the armatures (8) of said third wall (1); thereafter proceeding to fill in with concrete or mortar (9) the hollow prisms or cylinders (3) of said second double sheet mounting (4) or the drills (6) of said second solid mounting (5) and subsequently shooting concrete or mortar (9) on the seen face of the second double laminating sheet mountings (4) or solid (5) completing said second wall (1); and wherein in case a certain smoothness is needed in the seen face of any wall (1) they can be trimmed or troweled before concrete or mortar sets in; and still **in that** said generating module has still more walls (1) if the method is repeated until all said walls are built.

10. A method for using a module to generate surfaces for any kind of structural shapes without any access to one of the surface sides according to claims 1 to 8 consisting of the following steps:

a) Place a first mounting without any drool or hollow with the shape and dimensions of the surface to build.
b) Place the armatures (8) of the first wall (1) and the armatures (7) of the connectors (2).
c) Shoot concrete or mortar (9) to build said first wall (1).
d) Attach a second double sheet mounting (4) or solid mounting (5) with the corresponding hollow prisms and cylinders (3) or respective drills (6), so that longitudinal armatures (7) of connectors (2) get through said hollow prisms and cylinders (3), or respective drills (6).
e) Attach said second double sheet mounting (4) or solid mounting (5) to the armatures (8) of the second wall (1).
f) Fold and overlap the longitudinal armature pins (7) of the connectors (2) to the armatures (8) of said second wall (1), and
g) Build the connectors (2) filling with concrete and mortar (9) through shooting or pouring said hollow prisms or cylinders (3), of said double sheet mounting (4) or drills (6) of said solid mounting (5) and
h) Shoot concrete or mortar (9) on the seen face of said mounting (5) or of double sheet (4), until completely build said second wall (1).

11. A method for using a module to generate surfaces for any kind of structural shapes in surfaces attached to an excavation embankment or existing surface according to claims 1 to 8 consisting of the following steps:

a) Attach to excavation embankment or existing surface the armatures (8) of first wall (1) and armatures (7) of connectors (2).
b) Shoot concrete or mortar (9) on the embankment or existing surface, covering said armatures (8) until said wall (1) is completely built.
connectors (2) pass through hollow prism o cylinders (3) of said double sheet mounting (4) o through the drills (6) of said solid mounting.
d) Place said armatures (8) of the second wall (1).
e) Fold an overlapping said longitudinal armatures (7) of connectors (2) with said armatures (8) of said second wall (1).
f) Shoot concrete or mortar (9) by filling said hollow prisms or cylinders (3) of said double sheet mounting (4), o said drills (6) of said solid mounting (5) until said connectors (2) are completely built.
g) Continue casting said concrete or cement (9) on seen face of said double sheet mounting (4)

or solid (5) finishing said second wall (1).

12. A method for using a module to generate surfaces for any kind of structural shapes by means of prefabricated connectors according to claims 1 to 8 consisting of the following steps:

a) Place said double sheet mounting (4) or solid (5) with shape and dimensions of surface to be built.
b) Attach to each face of said double sheet mounting (4) or solid (5) the armatures (8) of each wall (1).
c) Introduce prefabricated connectors (10) through hollow prisms or cylinders (3) of said double sheet mounting (4), or through the drills (6) of said solid mounting (5).
d) Introduce tying bars (11) impregnated with resin in their central area (12) through drills (14) which prefabricated connectors (10) have in each of said bases (1).
e) If necessary place a second armatures grill (8) of said walls (1).
f) Shoot concrete or mortar (9) on each face of said double sheet mounting (4) or solid (5) until completing specified thickness for each wall (1).

13. A method for using a module to generate surfaces for any kind of structural buildings and civil engineer works in order to reinforce existing vertical, horizontal, slanted surfaces or with curvature according to claims 1 to 8 consisting of the following steps:

a) Tubing so that the following operations are sufficiently safe.
b) Practice drills (6a) in surface to be reinforced according to reinforcement design.
c) Introduce through said drills (6a) of said surface (13) to reinforce armatures (7) of connectors (2)
d) Attach to each face of said surface (13) armatures (8) of two walls (1).
e) Fold and overlap said armature pins (7) of said connectors (2) to said armatures pins (8) of each walls (1).
f) Shoot mortar or concrete (9) firstly by filling said drills (6a) so that said connectors (2) of said surface (13) to reinforce are built;
g) Finishing both walls (1) by shooting concrete and mortar (9) on a face of said surface and then on the other face.
h) Remove tubing from the structure once concrete or mortar (9) is cured and sufficiently aged to provide necessary resistance.

14. A method for using a module to generate surfaces for any kind of structural shapes in order to reinforce with prefabricated connectors an existing vertical, horizontal, slanted surface or with curvature according to claims 1 to 8 and 13 consisting of the following steps:

a) Tubing so that the following operations are sufficiently safe.
b) Practice drills (6a) in surface to be reinforced according to reinforcement design.
c) Attach to each face of said surface (13) armatures (8) of two walls (1).
d) Introduce through said drills (6a) prefabricated connectors (2)
e) Introduce through drills (14) said prefabricated connectors (2) in both bases the tying bars (11) impregnated with resin (12) in their central area.
f) Place if necessary the second armatures grill (8) of wall (1).
g) Shoot mortar or concrete (9) on both faces of said surface (13) to be reinforced until reaching a required thickness of each wall (1).
h) Remove tubing from the structure once concrete or mortar (9) is cured and sufficiently aged to provide necessary resistance.

15. A method for using a module to generate surfaces according to claims 13 and 14 to reinforce any kind of structures such as buildings and also civil engineering works.

16. A method for using a module to generate surfaces for according to claims 8 to 10 and 12 to build bearing walls, retaining walls, enclosure walls, walls for separation of spaces, pillars, forged floors, plates, laminated sheets, coverings, roofs, brackets, vaults, domes, construction of any surfaces of civil engineering works previously mentioned, and furthermore, abutments, stacks and bridge boards, frames, and vaults for highway and railway under-passed, walls and frames to channel ravines and rivers, liquid containment deposits, walls and crates for port docks and water reservoir dams either of gravity or vault.

17. A method for using a module to generate surfaces for according to claims 8 to 12 to build foundation slabs and retaining walls; and regarding civil engineering works to build buried or semi-buried water containment deposits, gallery and tunnel galleries and bridge abutments.

