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(54) **Prefabricated modular housing unit**

Vorgefertigte modulare Hauseinheit

Unité d'habitation modulaire préfabriquée

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Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention relates to a unit for the construction of prefabricated buildings. The single units can be connected one to the other so as to obtain complex structures.

PRIOR ART TECHNIQUE

[0002] The known technique has different solutions for the construction of housing units with prefabricated elements joined together so as to obtain the planned dwelling.

[0003] For example, the patent application WO2011144941 describes a prefabricated structure requiring the realization of a matrix or lattice, using boxed-beams. The external walls and the inner partition ones are fixed to said beam structure. The constructive choice allows, also at subsequent times, the redefinition of the rooms into which the volume of the construction is divided into. Moreover, the boxed-beams making up the structure also function as conduits for electrical connections; by suitably choosing the sections of the beams there can be accommodated plumbing ducts and/or gas ducts as well.

[0004] The matrix, in its entirety, is fixed to the ground by means of plates inserted into the concrete pours constituting the construction foundations. Said plates have on its upper side, pins apt to fix the footing of the pillars of the matrix and on the lower one, protrusions which will be buried in the foundations.

[0005] A different solution is described in the German patent application DE3609776. The document describes a housing unit, which can be assembled and disassembled, resting on plinths by means of a support element of adjustable height in order to obviate to possible different soil heights, and a neoprene cushion disc. The entire construction is made up of prefabricated elements which allow to make structures of different dimensions and the roof, too, as the other elements, is made of modular elements. The subdivision of the interior can be modified later after the construction completion.

[0006] The American patent US4123884 as well, describes a prefabricated modular housing unit. Among the construction elements, the walls are composed of supporting columns and panels filling the spaces between said columns; the columns are fixed by means of angle elements blocked by lag bolts buried in the foundations. As in previous cases the roof is formed by a modular structure.

[0007] The mentioned inventions describe apparatuses and methods for the construction of complex prefabricated buildings both for the number of items and for the complicated assembling operations required. It is clear that the sector of prefabricated constructions has to meet two opposed requirements, on the one hand, the standardization and versatility of items, and on the other hand, the personalization of the finished structure. At the same time, assembling has to be the simplest and the safest possible.

SUMMARY OF THE INVENTION

[0008] Object of the present invention is that of proposing a housing unit comprising elements constructively simple and easy to assemble, from the foundation blocks to the roof covering. In particular, the invention is characterized by a new shaping of the base plinths.

[0009] The above said purpose, and others which will be better described later, are achieved by a modular housing unit as defined by claim 1. Further preferred characteristics of the system are defined by the subsequent dependent claims.

BRIEF DESCRIPTION OF FIGURES

[0010] Advantages and innovative characteristics of the invention will become more apparent from the following description of an embodiment, for exemplification only but not limited to, with reference to the appended figures, wherein:

- Figs. 1A and 1B respectively show a perspective view of a modular housing unit and of a structure composed of more modular housing units at different assembling stages;
- Fig. 2 shows an exploded perspective view of a base plinth according to the present invention;
- Fig. 3 shows a perspective view of a guide for a supporting bracket associated to the plinth of figure 2;
- Fig. 4 shows a perspective view of a supporting bracket of the guide of figure 3;
- Fig. 5 shows a partial perspective view of the base plinth with conduits secured to the brackets of Fig. 4;
- Figs. 6A and 6B respectively show a top and bottom view of the closing plate of the plinth of figure 2;
- Fig. 7 shows a perspective view of the closing plate of figure 6A and 6B engaged by fixing pins;
- Fig. 8 shows a perspective view of the fixing pins between the plinth of figure 2 and the connecting plate of figure 9;
- Fig. 9 shows a top perspective view of a connecting plate for columns according to the present invention;
- Fig. 10 shows an exploded perspective view of a detail of the assembly of the housing unit of figure 1;
- Fig. 11 shows a perspective view of a base tension bar;
- Figs 12A, 12B, 12C show perspective views of an assembled supporting column, respectively, from the inner side without fillers, the inner side with fillers and the external side with fillers;
- Fig. 13 shows a perspective view of wooden beams worked for perimeter walls;
- Fig. 14 shows a perspective of a self-bearing truss

and of its components;

- Fig. 15 shows a perspective view of a base frame with details;
- Figs. 16A, 16B and 16C show perspective views of the aeration turret respectively exploded, assembled from the bottom and from the top;
- Fig. 17 shows a partial sectional perspective view of the housing unit the arrows thereof show rising air flows;
- Fig. 18 shows a partial view along the section line XVIII-XVIII of fig. 17;
- Fig. 19 shows a partial perspective view along the section line XIX-XIX of Fig. 18 of the wall and of the roof of the housing unit highlighting, in detail, the air flow directions;
- Figs. from 20A to 20D show perspective views of the closing plates with four instances of typical arrangements of the fixing pins;
- Figs. from 21 A to 21 D schematically show where exactly the specific configurations of the closing plates of Figs. 20A-20D are employed;
- Fig. 22 shows a perspective view with the details of the connection of the base tension bars and of a base frame to a base plinth;
- Fig. 23 shows a perspective view of the upper part of the supporting columns with the connecting structures for adjacent modular housing units;
- Fig. 24 shows a perspective view of the connection of an arm of the self-bearing truss with the supporting columns to a vertex of the modular housing unit.

DETAILED DESCRIPTION OF THE INVENTION

[0011] The availability of a modular housing unit (Fig. 1A) gives an important contribution in order to reduce the time needed to build housing units and, at the same time, modularity makes it possible to personalize the final structure (Fig. 1 B) so as to meet the customer's requirements.

[0012] In the following description, elements not described in detail are standard elements, in accordance with forms and/or uses following totally conventional procedures.

[0013] In general the housing unit comprises galvanized steel base plinths 1, steel base frames 6 as well as multilayer wooden panels 7, steel supporting columns 8, base 10 or ceiling 11 horizontal beams, or connecting beams, perimeter panels 16 and inner partition panels (not shown). There are also self-bearing trusses 13 and cladding 14 for the roof covering as well as connecting and joining devices for the same elements.

[0014] In particular, said base plinths 1 (Fig. 2) comprise a flat base plate 1.1, a boxed element 1.2, a closing plate 1.4 and longitudinal guides 1.5.

[0015] Preferably, the base plate 1.1 (Fig. 3) is square and provided with a raised peripheral border 1.6. On the plate surface there is at least a hole 1.7 for anchoring the base plate on respective lag bolts (not shown) deeply planted into the ground. Further, in the vicinity of said peripheral border there are provided threaded pins 1.8 to block, by means of nuts 1.9, boxed element 1.2 of the plinth to said base plates.

[0016] The boxed element 1.2 of the plinth (Fig. 2) is constituted of four plates having dimensions such that, welded together, form four perimeter lateral walls 1.3 each provided with a first and a second free edge. One between said first and second free edge is provided with flanges 1.10 which preferably are bent by 90° outwards of the volume enclosed by the lateral walls 1.3. On said flanges 1.10 there are provided holes, in a number and in a position so as to be able to engage said threaded pins 1.8 of the base plate 1.1.

[0017] With respect to the volume of the base plinth 1, on the outer side of each lateral wall 1.3 there is provided a longitudinal guide 1.5 (Figs. 2, 3 and 5) preferably having a rectangular section whereon supporting brackets 2 shall slidably engage (Fig.4). Preferably, the longitudinal guides 1.5 basically regard the entire longitudinal extension of the lateral walls 1.3 and they are formed of an open ring-shaped metal sheet. The section of the ring comprises a first back inner stop surface 1.11 for the locking elements of said brackets 2 and two second surfaces 1.12 parallel and opposed to the previous one defining a sliding slot for a supporting bracket for conduits.

[0018] The supporting brackets 2 (Fig. 4) comprise a main body 2.1 characterized by dimensions so as to be able to engage in said guides 1.5; an elongated arm 2.2, preferably characterized by a T-shaped cross section, is joined to said main body. The brackets 2 are completed with a bolt 2.3 which engages in a through and threaded hole (not shown) provided on the main body 2.1.

[0019] The closing plate 1.4 (Figs. 6A, 6B and 7) closes each base plinth 1 from the side opposed to the base plate 1.1. The closing plate 1.4 comprises a first face 1.14 and a second face 1.15 bearing through holes 1.16 arranged in a quincunx pattern or, in other words, as the figure number 5 in the dices, which repeats itself on the quadrants defined by the crossing of the medians of the plate four sides. Preferably, such pattern is superimposable and specular or, in other words, the overall pattern of their arrangement does not vary with respect to 90° rotations, or its multiples, around an axis orthogonal to the face housing said seats. Further, on the second face 1.15, there are protrusions 1.17, preferably arranged in correspondence of said medians, which will be inserted in the volume of the base plinth 1 so as to block the position of the closing plate 1.4 with respect to said base plinth.

[0020] Threaded fixing pins 3 (Fig. 8) are characterized by predefined heights, preferably two, and by having the same section. Still preferably, the outer surfaces of said fixing pins 3 have colouring corresponding to their height, or markings such as numbers, letters, identifying symbols to allow an easy identification of the item dimensions. Moreover, as it will be described later, other elements of the housing unit show the same markings or colourings,

on the entire body or only on the parts involved in the connection of the items, in order to facilitate the structure assembly.

[0021] Further, the housing unit comprises connecting plates 4 (Fig. 9). These plates have an extension so as to house inside one of the four sectors defined by the crossing of the medians of the above said closing plate 1.4 and in the vicinity of the vertexes of said connecting plates 4 there are made four holes 4.4 with the same distance between centres as of the holes 1.16 of said closing plate 1.4. A fifth hole 4.4 is substantially formed in the centre of said plate. In other words, as for the quadrants of the plate 1.4, the arrangement is in a quincunx pattern.

