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(54) **SPACE LIGHT STEEL FRAME CONCRETE BUILDING AND CONSTRUCTION METHOD THEREOF**

RAUMLICHTSTAHLRAHMEN-BETONGEBÄUDE UND KONSTRUKTIONSVERFAHREN DAFÜR

CONSTRUTION DE SURFACES EN BETON A CHARPENTE METALLIQUE LEGERE ET SON PROCEDE DE CONSTRUCTION

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Description

FIELD

[0001] Embodiments of the present disclosure generally relate to a building and a method for constructing the same, more particularly, to a spatial light steel frame concrete building and a method for constructing the same.

BACKGROUND

[0002] In the field of construction technology, a concrete structure may apply to not only a low-rise and multistorey building, but also a high-rise building, and consequently has been widely used.

[0003] For a cast-in-situ concrete structure, reinforcing steel bars may need to be assembled in situ, and formworks may need to be mounted or removed in situ, which may cause heavy in-situ labor and long construction period.

[0004] A pre-cast reinforced concrete shear wall structure is that components are produced in a factory and assembled in situ. However, in order to solve problems of integral connection between pre-cast components and water seepage at a joint between pre-cast components, the construction cost may be high.

[0005] A Chinese Patent application (Publishing No. CN1958984A) discloses a steel mesh frame concrete composite building and a method for constructing the same, in which a cold-formed thin-walled steel is used to make a steel skeleton, and a conventional wood or steel formwork is replaced by a steel mesh. A steel mesh skeleton is made in a factory and assembled into a steel mesh frame in situ, and then concrete is cast in situ to form a concrete seismic wall structure. However, this structure still has the following defects.

[0006] Firstly, a trellis profile steel used in the steel mesh frame is a cold-formed trellis profile steel component with a thickness of 1.0mm to 4.0mm and a C-shaped, U-shaped or Z-shaped cross section, holes are formed and arranged uniformly in a web member between two wing edges parallel to each other, a reinforcing hemming is formed on a periphery of each hole, and the reinforcing hemming between two adjacent holes forms a U-shaped web member. The production process of this trellis profile steel is relatively complicated, holes need to be formed in a thin steel sheet by a punch, and then bending is performed on a cold-formed device. Depending on different porosities, based on the total weight of the trellis profile steel, the amount of crap steel sheets may be about 10wt% to about 15wt%, which may cause waste. Moreover, a special trellis profile steel production line may need to be constructed, which may result in high investment and high production cost.

[0007] Secondly, the steel mesh used in the steel mesh frame is a fish scale mesh formed by cold forming a galvanized steel sheet with a thickness of 0.3mm to 0.6mm, convex strip-like ribs arranged parallel to each other and spaced apart from each other by a predetermined distance are formed on the fish scale mesh, and the steel mesh is fixed on the surface of the steel skeleton by the convex portions of the strip-like ribs. The steel mesh does not play a part in structure stress, but is merely used as a formwork, which may cause high construction cost and increase the steel amount of a building. After the concrete is cast, wet plastering may also need to be performed on the surface of the steel mesh to flatten the surface of the steel mesh, thus increasing working procedures and wasting labour. Another Chinese Patent application (Publishing No. CN 101654925 A) discloses a spatial solid mold truss concrete building and a method for constructing the same. However, in the method, non-removal formworks are used, and consequently may not be reused, which may increase the construction cost. In addition, because the formworks may not be removed, the density of the concrete after cast may not be detected conveniently.

[0008] Further build structures are known from US 4 107 886 A disclosing a spatial light steel frame concrete building according to the preamble of claim 1,CN100 451 257C, US1 006 047A, US804 614A and FR1 337 089A.

SUMMARY

[0009] Embodiments of the present disclosure seek to solve at least one of the problems existing in the prior art to at least some extent. Accordingly, a spatial light steel frame concrete building is provided. The frame of the spatial light steel frame concrete building may be simple to process, the labor cost and investments on apparatuses may be reduced, and steels may be saved. Furthermore, a method for constructing the spatial light steel frame concrete building is also provided.

[0010] There is provided a spatial light steel frame concrete building according to claim 1. The spatial light steel frame concrete building comprises: a wall spatial light steel frame; a floor slab spatial light steel frame connected to the wall spatial light steel frame to form a building unit spatial light steel frame; and concrete poured in the building unit spatial light steel frame, in which each of the wall spatial light steel frame and the floor slab spatial light steel frame comprises a welded mesh reinforcement and a plurality of trellis profile steels, the plurality of trellis profile steels are spaced apart from each other and each has a plurality of stretching holes, the welded mesh reinforcement is welded to the trellis profile steels so as to connect the plurality of trellis profile steels together, each trellis profile steel comprises two wing edges parallel to each other and a plurality of web members connected between the two wing edges, the two wing edges and the plurality of web members are integrally formed, the plurality of stretching holes are defined by the plurality of web members between the two wing edges, and the plurality of web members and the plurality of stretching holes are formed by stretching the two wing edges.

[0011] There is provided a method for constructing a

spatial light steel frame concrete building according to claim 5.

The method for constructing the spatial light steel frame concrete building comprises steps of:

(1) connecting a plurality of trellis profile steels which are spaced apart from each other and each having a plurality of stretching holes together by a welded mesh reinforcement to form a wall spatial light steel frame and a floor slab spatial light steel frame respectively, in which each trellis profile steel comprises two wing edges parallel to each other and a plurality of web members connected between the two wing edges, the two wing edges and the plurality of web members are integrally formed, the plurality of stretching holes are defined by the plurality of web members between the two wing edges, and the plurality of web members and the plurality of stretching holes are formed by stretching the two wing edges;

(2) fixing a lower end of the wall spatial light steel frame on a foundation, and connecting the wall spatial light steel frame and the floor slab spatial light steel frame together to form a building unit spatial light steel frame;

(3) mounting removable formworks onto the building unit spatial light steel frame to form a concrete pouring chamber in the building unit spatial light steel frame; and

(4) pouring concrete in the concrete pouring chamber and selectively removing the formworks to form an integral building unit.

[0012] With the spatial light steel frame concrete building and the method for constructing the same according to embodiments of the present disclosure, the wall spatial light steel frame and the floor slab spatial light steel frame are formed by welding the welded mesh reinforcement and the plurality of trellis profile steels each having a plurality of stretching holes respectively, such that the trellis profile steels may be simple to process, materials may be saved, and the cost, investments on production apparatuses, the time and the effort may be reduced. Moreover, the formworks may be removed to be reused, thus further reducing the cost.

[0013] Additional aspects and advantages of embodiments of present disclosure will be given in part in the following descriptions, become apparent in part from the following descriptions, or be learned from the practice of the embodiments of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] These and other aspects and advantages of embodiments of the present disclosure will become apparent and more readily appreciated from the following descriptions made with reference to the accompanying drawings, in which:

Fig. 1 is a schematic plan view of a wall spatial light steel frame of a spatial light steel frame concrete building according to an embodiment of the present disclosure;

Fig. 2 is a sectional view of the spatial light steel frame concrete building along a line A-A in Fig. 1;

Fig. 3 is a perspective view of a building unit spatial light steel frame formed by a wall spatial light steel frame and a floor slab spatial light steel frame according to an embodiment of the present disclosure;

Fig. 4 is a schematic view of a trellis profile steel having a plurality of stretching holes in a wall spatial light steel frame and a floor slab spatial light steel frame according to an embodiment of the present disclosure;

Fig. 5 is a schematic view of a welded mesh reinforcement in a wall spatial light steel frame and a floor slab spatial light steel frame according to an embodiment of the present disclosure;

Fig. 6 is a schematic perspective view of an insulation board of a spatial light steel frame concrete building according to an embodiment of the present disclosure; and

Fig. 7 is a flow chart of a method for constructing a spatial light steel frame concrete building according to an embodiment of the present disclosure.

DETAILED DESCRIPTION

[0015] Reference will be made in detail to embodiments of the present disclosure. The embodiments described herein with reference to drawings are explanatory, illustrative, and used to generally understand the present disclosure. The embodiments shall not be construed to limit the present disclosure. The same or similar elements and the elements having same or similar functions are denoted by like reference numerals throughout the descriptions.