18. A method for using a module to generate surfaces according to claims 8 to 12 to prefabricate in atelier and the assembly in building sites of freestanding panels, forged floors, covering roofs, pillars, beams, girders, drop forging, coverings, roofs, brackets, beams, vaults, domes, walls, frames, piping and canalizations of large diameter, complete modules of prefabricated dwellings, arch for sector assemblies,

bridge boards, arches for tunnel and gallery coatings.

Amended claims under Art. 19.1 PCT

1. Multipurpose module to generate surfaces of any type of structural shape of double or multiple walls (1) of reinforced mortar or concrete (9) inwardly braced through connectors (2 or 10), with armatures (7); provided said module of solid casting mounting (5) with drills (6) and prisms or hollow cylinders (3), sheets (4) **characterized by** comprising:

- Double grill armatures (8) inwardly separated in each wall (1);
- Connectors (2) of mortar or concrete (9) having longitudinal and transversal armatures (8) or enclosures built in situ
- Prefabricated connectors (10) of reinforced mortar or concrete (9) of rectangular or circular section, with drills close to each one of their bases (14) to introduce through them tied bars (11) to wall armatures (8)
- Hollow connectors (10) manufactured of tubular type metallic material with circumferential or rectangular section.
- Solid connectors (10) wooden or of polymeric material
- Solid casting mountings (5) with drills (6) to introduce prefabricated connectors (10) or armatures (7) of connectors in situ (2) and its further packing with mortar or concrete (9).
- Double metallic sheet casting mounting (4).

2. Multipurpose module to generate surfaces according to claim 1 **characterized in that** said armatures (7) of connectors (2) and said armatures (8) of walls are made of galvanized steel, high strength polymeric fibers' braided cords, vegetable fibers of string type braided cords or carbon fiber cords.

3. Multipurpose module to generate surfaces according to claim 1 **characterized in that** said prefabricated connectors (10) manufactured of polymeric material are made up of circular or rectangular section carbon fiber o glass fiber reinforced resin.

4. Multipurpose module to generate surfaces according to claim 1 **characterized in that** said solid mounting (5) consists of:

- Said drills (6) to introduce said armatures (7) of connectors (2); or
- Said prefabricated connectors (10)
- Said armatures (8) of each wall placed in both faces of solid mounting (5); and folded pins of said armatures (7) of said connectors (2) or tied bars (11) impregnated with resin(12) in their central area and introduced in prefabricated connectors (10).
- Mortar or concrete (9) shot to fill said drills (6) and casing of said armatures (8) of walls (1) and armature pins (7) or of said tied bars (11).

5. Multipurpose module to generate surfaces according to claim 1 **characterized in that** said mounting is of double metallic sheet (4) and consists of:

- Double metallic sheet casting mountings (4) constituting by themselves the wall armatures (1) of reinforced mortar
- Prisms or hollow cylinders (3) of same metal welded to both sheets (4) themselves constituting the connectors.
- Reinforced mortar or concrete (9) shot on both faces of the mounting totally covering each metallic sheet (4) on its outer face with appropriate thickness of said reinforced mortar or concrete (9).

6. A method using a multipurpose module to generate surfaces of any sort of structural shape of double or multiple reinforced mortar or concrete (9) walls inwardly braced through connectors in situ or prefabricated (2 to 10) with armatures (7) **characterized in that** it is carried out:

- by means of solid mountings (5) with drills (6);
- in structural configurations without access to one of the faces of surface;
- in surfaces attached to an excavation embankment or existing surface;
- by means of double metallic sheet mountings (4) with its prisms or metallic hollow cylinders (3) welded;
- in generation of surfaces with curvatures or single tubbed planes;
- in surfaces wherein armature of one of the walls provides shaping;
- surfaces built with prefabricated connectors;
- as armature of existing surfaces (13) vertical, horizontal, slanted or with curvature;
- to reinforce existing surfaces (13) by means of prefabricated connectors (10) of vertical, horizontal, slanted or with curvature types

7. Method using multipurpose module to generate surfaces of claim 6 by means of solid mountings (5) with drills (6) consisting of the following steps:

a) Place solid mounting (5) with drills (6) with the shape and dimensions of the whole surface to be built;
b) Attach armatures of each wall (8) to each face of said solid mounting (5);

c) Introduce armatures (7) of connectors (2) through drills (6) of said solid mounting (5)
d) Fold and overlap longitudinal armature pins (7) of connectors (2) to corresponding armatures (8) of each wall (1);
e) If necessary, place second armatures' grill (8) separated from said first armatures (8) from said first wall (1).
f) Form connectors (2) casting mortar or concrete (9) and packing drills (6) of solid mounting (5);
g) Shoot mortar or concrete (9) on one face of said solid mountings (5) and then on the other face until required thickness for each wall (1) is obtained
h) Trim or trowel before mortar or concrete sets in (9) if a certain smoothness is needed in the face of any seen wall (1)
i) If surface is to have three walls previous steps should be followed except d) in which longitudinal armature pins (7) of connectors are not folded. Once step g) is finished wherein the second wall (1) has been built, a second solid mounting (5) is placed such that pins of said armatures (7) of connectors pass through drills of second solid mounting (5). Next, armatures (8) of third wall are attached to seen face of second solid mounting (5) of third wall and steps d, e, f, g and h are repeated for third wall.

8. Method using multipurpose module to generate surfaces of claim 6 in structural forms without access to one of the faces of the facade consisting of the following steps:

a) Place a first mounting without drill or hole with the shape and dimensions of surface to be built.
b) Place armatures (8) of first wall (1) and armatures (7) of connectors (2)
c) If necessary, place second armatures' pin (8) separated from said first armatures (8) of said first wall (1)
d) Shoot concrete or mortar (9) to build said first wall (1)
e) Attach a second solid mounting (5) with drills (6) so that longitudinal armatures (7) of connectors (2) pass through drills (6).
f) Attach to said second solid mounting (7) armatures (8) of second wall (1)
g) Fold and overlap pins of longitudinal armatures (7) of connectors (2) to armatures (8) of said second wall (1)
h) If necessary, place second armatures' grill (8) separated from said first armatures (8) of said first wall (1)
i) Form connectors (2) filling with concrete or mortar (9) casting or pouring through drills (6) of said solid mounting (5), and
j) Shoot concrete or mortar (9) on seen face of said solid mounting (5) covering armatures (8) until said second wall (8) is totally formed.