On one of the two faces 4.1 of the plate 4 there are protruding abutments 4.2 whereon supporting columns 8 of the housing unit according to the present invention will abut and will be welded. Preferably, the abutments have an L-shaped section whose two stems are each parallel and in the vicinity of a median of two adjacent sides. Two reinforcing walls 4.3 are orthogonal one to the other and each is orthogonal to one of said stems; moreover they end in the proximity of a vertex of the plate 4. By means of this arrangement said face 4.1 of the plate is subdivided into areas, or portions, distinct one from the other by means of different colourings or markings such as numbers, letters, identifying symbols.

In particular, observing said faces 4.1, the central area comprised between the protruding abutments 4.2 and the reinforcing walls 4.3 is area β, the angle area comprised between the reinforcing walls 4.3 and the sides of the plate is area δ. In the vicinity of the other three vertexes of the plate, each one of which includes a hole 4.4, are identified two diagonally opposed areas α and an area γ in correspondence of the third vertex.

Such distinctions match the respective pins so as to show which one among them will have to be engaged with the relative areas.

In fact, for example, as shown in Fig. 10 the pins marked with letter 3α are engaged in the hole of the closing plate 1.4 having the symbol α, similarly for the pins marked 3β in the holes of the β areas and so on. Subsequently the connecting plate 4 engages holes 4.4 marked with letters α, β, etc. on the pins having the same markings, thus ensuring the correct orientation of the connecting plate 4. The same also applies when using numbers or colours.

[0022] The housing unit further has base tension bars 5 (Fig. 11) made up of an elongated body 5.1 whose ends have eyelets 5.2 apt at engaging with fixing pins 3. Said elongated body 5.1 comprises a screw device (not shown), of the known technique, for the fine adjustment of their length so as to be tightened.

[0023] The supporting columns 8 (Figs. 12A, 12B, 12C) comprise a boxed body 8.1 extending along a longitudinal axis and it is characterized by an overall transverse L-shaped section, preferably realized by means of the union of two steel U-profiles welded together. A first end of each supporting column 8 engages on the protruding abutments 4.2 of the connecting plates 4 in a complementary way, whereas the second end, opposed to the first one, engages elements of the roof trusses, as later explained. Said supporting columns 8 further comprise wooden bars 8.2 having a rectangular, preferably square section, inserted and fixed via known means, for example screws, in the empty spaces of said boxed structure 8.1. Steel supporting plates 8.3 and reinforcing plates 8.4 are welded to the second end of said boxed structure 8.1; in particular the supporting plate 8.3 has an upturned "T" section in order to support wooden beams described later; finally a plate 8.5 closes said second end and makes it possible to fix roof trusses, described later.

In a different preferred embodiment, said plates 8.3 and 8.4 form only one steel plate (not shown) which engages in a suitable slot formed in the boxed structure 8.1 and said only one plate is fixed thereto by means of welding.

[0024] Base frames 6 (Fig. 13) preferably made of steel section bars, are formed of two equal and specular parts joined together by means of known techniques. The section bars of each of the two parts form a rectangular perimeter with a reinforcing central cross. In particular, two adjacent vertexes of the perimeter are open, while the opposed ones are closed and joined to the corresponding ones of the other equal part of the frame. As shown in the details A and B of Fig. 13, steel plates 6.1 and 6.2 are welded at the joining points of said steel section bars which will be in contact with the base plinths 1; said plates have holes suitable for engagement with fixing pins 3.

In correspondence with the open vertexes (detail C in Fig. 15), there have been provided eyelets at the ends of the perimeter section bars for engagement with fixing pins 3 in order to firmly block together the base plinths 1, connecting plates 4 and frames 6.

[0025] Wooden panels 7 (Figs 1A, 1B), preferably having a multilayer structure, constitute the floor of the housing units. Said panels are manufactured so as to have border apt at being engaged with other elements of the housing unit, such as the supporting columns 8.

[0026] The housing unit comprises wooden beams whose dimensions and sections vary according to their use; in fact, there are base connecting beams 10 and perimeter ceiling solid wood beams 11 (Figs 1A, 1B) having a length the same as that of the space between two supporting columns 8. In particular, at the ends of the horizontal beams 11 there are provided slots apt at engaging the supporting plates 8.3 (Fig. 12).

[0027] Intermediate or supporting vertical beams 12 (Fig. 14) support the ceiling beams 11 and exterior 16.1 and inner 16.2 panels which form the perimeter walls 16 of the housing unit described later.

Preferably, the beams 12 have two different sections, the first one has a general shape of F and the second one of double specular F with a single stem 12.10. The beams having a single F-shaped section are divided into first 12.1 and second 12.4 beams and they are to be placed adhering to the uprights of the window and door fixtures on the two opposed sides, on the contrary, double F

beams 12.2 and 12.3 are to be inserted in the spaces without window and door fixtures. In particular, the latter are divided into first 12.2 and second 12.3 double F beams, wherein the second ones are characterized by having a double stem. In this way, they can be placed in correspondence with the junction of two perimeter adjacent walls 16 and hence they can offer a wider fixing surface.

The beams 12 have resting steps at the end which rests against the horizontal base connecting beams 10, in particular single F beams have a single step 12.5, while double F beams have also a second step 12.6.

[0028] The roof of the housing unit is supported by self-bearing roof trusses 13 (Fig. 15), formed by arms 13.1 joined at a first end, by means of flanging with the interposition of steel collars bolted to the steel cross 13.4. On the contrary, the second end ends with a connecting flange 13.2 for engaging said plates 8.5 at the head of said supporting columns 8.

Said arms 13.1 have, on the side in contact with the components of the roof covering, dividers 13.3 which make it possible the correct and stable positioning of the supporting beams for the roof covering 14.

[0029] In fact, said covering 14 is preferably made of various layers, alternating a series of wooden rafters with thermal insulating sheets and waterproofing sheets, closing the package with an external finishing, such as a bituminous granular sheath.

In particular, at least a series of wooden rafters is arranged so as to form channels 14.1 (Fig. 19) which will join with those of a turret, later described, to ventilate the roof.

[0030] An aeration turret 15 (Figs 16A-16C), to be placed on the top of the roof, is preferably made of steel sheet. Said turret comprises a first 15.3 and a second 15.6 rooflet, a closing plate 15.9 of said second rooflet, a first boxed body 15.1 and a second boxed body 15.7, grids 15.13 and/or filters 15.14 with corresponding fixing elements.

[0031] The first rooflet 15.3 is placed on top of the second rooflet 15.6 via the interposition of a grid ribbon 15.4. The second rooflet comprises an opening topped by said first rooflet and is closed, on the opposite side with respect to the first rooflet, by the closing plate 15.9, said plate being welded on the edge formed by a grid ribbon 15.8 interposed between the second rooflet and said plate. In particular, the closing plate 15.9 has an opening from the edges of which a collar 15.10 opposite the rooflets protrudes.

The second boxed body 15.7 is coaxial with the above said collar 15.10 of said closing plate 15.9 and it, too, is provided with a perforated plate 15.11 and a collar 15.12 coaxial with and parallel to said collar 15.10 of the closing plate. Moreover, said first boxed body 15.1 comprises closed side walls without top and floor. On a first free edge of said boxed body, four arms 15.2 extend so as to define four respective seats to receive arms of said bearing truss 13.4. A second free edge of said boxed body, opposite the first edge, engages flush with the inner edge of the opening of said second rooflet 15.6. Simultaneously, the side walls of said first boxed body 15.1 will engage the inner edge of the opening of said second boxed body.

[0032] Finally, grids 15.13 and/or filters 15.14 with corresponding fixing elements such as traditional plates and bolts can be connected to the turret 15. Preferably, also an air conditioning unit 15.15 can be employed in contact with said grids or filters.

[0033] The housing unit further comprises external 16.1 (Fig. 1 B) and inner 16.2 panels to form perimeter walls, removable baseboard 16.4 (Fig. 19), insulating panels 17 and interior partition walls (not shown). Both panels for the perimeter walls and those for the partition walls are preferably made of multilayer wood, and can be blind or with openings for doors or windows 18 (Figs. 1B, 17).

In particular, the perimeter panels have a sandwich structure (Fig. 18); between the external panel 16.1 and the inner panels 16.2, supported on the horizontal beams 10, 11 and on the vertical beams 12, there are inserted insulating panels 17 which engage in the longitudinal grooves 12.7 of said beams 12; further, at the base of the perimeter wall (Fig. 19, detail C), resting on the multilayer wooden panel 7 and contained between a face of the base connecting beams 10 and the external face of the inner panel 16.2, there are conduits and cables for the distribution of connection and control devices for electrical and/or plumbing lines inside the modular housing unit.

Preferably, in the lower part of each of said panels 16.1 there is provided a hole F for the air flow, covered with a grid, to prevent dusts and particulate from entering it.

[0034] The housing unit is completed with (Figs. 1B, 17) gutters 19, downspouts 20, profiles 21 and galvanized steel grids 22 to make up paving, staircases 23 and technical rooms 24. As already said, a particular description for these elements is not given, as well as for others obtained by means of standard components according to the technical regulations in force.

[0035] Having the elements in hand, the assembly process requires consolidation and levelling of the site whereon the modular housing unit will be built; alternatively the construction could be built on a suitably compacted soil surface or on a concrete bed.

[0036] In the case of construction on a soil surface, said base plinths 1 are assembled (Fig. 2) joining the base plates 1.1 to the assembly formed by a boxed element 1.2 whereto the closing plate 1.4 is welded. The base plate and the boxed element are then blocked one to the other with threaded pins 1.8 engaging in the corresponding holes on the flanges 1.10 of the same boxed element; nuts 1.9 block their relative position. The base plinths are then placed in the defined positions making the lag bolts planted into the ground engage in the holes 1.7 of the base plate.