[0016] In the specification, unless specified or limited otherwise, relative terms such as "central", "longitudinal", "lateral", "front", "rear", "right", "left", "inner", "outer", "lower", "upper", "horizontal", "vertical", "above", "below", "up", "top", "bottom" as well as derivative thereof (e.g., "horizontally", "downwardly", "upwardly", etc.) should be construed to refer to the orientation as then described or as shown in the drawings under discussion. These relative terms are for convenience of description and do not require that the present disclosure be constructed or operated in a particular orientation.

[0017] Terms concerning attachments, coupling and the like, such as "connected" and "interconnected", refer to a relationship in which structures are secured or attached to one another either directly or indirectly through intervening structures, as well as both movable or rigid attachments or relationships, unless expressly described otherwise.

[0018] The spatial light steel frame concrete building according to an embodiment of the present disclosure

will be described below with reference to the drawings.

[0019] As shown in Figs. 1-5, the spatial light steel frame concrete building according to an embodiment of the present disclosure comprises a wall spatial light steel frame 1, a floor slab spatial light steel frame 2 and concrete.

[0020] As shown in Fig. 3, the floor slab spatial light steel frame 2 is connected to the wall spatial light steel frame 1 to form a building unit spatial light steel frame. The concrete is poured in the building unit spatial light steel frame. It should be appreciated that removable formworks 3 are mounted onto the building unit spatial light steel frame before the concrete is poured, and the formworks 3 are selectively removed after the concrete is solidified, thus reusing the formworks 3.

[0021] It would be appreciated that the fact that "the formworks 3 are selectively removed after the concrete is solidified" means that whether the formworks 3 are removed may depend on requirements. For example, in one embodiment, the formwork 3 at an outer side of the wall spatial light steel frame 1 forming an outer wall of the spatial light steel frame concrete building may not be removed, but may be permanently reserved, and consequently an insulation board 8 may be attached to the formwork 3 at the outer side of the wall spatial light steel frame 1 forming the outer wall of the spatial light steel frame concrete building. That is, an insulation layer is disposed on the outer wall of the spatial light steel frame concrete building, thus enhancing the thermal insulation performance of the building. However, the formworks 3 under the floor slab spatial light steel frame 2 and the formworks 3 on the wall spatial light steel frame 1 which do not form the outer wall of the spatial light steel frame concrete building may be removed. Certainly, in another embodiment, all the formworks 3 may be removed.

[0022] Each of the wall spatial light steel frame 1 and the floor slab spatial light steel frame 2 comprises a welded mesh reinforcement 4 and a plurality of trellis profile steels 11, the plurality of trellis profile steels 11 are spaced apart from each other and each has a plurality of stretching holes 113, and the welded mesh reinforcement 4 is welded to the trellis profile steels 11 so as to connect the plurality of trellis profile steels 11 together.

[0023] Each trellis profile steel 11 comprises two wing edges 111 parallel to each other and a plurality of web members 112 connected between the two wing edges 111, the two wing edges 111 and the plurality of web members 112 are integrally formed, the plurality of stretching holes 113 are defined by the plurality of web members 112 between the two wing edges 111, and the plurality of web members 112 and the plurality of stretching holes 113 are formed by stretching the two wing edges 111.

[0024] With the spatial light steel frame concrete building according to an embodiment of the present disclosure, the wall spatial light steel frame 1 and the floor slab spatial light steel frame 2 are formed by welding the welded mesh reinforcement 4 and the plurality of trellis profile steels 11 together respectively, and the plurality of web members 112 and the plurality of stretching holes 113 are formed by stretching the two wing edges 111, such that the trellis profile steels 11 may be simple to manufacture, materials may be saved, and investments on production apparatuses, the labor cost and the construction cost may be reduced.

[0025] The spatial light steel frame concrete building is a multistorey building, as shown in Fig. 2. As an example, an eight-storey building is shown. Each storey of the spatial light steel frame concrete building is formed by one storey of integral building unit, and each integral building unit is formed by horizontally arranging one or more building units. For example, in the embodiment shown in Figs. 1-2, one integral building unit is formed by 10 building units.

[0026] Each building unit is formed by pouring the concrete in one building unit spatial light steel frame formed by one wall spatial light steel frame 1 and one floor slab spatial light steel frame 2, and a plurality of integral building units are sequentially stacked upwardly to form the multistorey spatial light steel frame concrete building, in which the wall spatial light steel frame 1 of an upper storey of integral building unit is fixed on the wall spatial light steel frame 1 of a lower storey of integral building unit adjacent thereto. For example, the wall spatial light steel frame 1 of the upper storey of integral building unit may be connected to the wall spatial light steel frame 1 of the lower storey of integral building unit adjacent thereto by a connection member. A lower end of the wall spatial light steel frame 1 of a bottom storey of integral building unit is fixed on a foundation 13. An upper end of the wall spatial light steel frame 1 of a top storey of integral building unit is connected to the floor slab spatial light steel frame 2 as a roof.

[0027] In some embodiments, the floor slab spatial light steel frame 2 may be connected to the wall spatial light steel frame 1 by welding to form the building unit spatial light steel frame. Alternatively, the floor slab spatial light steel frame 2 may be connected to the wall spatial light steel frame 1 by a connection member.

[0028] In an alternative embodiment, as mentioned above, the formwork 3 may be permanently disposed onto the outer side of the wall spatial light steel frame 1 forming the outer wall of the spatial light steel frame concrete building. In other words, after the concrete is solidified, the formwork 3 at the outer side of the wall spatial light steel frame 1 forming the outer wall of the spatial light steel frame concrete building may not be removed, and the insulation board 8 may be attached to the formwork 3, thus enhancing the thermal insulation effect of the building.

[0029] According to the invention , as shown in Fig. 4, each trellis profile steel 11 in the wall spatial light steel frame 1 and the floor slab spatial light steel frame 2 is formed by using one steel sheet, forming a plurality of slits extended between the two wing edges 111 in a longitudinal direction (i.e., a left and right direction in Fig. 4)

of the two wing edges 111 and then stretching the two wing edges 111 in a transversal direction (i.e., an up and down direction in Fig. 4) of the two wing edges 111, such that the plurality of web members 112 and the plurality of stretching holes 113 defined by the plurality of web members 112 are formed between the two wing edges 111. Therefore, the trellis profile steels 11 may be very simple to process, materials may be saved, and the time and the effort may be reduced.

[0030] It would be appreciated that the structure of the wall spatial light steel frame 1 is substantially the same as the structure of the floor slab spatial light steel frame 2, except that: before the concrete is poured, removable formworks 3 are mounted onto two sides of the wall spatial light steel frame 1, while removable formworks 3 are merely mounted onto a bottom surface of the floor slab spatial light steel frame 2.

[0031] In some embodiments, a window and a door of the building may be designed according to practical requirements. For this reason, a door opening and a window opening are reserved in portions of the wall spatial light steel frame 1 respectively so as to form the window and the door of the building respectively. A plurality of edge members 6 are disposed at two sides of the door opening and the window opening which are reserved in portions of the wall spatial light steel frame 1 in a horizontal direction respectively. Each edge member 6 comprises longitudinal reinforcing steel bars and horizontal stirrups or comprises vertical reinforcing steel bars, vertical profile steels and horizontal stirrups. In addition, a plurality of connection beams 7 are disposed above the door opening and the window opening. Each connection beam 7 comprises horizontal reinforcing steel bars and vertical stirrups. A stairwell opening may be previously formed in the floor slab spatial light steel frame 2 according to design requirements.

[0032] As shown in Fig. 5, the welded mesh reinforcement 4 may be formed by welding reinforcing steel bars 41 arranged horizontally and reinforcing steel bars 41 arranged vertically. The welded mesh reinforcement 4 is welded to the plurality of trellis profile steels 11, which are spaced apart from each other and each having a plurality of stretching holes 113, to form the wall spatial light steel frame 1 and the floor slab spatial light steel frame 2 respectively.

[0033] In some embodiments, the insulation board 8 disposed on the outer wall of the spatial light steel frame concrete building may be a composite insulation board. As shown in Fig. 6, the insulation board 8 comprises a polybenzene or rockwool insulation layer 801, an anti-crack mortar or board protection layer 802 and a decoration surface layer 803 from inside to outside.

