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(54) Modular formwork for the construction of walls and pillars

(57) The invention presented herewith is related to a modular formwork for the construction of walls and/or pillars in concrete, which comprises a plurality of modular elements (1,101) that form, on the inside of the formwork, a smooth surface and, on the outside, a surface comprising reinforcing ribs (2,102), the modular elements being connected together by means of linking elements (20) and characterized in that the modular elements (1,101) comprise complementary lateral connecting sections which serve to enable the firm connection, by means of the linking elements (20), of two, laterally adjoining elements (1,101), the modular elements furthermore comprising upper and lower protrusions (8,9,108,109) which serve to enable the firm connection, by means of the linking elements (20), of two elements (1,101) adjoining vertically.

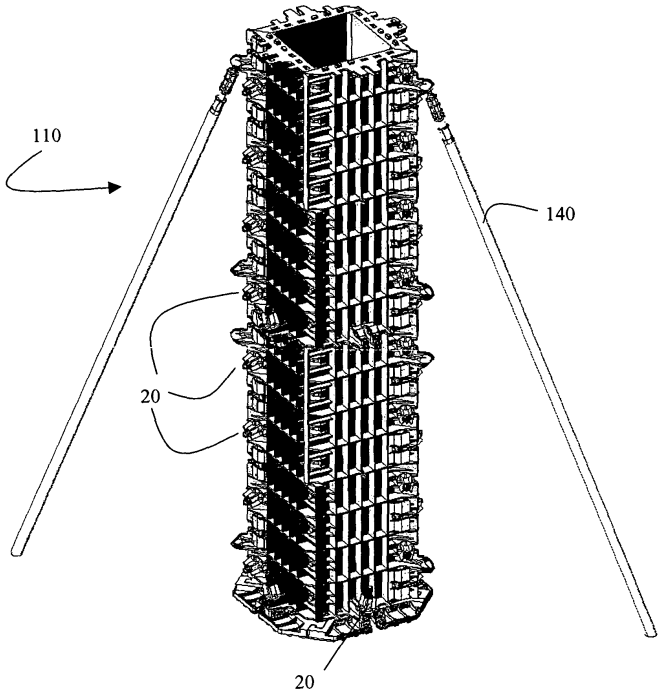

Fig. 8

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Description

[0001] The invention presented herewith is related to a modular formwork for the construction of walls and/or pillars in concrete.

[0002] Today, modular structures are known that are suitable to create a formwork for the construction of walls and pillars, whereby these are generally made of metal and comprise a plurality of flat wooden boards the surface of which is placed on the side in contact with the concrete.

[0003] Such structures constitute a variety of disadvantages which include their unwieldiness when putting them to use due to the notable weight of the elements of the structure and the modular accessories needed to assemble the same; the short life duration of the modular elements resulting from the use of wooden boards which, in spite of their being coated with impermeable resin, are subject to rotting; the increased costs and the high degree of complexity of the structure itself due, among other things, to the considerable number of accessories needed in putting it to use, above all in the case of corner wall construction or pillars.

[0004] Modular formworks are also known which, being made of plastic material, such as, for example, thermo-formed polymers, partially resolve the disadvantages shown by modular structures made of metal and wood. The panels made of plastic material prove, in fact, to be particularly manageable and are scarcely subject to wear and tear.

[0005] Such known modular structures made of thermoplastic material, however, still involve a high degree of complexity in putting them to use, since they require a large number of accessories for the attachment of adjoining elements, in particular, for the fixing of elements arranged perpendicularly to each other, so that the formwork constructed in this way is capable of withstanding the forces of pressure exerted by the concrete.

[0006] The object of the invention presented here is to eliminate the above mentioned inconveniences in known types of modular formworks for the construction of walls, contriving to devise a modular formwork for the construction of walls and/or pillars which offers the advantage of being installable in a simple and rapid manner.

[0007] In the scope of this object, one of the aims of the invention presented here is to furnish a modular formwork for the construction of walls and/or pillars which is suitable for the construction of linear walls, T-shaped walls. L-shaped walls or pillars without the need for specially designed modular elements. Not least, an aim of the present invention is to devise a modular formwork for the construction of walls and/or pillars which, exploiting the economy of scale, is feasible at competitive costs.

[0008] This object, quite apart from other aims to be seen more clearly in the following, is achieved by the formwork for the construction of walls and/or pillars according to the invention, which comprises a plurality of modular elements having a smooth surface on the inside of the formwork and on the outside a surface comprising reinforcing ribs, the modular elements being joined together by means of clamping devices, characterized in that the modular elements comprise complementary, lateral, segments for connecting one to another, capable of effecting the firm connection of two laterally adjoining elements by means of the clamping devices, and, moreover, in that the modular elements comprise protrusions above and below, enabling a firm connection of two elements adjoining vertically by means of clamping devices.

[0009] Preferably, the connecting segments are designed in the form of openings, hooking pieces and segments inclined in relation to the base of the modular element or as complementary ribs.

Advantageously, the protrusions are shaped in the form of a "U".

[0010] Further characteristics and advantages of the invention will be seen largely from the description of a preferable, but non exclusive, embodiment of the modular formwork for the construction of walls and/or pillars, which is illustrated by, but not limited to, the respective example drawings, in which

Figure 1 shows a perspective view of a modular element in an first embodiment of the formwork according to the invention;

Figure 2 is a side-view of the modular element shown in Fig. 1;

Figure 3 is an external front view of the modular element shown in Fig. 1;

Figure 4 is a perspective view of a formwork constructed with a number of individual elements shown in Fig. 1;

Figures 5 and 6 are detailed drawings of the formwork shown in Fig. 4, enlarged to show the manner in which the linking elements are used to connect the adjoining modular elements;

Figure 7 is a perspective view of two adjoining modular elements in a second embodiment of the formwork according to the invention;

Figure 8 is a perspective view of a formwork constructed with the modular elements of figure 7;

Figure 9 is a view from above of a basic element of a formwork according to the invention;

Figure 10 is a view from above of a base of the formwork according to the invention;

Figure 11 is a perspective view of a formwork constructed with the elements of Fig. 7, placed on the corresponding base;

Figure 12 is a detailed drawing of the formwork shown in Fig. 8, which illustrates the hooking together of the connecting links for sealing.