9. Method using multipurpose module to generate surfaces of claim 6 attached to an excavation embankment or existing surface consisting of the following steps:

a) Attach to excavation embankment or existing surface armatures (8) of first wall (1) and armatures (7) of connectors (2).
b) If necessary, place second armatures' grill (8) separated from said first armatures (8) of said first wall (1).
c) Shoot concrete or mortar (9) on embankment or existing facade covering said armatures (8) till said wall (1) is completed.
d) Attach a solid mounting (5) so that longitudinal armatures (7) of connectors (2) pass through drills (6) of said solid mounting (5)
e) Place said armatures (8) of second wall (1).
f) Fold and overlap pins of said longitudinal armatures (7) of connectors (2) with said armatures (8) of said second wall (1).
g) If necessary, place a second armatures' grill (8) separated from said first armatures (8) of said first wall (1)
h) Shoot concrete or mortar (9) filling said drills (6) of said solid mounting (5) until said connectors (2) are totally built.
i) Continue casting said concrete or cement (9) on seen face of said solid mounting (5) finishing said second wall (1).

10. Method using multipurpose module to generate surfaces of claim 6 by means of double metallic sheet mounting (4) with its prisms or metallic hollow cylinders (3) welded to both sheets by its bases for every type of structural forms consisting of the following steps:

a) Place double metallic sheet mounting (4) with its prisms or metallic hollow cylinders (3) welded to said sheets (4) with shape and dimensions of the whole facade to be built;
b) Form connectors (2) casting concrete or mortar (9) and packing prisms or hollow cylinders (3); or alternatively leaving prisms or metallic hollow cylinders empty (3), the connectors made up of said prisms or metallic hollow cylinders (3).
c) Shoot concrete or mortar (9) on one face of said double metallic sheet mounting
d) Trim or trowel before concrete or mortar (9) sets in if a certain smoothness is needed in the seen face of any wall (1)

11. Method using multipurpose module to generate sur-

faces of claim 6 with curvature or easily tubbing planes consisting of the following steps:

a) Either flat or with curvature tubing is prepared with shape of surface to be built.
b) Armatures (8) of first wall and armatures (7) of connectors are placed on tubing surface heightened with respect to surface at a distance corresponding to concrete covering of armatures (8) by means of conventional dividers.
c) If necessary, place second armatures' grill (8) separated from said first armatures (8) of said first wall (1).
d) Next concrete or mortar (9) is shot or poured watching fresh mass passes under armatures (8) and (7), thus first wall (1) is formed.
e) Next solid mounting (5) of second wall (19) with its drills (6) is placed so that armatures (7) pass through said drills (6) of each connector with emerging pins of longitudinal bars (7)
f) Place armatures (8) of second wall, armatures' pins of connectors (7) are folded overlapping armatures (8) of second wall.
g) If necessary, second grill of armatures (8) is placed separated from said first armatures (8) of said first wall (1).
h) Concrete or mortar (9) is shot or poured filling first drills (6) of solid mounting and proceeding on all the surface of solid mounting (5) until said second wall (1) is finished.

12. Method using multipurpose module to generate surfaces of claim 6 wherein facade shape is determined by means of armatures of one of the walls consisting of the following steps:

a) Armatures' grill (8) of first wall (1) is formed with the shape of surface, either flat or with curvature, with armatures (7) of connectors anchored to said grill.
b) Second armatures' grill (8) is placed separated from said first armatures (8) of said first wall (1).
c) A sheet (4) is fixed on the face opposing that of connectors' armatures (7).
d) Concrete or mortar (9) is shot covering grill (8) and pins of armatures (7) of connectors thus first wall is formed (1).
e) A solid mounting (5) is fixed with its drills (6) so that armatures (7) of connectors pass through them and overlap mounting (5)
f) Armatures (8) of second wall are placed and armatures' pins (7) of connectors are folded overlapping them with those of second wall (1).
g) If necessary, place second armatures' grill (8) separated from said first armatures (8) of said first wall (1).
h) Concrete or mortar (9) is shot again filling first drills (6) and covering afterwards armatures (8) of said second wall (1).

13. Method using multipurpose module to generate surfaces of claim 6 carried out by means of prefabricated connectors consisting of the following steps:

a) Place a solid mounting (5) with said drills (6) with shape and dimensions of surface to be built.
b) Attach armatures (8) of each wall (1) to each face of said solid mounting (5).
c) Introduce prefabricated connectors (10) through drills (6) of said solid mounting (5).
d) Introduce tied bars (11) impregnated in their central area with resin (12) through drills (14) having prefabricated connectors (10) in both said bases.
e) If necessary, place both second armatures' grills (8) of said walls (1) in each face of solid mounting (5) and separated of the first ones.
f) Shoot concrete or mortar (9) on each face of said solid mounting (5) until completing specified thickness for each wall (1).

14. Method using multipurpose module to generate surfaces of claim 6 as reinforcement of existing surfaces (13) of vertical, horizontal, slanted types or with curvature **characterized by** comprising the following steps:

a) Tubing and fixing surface to be reinforced (13) so that following operations are sufficiently safe.
b) Practice drills (6a) in surface to be reinforced (13) according to reinforcement design.
c) Introduce through said drills (6a) of said surface to be reinforced (13) armatures (7) of connectors (2).
d) Attach to each face of said surface (13) armatures (7) of said connectors (2) overlapping them with armatures (8) of walls (1).
e) Fold pins of said armatures (7) of said connectors (2) overlapping them with armatures (8) of walls (1).
f) If necessary, place second armatures' grill (8) separated from said first armatures (8) of said first wall (1).
g) Shoot concrete or mortar (9) filling first said drills (6a) thus forming said connectors (2) of said surface to be reinforced (13) and
h) Finish both walls (1) casting concrete or mortar (9) on one face of said surface (13) and next on the other.
i) Remove tubing from structure once concrete or mortar (9) is cured and sufficiently aged to provide necessary resistance.

15. Method using multipurpose module to generate surfaces of claim 6 as reinforcement by means of pre-

fabricated connectors of existing surface (13) of vertical, horizontal, or slanted types or with curvature consisting of the following steps:

a) Tube and attach said surface to be reinforced (13) so that the following operations are sufficiently safe.
b) Practice drills (6a) in surface to be reinforced (13) according to reinforcement design.
c) Attach to each face of said surface (13) armatures (8) of the two walls (1).
d) Introduce through said drills (6a) prefabricated connectors (10).
e) Introduce tied bars (11) impregnated with resin (12) in their central area through drills (14) of said prefabricated connectors (10) located in both bases
f) If necessary, place second armatures' grill (8) separated from said first armatures (8) of said first wall (1).
g) Shoot concrete or mortar (9) on both faces of said surface to be reinforced (13) until completing needed thickness of each wall (1).
h) Remove tubing of structure once concrete or mortar (9) is cured and sufficiently aged to provide necessary resistance.