Conversely, if it is used a concrete bed, the bodies formed

by the boxed elements 1.2 and the closing plates 1.4 are blocked by means of threaded pins 1.8 engaging in suitable seats provided in the body of the concrete pour. It is to note that preferably, the boxed elements 1.2 are internally void.

Then, one or more supporting brackets 2 are inserted into the guides 1.5 according to the number of conduits, which are to be secured to the base plinths1.

[0037] On the closing plates 1.4, fixing pins 3 are installed adjusting the position and the height of said fixing pins 3 according to the needs defined by the design plan and respecting the instructions given by means of said markings and colourings.

The number of said fixing pins 3 and their arrangement on the matrix of holes 1.16 on the closing plates 1.4 are shown in Figs. 20 and 21. The configuration shown in Fig. 20A is used for the plinths having the position shown in Fig. 21 A; the configuration shown in Fig. 20B for the plinths in the positions of Fig. 21B and so on for the remaining figures 20C-21C and 20D-21D.

Indications will be given by means of suitable marking through letters, numbers or colours.

[0038] The arrangement of the fixing pins 3 on each of the four quadrants defined by the crossing of medians of the plate four sides can have two possible arrangements that, depending on the needs, are repeated on the other areas symmetrically with respect to said medians.

A first more articulated configuration (Fig. 20A) requires the installation of a fixing pin 3 in each hole 1.16 of the four quadrants of the closing plate 1.4. In particular, a pin 3δ engages in the δ seats in the proximity of the vertexes of the closing plate 1.4, a pin 3β engages in the seat β at the centre of each of the four quadrants, while a pin 3γ engages in the seats γ, the nearest to the centre of the closing plate 1.4. Pins 3α engage in the two remaining seats α of each quadrant, those in the vicinity of the intersections of the medians of the sides of the closing plate with the respective sides of said plate. This configuration is necessary in order to block to the base plinth 1.1 the connecting plate 4 fixed to the base of a supporting column 8 and one of the eyelets of base tension bars 5.

The second simpler configuration (Fig. 20C) requires the installation of a pin 3β in the corresponding hole β placed at the centre of the respective quadrant.

[0039] In particular, the configuration shown in Fig. 20A shows all the four quadrants defined by the medians of the sides having the first type of configuration.

This configuration is required, as shown in Fig. 21A, when the vertexes of four housing units adjoin one to the other on the supporting plinth.

[0040] The configuration shown in Fig.20B has two quadrants coterminous with the first configuration, while the remaining two are organized according to the second configuration. Similarly to the previous case, the connecting plates 4 fixed to the base of the supporting columns 8 will engage in the first two quadrants with the first configuration, while a frame 6 will engage on the pins β of the remaining quadrants thanks to the holes on the steel blades 6.2.

The base plinths with the closing plate 1.4 characterized by this arrangement are placed in the positions shown in figure 21B. On the two areas characterized by the second configuration, the holes on the blades 6.2 engage at the mid of the side of the frame, while on each of the other two quadrants engage a supporting column 8, one of the eyelets of a base tension bar 5 and one end of the lateral section bar of the frame 6 of the modular housing units.

[0041] The plates with the configuration shown in Fig. 20C show four quadrants arranged according to the second configuration.

The base plinths with this arrangement of the fixing pins 3 are used in the positions shown in Fig. 21C; the holes of the plates 6.1 of the frames 6 and one of the eyelets 5.2 of the base tension bars 5 engage, in the way later described, on the pins β of the base plinths installed in the positions at the centre of the housing units.

Different is the case when the base plinths 1 are placed along a side of the housing unit. Thanks to holes 6.2, the side of a frame 6 engages on a first couple of pins 3β on adjacent quadrants of the plate 1.4. A second frame 6 engages on the other pair of pins if the base plinth is in a position wherein two housing units are built adjoining, or one of the supporting structures 21 for the paving grids engages if the plinth is placed on an external side of the unit or of the construction of more units.

[0042] Finally, the configuration of the plates shown in Fig. 20D has a quadrant with the first configuration and the remaining ones with the second configuration. The installation points in figure 21D are characterized by the presence of a supporting column 8; further, the plinths in the vicinity of the joining point of more housing units have two adjacent pins β of second configuration engaged by the holes of the plates 6.2 of frames 6 and by an end of the tension bars 5 and on the pin β of the third quadrant of second configuration, it engages an end of a frame 21 for supporting the paving grids 22. The ends of the frames 21 for supporting the paving grids 22 engage on the three quadrants characterized by the second configuration of the remaining plinths of Fig. 21D.

[0043] Said fixing pins 3 are blocked on the plates 1.4 in the respective positions by means of a pair of nuts: a first nut 1.9 is screwed on the end of said fixing pins 3 protruding through one of the holes 1.16 from the lower surface 1.15, and a second nut 1.9 will be screwed on the remaining part of the fixing pin 3 protruding from the upper surface 1.14. Both nuts are screwed until they abut on the plate 1.4.

[0044] When the structure of the base plinths 1 is made stable, the supporting columns 8 are installed on those at the ends of the sides of the housing unit and in the positions along the faces where the joining to other housing units has been planned (Figs. 1A, 1B and 21A, 21B, 21D). The end of the supporting columns 8, whereon a connecting plate 4 is mounted, is secured to the base plinths 1 through a pair of nuts.

In fact, as shown in Fig. 2, a first nut 4.5 is screwed on

each fixing pin 3, after that the supporting column 8 is installed and then a second nut 4.6 is screwed on the portions of the fixing pins 3 protruding from the holes 4.4 of the plate 4.

[0045] The base frames 6 are then laid on the base plinths 1. The position of said frames 6 is blocked by means of fixing pins 3 positioned on the base 1.4 as described above. Also in this case, a first nut 6.3 will be screwed on the fixing pins 3 of the plinths in Fig. 21C before positioning the frame and a second nut 6.3 will be screwed on the part protruding from the holes of the blades 6.1 and/or 6.2 of said pins.

[0046] At this point the assembly process requires to verify the horizontality of all the section bars constituting the frame 6. If the checking is positive, the nuts 4.5 and 4.6 on the connecting plates 4 and the nuts 6.3 on the frames 6 are tightened definitively. Otherwise, the assembly process requires to screw the first nuts 4.5 whereon frames and columns rest until said section bars of the frames are horizontal; the overall position is then made stable by tightening the second nuts 4.6.

[0047] The tension bars are tightened following the instructions given through the marking, engaging a first eyelet 5.2 on a pin with the symbol β on the central base plinth 1 arranged as in Fig. 20C, the second eyelet 5.2 on a pin δ fixed on the corresponding base plinth 1 at the vertexes of the housing unit, arranged as in one of the other figures of Fig 20.

In particular, each base tension bar 5 engages, by means of a first eyelet 5.2, on a pin 3β installed on the plinth at the centre of the housing unit (Figs. 21C, 22) and passing in the eyelet 6.1 of the frame 6; and, by means of the other eyelet 5.2, it engages on the pin 3δ on the plinth placed at the corresponding vertex of the housing unit plan. (Figs. 21A, 21B and 21D).

By means of a screw-like mechanism, known in the technique, the tension of the tension bars is adjusted and therefore the positions are made stable with known techniques such as with the use of fixing nuts 6.3.

[0048] The floor is filled by positioning multilayer wooden panels 7. Then, the construction is carried on installing the base connecting beams 10 and the ceiling ones 11, as well as the beams 12, thus completing the bearing structure of the housing unit. In particular the base connecting beams 10 are laid and fixed to the multilayer wooden panels 7 via known techniques such as screws. Conversely, ceiling horizontal beams 11 engage, by means of suitable grooves, the supporting plates 8.3 between two adjacent supporting columns 8 and herein supported thanks to the upturned T section of the same plates. At this stage, the beams 12 can be positioned as support and stabilization means between said base connecting beams 10 and ceiling horizontal beams 11. In fact, the step 16.5 of said beams is caused to rest on the base connecting beams 10, while the beam head surface, opposed to the step, abuts against the ceiling horizontal beam 11.

[0049] By repeating the same process the frames of other housing units can be put together so as to realize complex housing units (Fig.1 B).

Further housing units are built adjoining, for example according to the plans in Figs. 21 A and 21 B, respectively aligned or staggered, joining the housing units as in the example of Fig. 23.

[0050] After completing the construction and the union of the bearing structures of the housing units, the positions of the supporting brackets 2, previously inserted in the guides 1.5, are adjusted (Fig.5). The main body 2.1 is caused to slide within said vertical guide 1.5 until it reaches the suitable height, after that the position is fixed operating on the bolt 2.3 whose end opposite the head will thrust onto the inner surface 1.11 of said guide 1.5 so as to apply to the main body 2.1 a force which pushes it against the surfaces 1.10 of said guide 1.5. The force, so applied, is such that it prevents the vertical sliding of the brackets 2.

When all heights have been adjusted, conduits 2.4 are laid and fixed on the elongated arms 2.2 of said brackets 2 using the known techniques.

[0051] The assembling of each housing unit involved in the construction of the building is carried on positioning and securing the self-bearing trusses 13 which are fixed to the supporting columns 8 at the vertexes of the modular housing unit via flanges 13.2 (Fig. 24). On the arms 13.1, resting on the protrusions 13.3, there are distributed wooden blocks which will support a vapour barrier, insulating panels, more wooden blocks forming aeration ducts 14.1 (Fig. 19). The covering is completed by means of multilayer rough wooden board for covering whereon a waterproof external layer is fixed.

[0052] The structure of the housing unit, or of a construction composed of more units, is completed with the installation of the perimeter walls 16 (Figs 1B, 16) and of interior partition walls (not shown). Both can be provided with openings for installing doors and windows 18 (Figs. 1B, 17), they, too, are made according to standard dimensions.