[0011] As illustrated diagrammatically in the drawings, the formwork 10,110, according to the invention, comprises a plurality of elements 1,101 in plastic material, for example stamped and injection moulded, substantially in quadrilateral shape, which comprise on the outside, in relation to the formwork, reinforcing ribs 2,102 and

which, on the inside of the formwork, constitute a smooth surface.

[0012] The said modular elements 1,101 comprise lateral segments 3,4,103,104,105 suitable for the firm connection between two elements 1.101 adjoining laterally.

[0013] In an first embodiment, the segments for the lateral connection are effected as complementary ribs 3, 4 between them, more protruding than the reinforcement ribs 2.

The ribs for the connection 3 are on one side where they form a plurality of square structures 5 in relief which, in turn, constitute an aperture 6 on their upper or lower facet respectively.

On the other side of the modular element 1 are ribs 4, inclined in relation to the base of the element 1 and terminated, at their most protruding point, by a panel section 7 parallel to the base of the element 1.

Said ribs 4 protrude in such a manner that when two elements are placed laterally side by side, the panel sections 7 cover from above a part of the plurality of square structures 5 of the adjoining element 1.

[0014] Moreover, the modular elements 1,101 comprise, on their upper and lower sides, protrusions 8,9,108,109 shaped in the form of a "U" substantially placed in the centre of the upper and lower sides. In particular, the U-shaped protrusions 8,108 on the lower side comprise two, semi-circular indentations 11,111.

[0015] To complete the fixing, the adjoining modular elements 1,101 are attached by means of linking elements 20, for example flanged wing-nut-type clamps, which are generally made of fibre-glass reinforced plastic material. These linking elements 20 comprise a body 21, which can be substantially assembled in the form of a "T", whereby the shaft of the "T" comprises a threaded section for the application of a flanged plastic wing-nut 22.

[0016] Generally, to position or insert the fastener, the short side of the "T" is hooked into one of the modular elements 1,101, while the flanged plastic wing-nut 22 is placed in a position where it can connect the suitably shaped opposite part of the other modular element 1,101, which is designed to receive and firmly arrest the flanged plastic wing-nut 22.

[0017] In the first embodiment illustrated, four linking elements 20 are used to connect two horizontally adjoining modular elements 1 and one single fastener for the vertical connection of two adjoining modular elements 1. In particular, for the horizontal connection, the short side of the T-shaped body is inserted into the apertures 6 located on the upper and lower facets of two previously described square structures in relief 5, of a first modular element 1, while the flanged plastic wing-nut of the fastener 22 is placed between two corresponding panel sections 7 protruding further out from the complementary ribs 4 of the second modular element 1.

[0018] The particular configuration, especially of the lateral ribs 3,4 of the modular elements 1, permits the horizontal connection, as described above, which can be effected either in the case of a linear connection or in the case of an orthogonal, external or internal corner connection. In effect, the square structure in relief 5 offers a support for the panel section 7 of the complementary ribs 4, irrespective of the manner in which the positioning is effected in one of the three possible reciprocal positions of two modular elements 1 (linear, orthogonal internal corner, orthogonal external corner).

[0019] Furthermore, the particular "T" configuration of the linking elements 20 enables them to be positioned easily and conveniently according to existing requirements in that the fastener can rotate in the apertures 6 around the rotation axis created by the short side of the T-shaped body.

[0020] For connecting two, vertically adjoining modular elements 1, the short side of the T-shaped body is carefully placed in the two semicircular indentations 11 of the lower U-shaped protrusions 8 of the first modular element to be connected, while the flanged plastic wing-nut of the fastener 22 is locked against the corresponding upper U-shaped protrusion 9 of the second modular element 1 to be connected.

[0021] In Figures 7 -12, a second embodiment is illustrated, in particular for the construction of pillars, which differs simply in the construction of the horizontal connection between two adjoining elements 1,101.

[0022] The elements 101 of the second embodiment, comprise one side of hooks 104 and complementary apertures 103 for the hooks 104 and, on the other side, are terminated by protruding sections 105 inclined at and angle of 45° in relation to the base of the element 101.

Also, as already explained in regard to the first embodiment, on the upper and lower sides, U-shaped protrusions 108,109 are provided.

[0023] Whilst the connection of two vertically adjoining modular elements 1 is effected in an identical manner to that for the first embodiment, the horizontal connection between the two elements 101 can be effected only for orthogonal, external corner connections, i.e. exclusively for the construction of pillars.

Such connections are effected from one side for securing the hooks 104 in the apertures 103, while on the other side, being analogous to the first embodiment by means of linking elements 20.

In order to position the hooks 104 of an element 101 so that they correspond with the adjoining element, it is sufficient to rotate the first element 101 to an angle of 180° in relation to the other.

[0024] The assembly of the formwork in accordance with the described embodiment is effected as follows:

In accordance with the particular construction requirements, the initial assembly of a base 130 for the formwork may be carried out. Examples of the respective base elements 131 are shown in Figures 9 and 10 for the second embodiment. The base 130, thus constructed, is anchored to the ground by nails using the holes 132 provided for this purpose.

[0025] The elements 1,101 necessary to form the first layer of the formwork are successively connected to one

another horizontally by linking elements 20. The first layer of elements 1,101 are then fixed to the base 130 using the vertical connection procedure described above.

[0026] In a similar manner, the elements 1,101 are connected together horizontally to form the successive layers which are then linked together vertically. The total number of layers that will build up the finished formwork is variable and depends on the height of the wall and/or pillar to be constructed.

[0027] In the case of constructing pillars by the second mode of constructing the formwork it is absolutely necessary to provide support by means of rods 140, anchored to the ground by nails. These rods 140 are fitted with a threaded metal ring 141 at their upper end, which ideally, by turning the ring, enables the adjustment of the length of the rod 140.

