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

MODUL FÜR GEBÄUDEFASSADEN UND VERFAHREN ZUR VERWENDUNG IM BAU

MODULE DE FORMATION DE PAREMENTS ET PROCÉDÉ D'UTILISATION DUDIT MODULE DANS LA CONSTRUCTION

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Description

OBJECT OF THE INVENTION

[0001] A general object of the invention is the design of a structure capable of application in different areas of the construction sector, in buildings and in engineering works.

[0002] A second general object of the invention is a method of building a structure which may be used 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 structure that can be used in different areas of the construction sector, based on polymeric material solid supports and in alternative materials to polymeric ones such as concrete blocs, ceramic elements' parts, and granular material.

[0004] A second particular object of the disclosure is the design of a structure that can be used in different areas of the construction sector based on polymeric material sheet supports 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 structure 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 a structure and a method for building a structure, that can be used in diverse areas of the construction sector, both in buildings and engineering works, including not only the use of concrete poured into the mold, but also shooting concrete on a support and using alternative materials to concrete or cement mortar in some of its parts.

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 mesh 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 concrete walls packed *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. ES 2163938 discloses a structure with two or more concrete walls connected by other elements of the same material and a process to manufacture the same.

[0014] Thus the need of an innovative solution having adequate stiffness 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 point according to required stress level of said point.

DESCRIPTION OF THE INVENTION

Features of the present surface generating module

[0015] The present invention provides a structure according to claim 1 and a method according to claim 9. Various optional features are set out in the dependent claims. The structures of the invention used in a given construction have some features previously mentioned providing at the same time inventive, novel features with respect to the state of the art.

[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 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 support to shoot concrete or mortar on both faces of same. The support is not necessarily removed but it may be 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] All types of structural elements and shapes can be made by the invention, 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 structure comprises at least two reinforced 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 structure of the invention is the fact that it increases the inertia momentum of a surface regarding its medium plane, by separating walls from each other 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 invention provides very resistant structures with a much lower use of resources. Structures built according to this invention are much more resistant to seismic movement stresses. All of this results in an important saving of resources, rendering a significant applicability and an important economic effect.

Building procedure

[0021] The following is an example of a method to build a structure using a solid support.

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 drillable.

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

c) Armatures of future connectors are introduced through bores of the support. Armatures carry ends to overlap with wall armatures.

d) Armatures of each future wall are attached and

fixed to each face of support.

e) Ends 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 bores 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 construction is three-walled, operations previously described are repeated except for folding of the ends of connector armatures in the face wherein the third wall is to be built. Next a second support is attached to the wall already built with bores facing salient ends of connectors' armatures so that the ends, once the second support is placed, protrude through its bores. Next armatures of second wall are placed. Protruding ends of armatures of connectors are folded and overlapped with those of the third wall and concrete or mortar is shot beginning by filling bores of second support, and next on seen face of second support, covering armatures and thus forming the third wall. If the structure 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 bores close to both bases of said elements. Once in the construction site they are introduced in the support bores. Wall armatures are placed at both faces of support and tying bars overlapping with armatures of future walls are introduced through connectors' bores. Tying bars introduced in connectors should be impregnated with resin so that they adhere to the concrete or mortar of connector's bores along their 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] 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 bores 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 a non-claimed double-sheet support. Bores of this second support are arranged so that when attaching same to the already built wall, connectors' armatures are introduced through the bores protruding from them. Next armatures of second wall are placed, folding and overlapping ends of connectors' armatures with armatures of second wall, shooting concrete or mortar, filling bores and covering armatures of second wall, thus finishing same.

[0025] When 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 actual structure acts as support for shooting of concrete or mortar.

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

c) Connectors' armatures are introduced through these bores

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

e) Connectors' armature ends 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 bores 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.

[0026] Alternatively, connectors can be prefabricated for this reinforcement application. In this case, the work method is similar, but introduction of connectors' armatures and folding of ends of armatures is substituted by introduction of prefabricated connectors and introduction of tying bars impregnated with adherent resin through bores that the prefabricated connectors have in both bases, overlapping these tying bars with the armatures of the respective wall. Finally concrete or mortar is shot on both faces.

[0027] Thus former construction is embedded in the double wall formed by said reinforcement.

Applications of the structures of the invention

[0028] Industrial application of the herein disclosed

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.

[0029] The structures built according to examples of the invention may be 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.

[0030] Besides the ones previously mentioned, applications in civil engineering works of structures according to the invention may also include: construction of water storage deposits, soil containment walls, caissons 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.

[0031] With the present invention any type of conventional reinforced concrete elements can be built in the field of in shop prefabricated reinforced concrete parts to be carried and placed in engineer works, including self carrying panels, slabs, pillars and stacks, girders, sill plates, etc.. These parts can have any required form or dimension.

DESCRIPTION OF THE DRAWINGS

[0032]

Figure 1 presents a module of double reinforced concrete or mortar wall.

Figure 2 presents a perspective of a fragment of the surface (support omitted) built according to an example of the invention.

Figure 3 presents the double-sheet support, which is not claimed, 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 bores 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, which is not claimed.

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 which may be used in examples of the invention.

Figure 11 represents bracing of the two walls by means of prefabricated connectors of concrete or reinforced mortar which may be used in examples of the invention.

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

PREFERRED EMBODIMENTS

Generating module

Embodiment No.1. Components of the generating module.

[0033] Figure 1 presents a two-wall reinforced concrete or mortar surface, 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 structure. In vertical or slanted surfaces shooting 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.

[0034] Figure 2 provides additional information showing in perspective a facade fragment. The figure only illustrates concrete or mortar elements 9, omitting the support, either a non-claimed double-sheet one 4 or a solid support (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 supports

[0035] Figure 3 presents the non-claimed 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.

[0036] 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 bores 6 bored in solid support 5 wherein six of them are prism shaped while the remaining three are cylindrical.

Embodiment No. 3. Connectors

[0037] 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 hatching shows concrete or mortar 9 area cut by the section; only two walls 1 of the surface fragment were cut in this case. Hatching of section CD

shows this section cuts concrete or mortar of the two walls 1 and three connectors 2.

[0038] Figure 6 shows more detailed information of a structure according to the invention, presenting two details of section AB and CD of Figure 5 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 second detail corresponding to section CD shows how said section CD cuts concrete or mortar 9 of connector 2.

[0039] For the same detailed information of the non-claimed double-walled generating module 1, Figure 7 illustrates two details of sections AB and CD of Figure 5 when using a non-claimed 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

[0040] 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.

[0041] 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.

[0042] 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 the 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

[0043] 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 right hand side detail of said figure, having close to each of its two bases at least two bores 14 parallel to them. Once the solid support 5 has been placed, each prefabricated connector 10 is introduced through bores 6 in the solid support 5. Next armatures 8 of the two walls 1 are fixed in place and then tying bars 11 are introduced through bores 14 of both bases of the prefabricated connector 10, impregnating previously with resin 12 each tying bar 11 in the contact area between said tying bar 11 and the corresponding bore 14 of prefabricated connector 10; said resin 12 guarantees adherence between tying bars 11 and prefabricated connector 10. Concrete or mortar 9 is then shot on both faces of the solid support 5, thus forming the structure of the invention.