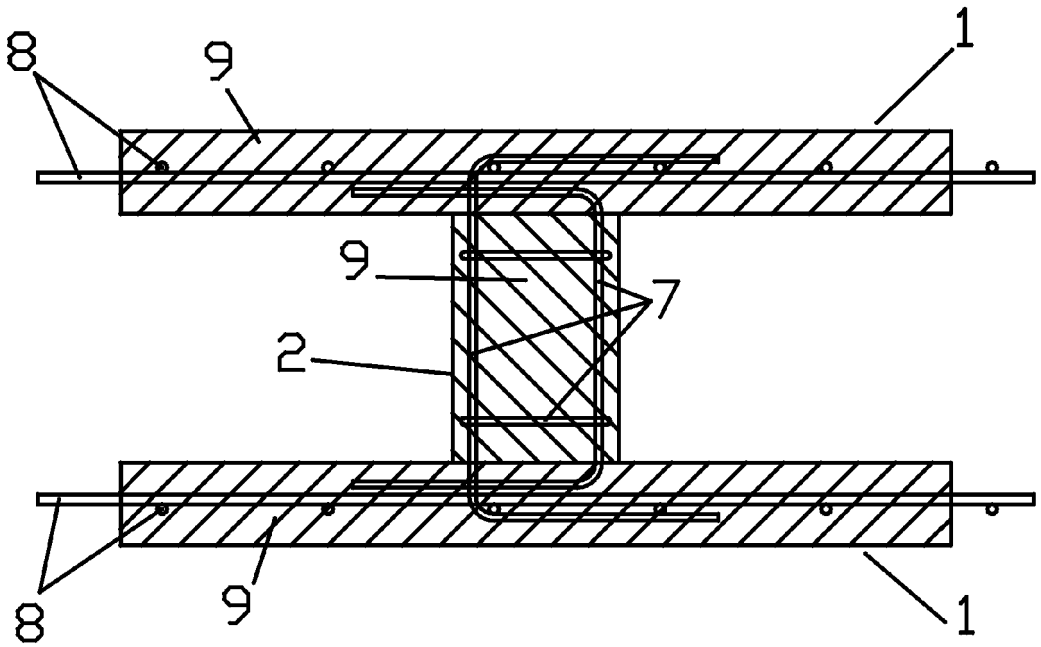

FIGURE 1

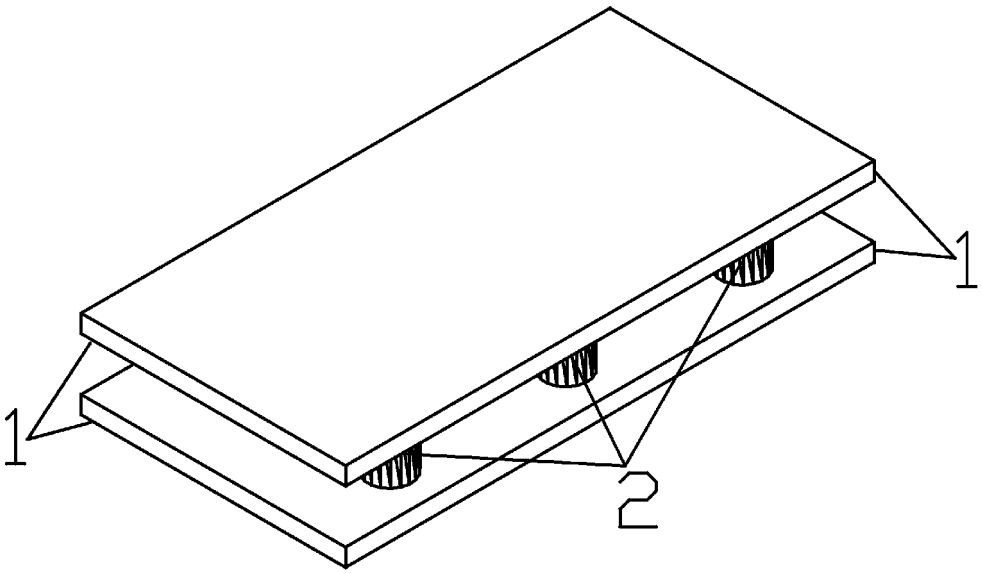

FIGURE 2

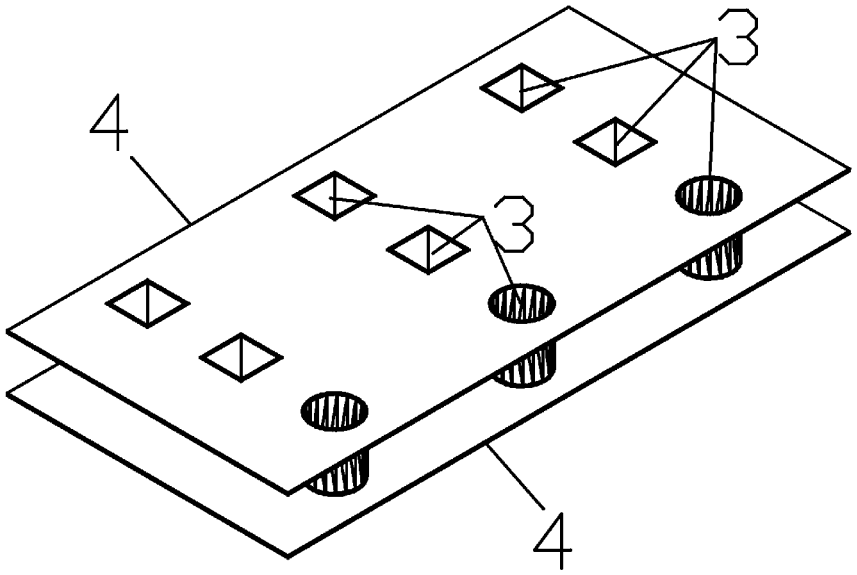

FIGURE 3

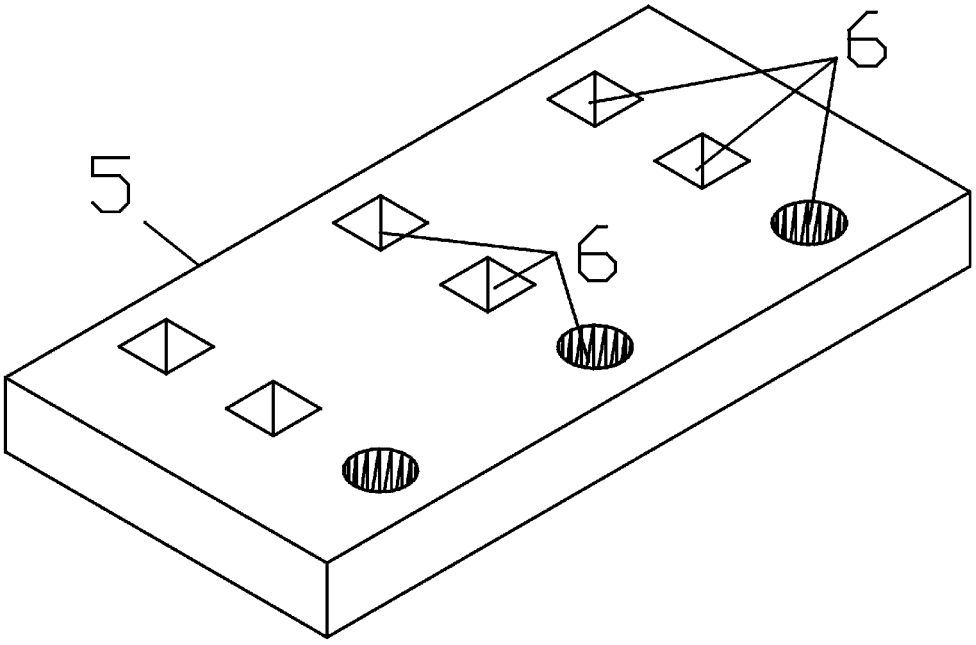

FIGURE 4

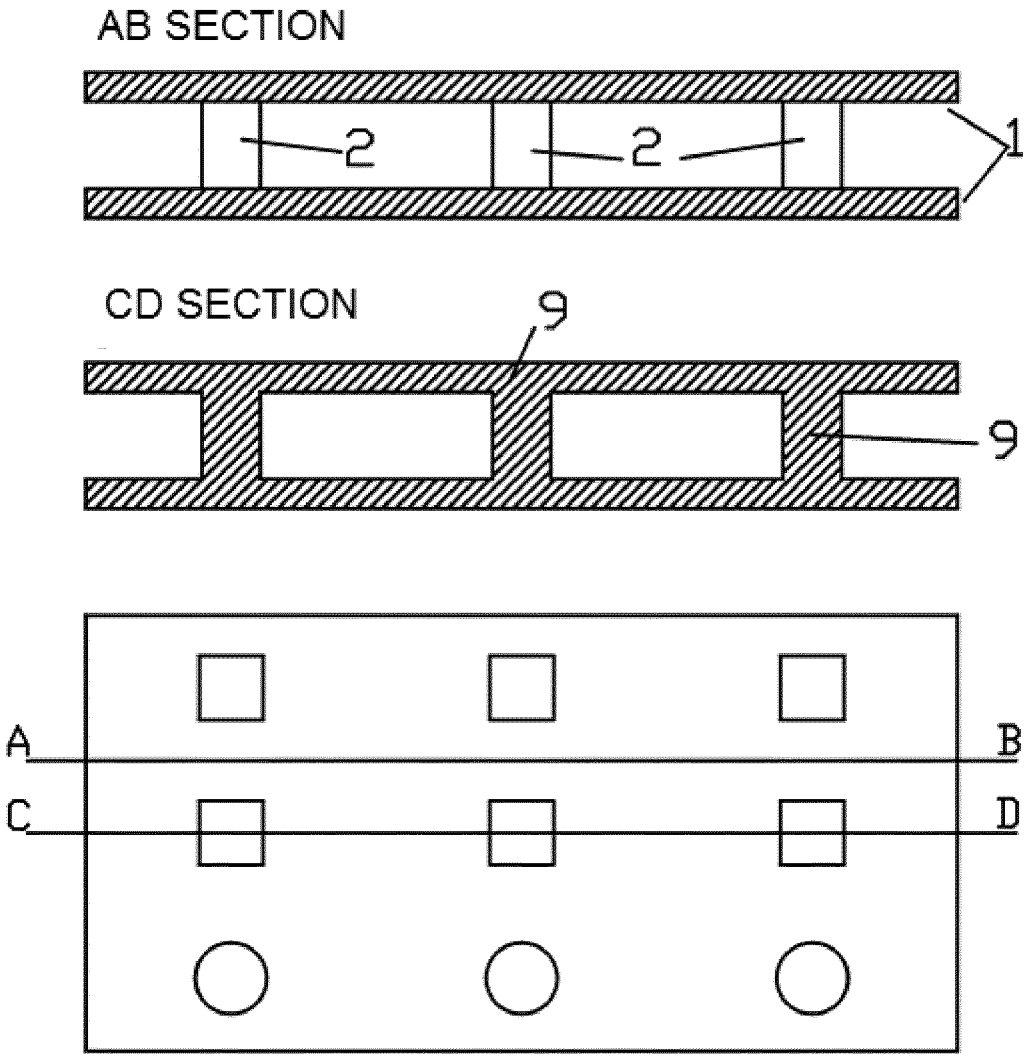

FIGURE 5

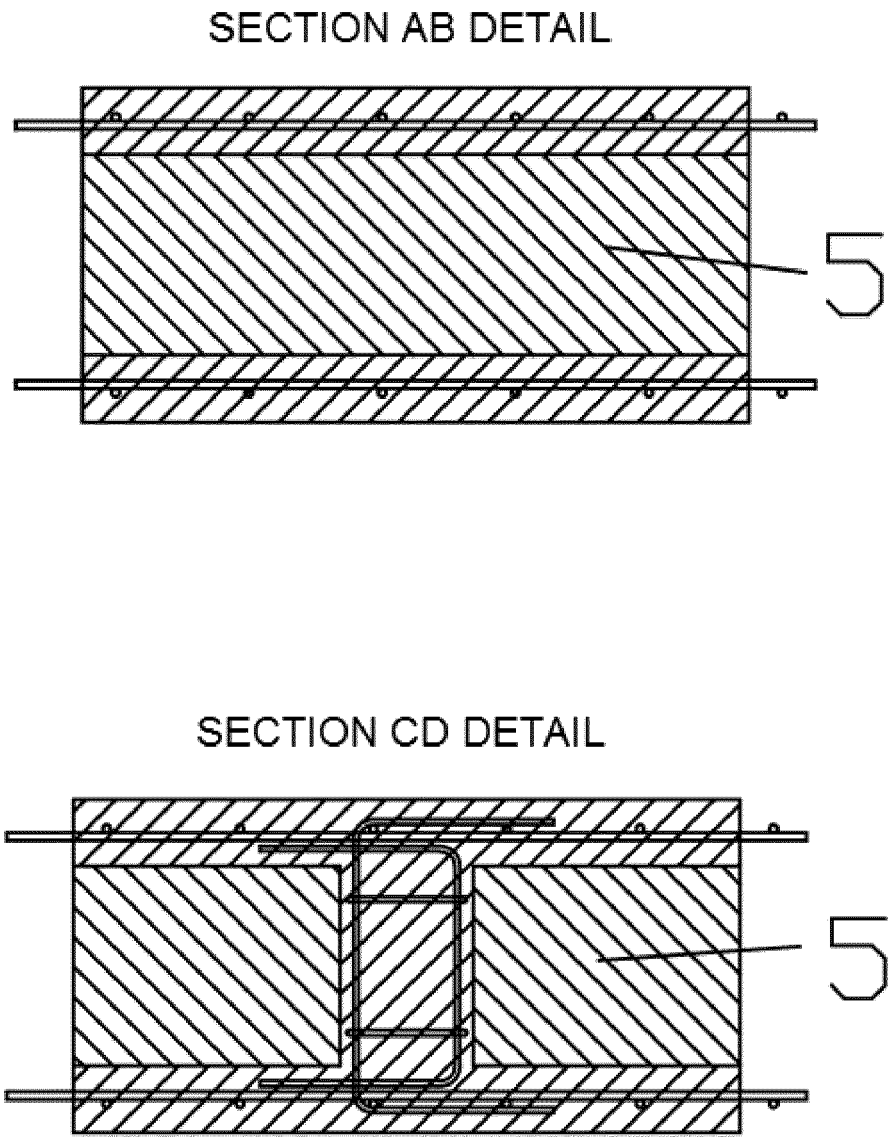

FIGURE 6

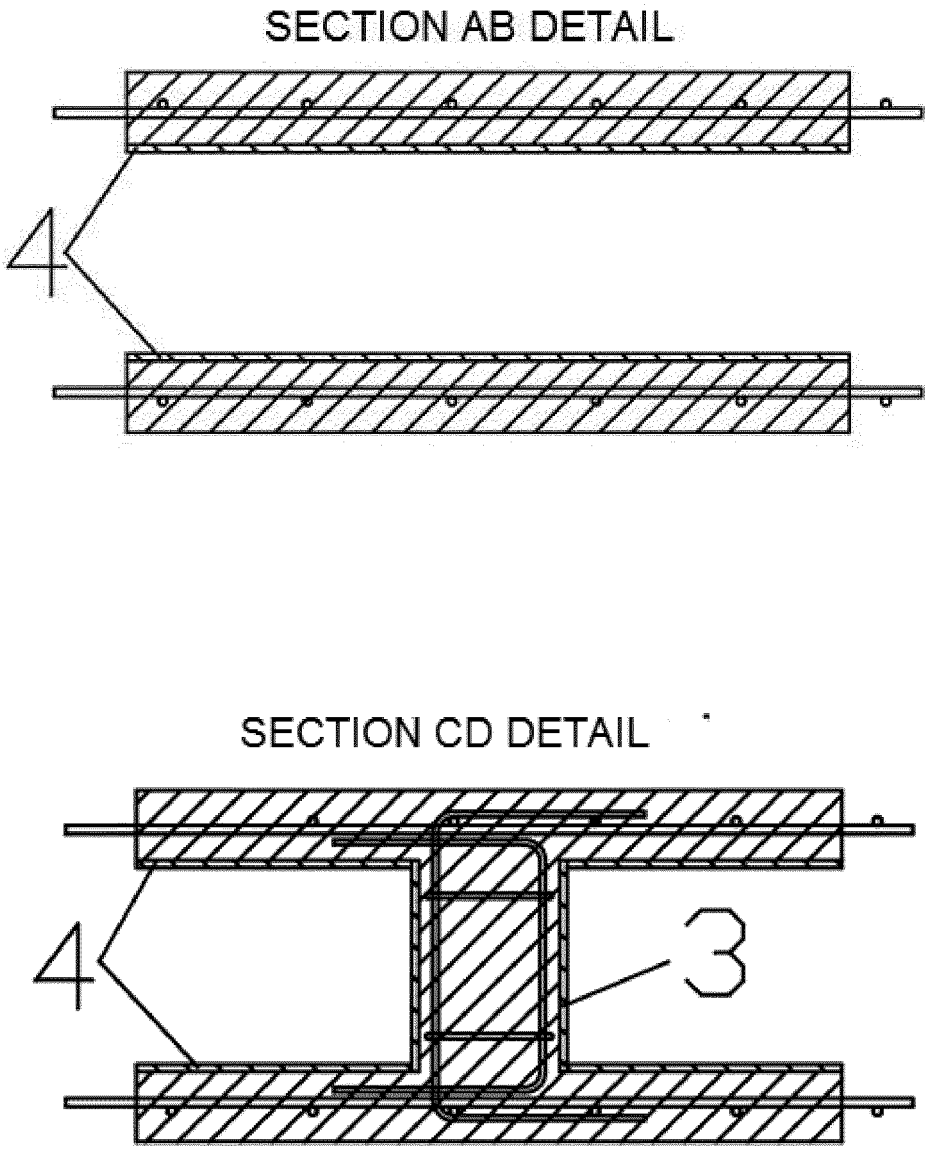

FIGURE 7

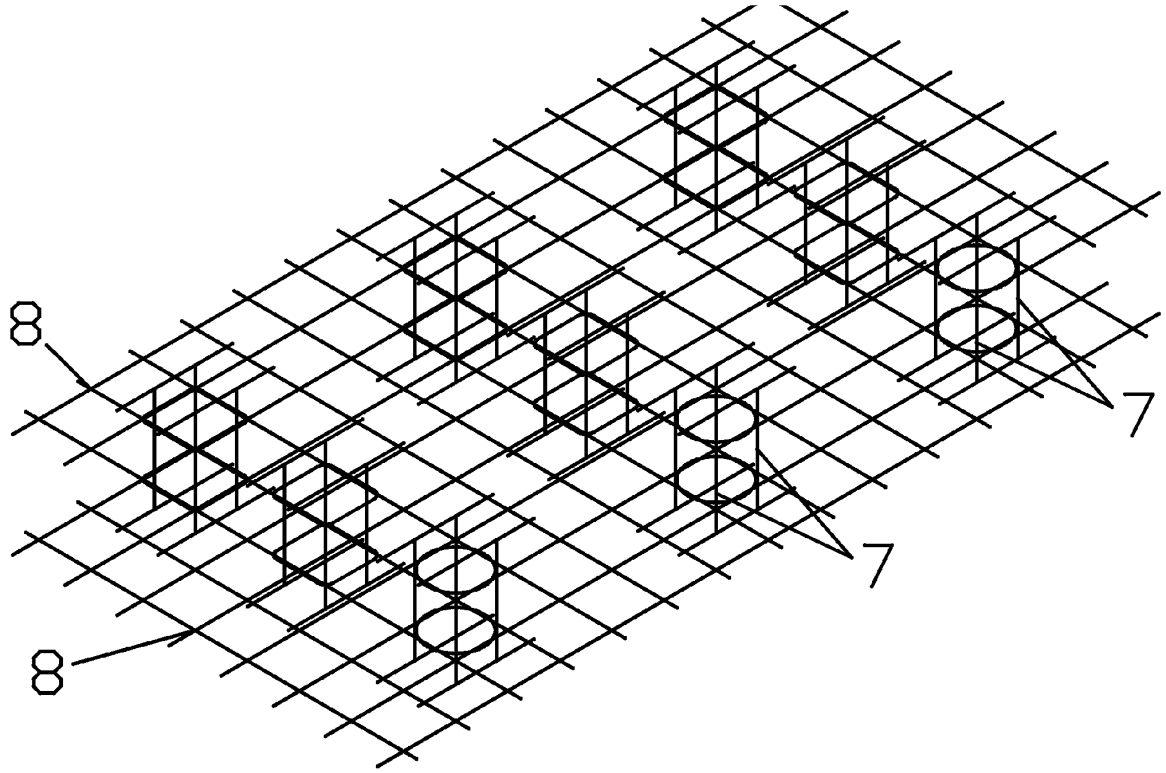

FIGURE 8

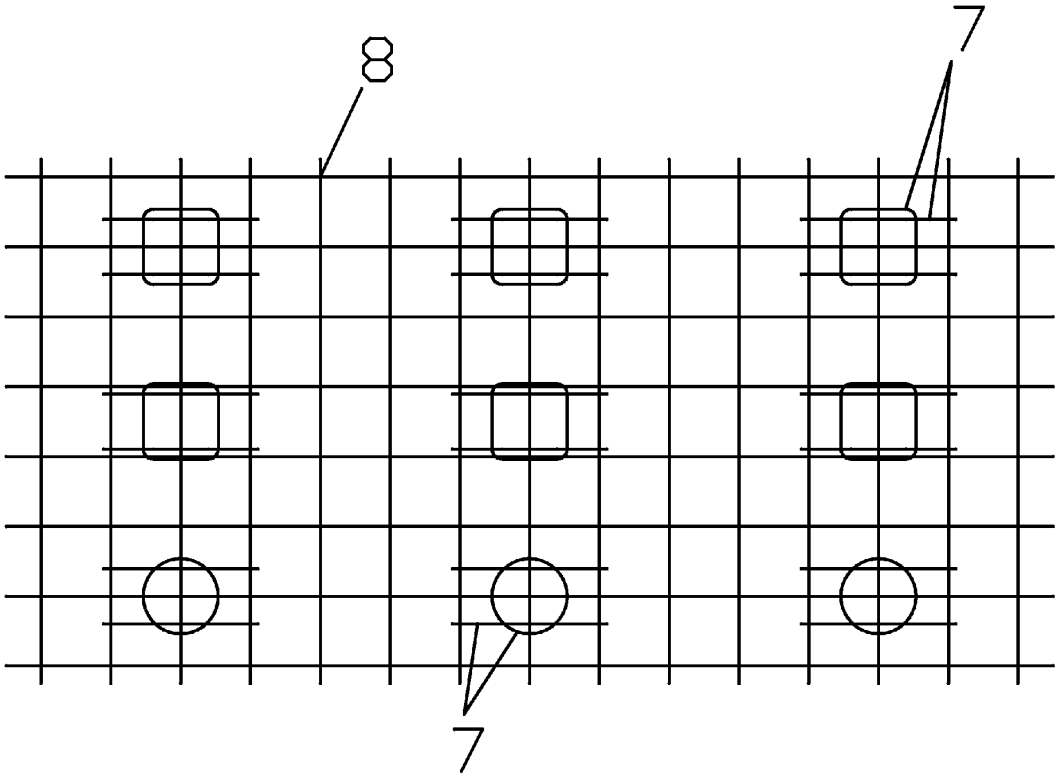

FIGURE 9

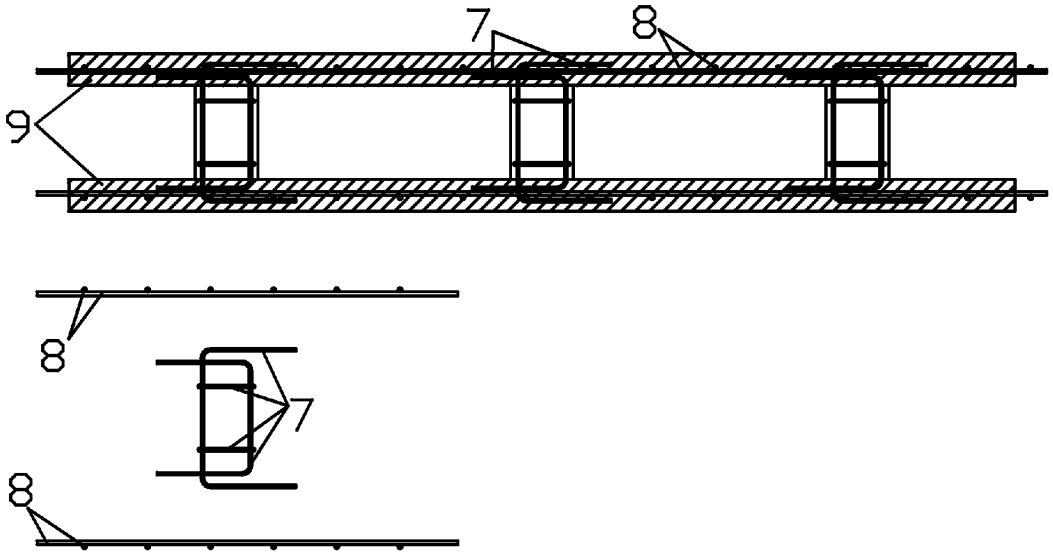

FIGURE 10

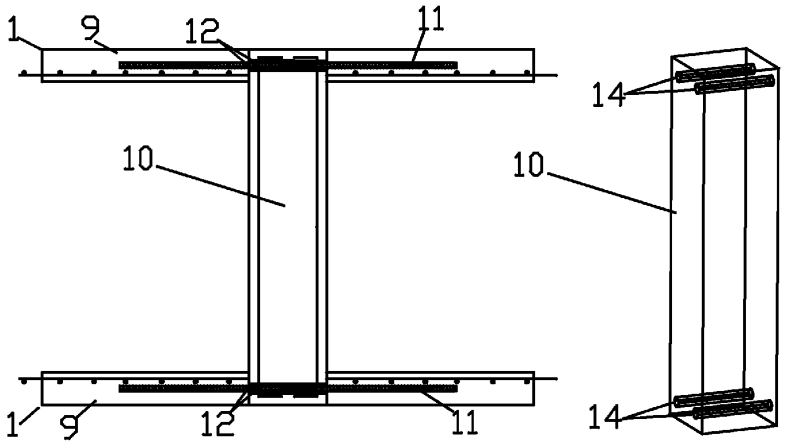

FIGURE 11

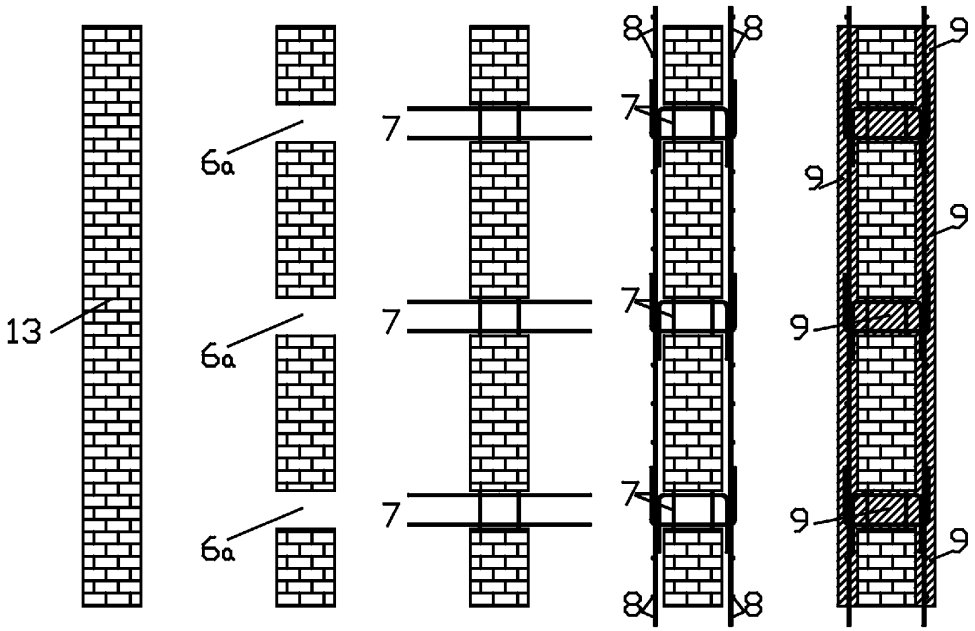

FIGURE 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2011/070888