[0028] In practice, using a modular formwork for the construction of walls and/or pillars according to the invention, it is possible to complete any predetermined object for whatever purpose by a simple assembly, solely applying modular elements and linking elements as described above. The particular structure of the modular elements also makes it possible, without the aid of special accessories, to clamp together reciprocal modular elements either in a linear or orthogonal configuration. As a result, it is possible to construct a modular formwork without the need for additional elements, for the construction of walls and or pillars, whether as linear walls, T-shaped walls, L-shaped walls or pillars.

[0029] Not least, it is possible to effect construction work at competitive costs in that the necessity to use only one single process of assembly for the construction of a modular formwork for the construction of walls and/or pillars according to the invention also makes it possible to exploit the advantages ensuing from the effects of the economy of scale.

[0030] The invention, conceived in this way, is predisposed to numerous forms of modification and variants, all within the scope of the inventive concept. Thus, for example, the screw-type linking elements can be substituted by any other means of fastening which enables the connection of two adjoining modular elements.

Moreover, all of the details can be substituted by other elements and materials used, not to mention the dimensions, which can be freely determined in accordance with any requirements.

Claims

1. Formwork for the construction of walls and/or pillars comprising a plurality of modular elements (1,101) which form on the inside of the formwork (10,110) a smooth surface and on the outside a surface comprise reinforcing ribs (2,102), said modular elements being connected together by means of linking elements 20, **characterized in that** said modular elements (1,101) comprise laterally arranged connecting sections (3,4,103,104,105) serving to effect a firm connection between the complementary sections of two laterally adjoining elements (1,101) by means of said linking elements (20), said modular elements (1) also comprising upper and lower protrusions (8.9,108,109) serving to effect the firm connection of two elements (1,101) adjoining vertically by means of said linking elements (20).

2. Formwork for the construction of walls and/or pillars according to Claim 1, **characterized in that** said connecting sections are designed in the form of apertures (103), hooks (104) and inclined sections (105) in relation to the base of said modular elements (1).

3. Formwork for the construction of walls and/or pillars according to Claim 1, **characterized in that** said element sections are designed in the form of complementary ribs (3,4).

4. Formwork for the construction of walls and/or pillars according to Claim 3 **characterized in that** said complementary ribs comprise, on one side, a plurality of square structures in relief (5).

5. Formwork for the construction of walls and/or pillars according to Claims 3 or 4 **characterized in that** said complementary ribs (3,4) comprise on the other side modular elements (1) ribs (4) inclined in relation to the base of said modular elements (1), said ribs (4) terminating at the most protruding point of an element section (7) parallel to the base of said element (1).

6. Formwork for the construction of walls and/or pillars according to Claims 3-5, **characterized in that** said square structures (5) in relief comprise in their upper and lower facets respectively an apperture (6).

7. Formwork for the construction of walls and/or pillars according to Claims 3-6, **characterized in that** said inclined ribs (4), meet a protrusion in such a manner that when two modular elements (1) are placed laterally side by side, said element sections (7) cover from above a part of said plurality of square structures (5) of the adjoining element (1).

8. Formwork for the construction of walls and/or pillars according to one of the previous Claims, **characterized in that** said protrusions (8, 9,108,109) are shaped in the form of a "U".

9. Formwork for the construction of walls and/or pillars according to one of the previous claims, **characterized in that** said protrusions (8,108) located on the lower side comprise two, semicircular indentations (11,111).

10. Formwork for the construction of walls and/or pillars according to one of the previous claims, **characterized in that** said connecting means (20) are screw-type linking elements (20).

11. Formwork for the construction of walls and/or pillars according to Claim 10, **characterized in that** said screw-type linking elements (20) comprise a body (21) which can be assembled substantially in the shape of a "T", whereby the shaft of the "T" comprises a threaded section onto which is screwed a clamping nut (22).

12. Formwork for the construction of walls and/or pillars according to Claim 11, **characterized in that** the short side of said body (21) shaped in the form of a "T" is designed so as to be able to be inserted into said apertures (6).

13. Formwork for the construction of walls and/or pillars according to Claim 8, **characterized in that** the short side of said body (21) shaped in the form of a "T" is designed so as to be able to be lodged in said two semicircular indentations (11,111).

14. Formwork for the construction of walls and/or pillars according to one of the previous claims, **characterized in that** the assembled modular elements (1,101) are fixed by means of linking elements (20) to a base (130), anchored to the ground.

15. Formwork for the construction of walls and/or pillars according to Claim 14, **characterized in that** said base (130) comprises apertures (132) for anchoring to the ground by means of nails.

16. Formwork for the construction of walls and/or pillars according to any of the claims 2 and 8 to 15, **characterized in that** it comprises a plurality of supporting rods (140) with metal adjustment rings (141) for maintaining an upright position.