Embodiment No. 6. Reinforcement of existing surface

[0044] Method of reinforcement of existing surface 13 according to 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 bores 6a are bored in surface 13 according to reinforcement design, then armatures 7 of connectors 2 are introduced through said bores 6a. Armatures 8 of the two future walls 1 of reinforcement are attached to each face of surface 13. Next, the ends of armatures 7 of connectors 2 are folded overlapping them with armatures 8 of walls 1. Finally concrete or mortar 9 is shot beginning by filling bores 6a thus forming connectors 2, shooting concrete or mortar 9 continues on one face of surface 13 and then on the other, thus finishing reinforcement by means of the structure of the invention. Once concrete or mortar 9 is cured and sufficiently aged to provide necessary resistance tubbing is removed from the structure.

Embodiment No. 7. General method

[0045] General building method is as follows: placing solid support 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 support, armatures of connectors 7 are introduced through bores 6 of solid support; ends of longitudinal armatures of connectors are folded and overlapped to armatures 8 corresponding to each wall 1. Concrete or mortar 9 is shot packing bores 6 in the solid support 5, thus forming connectors 2. The shooting of concrete or mortar 9 on one face of the support and then on the other continues until achieving required thickness in each wall 1. If the structure of the invention to be used is three-walled 1 the same method is followed as previously explained except folding the ends of armatures 7 of connectors 2 in the face of support 5 where third wall is to be formed. Once concrete or mortar 9 of second wall 1 is shot then second support is attached to same so that unfolded ends of armatures of the connectors pass through bores 6 in the solid support 5, placing then armatures 8 of third wall 1. Ends of armatures of connectors 2 are folded overlapping them with armatures 8 of third wall 1, filling bores 6 of the second solid support 5, then shooting concrete or mortar 9 on seen face of said second support 5, completing third wall 1. If the structure has more walls the method is repeated until completion of all of them. Before concrete or mortar sets in, it can be trimmed or troweled 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

[0046] Construction method if there is no access to one of the faces of the surface is as follows: a common support, not of the invention, is placed with no bores, 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 solid support 5, is attached with bores 6 so that longitudinal armatures 7 of connectors 2 pass through said bores; armatures of second wall are attached to this second support, folding and overlapping the ends of longitudinal armatures of connectors 7 to armatures of second wall 8, filling bores 6 with concrete or mortar 9 thus forming connectors 2, shooting of concrete or mortar 9 continues on seen face of support thus forming second wall 1.

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

[0047] 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 (shot) on embankment or on existing surface covering armatures of wall 8, thus completing first wall 1. A 5 support is attached so that longitudinal armatures of connectors 7 pass through bores in the solid support 5, armatures 8 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 bores 6, thus forming connectors 2, shooting of concrete or mortar 9 continues on seen face of support thus completing second wall 1.

Embodiment No. 10. Method with prefabricated connectors

[0048] In this case the method to build a surface is as follows: Solid support 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 support, introducing prefabricated connectors 10 through bores 6 in the solid support 5; tying bars 11 impregnated with resin 12 in their central area are introduced through bores 14 that the prefabricated connectors have in both bases. If walls 1 needed a second armature 8 said second armatures 8 are placed in each face of support. Concrete or mortar 9 is shot on both faces of solid support 5 until completion of thickness required for each wall 1.

Embodiment No.11. Method to reinforce a surface

[0049] 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. Bores 6a are bored in said surface 13 according to reinforcement design, armatures of connectors 7 are introduced through said bores 6a; armatures of the two walls 8 are attached to each face of surface 13, folding the ends of armatures of connectors 7 overlapping them with those of walls 8. Concrete or mortar 9 is shot beginning by filling bores 6a thus forming connectors 2, shooting 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

[0050] 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. Bores 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 bores 6a; tying bars 11 impregnated with resin 12 in their central area are introduced through bores 14 that the prefabricated connectors have in both bases, placing if the case, second armature 8 of walls 1. Concrete or mortar 9 is shot 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

[0051] Thus the present invention provides inventive, novel features as compared to the state of the art. The invention provides structures having stiffness in all directions enabling its use in the construction of any surface no matter the stress it may be subject to. 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 point to the required stress level in the same. A material having low heat conductivity may be selected to construct the support, thus bestowing heat isolation features on the surface constructed according to the invention. Furthermore, structures built applying this invention are much more resistant to stresses provoked by seismic movement than conventional ones.

Claims

1. A structure comprising:

a solid support (5) having a first face and a second face, and a plurality of bores (6) extending through the solid support (5) from the first face to the second face,
a first wall formed on the first face of the solid support, and a second wall formed on the second face of the solid support (5), the first and second walls being reinforced concrete or mortar walls including a wall armature (8);
connectors arranged inside the bores of the solid support which connect the first wall and the second wall wherein

- the connectors (2) are reinforced mortar or concrete elements, having a connector armature (7), and wherein ends of the connector armature are folded to overlap with the wall armatures, or
- the connectors are prefabricated connectors (10) having connector bores, wherein resin impregnated tying bars (11) are arranged through the connector bores.

2. The structure according to claim 1, wherein the connector armature includes steel bars, in a longitudinal direction of the connector and steel bars in a second transverse direction enclosing the steel bars in the longitudinal direction.

3. The structure according to claim 1, wherein the solid support is made of polymeric material, concrete blocks, ceramic pieces, or granular material.

4. The structure according to any of claims 1 - 3, wherein the solid support is made of a material having a low thermal conductivity.

5. The structure according to claim 1, wherein the solid support is an existing wall structure (13).

6. The structure according to any of claims 1 - 5, wherein the first and the second walls are formed by pouring or shooting concrete or mortar on the first and second faces of the solid support.

7. The structure according to any of claims 1 - 6, wherein the connectors and first and second wall are built *in situ* by shooting mortar or concrete in the bores.

8. The structure according to any of claims 1 - 7, wherein the wall armatures are made of steel bars, other metals, polymeric materials, carbon fibers or glass fibers.

9. A method for building a structure:

- providing a solid support (5) with the shape of the whole surface and dimensions to be built, the solid support (5) having a first face and a second face and a plurality of bores (6) extending through the solid support from the first face to the second face;
- attaching a wall armature (8) to each of the first and second faces of said solid support (5);
- providing connectors (2) through the bores (6) of said solid support (5);
- Shooting or pouring concrete or mortar (9) on the first face of the solid support (5), and subsequently on to the second face until reaching the required thickness on the first and second faces (1) to form a first and a second wall, wherein

providing the connectors through the bores comprises:

- providing connector armature through the bores, folding ends of the connector armature to overlap with the wall armatures, and shooting or pouring concrete or mortar in the bores or
- providing prefabricated connectors (10) having connector bores, and introducing adherent resin impregnated tying bars (11) through the connector bores and overlapping with the wall armature.