[0034] The method for constructing the spatial light steel frame concrete building according to the invention will be described below with reference to Fig. 7. The method for constructing the spatial light steel frame concrete building according to the invention comprises steps of:

(1) connecting a plurality of trellis profile steels 11 which are spaced apart from each other and each having a plurality of stretching holes 113 together by a welded mesh reinforcement 4 to form a wall spatial light steel frame 1 and a floor slab spatial light steel frame 2 respectively, in which each trellis profile steel 11 comprises two wing edges 111 parallel to each other and a plurality of web members 112 connected between the two wing edges 111, the two wing edges 111 and the plurality of web members 112 are integrally formed, the plurality of stretching holes 113 are defined by the plurality of web members 112 between the two wing edges 111, and the plurality of web members 112 and the plurality of stretching holes 113 are formed by stretching the two wing edges 111;

(2) fixing a lower end of the wall spatial light steel frame 1 on a foundation 13, and connecting the wall spatial light steel frame 1 and the floor slab spatial light steel frame 2 together to form a building unit spatial light steel frame;

(3) mounting removable formworks 3 onto the building unit spatial light steel frame to form a concrete pouring chamber in the building unit spatial light steel frame; and

(4) pouring concrete in the concrete pouring chamber and selectively removing the formworks 3 to form an integral building unit, in which each storey of the spatial light steel frame concrete building is formed by one storey of integral building unit.

[0035] According to the invention, the steps (1) to (4) are repeated to form multiple storeys of the integral building units, in which a lower end of the wall spatial light steel frame 1 of an upper storey of integral building unit is fixed on the wall spatial light steel frame 1 of a lower storey of integral building unit adjacent thereto, for example, by a steel connection member, so as to form a multistory spatial light steel frame concrete building. Each integral building unit may be formed by horizontally arranging one or more building units, each building unit is formed by pouring the concrete in one building unit spatial light steel frame formed by one wall spatial light steel frame 1 and one floor slab spatial light steel frame 2, and a plurality of integral building units are sequentially stacked upwardly to form the multistorey spatial light steel frame concrete building. The floor slab spatial light steel frame 2 may be connected to the wall spatial light steel frame 1 by welding or by a connection member.

[0036] As mentioned above, each trellis profile steel 11 is formed by forming a plurality of slits extended between the two wing edges 111 in a longitudinal direction of the two wing edges 111 and then stretching the two wing edges 111 in a transversal direction of the two wing edges 111.

[0037] In one embodiment, the method for constructing the spatial light steel frame concrete building further comprises: disposing an insulation board 8 on an outer wall

of the spatial light steel frame concrete building, in which the formwork 3 at an outer side of the wall spatial light steel frame 1 forming the outer wall of the spatial light steel frame concrete building is permanently reserved, and the insulation board 8 is attached to the formwork 3 at the outer side of the wall spatial light steel frame 1 forming the outer wall of the spatial light steel frame concrete building.

[0038] With the method for constructing the spatial light steel frame concrete building according to an embodiment of the present disclosure, the trellis profile steels 11 forming the wall spatial light steel frame 1 and the floor slab spatial light steel frame 2 may be simple to process, materials may be saved, and the cost, investments on production apparatuses, the time and the effort may be reduced. Moreover, the formworks 3 may be removed to be reused, thus further reducing the cost.

[0039] Reference throughout this specification to "an embodiment," "some embodiments," "one embodiment", "another example," "an example," "a specific example," or "some examples," means that a particular feature, structure, material, or characteristic described in connection with the embodiment or example is included in at least one embodiment or example of the present disclosure. Thus, the appearances of the phrases such as "in some embodiments," "in one embodiment", "in an embodiment", "in another example," "in an example," "in a specific example," or "in some examples," in various places throughout this specification are not necessarily referring to the same embodiment or example of the present disclosure.

[0040] Although explanatory embodiments have been shown and described, it would be appreciated by those skilled in the art that the above embodiments can not be construed to limit the present disclosure, and changes, alternatives, and modifications can be made in the embodiments without departing from the scope of the present set of claims.

Claims

1. A spatial light steel frame concrete building, comprising:

   a wall spatial light steel frame (1);
   a floor slab spatial light steel frame (2) connected to the wall spatial light steel frame (1) to form a building unit spatial light steel frame; and
   concrete poured in the building unit spatial light steel frame,

   wherein
   each of the wall spatial light steel frame (1) and the floor slab spatial light steel frame (2) comprises a welded mesh reinforcement (4) and a plurality of trellis profile steels (11), the plurality of trellis profile steels (11) are spaced apart from each other and each has a plurality of stretching holes (113);
   the spatial light steel frame concrete building is a multistorey building, each storey of the spatial light steel frame concrete building is formed by one storey of integral building unit, each integral building unit is formed by horizontally arranging one or more building units, each building unit is formed by pouring the concrete in one building unit spatial light steel frame, and a plurality of integral building units are sequentially stacked upwardly to form the multistorey spatial light steel frame concrete building, in which the wall spatial light steel frame (1) of an upper storey of integral building unit is fixed on the wall spatial light steel frame (1) of a lower storey of integral building unit adjacent thereto;
   where the welded mesh reinforcement (4) is connected to the trellis profile steels (11) so as to connect the plurality of trellis profile steels (11) together, each trellis profile steel (11) comprises two wing edges (111) parallel to each other and a plurality of web members (112) connected between the two wing edges (111), the two wing edges (111) and the plurality of web members (112) are integrally formed, the plurality of stretching holes (113) are defined by the plurality of web members (112) between the two wing edges (111);
   characterized in that the welded mesh reinforcement (4) is connected by welding to the trellis profile steels (11) so as to connect the plurality of trellis profile steels (11) together; and the plurality of web members (112) and the plurality of stretching holes (113) are formed by stretching the two wing edges (111); and
   each trellis profile steels (11) is formed by forming a plurality of slits extended between the two wing edges (111) in a longitudinal direction of the two wing edges (111) and then stretching the two wing edges (111) in a transversal direction of the two wing edges (111).

2. The spatial light steel frame concrete building according to claim 1, wherein the floor slab spatial light steel frame (2) is connected to the wall spatial light steel frame (1) by welding or by a connection member.

3. The spatial light steel frame concrete building according to claim 1, wherein a formwork (3) is permanently disposed onto an outer side of the wall spatial light steel frame (1) forming an outer wall of the spatial light steel frame concrete building, and an insulation board (8) is attached to the formwork (3).

4. The spatial light steel frame concrete building according to claim 1, further comprising:

   a plurality of edge member (6) disposed at two sides of a door opening and a window opening

which are reserved in portions of the wall spatial light steel frame (1) in a horizontal direction respectively; and
a plurality of connection beams (7) disposed above the door opening and the window opening,

wherein each edge member (6) comprises longitudinal reinforcing steel bars (41) and horizontal stirrups or comprises vertical reinforcing steel bars (41), vertical profile steels (11) and horizontal stirrups; and each connection beams (7) comprises horizontal reinforcing steel bars (41) and vertical stirrups.

5. A method for constructing a spatial light steel frame concrete building, comprising steps of:

(1) connecting by welding each of a plurality of trellis profile steels (11) which are spaced apart from each other and each having a plurality of stretching holes (113) together by a welded mesh reinforcement (4) to form a wall spatial light steel frame (1) and a floor slab spatial light steel frame (2) respectively, in which each trellis profile steels (11) comprises two wing edges (111) parallel to each other and a plurality of web members (112) connected between the two wing edges (111), the two wing edges (111) and the plurality of web members (112) are integrally formed, the plurality of stretching holes (113) are defined by the plurality of web members (112)s between the two wing edges (111), and the plurality of web members (112) and the plurality of stretching holes (113) are formed by stretching the two wing edges (111);
(2) fixing a lower end of the wall spatial light steel frame (1) on a foundation, and connecting the wall spatial light steel frame (1) and the floor slab spatial light steel frame (2) together to form a building unit spatial light steel frame;
(3) mounting removable formwork (3) onto the building unit spatial light steel frame to form a concrete pouring chamber in the building unit spatial light steel frame; and
(4) pouring concrete in the concrete pouring chamber and selectively removing the formwork (3) to form an integral building unit;

wherein each trellis profile steels (11) is formed by forming a plurality of slits extended between the two wing edges (111) in a longitudinal direction of the two wing edges (111) and then stretching the two wing edges (111) in a transversal direction of the two wing edges (111); and
the method further comprises:

repeating steps (1) to (4) to form multiple storeys of the integral building units so as to form a multistory spatial light steel frame concrete building, wherein each storey of the spatial light steel frame concrete building is formed by one storey of integral building unit, each integral building unit is formed by horizontally arranging one or more building units, each building unit is formed by pouring the concrete in one building unit spatial light steel frame, and a plurality of integral building units are sequentially stacked upwardly to form the multistorey spatial light steel frame concrete building, in which the wall spatial light steel frame (1) of an upper storey of integral building unit is fixed on the wall spatial light steel frame (1) of a lower storey of integral building unit adjacent thereto.