[0053] In particular, the external perimeter walls are made of a multilayer structure. On the horizontal beams 10, 11 and girders 12, on the external perimeter walls of the housing unit or of the complex of housing units, there are installed external panels 16.1 and inner panels 16.2. In particular, said external panels extend from the ceiling horizontal beam 11 towards the base connecting beam 10, exceeding the line of the base frame 6, thus ensuring that liquids caused by bad weather slide and fall onto the ground without entering into contact with the other wooden components of the structure of the housing unit (detail C of Fig. 19).

As previously mentioned, panels 17 of insulating material are inserted between the longitudinal grooves 12.7 (Fig. 13) of two adjacent girders 12. Said panels have dimensions so as to fill in height the space between the horizontal beams 10 and 11 and have an extension the same as the distance between two adjacent girders 12 (Fig. 17). Moreover, the thickness of the head and that of the

arm of the F-like section of the girders 12 defines, when assembled together and together with the external and inner walls, vertical aeration channels or cavities communicating (Figs. 17, 18, 19), on one side, with the chambers of the ventilated roof and, on the other, with a channel extending for the whole base of the wall along the base connecting beam 10. In fact, as shown in the detail C of Fig. 19, the ends of the girders 12 not placed against the supporting columns 8 rest on the connecting beams 10 with the first step 12.5, while the second step 12.6 forms a channel at the base of the whole wall.

[0054] With the structure of the turret, of the walls and of the beams described above, it is possible to obtain a double separated HVC circuit (Fig. 19) in order to obtain an air flow entering the housing unit and an air flow circulating in the cavities in the perimeter walls and in the roof.

[0055] In particular, a first air flow, going in and coming out the habitable zone of the housing unit (Fig.19, detail A) is formed by the air, shown by bidirectional arrows, passing through the grid ribbon 15.4 of the first rooflet, then passes through the first boxed body 15.1, further passing the grids 15.13 and/or filters 15.14 reaching then, if present, the air conditioning device 15.15 which treats air before its final introduction into the housing unit.

[0056] The second airflow flows in the cavities provided in the structure of the housing unit and has two components. The first component draws air from the habitable zone causing it to pass through the slits in the contact area between the panels 16.2 and the floor panels 7, rises along the channels or cavities, made between said inner panels 16.2, the faces of the insulating panels 17 and the surfaces of the supporting columns 8. The second component of the airflow removes moisture from the walls making it possible to achieve both a better insulation of the housing unit, and a longer life of the insulating panels 17, of the beams 12 and of all the components of the perimeter walls.

As shown in Figs 17 and 19-C, this second airflow originates in the lower part of the walls. In figure 17 arrows in a continuous line show the air flow entering through the ventilation holes F, it splits in the channel (Fig. 19 detail C) formed at the bottom of the wall by the upper border of the base connecting beams 10 and by the lower parts of the panels 16.1 and 16.2.

The upper side of said channel is discontinuous, in fact as said above, the insulating panel 17 is separated from the panel 16.1, thus forming channels or cavities, (Fig. 18) which make the drawn air rise along the walls.

In the detail B of Fig. 19, the arrows show the union of the first and second component of the air flow, and its passage through said channels or cavities of the perimeter walls to the conduits 14.1 formed in the multilayer structure of the roof 14. In the detail A, still of Fig. 19, the unidirectional arrows describing said air flow, show the passage from the channels of the roof to the channel formed by the collars 15.10 and 15.12, then in the space defined in the lower part by the closing plate 15.9 and in the upper part by the rooflet 15.3 finally the air flow exits outside after passing through the grid ribbon 15.8.

[0057] Finally, externally to the construction, supporting structures 21 for the paving grids 22, as well as those for access staircases 23 are installed and the remaining finishing such as gutters 19 and downspouts 20 are mounted.

[0058] As already said, reduced realization times are among the advantages coming from the availability of a prefabricated housing unit, further the present invention can be found as a kit to assemble and joins the easiness of assembling, thanks to marking by means of symbols or colours, to the flexibility offered by a base unit which can be joined to similar units to obtain highly personalized bigger constructions.

[0059] A further advantage offered by the present invention is the quick access for checking and maintenance operations following the completing of the construction.

[0060] Not last, the flexibility remains also after the first construction, in fact, should be necessary to expand the building initially built it is possible to expand its plan by joining more housing units.

[0061] Further the structure of the housing unit can be easily disassembled and its components can be easily reused to rebuild it in a different site or at future times.

[0062] The flexibility of the structure of the housing unit makes it possible to market it as a do-it-yourself kit, made up according to the designed plan specifications and to the buyer's requirements.

[0063] The construction of an aeration/insulation system of the walls of the unit and of the aeration turret advantageously makes it possible to achieve a very good air-conditioning of the unit.

[0064] Of course, the present invention can undergo various modifications or variations without exiting the field of its protection, as defined by claim 1. For example, the plinths can have sections different from the square one, can be circular or of other polygons; the cross section of the supporting columns, necessary to house wooden boards, can be different from the double U-like one.

Claims

1. Modular housing unit comprising:

- base plinths (1) and base frames (6) to support the housing unit;
- supporting angle columns (8) to support roof trusses (13);
- horizontal beams (10, 11) to connect said angle columns (8);
- vertical beams (12) supporting the horizontal beams;

characterized in that:

said base plinths (1) comprising a box element (1.2) having lateral walls, which walls (1.3) bear longitudinal guides (1.5) for brackets (2) supporting conduits (2.4), a first head opening closed by a closing plate (1.4) flush with said box element, the closing plate bearing a plurality of holes (1.16) engageable by pins (3) on which said columns (8) are installed, said holes being arranged in a quincunx pattern on four equal quadrants in which said plate is divided; and
said supporting angle columns (8) comprise a boxed body (8.1) with a longitudinal overall L-shaped section having a first end fixed to a connecting plate (4) which plate connects to said base plinth (1), and a second end fixing an element of said roof trusses (13) with said connecting beams (11), wherein said connecting plate (4) comprises holes (4.4) arranged in a quincunx pattern to engage said fixing pins (3).

2. Modular housing unit according to claim 1, wherein said plinth (1) has a square section, said closing plate (1.4) is divided by the crossing of its four medians and said connecting plate (4) fits within one of said quadrants.

3. Modular housing unit according to claim 1 or 2, wherein said connecting plate (4) comprises a face (4.1) provided with L-shaped abutments (4.2) against which a first end of said supporting columns (8) is fixed, preferably also includes reinforcing walls (4.3) of said abutments.

4. Modular housing unit according to any of claims 1 to 3, wherein said overall L-shape of said supporting columns (8) is realized through the union of two U-profiles that define a seat outside the L-shaped body and two seats inside the L-shaped body receiving wooden bars (8.2), said supporting columns comprising preferably plates (8.3) to hold said horizontal beams (11) and plates (8.4) to reinforce, both being welded to the second end of said column.

5. Modular housing unit according to any of claims 1 to 4, wherein said base plinths (1) include a base plate (1.1) presenting a central hole (1.7) for engaging lag bolts and a raised peripheral border (1.6) in the vicinity of which threaded pins (1.8) protrude to couple to the flange (1.10) formed on the free edge of a second opening of the box element (1.2) of the base plinth, on the side opposite to the closing plate (1.4).

6. Modular housing unit according to any of claims 1 to 5, wherein said base frames (6) are composed of section bars which form two equal and symmetrical parts of a rectangular perimeter, said two equal parts are reinforced by an inner cross; the vertexes of said rectangular perimeter are open for engagement with said angular supporting columns (8).

7. Modular housing unit according to any of claims 1 to 6, wherein said vertical beams (12) have a general shape section of F or double specular F with single stem (12.10), the ends of said beams resting against horizontal base connecting beams (10) also have resting steps, wherein single F beams have a single step (12.5) while double F beams have a first step (12.5) and a second step (12.6).

8. Modular housing unit according to any one of claims 1 to 7, further comprising an aeration turret (15) to be placed on the top of the roof, said turret being provided with a first rooflet (15.3) placed on top a second rooflet (15.6) via the interposition of a grid ribbon (15.4), the second rooflet having an opening topped by said first rooflet and being closed, on the opposite side respect to the first rooflet, by a closing plate (15.9) welded on the edge formed by a grid ribbon (15.8) interposed between the second rooflet and said plate, the closing plate (15.9) also having a collar (15.10) protruding opposite to the roofs from the edges of opening on its surface, the turret also comprising a second boxed body (15.7) coaxial with said collar (15.10) and provided with a perforated plate (15.11) and a collar (15.12), said collar being coaxial and parallel to said collar (15:10), and a first boxed body (15.1) comprising closed side walls without top and floor, on a first free edge of said boxed body four arms (15.2) extend so as to define four respective seats to receive arms (13.4) of said bearing truss, a second free edge of said boxed body, opposite to the first edge, engages flush with the inner edge of the opening of said second rooflet (15.6) and simultaneously the side walls of said first boxed body (15.1) engage the inner edge of the opening of said second body.

9. Modular housing unit according to any one of claims 1 to 8, further comprising insulating panels (17) placed between two vertical beams (12) so that each of their two respective opposite vertical edges engages a longitudinal groove (12.7), and comprising external perimeter panels (16.1) and inner panels (16.2), said panels being sandwiched with the interposition of said beams (12), said insulating panels (17) extending between said beams.