10. The method according to claim 9, wherein providing bores in the solid support comprises boring holes in the solid support (5).

11. The method according to claim 9 or 10, wherein the solid support (5) is made of polymeric material, concrete blocks, ceramic pieces, or granular material.

12. The method according to any of claims 9 - 11, wherein the solid support is made of a material having a low thermal conductivity.

13. The method according to claim 10, wherein the solid support is an existing wall structure (13), and the method comprises bracing the pre-existing wall structure before drilling the bores and removing the bracing after forming the first and the second walls.

14. The method according to any of claims 9 - 13, wherein attaching a wall armature (8) includes attaching a secondary armature on the first and/or second face.

15. The method according to any of claims 9 - 14, wherein the wall armatures are made of steel bars, other metals, polymeric materials, carbon fibers or glass fibers.

Patentansprüche

1. Eine Struktur umfassend:

einen festen Träger (5) mit einer ersten Fläche und einer zweiten Fläche und mehreren Bohrungen (6), die sich durch den festen Träger (5) von der ersten Fläche zur zweiten Fläche erstrecken,
eine erste Wand, die auf der ersten Fläche des festen Trägers ausgebildet ist, und eine zweite Wand, die auf der zweiten Fläche des festen Trägers (5) ausgebildet ist, wobei die erste und die zweite Wand Stahlbeton- oder Mörtelwände sind, die eine Wandarmierung (8) einschließen;
Verbinder, die innerhalb der Bohrungen des festen Trägers angeordnet sind und die erste Wand und die zweite Wand verbinden, wobei

- die Verbinder (2) bewehrte Mörtel- oder Betonelemente mit einer Verbinderarmierung (7) sind und wobei die Enden der Verbinderarmierung so gefaltet sind, dass sie mit den Wandarmierungen überlappen oder
- die Verbinder vorgefertigte Verbinder (10) mit Verbinderbohrungen sind, wobei mit Harz imprägnierte Verbindungsstangen (11) durch die Verbinderbohrungen angeordnet sind.

2. Struktur nach Anspruch 1, wobei die Verbinderarmierung Stahlstangen in Längsrichtung des Verbinders und Stahlstangen in einer zweiten Querrichtung umfasst, die die Stahlstangen in Längsrichtung einschließen.

3. Struktur nach Anspruch 1, wobei der feste Träger aus Polymermaterial, Betonblöcken, Keramikstücken, oder Granulat besteht.

4. Struktur nach einem der Ansprüche 1 bis 3, wobei der feste Träger aus einem Material mit geringer Wärmeleitfähigkeit besteht.

5. Struktur nach Anspruch 1, wobei der feste Träger eine vorhandene Wandstruktur (13) ist.

6. Struktur nach einem der Ansprüche 1 bis 5, wobei die erste und die zweite Wand durch Gießen oder Spritzen von Beton oder Mörtel auf die erste und zweite Fläche des festen Trägers gebildet werden.

7. Struktur nach einem der Ansprüche 1 bis 6, wobei die Verbinder und die erste und zweite Wand *in situ* durch Spritzen von Mörtel oder Beton in die Bohrungen gebaut werden.

8. Struktur nach einem der Ansprüche 1 bis 7, wobei die Wandarmierungen aus Stahlstangen, anderen Metallen, Polymermaterialien, Kohlenstofffasern oder Glasfasern bestehen.

9. Verfahren zum Bau einer Struktur:

- Bereitstellen eines festen Trägers (5) mit der Form der gesamten Oberfläche und den Abmessungen, die gebaut werden sollen, wobei der feste Träger (5) eine erste Fläche und eine zweite Fläche und mehrere Bohrungen (6) aufweist, die sich von der ersten durch den festen Träger zur zweiten Fläche erstrecken;
- Anbringen einer Wandarmierung (8) an jeder der ersten und zweiten Fläche des genannten festen Trägers (5);
- Bereitstellen von Verbindern (2) durch die Bohrungen (6) des genannten festen Trägers (5);
- Spritzen oder Gießen von Beton oder Mörtel (9) auf die erste Fläche des festen Trägers (5) und anschließend auf die zweite Fläche, bis die erforderliche Dicke auf der ersten und zweiten Fläche (1) erreicht ist, um eine erste und eine zweite Wand zu bilden, wobei das Bereitstellen der Verbinder durch die Bohrungen umfasst:

  - Bereitstellen einer Verbinderarmierung durch die Bohrungen, Falten der Enden der Verbinderarmierung, sodass sie mit den Wandarmierungen überlappen, und Spritzen oder Gießen von Beton oder Mörtel in die Bohrungen oder
  - Versehen von vorgefertigten Verbindern (10) mit Verbinderbohrungen und Einbringen von haftenden, mit Harz imprägnierten Verbindungsstangen (11) durch die Verbinderbohrungen und Überlappen mit der Wandarmierung.

10. Verfahren nach Anspruch 9, wobei das Bereitstellen von Bohrungen im festen Träger das Bohren von Löchern im festen Träger (5) umfasst.

11. Verfahren nach Anspruch 9 oder 10, wobei der feste Träger (5) aus Polymermaterial, Betonblöcken, Keramikstücken, oder Granulat besteht.

12. Verfahren nach einem der Ansprüche 9 bis 11, wobei der feste Träger aus einem Material mit geringer Wärmeleitfähigkeit besteht.

13. Verfahren nach Anspruch 10, wobei der feste Träger eine vorhandene Wandstruktur (13) ist und das Verfahren das Verstärken der bereits vorhandenen Wandstruktur vor dem Bohren der Bohrungen und das Entfernen der Verstärkung nach dem Ausbilden der ersten und der zweiten Wand umfasst.

14. Verfahren nach einem der Ansprüche 9 bis 13, wobei das Anbringen einer Wandarmierung (8) das Anbringen einer sekundären Armierung auf der ersten und/oder zweiten Fläche umfasst.

15. Verfahren nach einem der Ansprüche 9 bis 14, wobei die Wandarmierungen aus Stahlstangen, anderen Metallen, Polymermaterialien, Kohlenstofffasern oder Glasfasern bestehen.

Revendications

1. Structure comprenant :

un support solide (5) ayant une première face et une deuxième face et une pluralité d'alésages (6) s'étendant à travers le support solide (5) de la première face à la deuxième face,
une première paroi formée sur la première face du support solide et une deuxième paroi formée sur la deuxième face du support solide (5), les première et deuxième parois étant des parois en mortier ou en béton armé comprenant une armature de paroi (8) ;
des connecteurs disposés à l'intérieur des alésages du support solide qui relient la première paroi et la deuxième paroi dans laquelle

- les connecteurs (2) sont des éléments en mortier ou en béton armé, ayant une armature de connecteur (7) et dans laquelle les extrémités de l'armature de connecteur sont pliées pour chevaucher les armatures de paroi ou
- les connecteurs sont des connecteurs préfabriqués (10) ayant des alésages de connecteur, dans laquelle des barres de liaison imprégnées de résine (11) sont disposées à travers les alésages de connecteur.