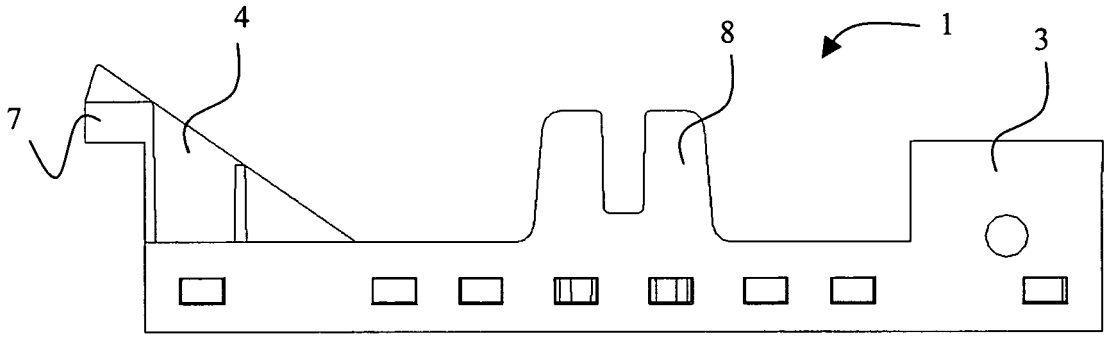

Fig. 1

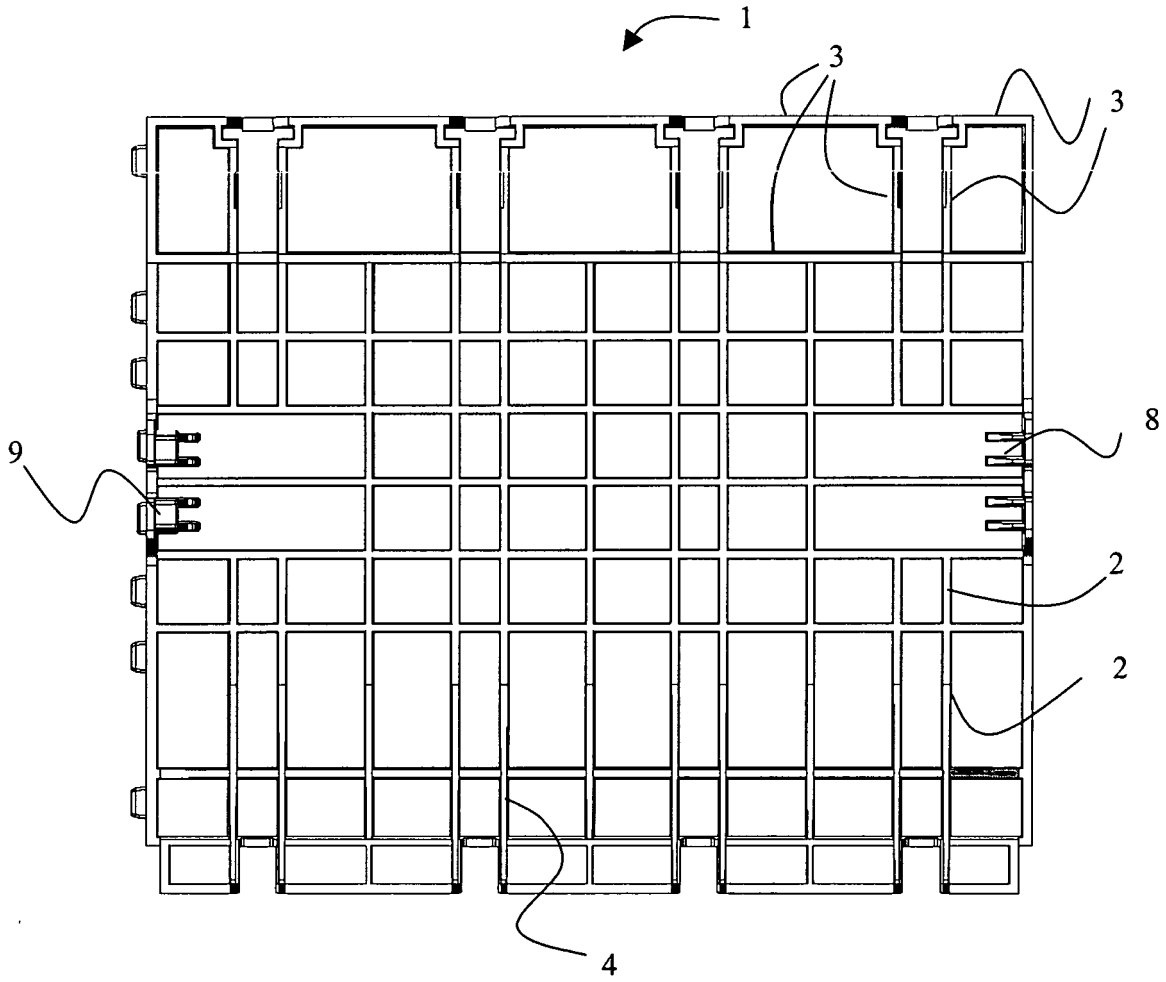

Fig. 2

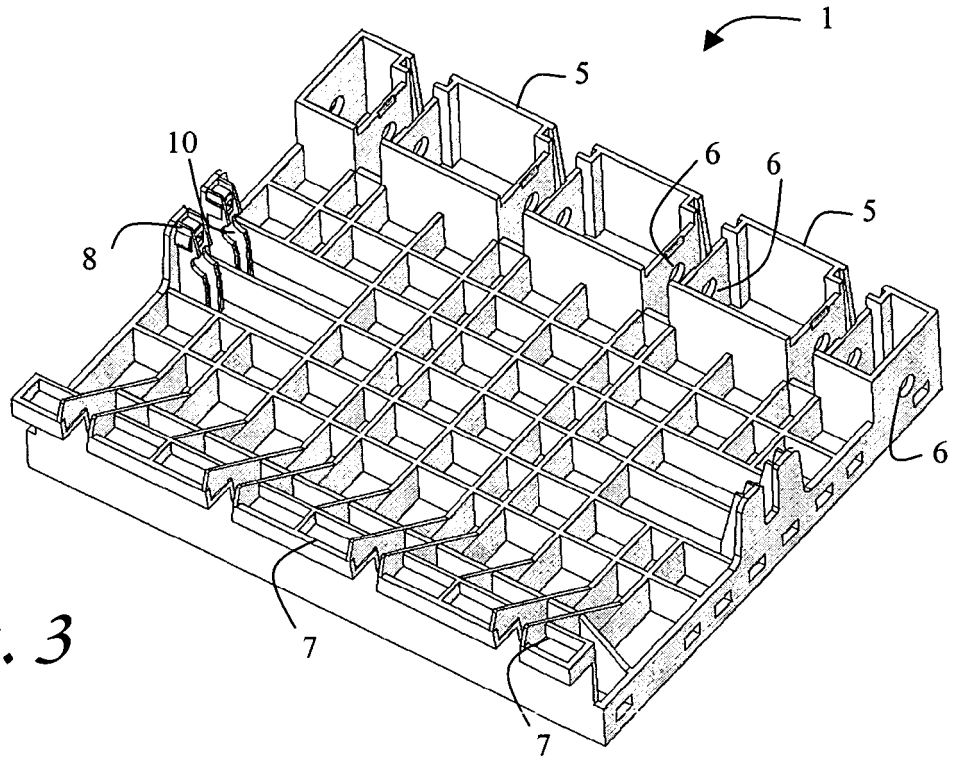