6. The method according to claim 5, wherein the floor slab spatial light steel frame (2) is connected to the wall spatial light steel frame (1) by welding or by a connection member.

7. The method according to claim 5, wherein the wall spatial light steel frame (1) of the upper storey of integral building unit and the wall spatial light steel frame (1) of the lower storey of integral building unit adjacent thereto are connected together by a steel connection member.

8. The method according to claim 5, wherein the formwork (3) at an outer side of the wall spatial light steel frame (1) forming an outer wall of the spatial light steel frame concrete building is permanently reserved, and an insulation board (8) is attached to the formwork (3) at the outer side of the wall spatial light steel frame (1) forming the outer wall of the spatial light steel frame concrete building.

Patentansprüche

1. Leichtes Raumtragstahlskelett-Betongebäude, das enthält:

ein leichtes Wand-Raumtragstahlskelett (1);
ein leichtes Bodenplatten-Raumtragstahlskelett (2), das mit dem leichten Wand-Raumtragstahlskelett (1) verbunden ist, um ein leichtes Gebäudeeinheit-Raumtragstahlskelett zu bilden; und
Beton, der in das leichte Gebäudeeinheit-Raumtragstahlskelett gegossen ist,

wobei sowohl das leichte Wand-Raumtragstahlskelett (1) als auch das leichte Bodenplatten-Raumtragstahlskelett (2) eine verschweißte Maschenverstärkung (4) und mehrere Gitterprofilstähle (11) enthält, wobei die mehreren Gitterprofilstähle (11) voneinander beabstandet sind und jeweils mehrere Deh-

nungslöcher (113) besitzen;
wobei das leichte Raumtragstahlskelett-Betongebäude ein mehrstöckiges Gebäude ist, wobei jedes Stockwerk des leichten Raumtragstahlskelett-Betongebäudes durch ein Stockwerk einer einteiligen Gebäudeeinheit gebildet ist, wobei jede einteilige Gebäudeeinheit durch horizontales Anordnen einer oder mehrerer Gebäudeeinheiten gebildet ist, wobei jede Gebäudeeinheit durch Gießen des Betons in ein leichtes Gebäudeeinheit-Raumtragstahlskelett gebildet ist und mehrere einteilige Gebäudeeinheiten nacheinander in Aufwärtsrichtung gestapelt werden, um das mehrstöckige leichte Raumtragstahlskelett-Betongebäude zu bilden, indem das leichte Wand-Raumtragstahlskelett (1) eines oberen Stockwerks der einteiligen Gebäudeeinheit an dem leichten Wand-Raumtragstahlskelett (1) eines hierzu benachbarten unteren Stockwerks einer einteiligen Gebäudeeinheit befestigt ist;
wobei die verschweißte Maschenverstärkung (4) mit den Gitterprofilstählen (11) verbunden ist, um die mehreren Gitterprofilstähle (11) miteinander zu verbinden, wobei jeder Gitterprofilstahl (11) in zwei zueinander parallele Flankenkanten (111) und mehrere Bahnelemente (112), die zwischen den zwei Flankenkanten (111) verbunden sind, enthält, wobei die zwei Flankenkanten (111) und die mehreren Bahnelemente (112) einteilig ausgebildet sind und wobei die mehreren Dehnungslöcher (113) durch die mehreren Bahnelemente (112) zwischen den zwei Flankenkanten (111) definiert sind; **dadurch gekennzeichnet, dass** die verschweißte Maschenverstärkung (4) durch Schweißen an die Gitterprofilstähle (11) verbunden ist, um die mehreren Gitterprofilstähle (11) miteinander zu verbinden; und die mehreren Bahnelemente (112) und die mehreren Dehnungslöcher (113) durch Dehnen der zwei Flankenkanten (111) gebildet sind; und
jeder der Gitterprofilstähle (11) durch Bilden mehrerer Schlitze, die sich zwischen den zwei Flankenkanten (111) in einer Längsrichtung der zwei Flankenkanten (111) und dann durch Dehnen der zwei Flankenkanten (111) in einer Querrichtung der zwei Flankenkanten (111) gebildet sind.

2. Leichtes Raumtragstahlskelett-Betongebäude nach Anspruch 1, wobei das leichte Bodenplatten-Raumtragstahlskelett (2) mit dem leichten Wand-Raumtragstahlskelett (1) durch Verschweißen oder durch ein Verbindungselement verbunden ist.

3. Leichtes Raumtragstahlskelett-Betongebäude nach Anspruch 1, wobei an einer Außenseite des leichten Wand-Raumtragstahlskeletts (1) eine Verschalung (3) dauerhaft angeordnet ist und eine Außenwand des leichten Raumtragstahlskelett-Betongebäudes bildet und eine Isolierplatte (8) an der Verschalung (3) befestigt ist.

4. Leichtes Raumtragstahlskelett-Betongebäude nach Anspruch 1, das ferner Folgendes enthält:

mehrere Kantenelemente (6), die auf zwei Seiten einer Türöffnung und einer Fensteröffnung, die in Abschnitten des leichten Wand-Raumtragstahlskeletts (1) ausgespart sind, jeweils in einer horizontalen Richtung angeordnet sind; und
mehrere Verbindungsträger (7), die über der Türöffnung und der Fensteröffnung angeordnet sind,

wobei jedes Kantenelement (6) longitudinale Verstärkungsstahlstäbe (41) und horizontale Bügel enthält oder vertikale Verstärkungsstahlstäbe (41), vertikale Profilstähle (11) und horizontale Bügel enthält; und jeder Verbindungsträger (7) horizontale Verstärkungsstahlstäbe (41) und vertikale Bügel enthält.

5. Verfahren zum Konstruieren eines leichten Raumtragstahlskelett-Betongebäudes, das die folgenden Schritte umfasst:

(1) Verbinden durch Verschweißen jedes von mehreren Gitterprofilstählen (11), die voneinander beabstandet sind und jeweils mehrere Dehnungslöcher (113) besitzen, durch eine verschweißte Maschenverstärkung (4), um ein leichtes Wand-Raumtragstahlskelett (1) bzw. ein leichtes Bodenplatten-Raumtragstahlskelett zu bilden, in denen jeder Gitterprofilstahl (11) zwei zueinander parallele Flankenkanten (111) und mehrere Bahnelemente (112), die zwischen den zwei Flankenkanten (111) verbunden sind, aufweist, wobei die zwei Flankenkanten (111) und die mehreren Bahnelemente (112) einteilig ausgebildet sind, wobei die mehreren Dehnungslöcher (113) durch die mehreren Bahnelemente (112) zwischen den zwei Flankenkanten (111) definiert sind und die mehreren Bahnelemente (112) und die mehreren Dehnungslöcher (113) durch Dehnen der zwei Flankenkanten (111) gebildet sind;
(2) Befestigen eines unteren Endes des leichten Wand-Raumtragstahlskeletts auf einem Fundament und Verbinden des leichten Wand-Raumtragstahlskeletts (1) und des leichten Bodenplatten-Raumtragstahlskeletts (2) miteinander, um ein leichtes Gebäudeeinheit-Raumtragstahlskelett zu bilden;
(3) Montieren einer entfernbaren Verschalung (3) auf dem leichten Gebäudeeinheit-Raumtragstahlskelett, um eine Betongießkammer in dem leichten Gebäudeeinheit-Raumtragstahlskelett zu bilden; und
(4) Gießen von Beton in die Betongießkammer und wahlweises Entfernen der Verschalung (3),

um eine einteilige Gebäudeeinheit zu bilden;

wobei jeder Gitterprofilstahl (11) durch Bilden mehrerer Schlitze, die sich zwischen den zwei Flankenkanten (111) in einer Längsrichtung der zwei Flankenkanten (111) erstrecken, und dann durch Dehnen der zwei Flankenkanten (111) in einer Querrichtung der zwei Flankenkanten (111) gebildet wird; und
wobei das Verfahren ferner Folgendes umfasst:

Wiederholen der Schritte (1) bis (4), um mehrere Stockwerke der einteiligen Gebäudeeinheiten zu bilden, um so ein mehrstöckiges leichtes Raumtragstahlskelett-Betongebäude zu bilden, wobei jedes Stockwerk des leichten Raumtragstahlskelett-Betongebäudes durch ein Stockwerk einer einteiligen Gebäudeeinheit gebildet wird, jede einteilige Gebäudeeinheit durch horizontales Anordnen einer oder mehrerer Gebäudeeinheiten gebildet wird, jede Gebäudeeinheit durch Gießen des Betons in ein leichtes Gebäudeeinheit-Raumtragstahlskelett gebildet wird und mehrere einteilige Gebäudeeinheiten nacheinander in Aufwärtsrichtung gestapelt werden, um das mehrstöckige leichte Raumtragstahlskelett-Betongebäude zu bilden, indem das leichte Wand-Raumtragstahlskelett eines oberen Stockwerks der einteiligen Gebäudeeinheit an dem leichten Wand-Raumtragstahlskelett (1) eines hierzu benachbarten unteren Stockwerks der einteiligen Gebäudeeinheit befestigt wird.

6. Verfahren nach Anspruch 5, wobei das leichte Bodenplatten-Raumtragstahlskelett mit dem leichten Wand-Raumtragstahlskelett (1) durch Verschweißen oder durch ein Verbindungselement verbunden wird.

7. Verfahren nach Anspruch 5, wobei das leichte Wand-Raumtragstahlskelett (1) des oberen Stockwerks der einteiligen Gebäudeeinheit und das leichte Wand-Raumtragstahlskelett (1) des hierzu benachbarten unteren Stockwerks der einteiligen Gebäudeeinheit durch ein Stahlverbindungselement miteinander verbunden werden.

8. Verfahren nach Anspruch 5, wobei die Verschalung (3) an einer Außenseite des leichten Wand-Raumtragstahlskeletts (1), die eine Außenwand des leichten Raumtragstahlskelett-Betongebäudes bildet, dauerhaft bestehen bleibt und eine Isolierplatte (8) an der Verschalung (3) an der Außenseite des leichten Wand-Raumtragstahlskeletts (1) befestigt ist und die Außenwand des leichten Raumtragstahlskelett-Betongebäudes bildet.

Revendications

1. Bâtiment en béton à charpente spatiale légère en acier, comportant :

une charpente de paroi spatiale légère en acier (1) ;
une charpente de dalle de plancher spatiale légère en acier (2) reliée à la charpente de paroi spatiale légère en acier (1) pour former une charpente d'unité de construction spatiale légère en acier ; et
du béton coulé dans la charpente d'unité de construction spatiale légère en acier,

dans laquelle
chaque charpente parmi la charpente de paroi spatiale légère en acier (1) et la charpente de dalle de plancher spatiale légère en acier (2) comporte une armature en treillis soudé (4) et une pluralité de treillis en acier profilé (11), les treillis de la pluralité de treillis en acier profilé (11) sont espacés les uns des autres et ont chacun une pluralité de trous d'étirage (113) ;
le bâtiment en béton à charpente spatiale légère en acier est un bâtiment à étages multiples, chaque étage du bâtiment en béton à charpente spatiale légère en acier est formé par un étage d'une unité de construction monobloc,
chaque unité de construction monobloc est formée en agençant horizontalement une ou plusieurs unités de construction, chaque unité de construction est formée en coulant le béton dans une charpente d'unité de construction spatiale légère en acier, et une pluralité d'unités de construction monoblocs sont empilées séquentiellement vers le haut pour former le bâtiment à étages multiples en béton à charpente spatiale légère en acier, dans lequel la charpente de paroi spatiale légère en acier (1) d'un étage supérieur d'une unité de construction monobloc est fixée sur la charpente de paroi spatiale légère en acier (1) d'un étage inférieur d'une unité de construction monobloc adjacente à celui-ci ; où l'armature en treillis soudé (4) est reliée aux treillis en acier profilé (11) de manière à relier ensemble la pluralité de treillis en acier profilé (11), chaque treillis en acier profilé (11) comporte deux bords d'aile (111) parallèles l'un à l'autre et une pluralité d'éléments d'âme (112) reliés entre les deux bords d'aile (111), les deux bords d'aile (111) et la pluralité d'éléments d'âme (112) sont formés d'un seul tenant, les trous de la pluralité de trous d'étirage (113) sont définis par la pluralité d'éléments d'âme (112) entre les deux bords d'aile (111) ; **caractérisé en ce que** l'armature en treillis soudé (4) est reliée par soudage aux treillis en acier profilé (11) de manière à relier ensemble la pluralité de treillis en acier profilé (11) ;
la pluralité d'éléments d'âme (112) et la pluralité de trous d'étirage (113) sont formés en étirant les deux

bords d'aile (111) ; et
chaque treillis en acier profilé (11) est formé en formant une pluralité de fentes s'étendant entre les deux bords d'aile (111) dans une direction longitudinale des deux bords d'aile (111) et en étirant ensuite les deux bords d'aile (111) dans une direction transversale des deux bords d'aile (111).

2. Bâtiment en béton à charpente spatiale légère en acier selon la revendication 1, dans lequel la charpente de dalle de plancher spatiale légère en acier (2) est reliée à la charpente de paroi spatiale légère en acier (1) par soudage ou par un élément de liaison.

3. Bâtiment en béton à charpente spatiale légère en acier selon la revendication 1, dans lequel un coffrage (3) est disposé de manière permanente sur un côté extérieur de la charpente de paroi spatiale légère en acier (1) formant une paroi extérieure du bâtiment en béton à charpente spatiale légère en acier, et un panneau isolant (8) est fixé au coffrage (3).

4. Bâtiment en béton à charpente spatiale légère en acier selon la revendication 1, comportant en outre :

une pluralité d'éléments de bord (6) disposés sur deux côtés d'une ouverture de porte et d'une ouverture de fenêtre qui sont respectivement réservées dans des parties de la charpente de paroi spatiale légère en acier (1) dans une direction horizontale ; et
une pluralité de poutres de liaison (7) disposées au-dessus de l'ouverture de porte et de l'ouverture de fenêtre,

dans lequel chaque élément de bord (6) comporte des barres de renfort longitudinales en acier (41) et des étriers horizontaux ou comporte des barres de renfort verticales en acier (41), des treillis en acier profilé (11) et des étriers horizontaux ; et chaque poutre de liaison (7) comporte des barres de renfort horizontales en acier (41) et des étriers verticaux.

5. Procédé de construction d'un bâtiment en béton à charpente spatiale légère en acier comportant les étapes consistant à :

(1) relier ensemble par soudage chaque treillis d'une pluralité de treillis en acier profilé (11) qui sont espacés les uns des autres et ayant chacun une pluralité de trous d'étirage (113) par une armature en treillis soudé (4) pour former respectivement une charpente de paroi spatiale légère en acier (1) et une charpente de dalle de plancher spatiale légère en acier (2), dans lequel chaque treillis en acier profilé (11) comporte deux bords d'aile (111) parallèles l'un à l'autre et une pluralité d'éléments d'âme (112) reliés entre les deux bords d'aile (111), les deux bords d'aile (111) et la pluralité d'éléments d'âme (112) sont formés d'un seul tenant, la pluralité de trous d'étirage (113) est définie par la pluralité d'éléments d'âme (112) entre les deux bords d'aile (111), et la pluralité d'éléments d'âme (112) et la pluralité de trous d'étirage (113) sont formés en étirant les deux bords d'aile (111) ;
(2) fixer une extrémité inférieure de la charpente de paroi spatiale légère en acier (1) sur une fondation, et relier ensemble la charpente de paroi spatiale légère en acier (1) et la charpente de dalle de plancher spatiale légère en acier (2) pour former une charpente d'unité de construction spatiale légère en acier ;
(3) monter un coffrage amovible (3) sur la charpente d'unité de construction spatiale légère en acier pour former une chambre de coulée de béton dans la charpente d'unité de construction spatiale légère en acier ; et
(4) couler du béton dans la chambre de coulée de béton et retirer sélectivement le coffrage (3) pour former une unité de construction monobloc ;