2. Structure selon la revendication 1, dans laquelle l'armature de connecteur comprend des barres d'acier, dans une direction longitudinale du connecteur et des barres d'acier dans une deuxième direction transversale enfermant les barres d'acier dans la direction longitudinale.

3. Structure selon la revendication 1, dans laquelle le support solide est constitué de matériau polymère, blocs de béton, pièces en céramique, ou matériau granulaire.

4. Structure selon l'une quelconque des revendications 1 à 3, dans laquelle le support solide est constitué d'un matériau ayant une faible conductivité thermique.

5. Structure selon la revendication 1, dans laquelle le support solide est une structure de paroi existante (13).

6. Structure selon l'une quelconque des revendications 1 à 5, dans laquelle les première et deuxième parois sont formées en coulant ou en projetant du béton ou du mortier sur les première et deuxième faces du support solide.

7. Structure selon l'une quelconque des revendications 1 à 6, dans laquelle les connecteurs et la première et la deuxième paroi sont construits *in situ* en projetant du mortier ou du béton dans les alésages.

8. Structure selon l'une quelconque des revendications 1 à 7, dans laquelle les armatures de paroi sont constituées de barres d'acier, d'autres métaux, de matériaux polymères, de fibres de carbone ou de fibres de verre.

9. Procédé pour construire une structure :

- en fournissant un support solide (5) ayant la forme de l'intégralité de la surface et des dimensions à construire, le support solide (5) ayant une première face et une deuxième face et une pluralité d'alésages (6) s'étendant à travers le support solide de la première face à la deuxième face ;
- en fixant une armature de paroi (8) à chacune des première et deuxième faces dudit support solide (5) ;
- en fournissant des connecteurs (2) à travers les alésages (6) dudit support solide (5) ;
- en projetant ou en coulant du béton ou du mortier (9) sur la première face du support solide (5), puis sur la deuxième face jusqu'à atteindre l'épaisseur requise sur les première et deuxième faces (1) pour former une première et une deuxième paroi, dans lequel la fourniture des connecteurs à travers les alésages comprend :

  - la fourniture d'une armature de connecteur à travers les alésages, le repli des extrémités de l'armature de connecteur pour chevaucher les armatures de paroi et la projection ou le coulage du béton ou du mortier dans les alésages ou
  - la fourniture de connecteurs préfabriqués (10) ayant des alésages de connecteur et l'introduction des barres de liaison imprégnées de résine adhérente (11) à travers les alésages de connecteur et chevauchant l'armature de paroi.

10. Procédé selon la revendication 9, dans lequel la fourniture d'alésages dans le support solide comprend

le forage de trous dans le support solide (5).

11. Procédé selon la revendication 9 ou 10, dans lequel le support solide (5) est constitué de matériau polymère, blocs de béton, pièces en céramique, ou matériau granulaire.

12. Procédé selon l'une quelconque des revendications 9 à 11, dans lequel le support solide est constitué d'un matériau ayant une faible conductivité thermique.

13. Procédé selon la revendication 10, dans lequel le support solide est une structure de paroi existante (13) et le procédé comprend le contreventement de la structure de paroi préexistante avant de percer les alésages et de retirer le contreventement après la formation des première et deuxième parois.

14. Procédé selon l'une quelconque des revendications 9 à 13, dans lequel la fixation d'une armature de paroi (8) comprend la fixation d'une armature secondaire sur la première et/ou la deuxième face.

15. Procédé selon l'une quelconque des revendications 9 à 14, dans lequel les armatures de paroi sont constituées de barres d'acier, d'autres métaux, de matériaux polymères, de fibres de carbone ou de fibres de verre.