Fig. 3

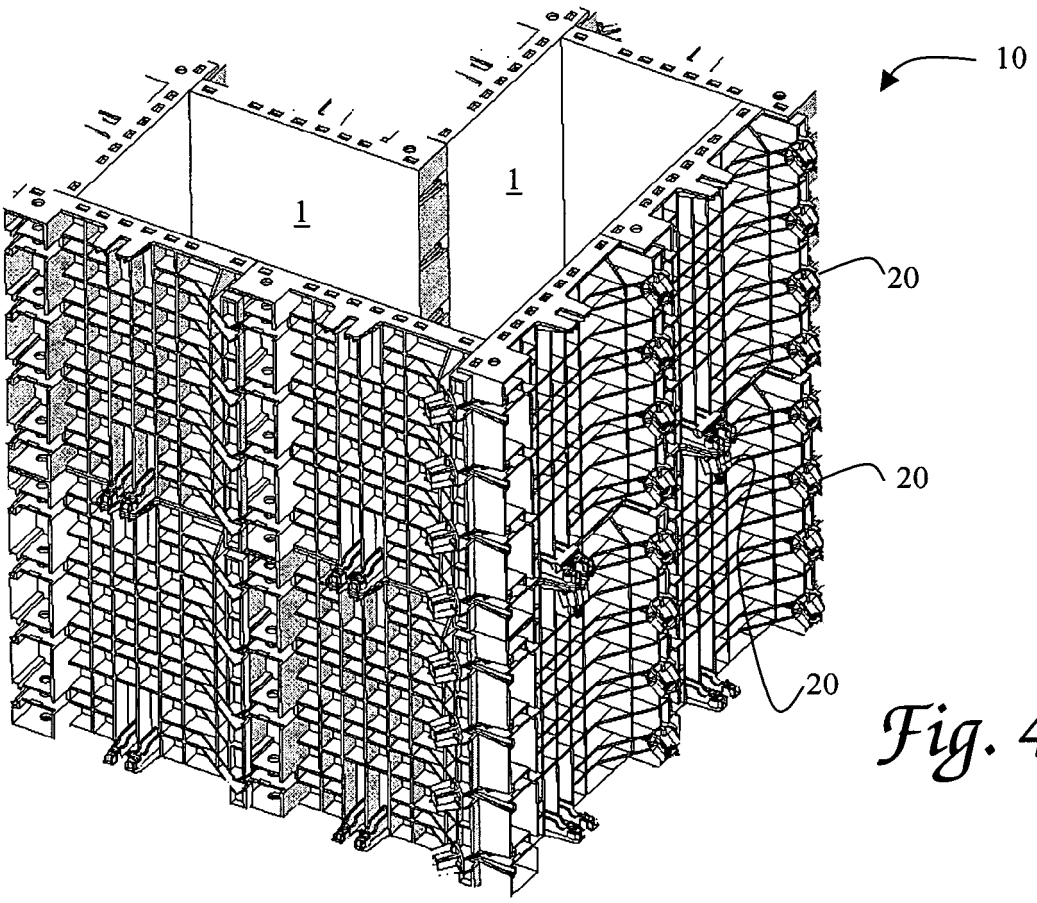

Fig. 4

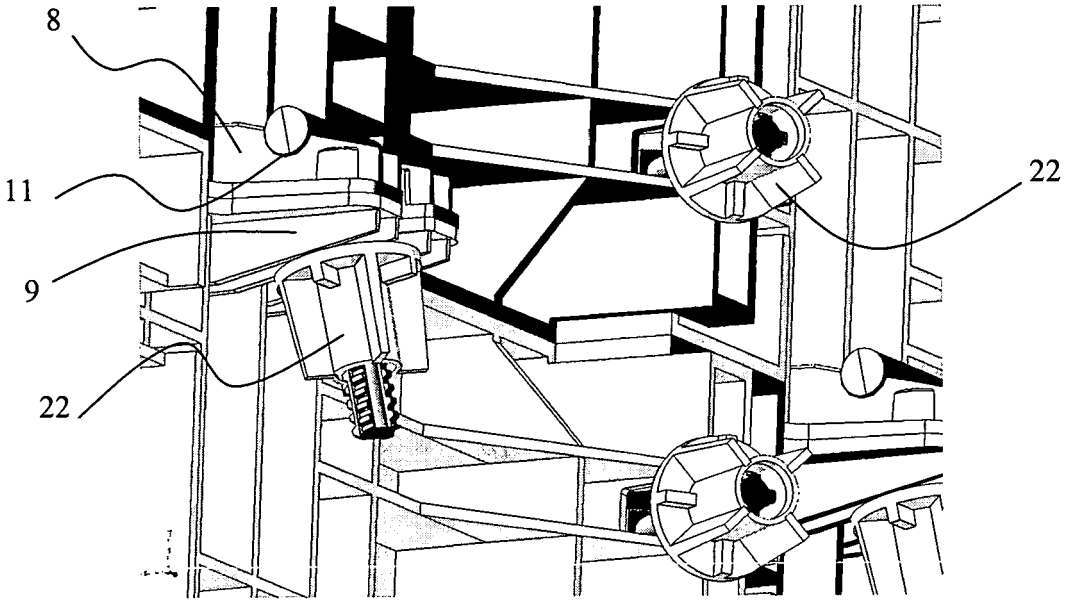

Fig. 5