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E04B, E04G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, INVENES

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ES 2163938 A1 (ROJAS FERNANDEZ FIGARES MANUEL) 01/02/2002, column 1, line 42 – column 6, line 17; figures 1 - 5.	1-18
A	GB 2023215 A (LUDDINGTON ENTERPRISES LTD) 28/12/1979, page 1, line 4 - page 2, line 8; figures 1 - 6.	1-18
A	US 3982368 A (PERRIN ARTHUR) 28/09/1976, column 2, line 15 - column 3, line 22; figures 1 - 12.	1-18
A	DE 19520082 A1 (BITTSCHEIDT NORBERT) 05/12/1996, Fig. 1- 4 & Abstract from DataBase WPI. Retrieved from EPOQUE; AN 1997-022024	1-18

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance.
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure use, exhibition, or other means.
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other documents , such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14/09/2012	**(20/09/2012)**
Name and mailing address of the ISA/ OFICINA ESPAÑOLA DE PATENTES Y MARCAS Paseo de la Castellana, 75 - 28071 Madrid (España) Facsimile No.: 91 349 53 04	Authorized officer M. Revuelta Pollán Telephone No. 91 3496824

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2011/070888

C (continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of documents, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4505019 A (DEINZER DIETRICH F) 19/03/1985, column 2, line 51 - column 3, line 57; figures 1 - 8.	1-18