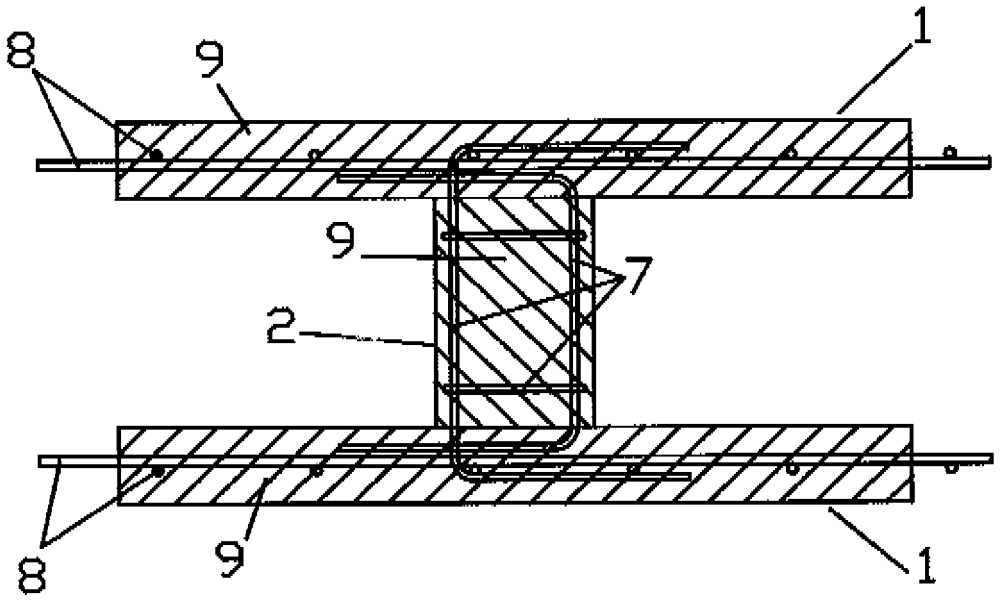


FIGURE 1

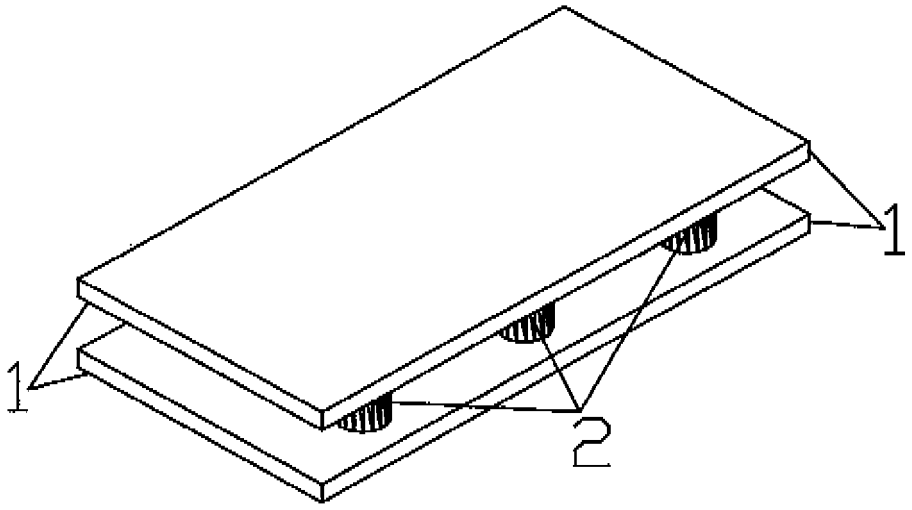


FIGURE 2

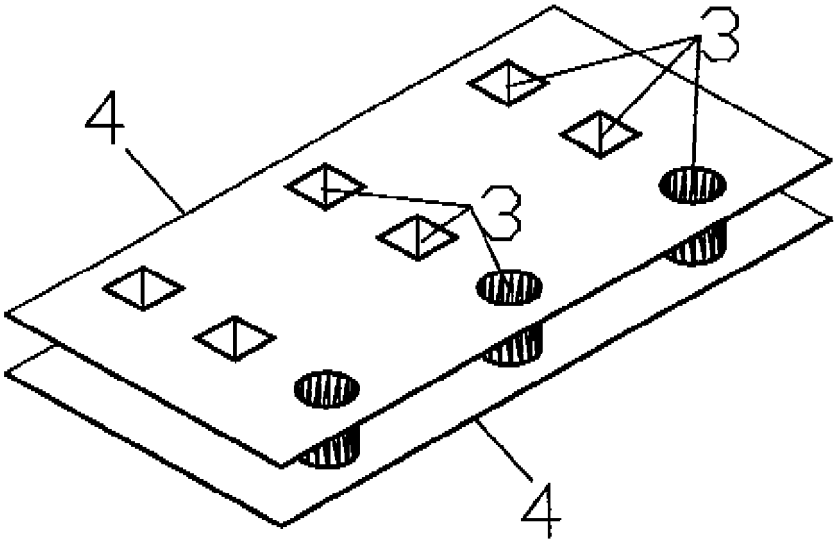


FIGURE 3

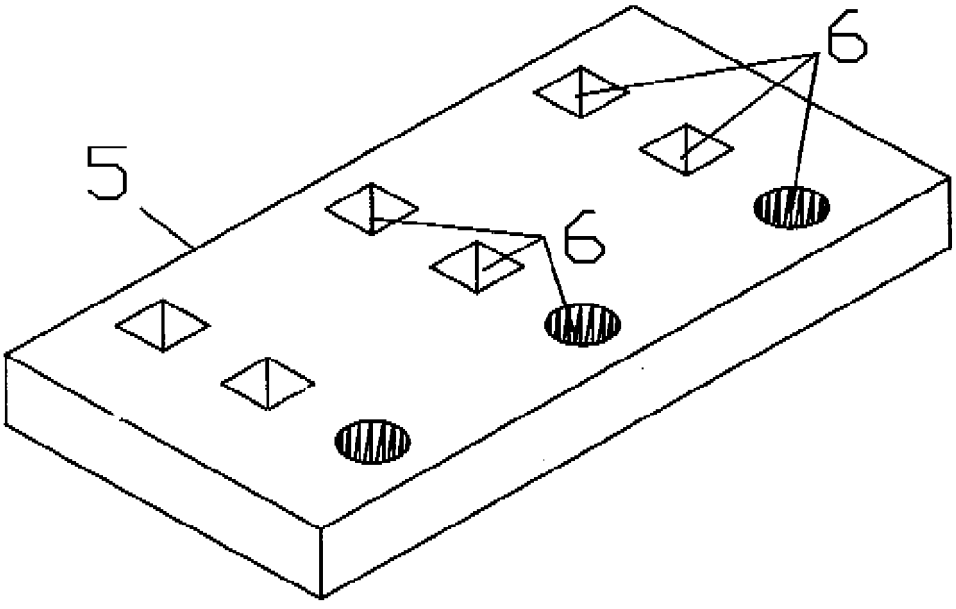


FIGURE 4

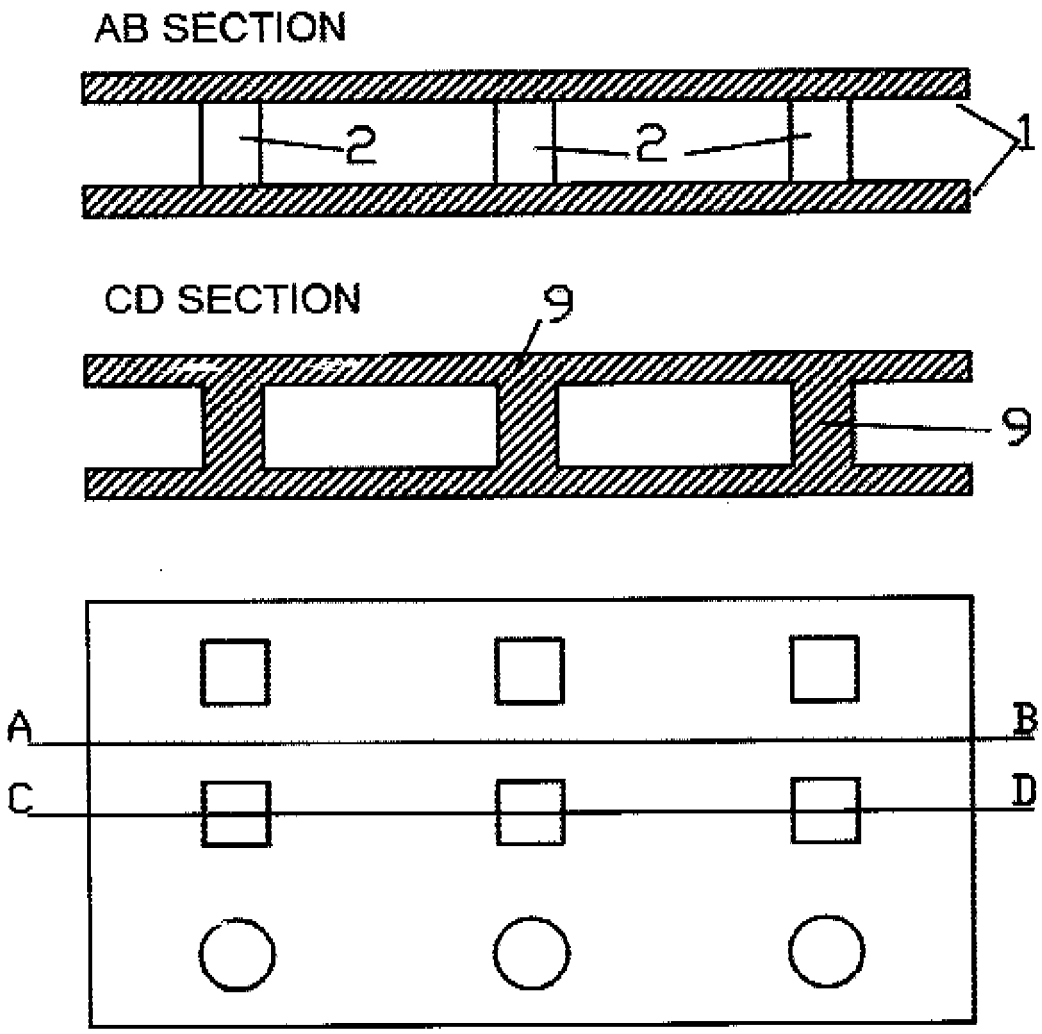
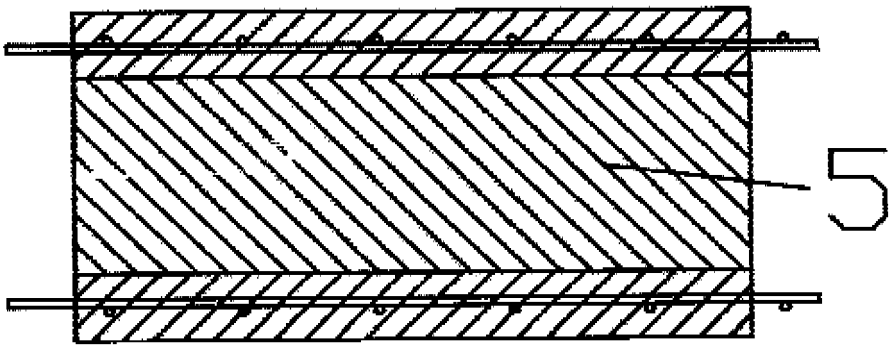