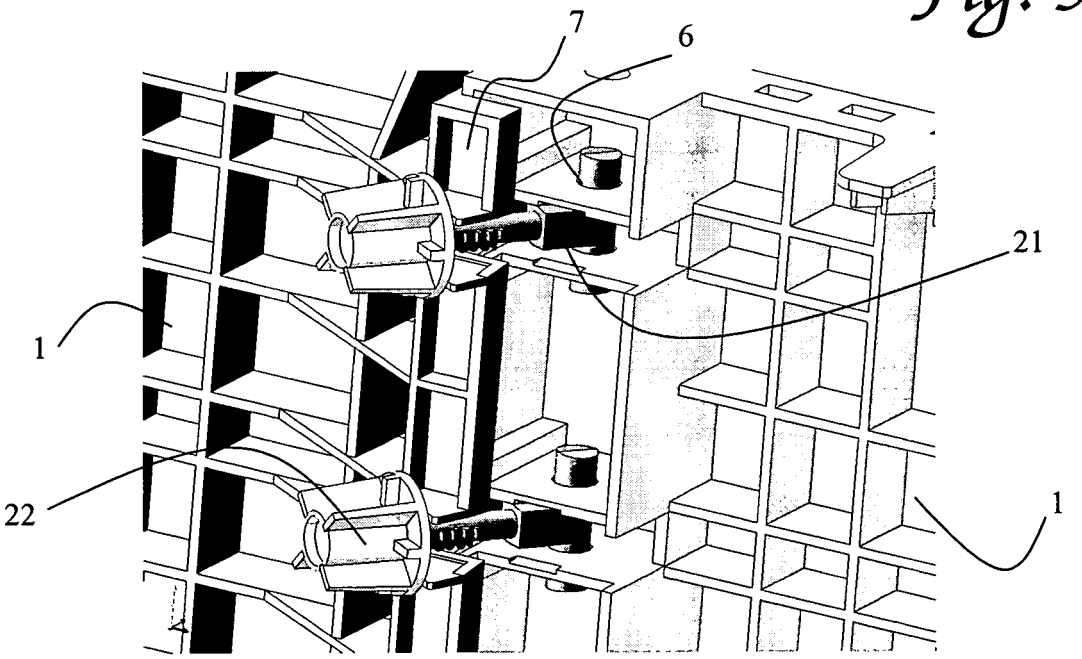

Fig. 6

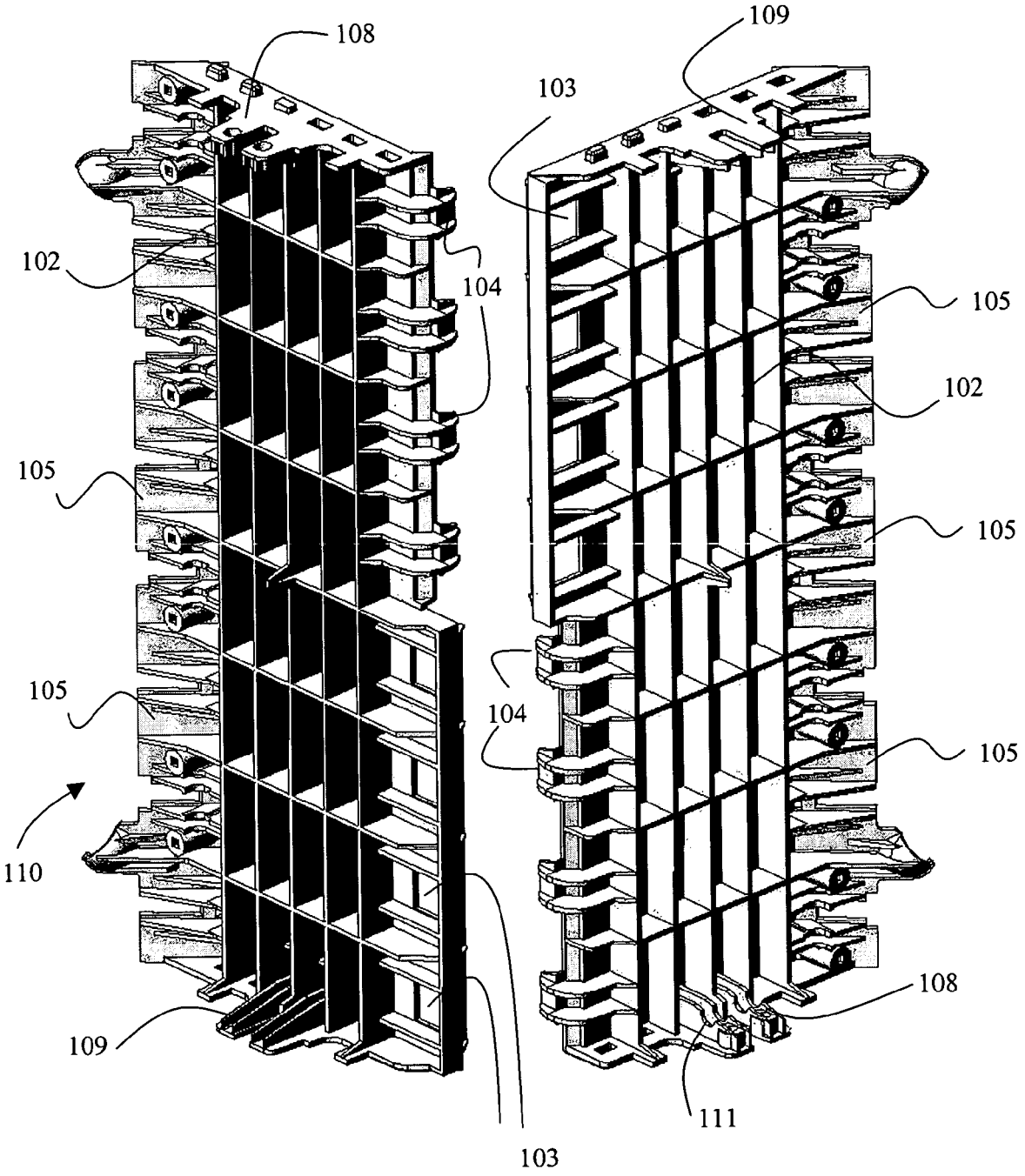
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Fig. 7