dans lequel chaque treillis en acier profilé (11) est formé en formant une pluralité de fentes s'étendant entre les deux bords d'aile (111) dans une direction longitudinale des deux bords d'aile (111) et en étirant ensuite les deux bords d'aile (111) dans une direction transversale des deux bords d'aile (111) ; et
le procédé comporte en outre :

la répétition des étapes (1) à (4) pour former de multiples étages des unités de construction monoblocs de manière à former un bâtiment à étages multiples en béton à charpente spatiale légère en acier, dans lequel chaque étage du bâtiment en béton à charpente spatiale légère en acier est formé par un étage de l'unité de construction monobloc, chaque unité de construction monobloc est formée en agençant horizontalement une ou plusieurs unités de construction, chaque unité de construction est formée en coulant le béton dans une charpente d'unité de construction spatiale légère en acier, et une pluralité d'unités de construction monoblocs sont empilées séquentiellement vers le haut pour former le bâtiment à étages multiples en béton à charpente spatiale légère en acier, dans lequel la charpente de paroi spatiale légère en acier (1) d'un étage supérieur de l'unité de construction monobloc est fixée sur la charpente de paroi spatiale légère en acier (1) d'un étage inférieur d'une unité de construction monobloc adjacente à celui-ci.

6. Procédé selon la revendication 5, dans lequel la charpente de dalle de plancher spatiale légère en acier (1) est reliée à la charpente de paroi spatiale légère en acier (1) par soudage ou par un élément de liaison.

7. Procédé selon la revendication 5, dans lequel la charpente de paroi spatiale légère en acier (1) de l'étage supérieur de l'unité de construction monobloc et la charpente de paroi spatiale légère en acier (1) de l'étage inférieur de l'unité de construction monobloc adjacente à celui-ci sont reliées ensemble par un élément de liaison en acier.

8. Procédé selon la revendication 5, dans lequel le coffrage (3) sur un côté extérieur de la charpente de paroi spatiale légère en acier (1) formant une paroi extérieure du bâtiment en béton à charpente spatiale légère en acier est réservé de manière permanente, et un panneau isolant (8) est fixé au coffrage (3) sur le côté extérieur de la charpente de paroi spatiale légère en acier (1) formant la paroi extérieure du bâtiment en béton à charpente spatiale légère en acier.