10. Modular housing unit according to any one of claims 8 or 9, wherein a first air flow, going in and coming out the habitable zone of the housing unit, is formed by the air passing through the grid ribbon (15.4) of the first rooflet (15.3) of the turret (15), then passes through the first box body (15.1), further passing the grids (15.13) and/or filters (15.14), reaching then the interior of the housing unit; a second air flow comprises a first component that draws air from the hab-

itable zone through slits in the contact area between the panels (16.2) and the floor panels (7), rises along the channels or cavities defined by said inner panels (16.2), faces of said insulating panels (17) and said grinders (12), and a second component which enters through the ventilation holes (F) formed on the exterior panels (16.1), it splits at the bottom of said panel in the channel created by the upper border of the base connecting beams (10), by the second steps (12.6), by the insulating panel (17) and rises passing then along a groove between the upper edge of the insulating panel (17) and an upper horizontal beam (11) to join to the first component of air and to go through a gap in the roof, this gap allowing the flow through the space between the collar (15.12) of the second box body (15.7) and the collar (15.10) of the closure plate (15.9) of the turret of aeration (15) to exit outside from the tape grid (15.8).

Patentansprüche

1. Modulare Hauseinheit, umfassend:

- Grundsockel (1) und Grundrahmen (6) zum Tragen der Hauseinheit;
- Winkelstützpfeiler (8) zum Tragen von Dachbindern (13);
- horizontale Träger (10, 11) zum Verbinden der Winkelpfeiler (8);
- vertikale Träger (12) zum Tragen der horizontalen Träger;

dadurch gekennzeichnet, dass:

die Grundsockel (1) ein Kastenelement (1.2) mit Seitenwänden umfassen, wobei die Wände längslaufende Führungen (1.5) für Klammern (2) aufweisen, die Leitungen (2.4) tragen, eine erste Kopföffnung, die von einer Verschlussplatte (1.4) geschlossen wird, welche fluchteben mit dem Kastenelement ist, wobei die Verschlussplatte eine Vielzahl von Löchern (1.16) aufweist, in die Stifte (3) einrücken können, mit welchen die Pfeiler (8) installiert werden, wobei die Löcher in einem Fünfpunktmuster auf vier gleichen Quadranten angeordnet sind, in welche die Platte unterteilt ist; und
wobei die Winkelstützpfeiler (8) einen kastenförmigen Körper (8.1) mit einem in Längsrichtung insgesamt L-förmigen Querschnitt umfassen, dessen erstes Ende an einer Verbindungsplatte (4) befestigt ist, die an den Basissockel (1) anschließt, und dessen zweites Ende ein Element der Dachbinder (13) mit den Verbindungsträgern (11) fixiert, wobei die Verbindungsplatte (4) Löcher (4.4) umfasst, die in einem Fünfpunktmuster angeordnet sind, um mit den Befestigungsstiftern (3) in Eingriff zu kommen.

2. Modulare Hauseinheit nach Anspruch 1, wobei der Sockel (1) einen quadratischen Querschnitt hat, die Verschlussplatte (1.4) durch das Überkreuzen ihrer vier Mediane unterteilt ist und die Verbindungsplatte (4) in einen der Quadranten passt.

3. Modulare Hauseinheit nach Anspruch 1 oder 2, wobei die Verbindungsplatte (4) eine Fläche (4.1) umfasst, die mit L-förmigen Stößen (4.2) versehen ist, an welchen ein erstes Ende der Stützpfeiler (8) fixiert ist, wobei sie vorzugsweise auch Verstärkungswände der Stöße aufweist.

4. Modulare Hauseinheit nach einem der Ansprüche 1 bis 3, wobei die insgesamt L-förmige Form der Stützpfeiler (8) durch das Zusammenfügen von zwei U-Profilen realisiert wird, die einen Sitz außerhalb des L-förmigen Körpers definieren und zwei Sitze innerhalb des L-förmigen Körpers, welche Holzträger (8.2) aufnehmen, wobei die Stützpfeiler vorzugsweise Platten (8.3) umfassen, um die horizontalen Träger (11) zu halten sowie Verstärkungsplatten, die jeweils an das zweite Ende der Säule geschweißt sind.

5. Modulare Hauseinheit nach einem der Ansprüche 1 bis 4, wobei die Grundsockel (1) eine Grundplatte (1.1) mit einer mittigen Bohrung (1.7) für eine Ankerschraube und einem angehobenen umlaufenden Rand (1.6) aufweisen, in dessen Nähe Gewindestifte (1.8) vorstehen, um mit dem Flansch (1.10) zu koppeln, der an dem freien Rand der zweiten Öffnung des Kastenelements (1.2) des Grundsockels auf der Seite gegenüber der Verschlussplatte (1.4) ausgebildet ist.

6. Modulare Hauseinheit nach einem der Ansprüche 1 bis 5, wobei die Grundrahmen (6) aus Profilträgern bestehen, die zwei gleiche und symmetrische Teile eines rechtwinkligen Umfangs bilden, wobei die zwei gleichen Teile von einem inneren Kreuz verstärkt werden; wobei die Scheitelpunkte des rechtwinkligen Umfangs offen für den Eingriff mit den Winkelstützpfeilern (8) sind.

7. Modulare Hauseinheit nach einem der Ansprüche 1 bis 6, wobei die vertikalen Träger (12) im Allgemeinen eine Querschnittsform eines F oder doppelten gespiegelten F mit einem einzigen Stil (12.10) aufweisen, wobei die Enden der Träger an horizontalen Grundverbindungsträgern (10) ruhen, die auch Auflagestufen aufweisen, wobei einzelne F-Träger eine einzelne Stufe (12.5) aufweisen, wogegen doppelte F-Träger eine erste Stufe (12.5) und eine zweite Stufe (12.6) aufweisen.

8. Modulare Hauseinheit nach einem der Ansprüche 1 bis 7, des Weiteren umfassend einen Lüftungsdachaufbau (15) zur Anordnung oben auf dem Dach, wobei der Dachaufbau ein erstes kleines Dach (15.3) aufweist, das auf einem zweiten kleinen Dach (15.6) angeordnet wird, wobei dazwischen ein Gitterband (15.4) angeordnet ist, wobei das zweite kleine Dach eine Öffnung aufweist, über der das erste kleine Dach angeordnet ist und die auf der gegenüberliegenden Seite bezüglich des ersten kleinen Daches durch eine Verschlussplatte (15.9) verschlossen ist, welche an die Kante geschweißt ist, die von einem Gitterband (15.8) gebildet wird, das zwischen dem zweiten kleinen Dach und der Platte angeordnet ist, wobei die Verschlussplatte (15.9) außerdem einen Kragen (15.10) aufweist, der gegenüber den kleinen Dächern von den Rändern der Öffnung vorsteht, wobei der Dachaufbau außerdem einen zweiten kastenförmigen Körper (15.7) umfasst, der koaxial zu dem Kragen (15.10) ausgebildet und mit einer perforierten Platte (15.11) und einem Kragen (15.12) versehen ist, wobei dieser Kragen parallel zu dem Kragen (15.10) ausgerichtet ist, und einen ersten kastenförmigen Körper (15.1), der geschlossene Seitenwände ohne Oberseite und Boden umfasst, wobei sich von einem ersten freien Rand des kastenförmigen Körpers vier Arme (15.2) erstrecken, die jeweils vier Auflagen bilden, um Arme (13.4) des Dachbinders aufzunehmen, wobei ein zweiter freier Rand des kastenförmigen Körpers gegenüber dem ersten Rand fluchteben mit dem Innenrand der Öffnung des zweiten kleinen Daches (15.6) in Eingriff kommt und gleichzeitig die Seitenwände des ersten kastenförmigen Körpers (15.1) mit dem Innenrand der Öffnung des zweiten Körpers in Eingriff kommen.

9. Modulare Hauseinheit nach einem der Ansprüche 1 bis 8, des Weiteren umfassend Isolierpaneele (17), die zwischen zwei vertikalen Trägern (12) angeordnet sind, so dass jeder ihrer zwei jeweils gegenüberliegenden vertikalen Ränder in eine Längsnut (12.7) einrückt, und umfassend Außenumfangspaneele (16.1) und Innenpaneele (16.2), wobei die Paneele so angeordnet sind, dass sich dazwischen die Träger (12) befinden, wobei sich zwischen diesen Trägern die Isolierpaneele (17) erstrecken.

10. Modulare Hauseinheit nach einem der Ansprüche 8 oder 9, wobei ein erster Luftstrom, der in den Wohnbereich der Hauseinheit strömt und daraus herauskommt, von der Luft gebildet wird, die durch das Gitterband (15.4) des ersten kleinen Daches (15.3) des Dachaufbaus (15) strömt, dann durch den ersten kastenförmigen Körper (15.1) verläuft, weiter die Gitter (15.13) und/oder Filter (15.14) durchströmt, dann das Innere der Hauseinheit erreicht; wobei ein zweiter Luftstrom eine erste Komponente umfasst, die Luft aus dem Wohnbereich durch Schlitze in der Kontaktfläche zwischen den Kanälen (16.2) und den Bodenkanälen (7) saugt, entlang den Kanälen oder Hohlräumen aufsteigt, die von den Innenpaneelen (16.2), Flächen der Isolierpaneele (17) und den Trägern (12) definiert werden, und eine zweite Komponente, die durch die Lüftungslöcher (F) eintritt, die an den Außenpaneelen (16.1) ausgebildet sind, sich am Boden des Paneels in den Kanal aufteilt, der von der Obergrenze der Grundverbindungsträger (10), von denen zweiten Stufen (12.6), von den Isolierpaneelen (17) gebildet wird, und aufsteigt und dabei entlang einer Nut zwischen dem oberen Rand des Isolierpaneels (17) und einem oberen horizontalen Träger (11) verläuft, um sich mit der ersten Komponente der Luft zu vereinen und durch einen Spalt in dem Dach auszutreten, wobei dieser Spalt den Strom durch den Raum zwischen dem Kragen (15.12) des zweiten kastenförmigen Körpers (15.7) und dem Kragen (15.10) der Verschlussplatte (15.9) des Lüftungsdachaufbaus (15) und das Austreten aus dem Gitterband (15.8) ermöglicht.