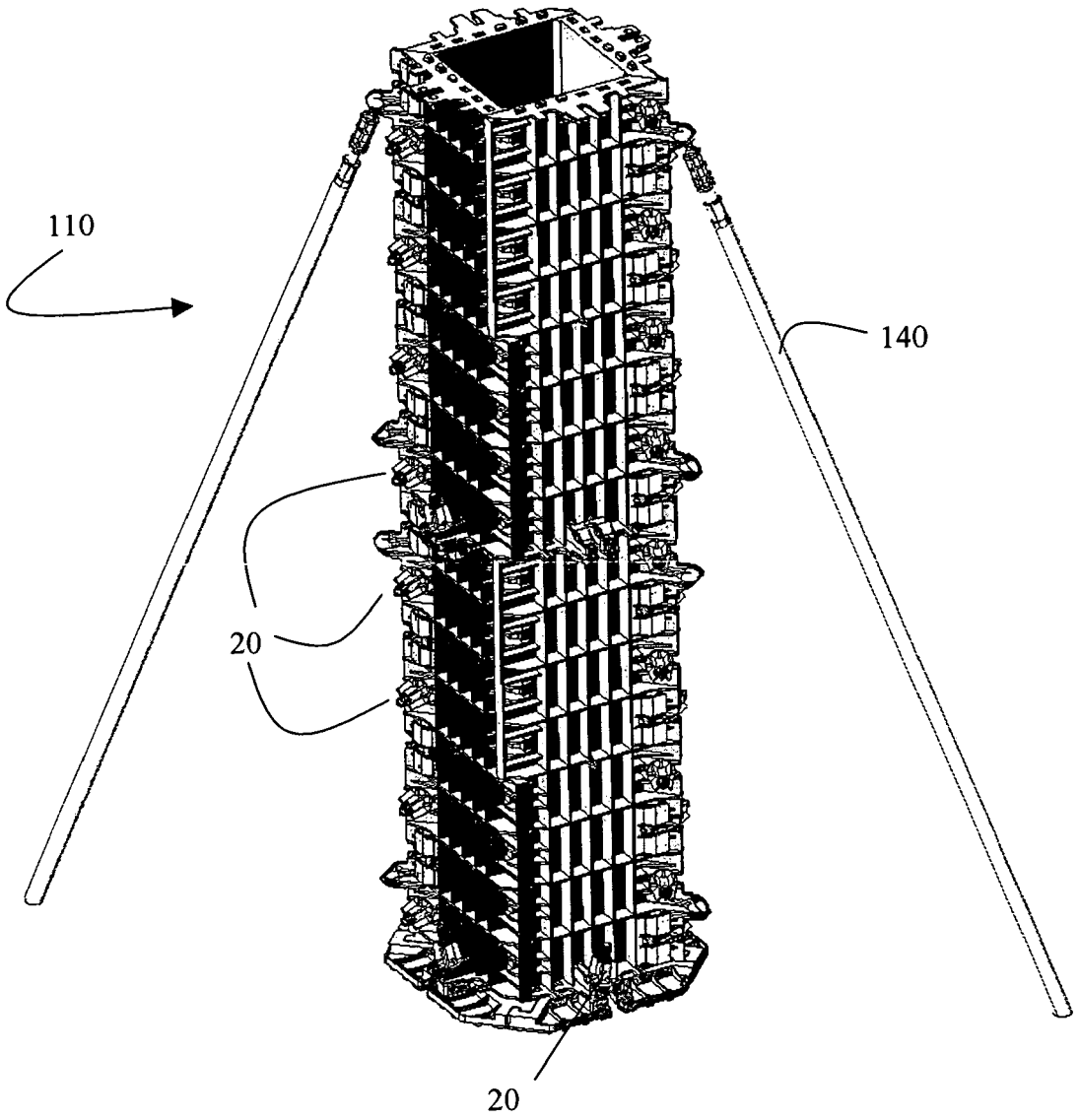

Fig. 8

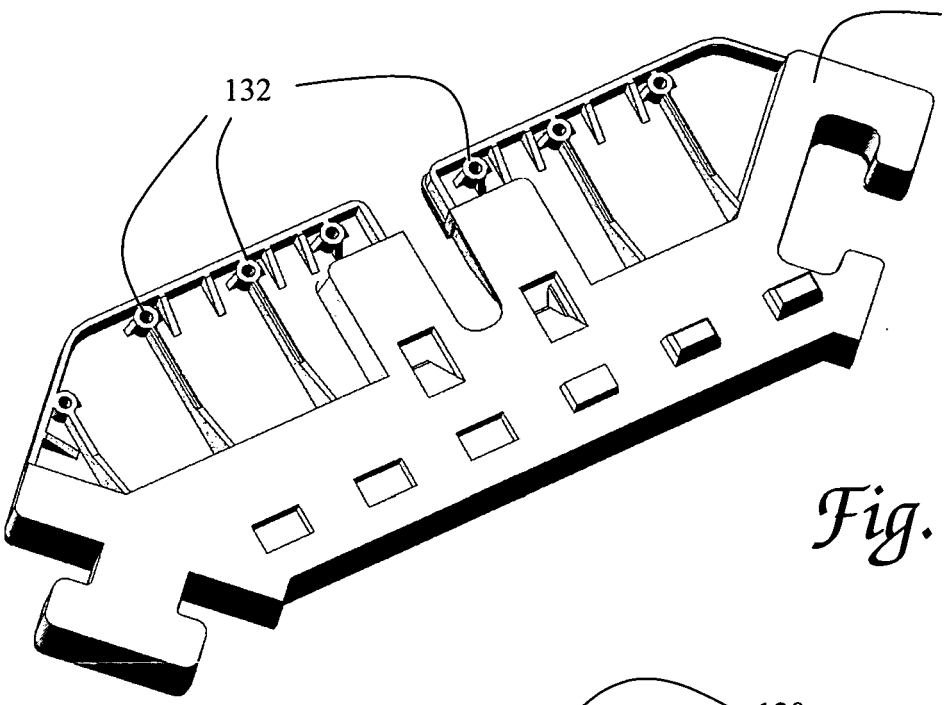

Fig. 9

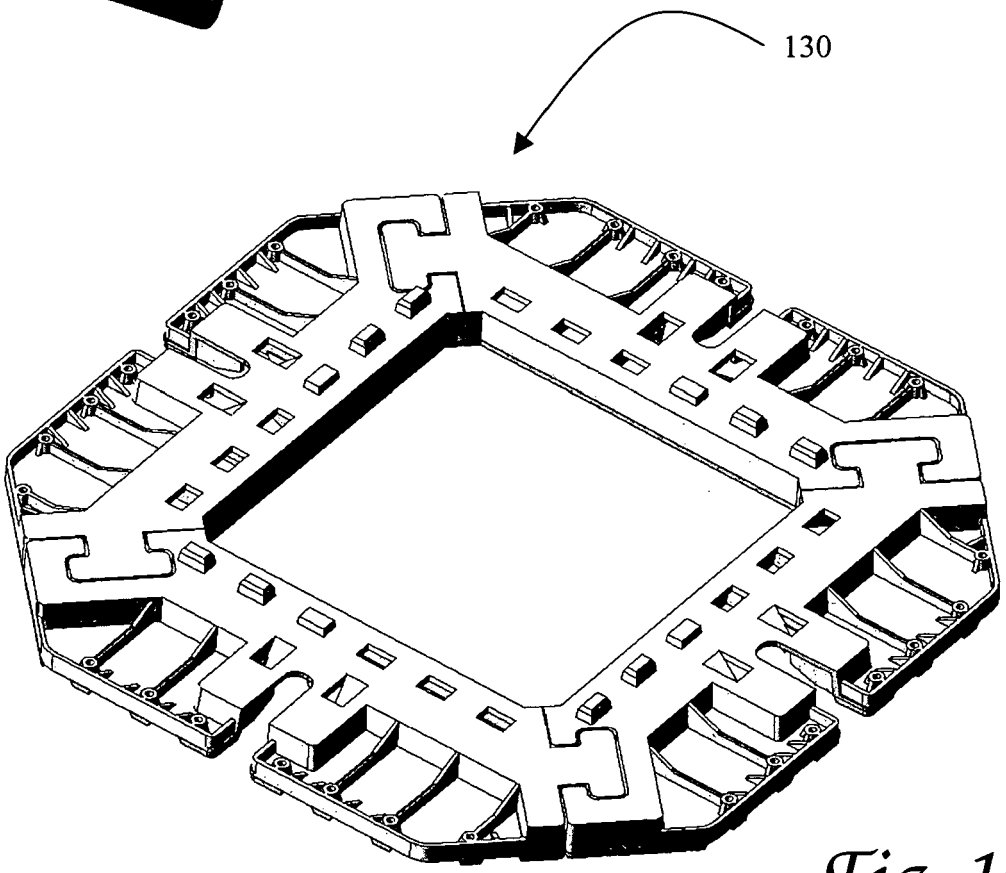