FIGURE 5

SECTION AB DETAIL



SECTION CD DETAIL

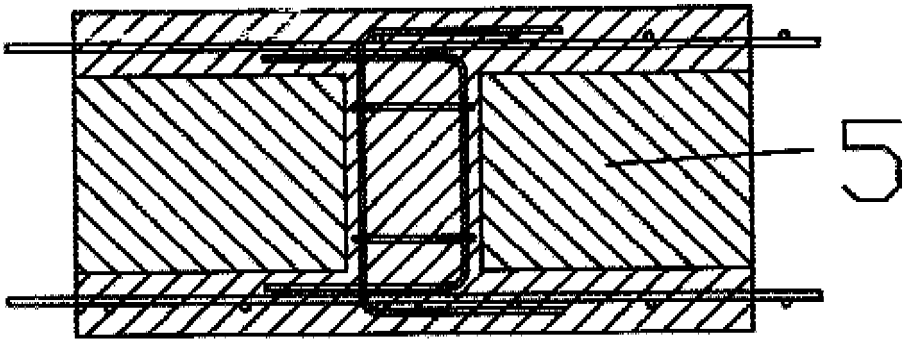


FIGURE 6

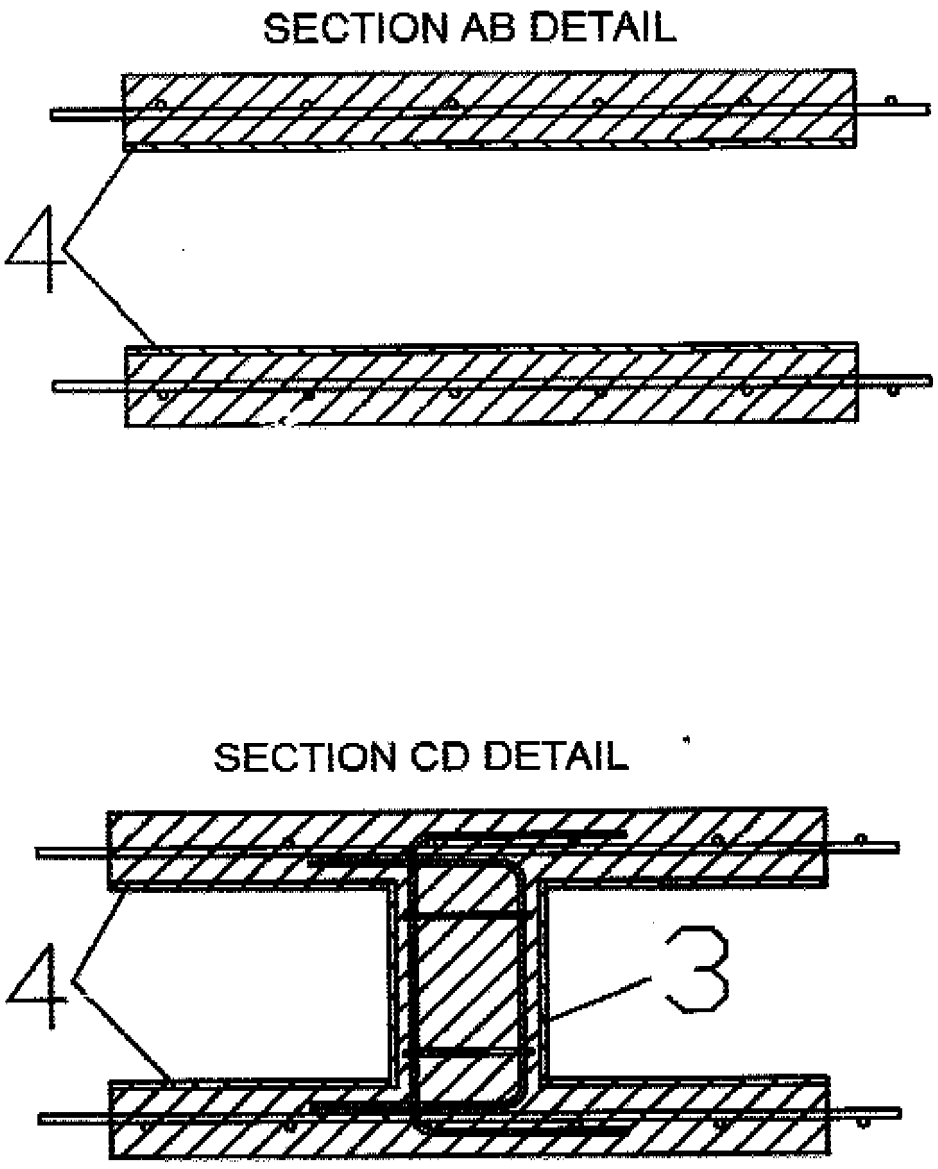


FIGURE 7

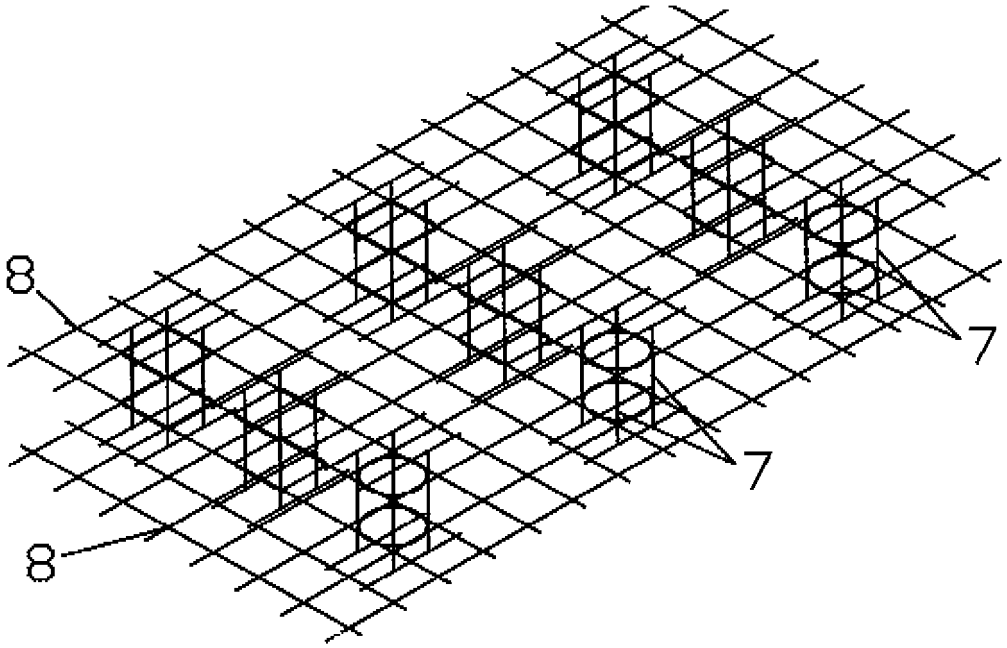


FIGURE 8