Revendications

1. Unité d'habitation modulaire comprenant:

- des socles de base (1) et des cadres de base (6) pour soutenir l'unité d'habitation,
- des colonnes d'angle de support (8) pour soutenir la charpente (13),
- des poutres horizontales (10, 11) pour relier lesdites colonnes d'angle (8),
- des poutres verticales (12) supportant les poutres horizontales,

caractérisée en ce que

lesdits socles de base (1) comprenant un caisson (1.2) ayant des parois latérales, lesquelles parois (1.3) portent des guides longitudinaux (1.5) pour des crochets (2) supportant des conduits (2.4), une première ouverture de tête fermée par une plaque de fermeture (1.4) affleurante avec ledit caisson, la plaque de fermeture portant une pluralité de trous (1.16) pouvant être engagés par des broches (3) sur laquelle lesdites colonnes (8) sont installées, lesdits trous étant disposés selon un motif en quinconce sur quatre quadrants égaux, dans lesquels ladite plaque est divisée ; et

lesdites colonnes d'angle de support (8) comprennent un corps encastré (8.1) avec une section longitudinale globalement en forme de L ayant une première extrémité fixée à une plaque de connexion (4), laquelle plaque reliant ledit socle de base (1), et une seconde extrémité fixant un élément de ladite charpente (13) avec lesdites poutres (11) de liaison, dans laquelle ladite plaque de connexion (4) comprend des trous (4.4) disposés selon un motif en quinconce

pour engager lesdites broches de fixation (3).

2. Unité d'habitation modulaire selon la revendication 1, dans laquelle ledit socle (1) présente une section carrée, ladite plaque de fermeture (1.4) est divisée par le croisement de ses quatre médianes et ladite plaque de connexion (4) s'inscrit dans l'un desdits quadrants.

3. Unité d'habitation modulaire selon la revendication 1 ou 2, dans laquelle ladite plaque de connexion (4) comprend une face (4.1) prévue avec des butées en forme de L (4.2) contre lesquelles une première extrémité desdites colonnes de support (8) est fixée, et de préférence comprend également des parois de renforcement (4.3) desdites butées.

4. Unité d'habitation modulaire selon l'une quelconque des revendications 1 à 3, dans laquelle ladite forme de L globale desdites colonnes de support (8) est réalisée par l'union de deux profilés en U qui définissent un siège à l'extérieur du corps en forme de L et deux sièges à l'intérieur du corps de réception de barres de bois en forme de L (8.2), lesdites colonnes de support comprenant de préférence des plaques (8.3) pour maintenir lesdites poutres horizontales (11) et des plaques (8.4) à renforcer, les deux étant soudées à la deuxième extrémité de ladite colonne.

5. Unité d'habitation modulaire selon l'une quelconque des revendications 1 à 4, dans laquelle lesdits socles de base (1) comprennent une plaque de base (1.1) présentant un trou central (1.7) pour mettre en prise des tirefonds et une bordure périphérique surélevée (1.6) au voisinage de laquelle des tiges filetées (1.8) font saillie pour se coupler à la collerette (1.10) formée sur le bord libre d'une deuxième ouverture du caisson (1.2) du socle de base, sur le côté opposé à la plaque de fermeture (1.4).

6. Unité d'habitation modulaire selon l'une quelconque des revendications 1 à 5, dans laquelle lesdits cadres de base (6) sont constitués de barres profilées qui forment deux parties égales et symétriques de périmètre rectangulaire, lesdites deux parties égales sont renforcées par une section intérieure; les sommets dudit périmètre rectangulaire sont ouverts pour une mise en prise avec lesdites colonnes de support angulaires (8).

7. Unité d'habitation modulaire selon l'une quelconque des revendications 1 à 6, dans laquelle lesdites poutres verticales (12) ont une section générale en forme de F ou de double F spéculaires à tige unique (12.10), les extrémités desdites poutres en appui contre les poutres horizontales de liaison (10) ont également des marches d'appui, dans laquelle des poutres simples F ont une seule marche (12.5) tandis que des poutres en double F ont une première marche (12.5) et une seconde marche (12.6).

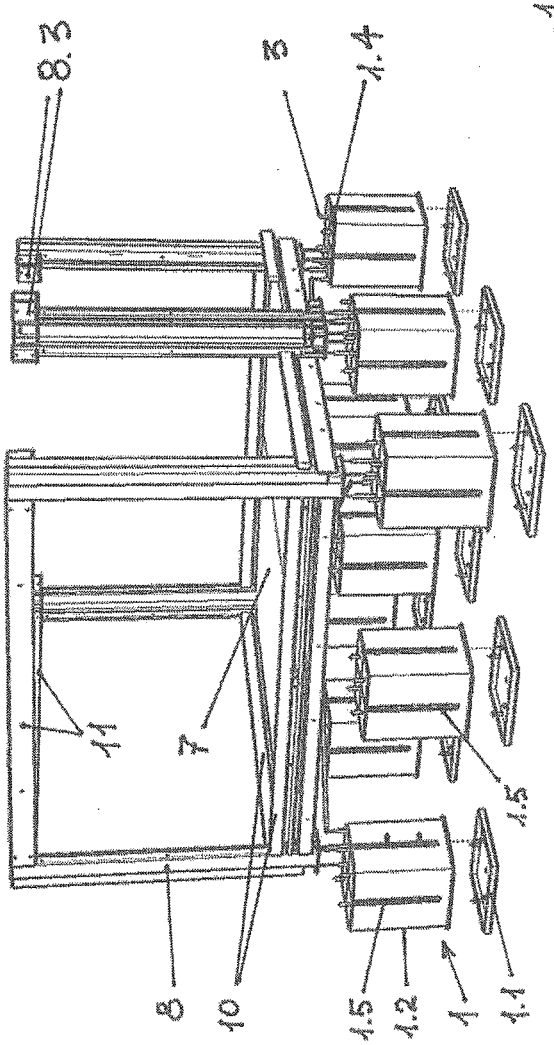
8. Unité d'habitation modulaire selon l'une quelconque des revendications 1 à 7, comprenant en outre une tourelle d'aération (15) pour être placée sur le dessus de la toiture, ladite tourelle étant pourvue d'un premier petit toit (15.3) placé au-dessus d'un second petit toit (15.6) par l'interposition d'un bandeau grillagé (15.4), le second petit toit ayant une ouverture surmontée par ledit premier petit toit et étant fermé, à l'égard de la face opposée au premier petit toit, par une plaque de fermeture (15.9) soudée sur le bord formé par un bandeau grillagé (15.8) interposé entre le second petit toit et ladite plaque, la plaque de fermeture (15.9) comportant également un collier (15.10) faisant saillie à l'opposé des toitures à partir des bords de l'ouverture sur sa surface, la tourelle comportant en outre un deuxième corps encastré (15.7) coaxial avec ledit collier (15.10) et muni d'une plaque perforée (15.11) et un collier (15.12), ledit collier étant coaxiale et parallèle audit collier (15:10), et un premier corps encastré (15.1) comprenant des parois latérales fermées sans couvercle ni plancher, sur un premier bord libre dudit corps encastré quatre bras (15.2) s'étendent de manière à définir quatre sièges respectifs pour recevoir des bras (13.4) de ladite charpente, un second bord libre dudit corps encastré, opposé au premier bord, vient en prise au ras du bord intérieur de l'ouverture dudit second petit toit (15.6) et en même temps les parois latérales dudit premier corps encastré (15.1) en prise avec le bord intérieur de l'ouverture dudit deuxième corps.

9. Unité d'habitation modulaire selon l'une quelconque des revendications 1 à 8, comprenant en outre des panneaux isolants (17) placés entre deux poutres verticales (12) de sorte que chacun de leurs deux bords verticaux opposés respectifs est en prise avec une rainure longitudinale (12.7), et comprenant des panneaux périphériques extérieurs (16.1) et intérieurs (16.2), lesdits panneaux étant pris en sandwich en intercalant lesdites poutres (12), lesdits panneaux isolants (17) s'étendant entre lesdites poutres.

10. Unité d'habitation modulaire selon l'une quelconque des revendications 8 ou 9, dans laquelle un premier flux d'air, entrant et sortant de la zone habitable de l'unité d'habitation, est formé par l'air passant à travers le bandeau grillagé (15.4) du premier petit toit (15.3) de la tourelle (15), puis passe à travers le premier corps encastré (15.1), passant en outre les grillages (15.13) et / ou les filtres (15.14), pour atteindre ensuite l'intérieur de l'unité d'habitation, un deuxième flux d'air comprend un premier composant qui aspire l'air de la zone habitable à travers des

fentes dans la zone de contact entre les panneaux (16.2) et les panneaux de plancher (7), monte le long des canaux ou des cavités définis par lesdits panneaux intérieurs (16.2), face auxdits panneaux isolants (17) et auxdits broyeurs (12), et un deuxième composant qui pénètre par les trous de ventilation (F) formés sur les panneaux extérieurs (16.1), il se divise en bas dudit panneau dans le canal créé par la bordure supérieure des poutres horizontales de liaison (10), par les deuxième marches (12.6), par le panneau isolant (17) et remonte en passant ensuite le long d'une rainure entre le bord supérieur du panneau isolant (17) et une poutre horizontale supérieure (11) pour se joindre à la première composante de l'air et de passer par un trou dans la toiture, cet espace permettant l'écoulement à travers l'espace entre le collier (15.12) du second corps encastré (15.7) et le collier (15.10) de la plaque de fermeture (15.9) de la tourelle d'aération (15) pour sortir à l'extérieur de la grille du bandeau (15.8).