Fig. 10

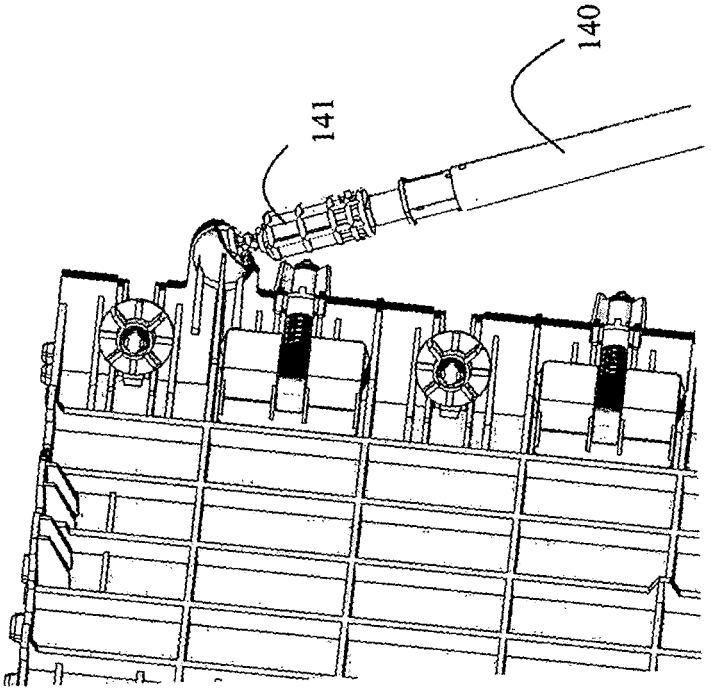

Fig. 12

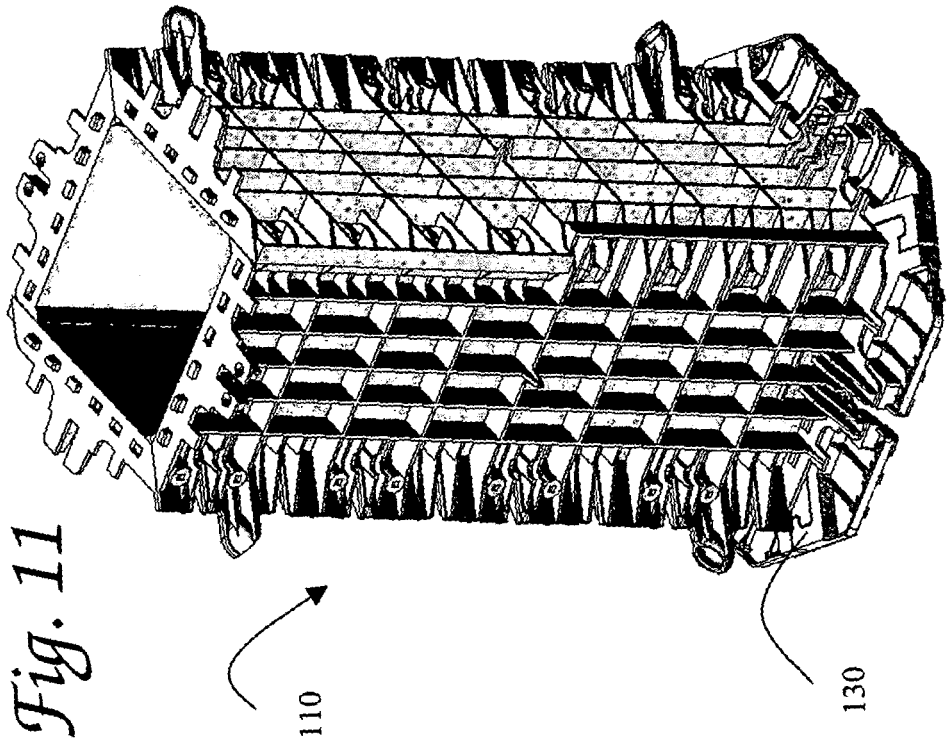

Fig. 11