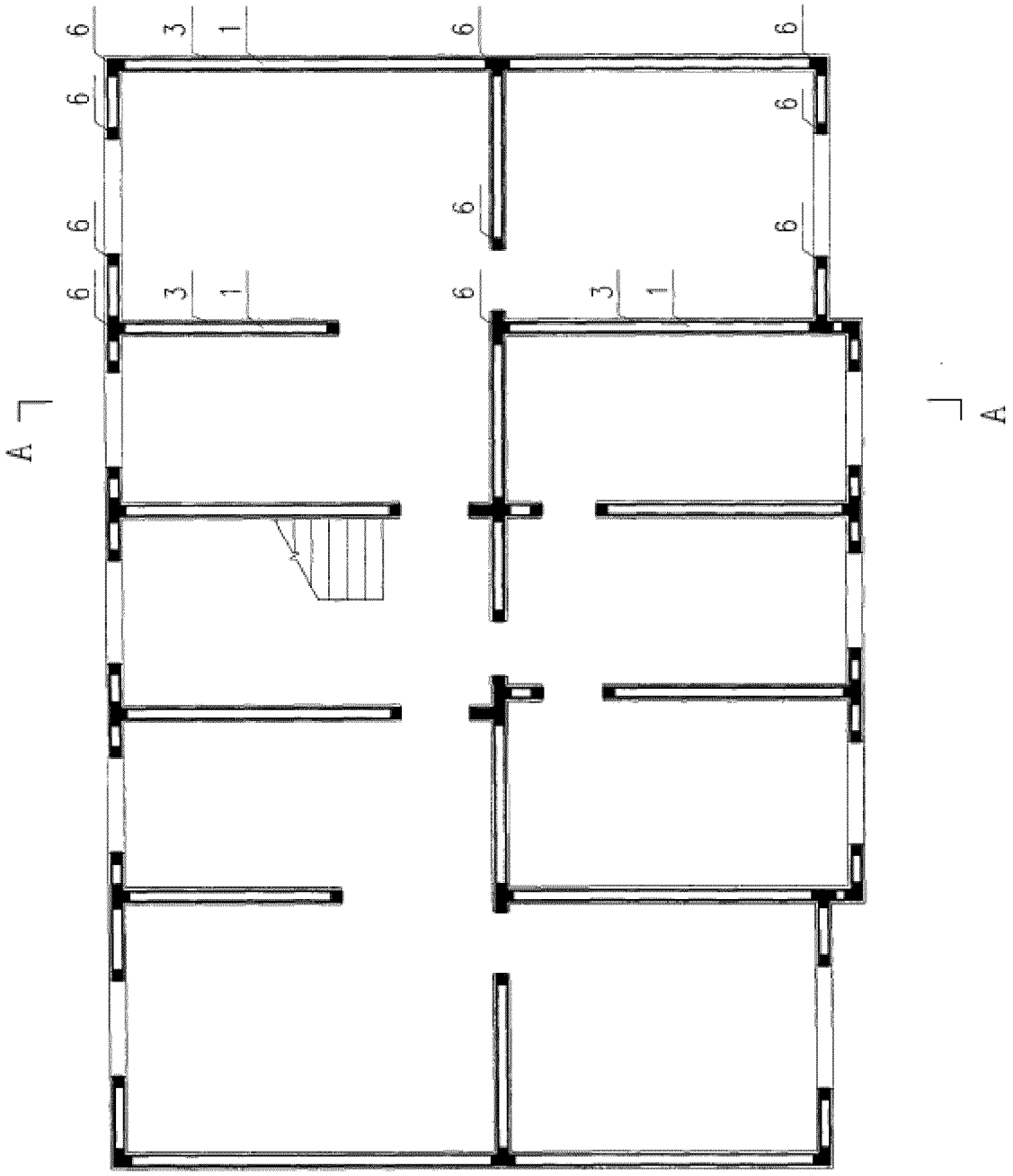


Fig. 1

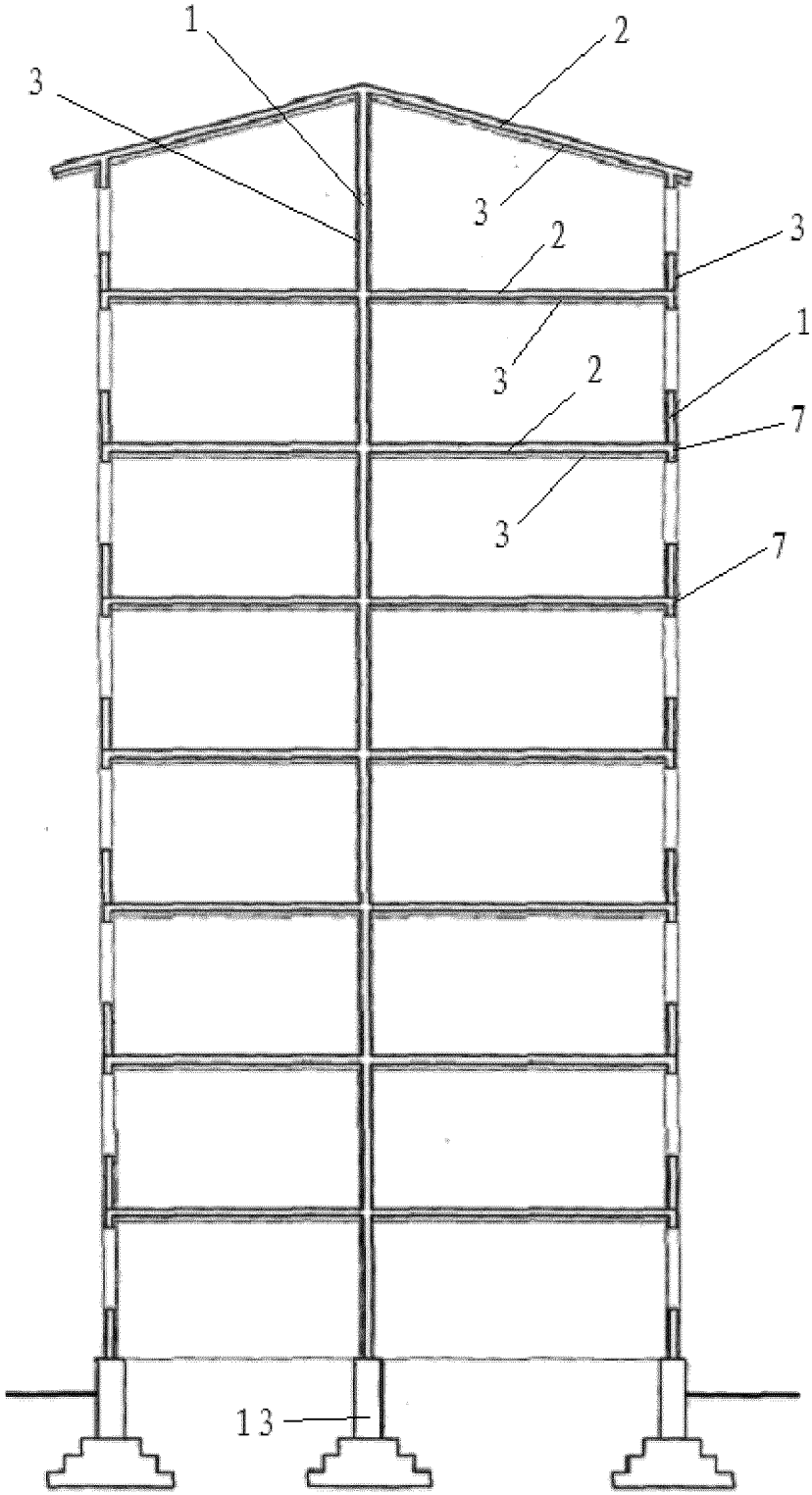


Fig. 2

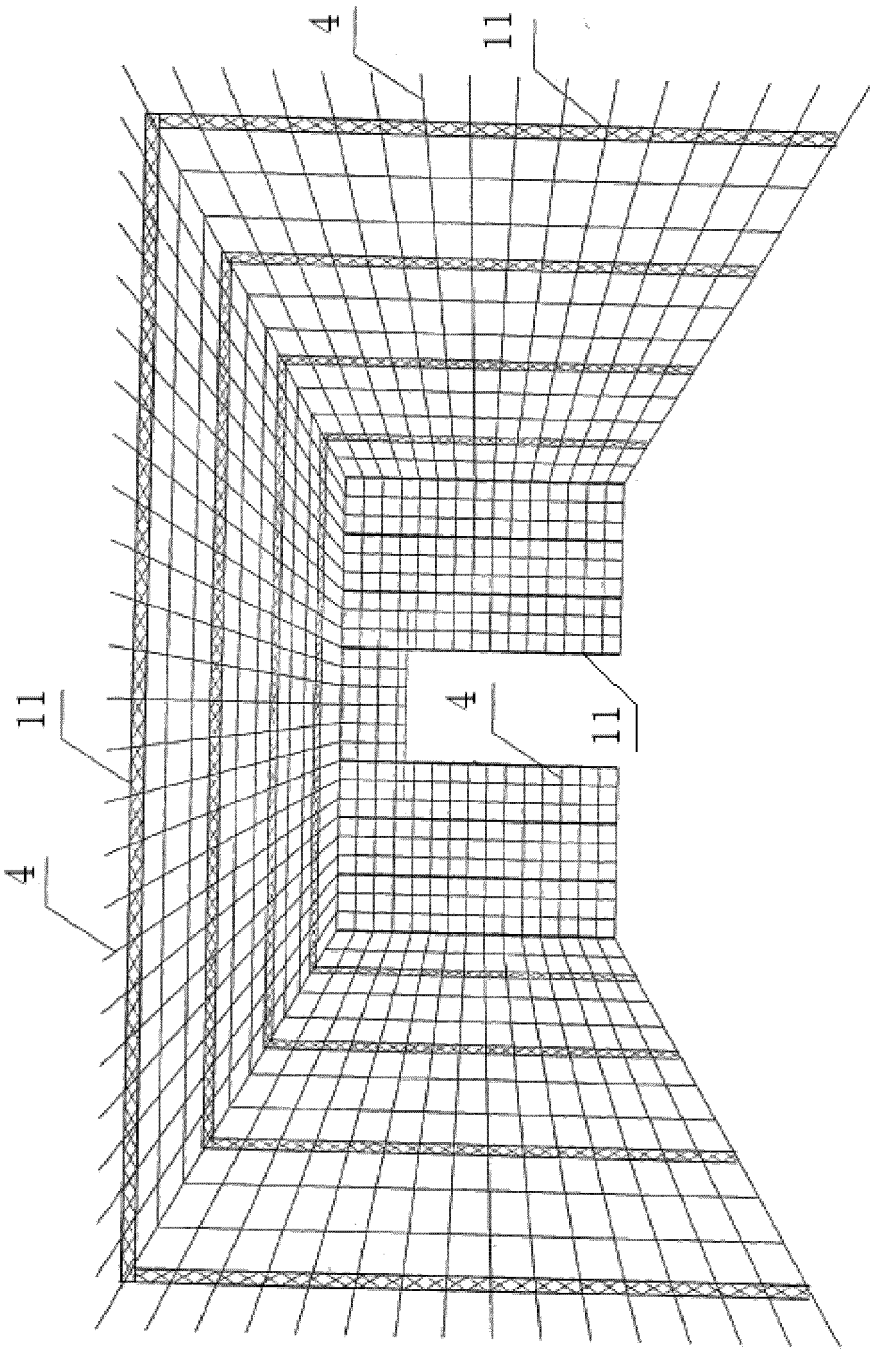


Fig. 3

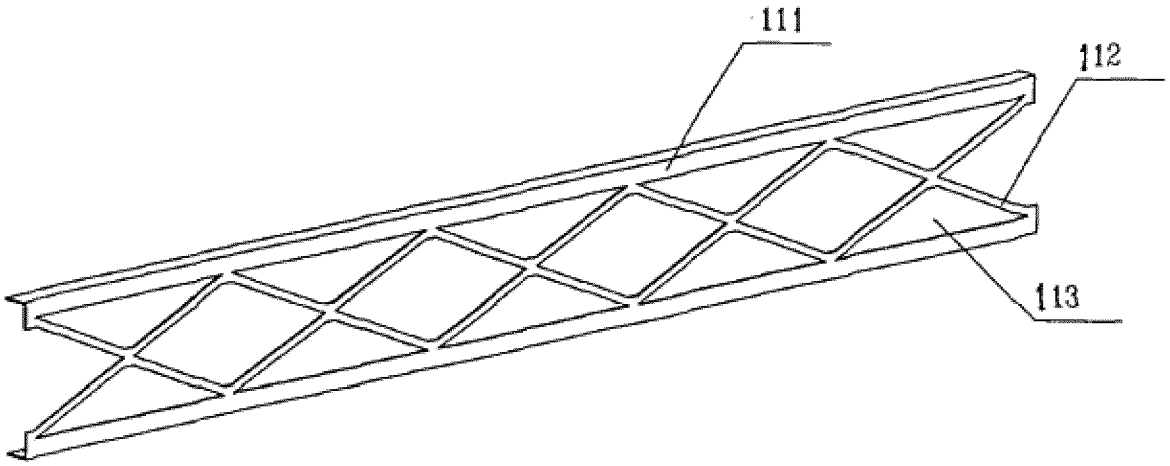


Fig. 4

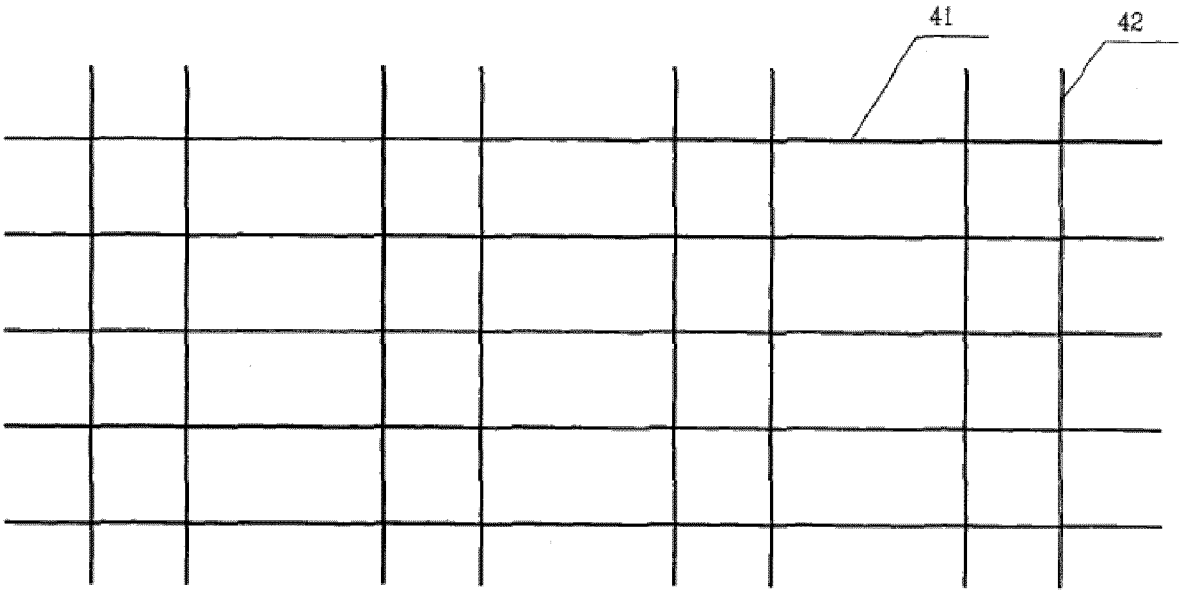


Fig. 5

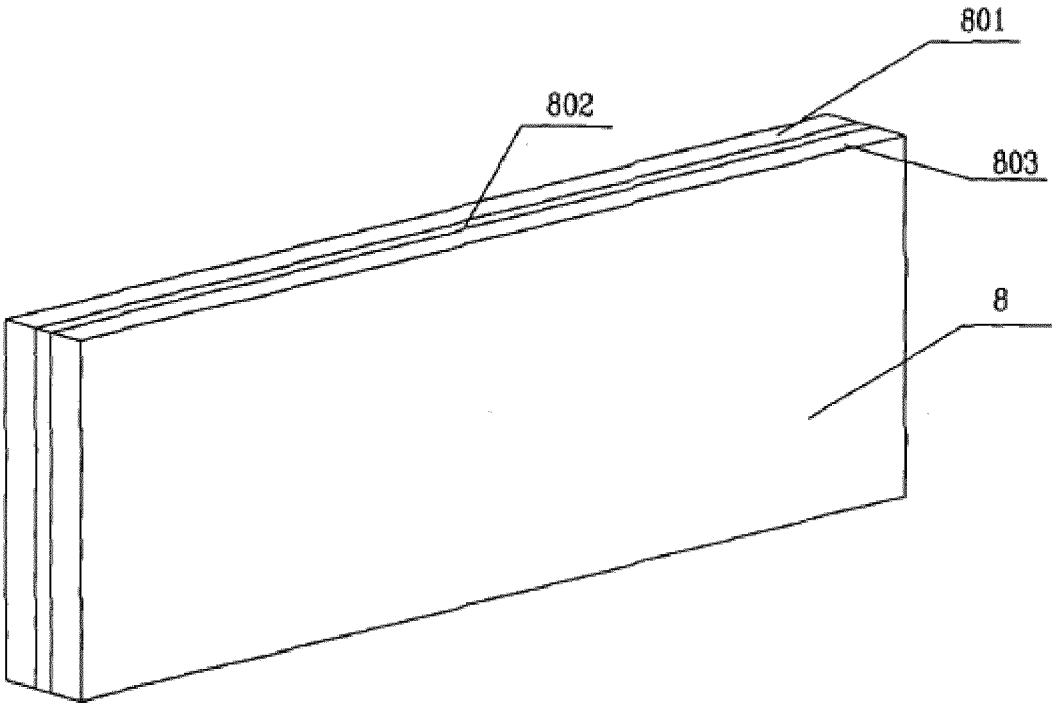


Fig. 6

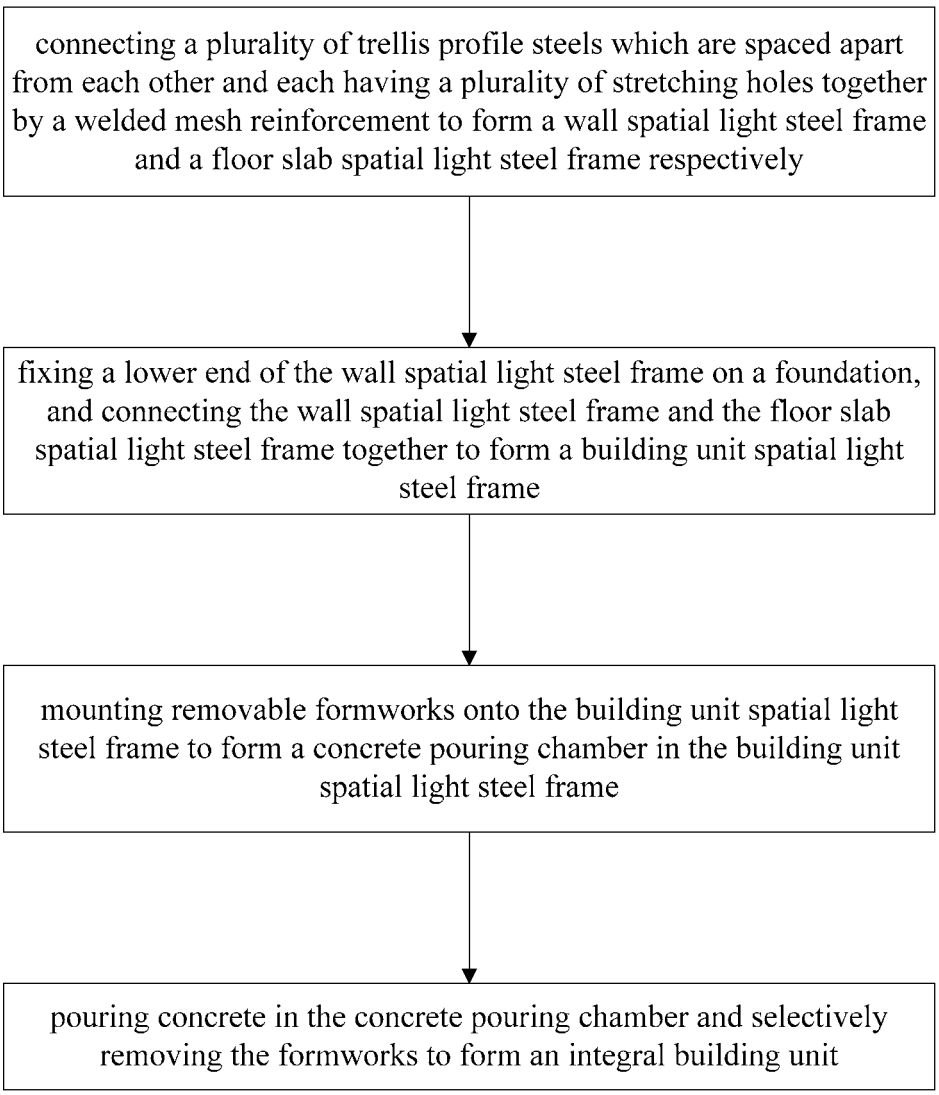

connecting a plurality of trellis profile steels which are spaced apart from each other and each having a plurality of stretching holes together by a welded mesh reinforcement to form a wall spatial light steel frame and a floor slab spatial light steel frame respectively
fixing a lower end of the wall spatial light steel frame on a foundation, and connecting the wall spatial light steel frame and the floor slab spatial light steel frame together to form a building unit spatial light steel frame
mounting removable formworks onto the building unit spatial light steel frame to form a concrete pouring chamber in the building unit spatial light steel frame
pouring concrete in the concrete pouring chamber and selectively removing the formworks to form an integral building unit

Fig. 7

REFERENCES CITED IN THE DESCRIPTION

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