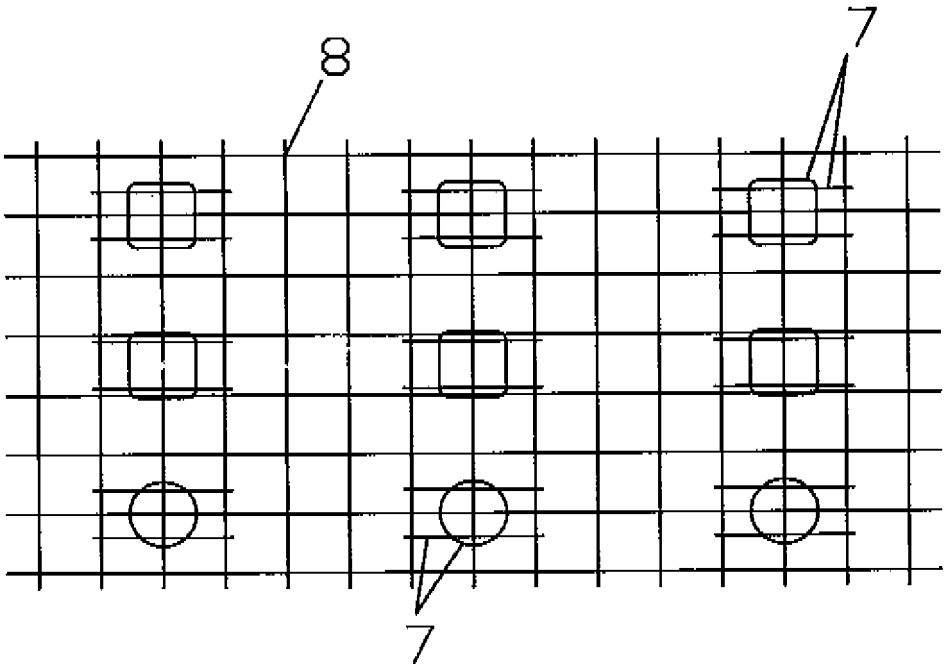


FIGURE 9

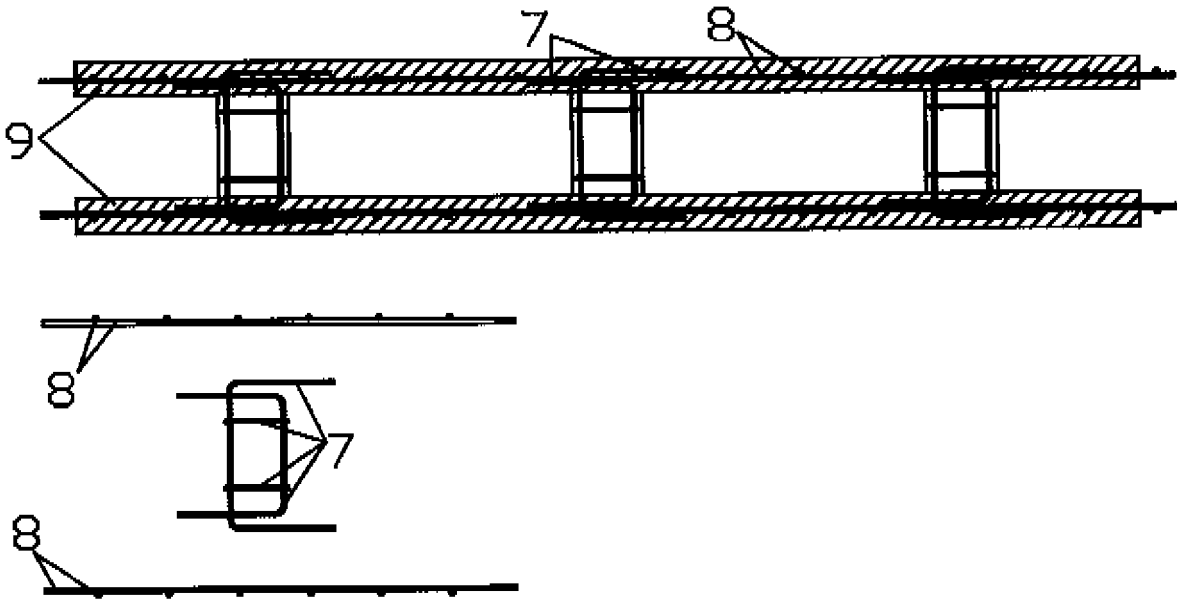


FIGURE 10

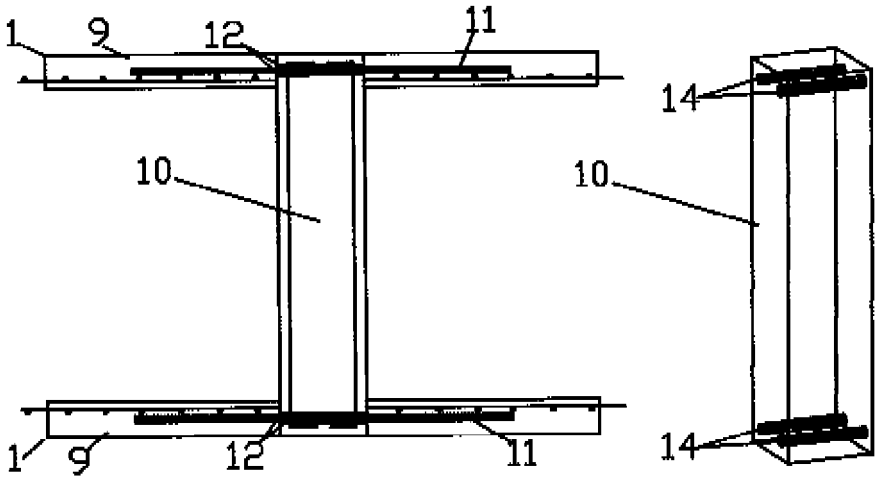


FIGURE 11

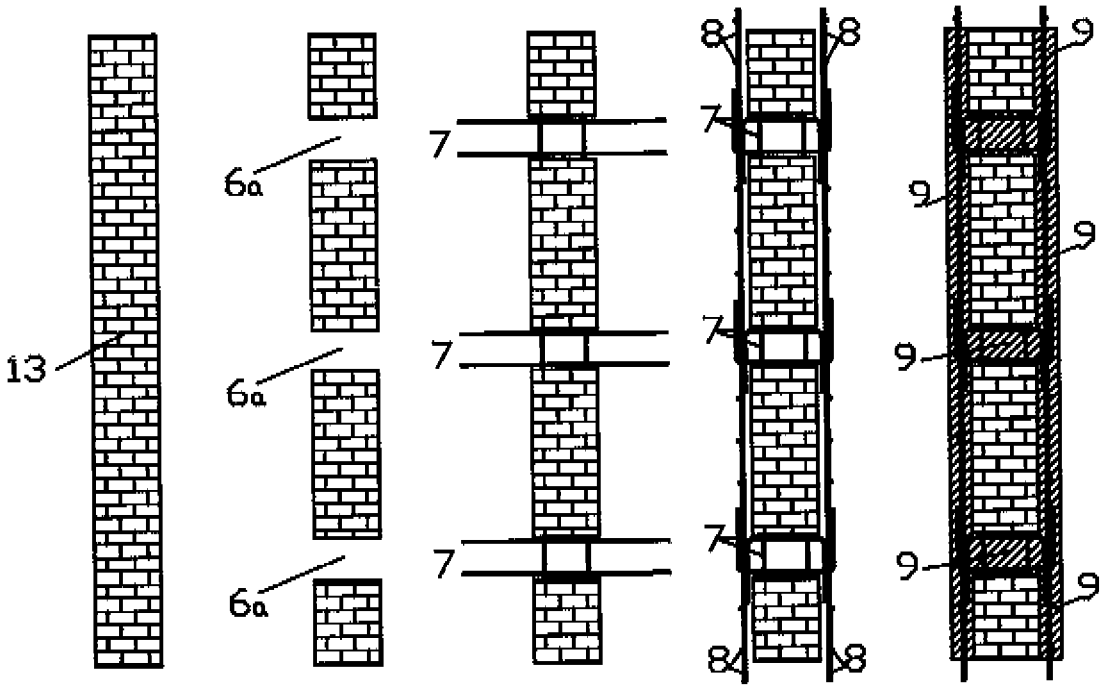