FIG. 1A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8
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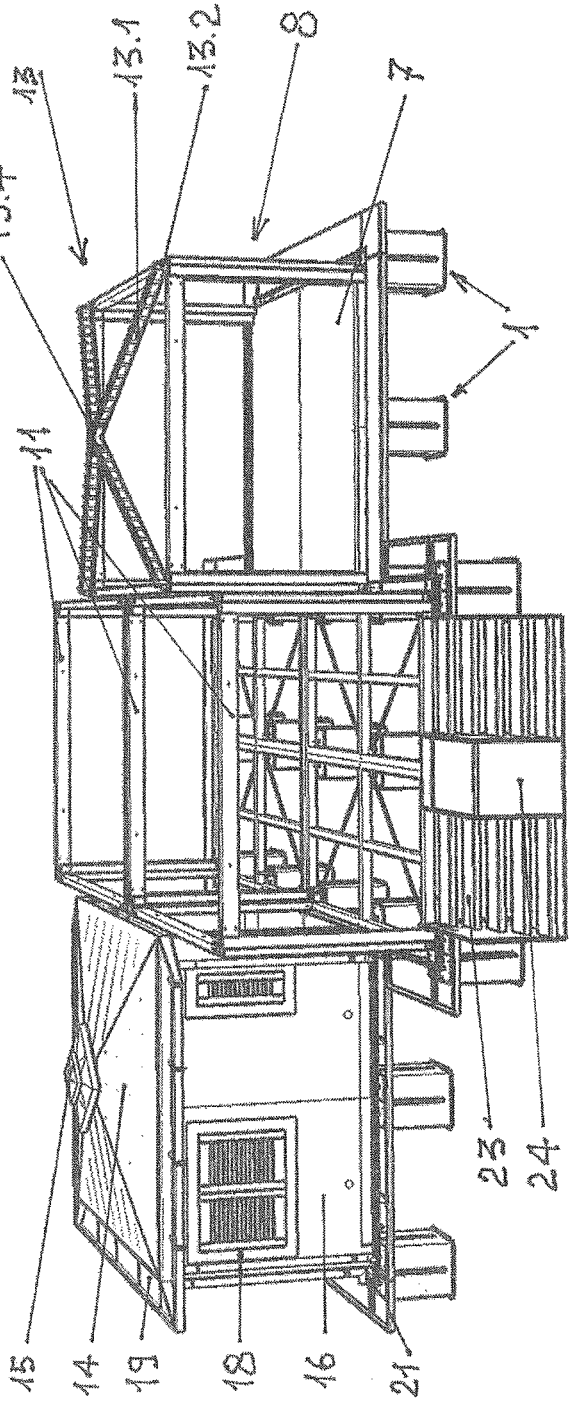
1.2
1
1.1

FIG. 1B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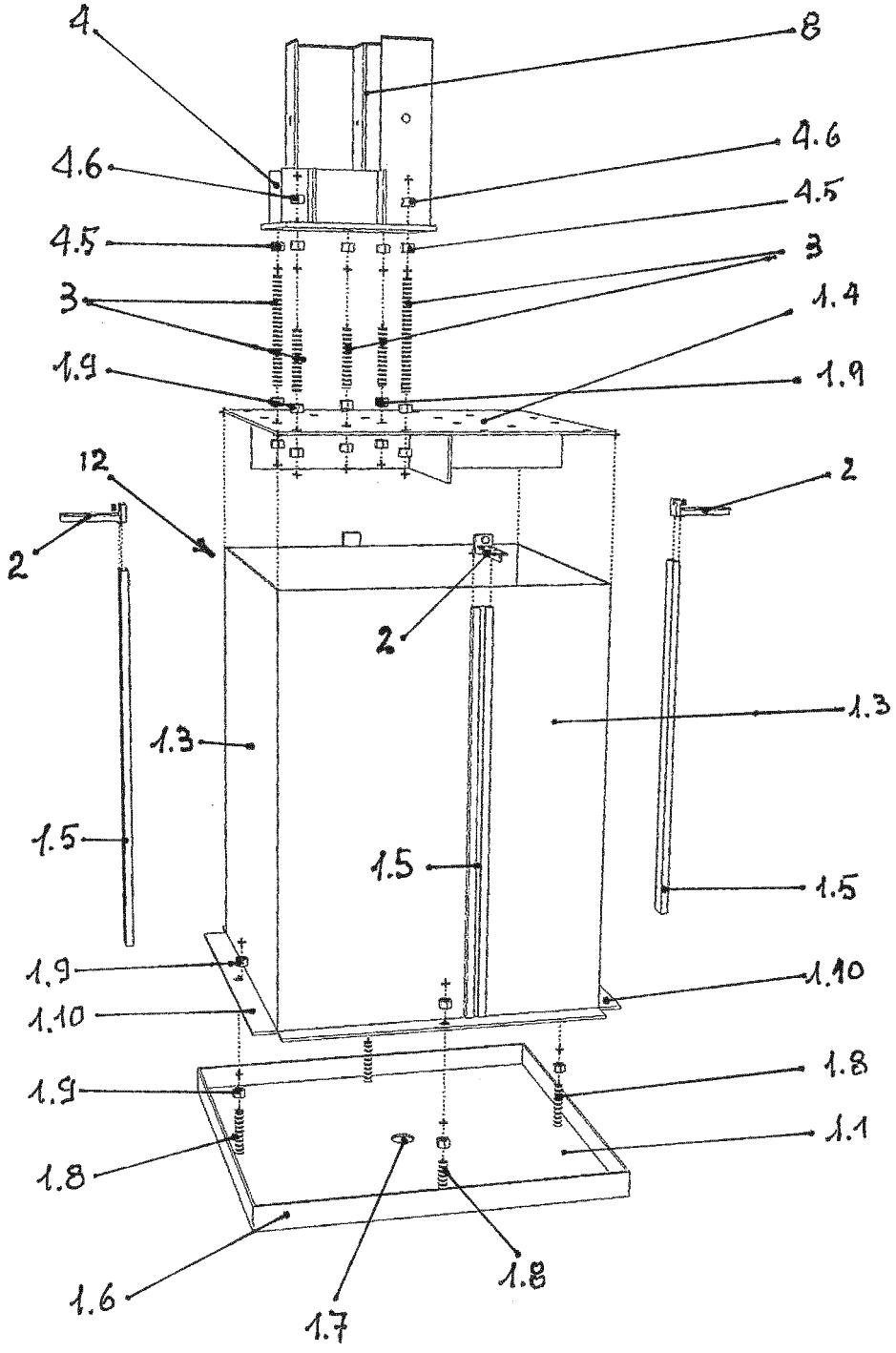
4
8
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4.5
4.5
3
3
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1.9
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12
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1.3
1.5
1.5
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1.8
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1.1
1.6
1.7
1.8