A	US 4125981 A (MACLEOD COLIN J ET AL.) 21/11/1978, column 1, line 37 - column 5, line 30; figures 1 - 3.	1-18

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/ES2011/070888

Patent document cited in the search report	Publication date	Patent family member(s)	Publication date
US4125981 A	21.11.1978	LU77320 A	24.08.1977
		BE854554 A	01.09.1977
		IE45500 B	08.09.1982
		IE45500 L	14.11.1977
		DK210077 A	15.11.1977
		DK145803 B	07.03.1983
		DK145803 C	29.08.1983
		NL7705250 A	16.11.1977
		DE2722711 A	01.12.1977
		FR2351221 AB	09.12.1977
		JP53010518 A	31.01.1978
		JP61008221 B	12.03.1986
		ZA7702865 A	26.04.1978
		ES458786 A	01.08.1978
		AU2495377 A	09.11.1978
		AU510681 B	10.07.1980
		CA1083845 A	19.08.1980
		GB1585271 A	25.02.1981
		IT1074377 B	20.04.1985
US4505019 A	19.03.1985	NONE	
ES2163938 AB	01.02.2002	NONE	
US3982368 A	28.09.1976	NONE	
DE19520082 A	05.12.1996	NONE	
GB2023215 A	28.12.1979	NONE	

Form PCT/ISA/210 (patent family annex) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/ES2011/070888

CLASSIFICATION OF SUBJECT MATTER

E04B2/86 (2006.01)
E04B1/16 (2006.01)
E04G17/075 (2006.01)
E04G11/00 (2006.01)
E04B1/35 (2006.01)

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

- GB 2023215 A **[0011]**
- US 3982368 A **[0012]**
- DE 19520082 **[0013]**