FIGURE 12

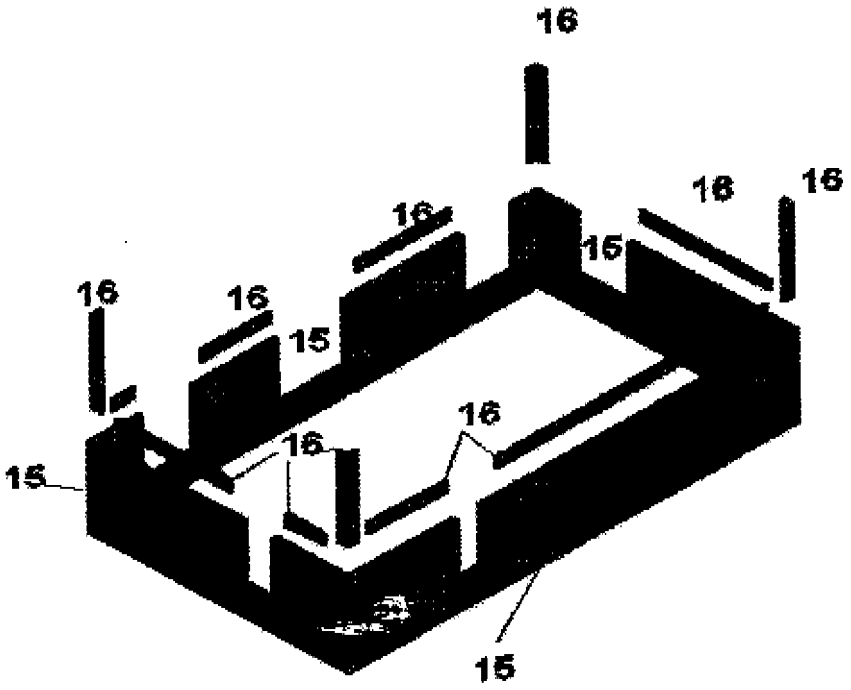


FIGURE 13

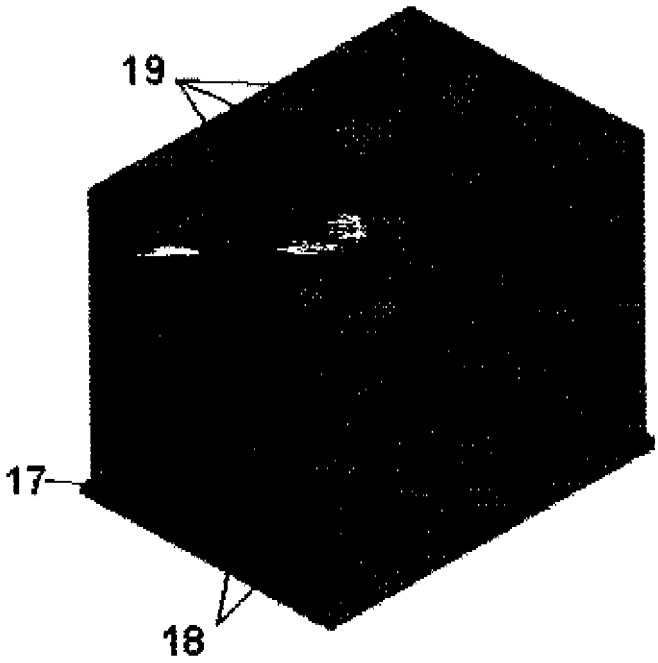


FIGURE 14

REFERENCES CITED IN THE DESCRIPTION

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