FIG. 2

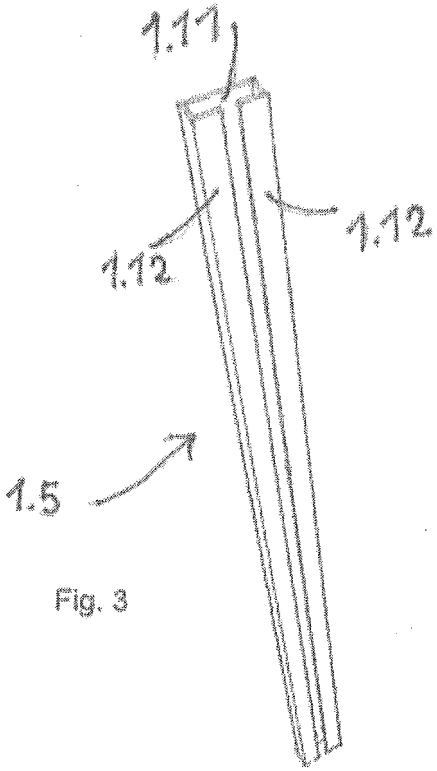


Fig. 3

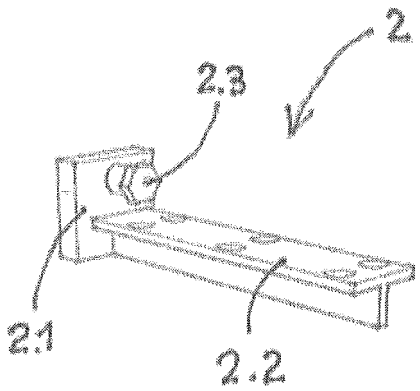


Fig. 4

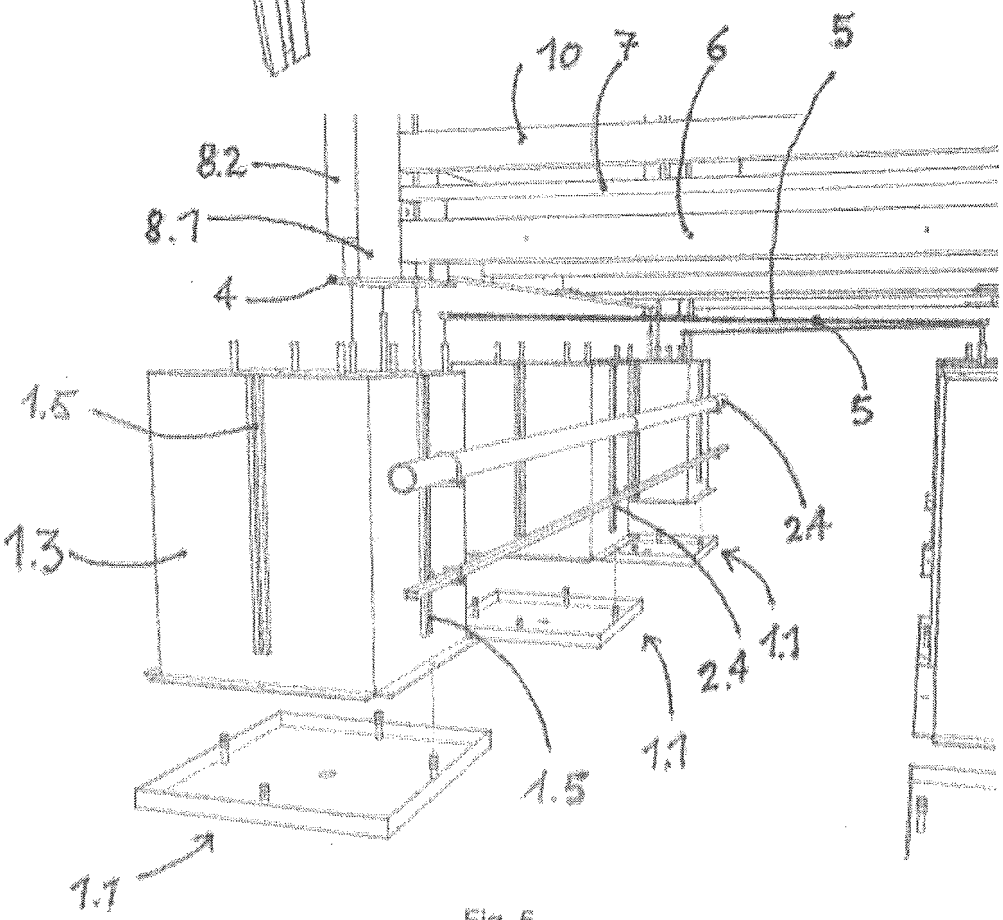


Fig. 5

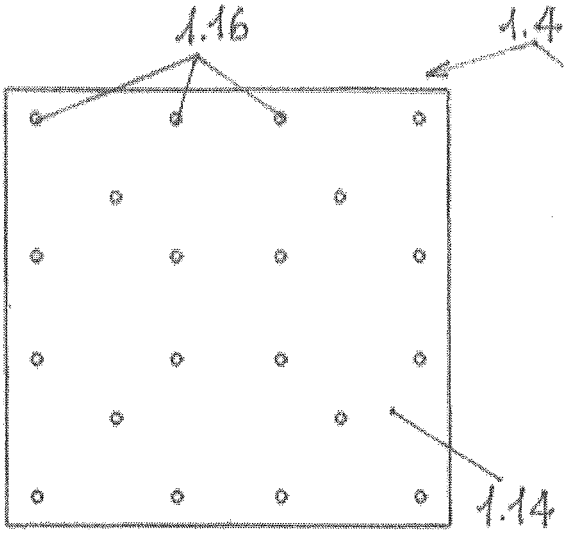


FIG. 6 A

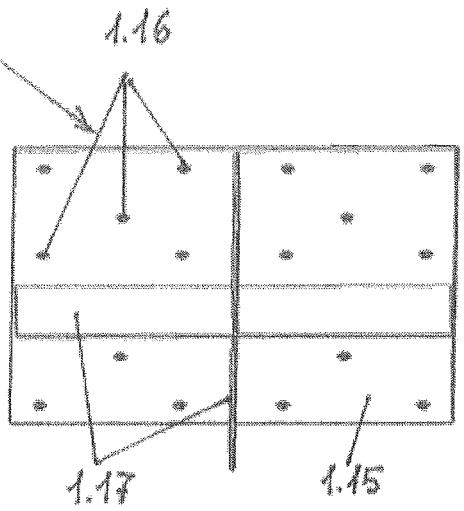


FIG. 6 B

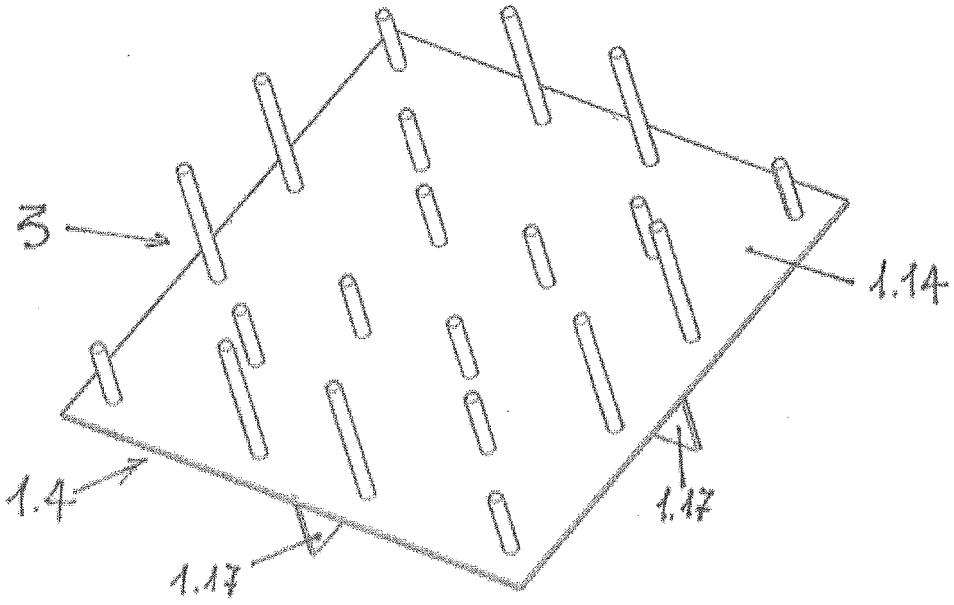


FIG. 7

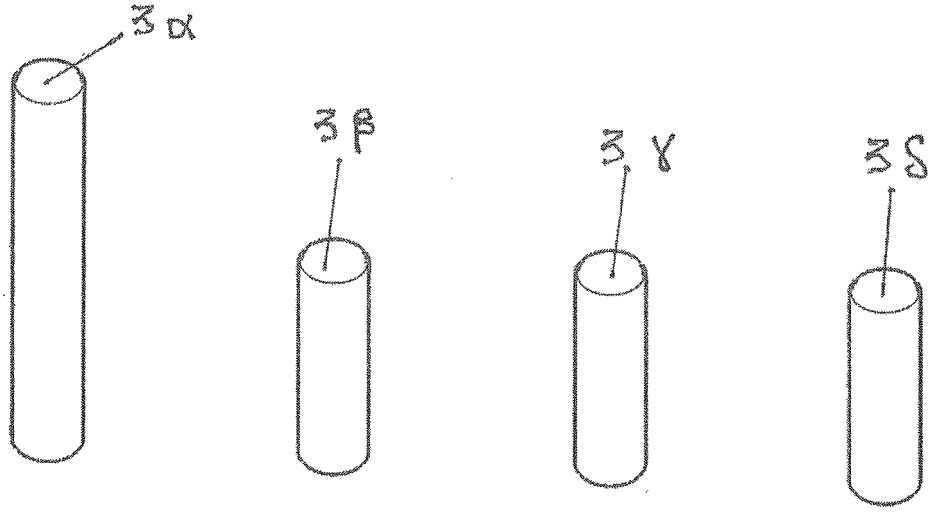


FIG. 8

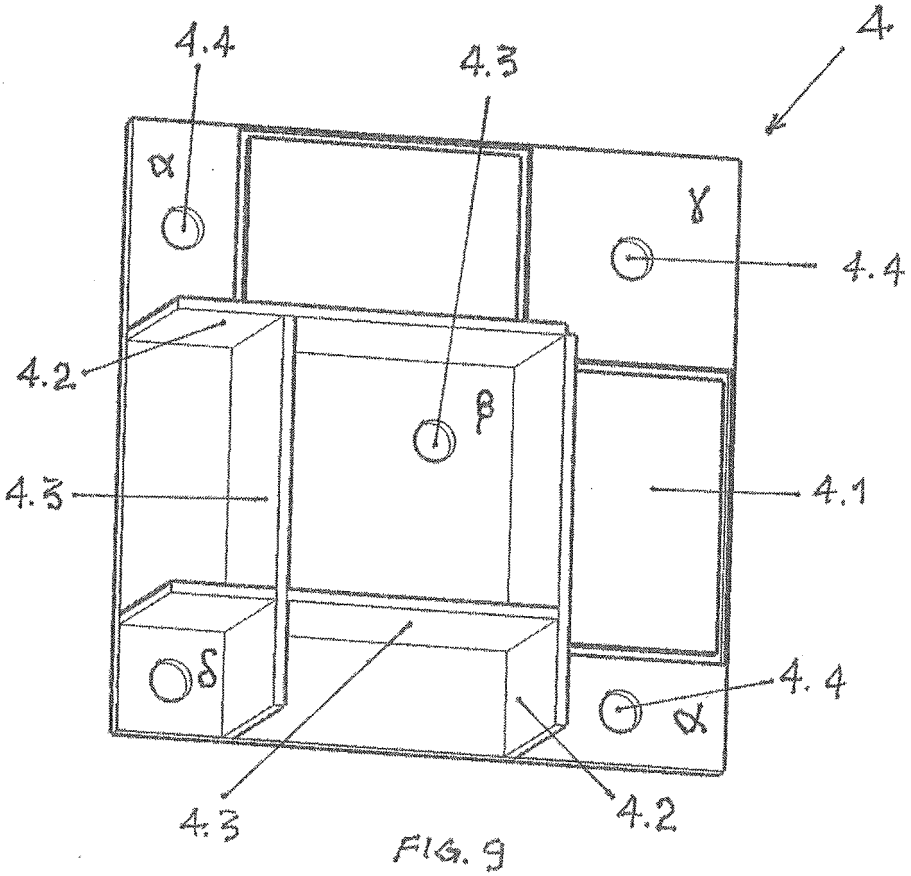


FIG. 9

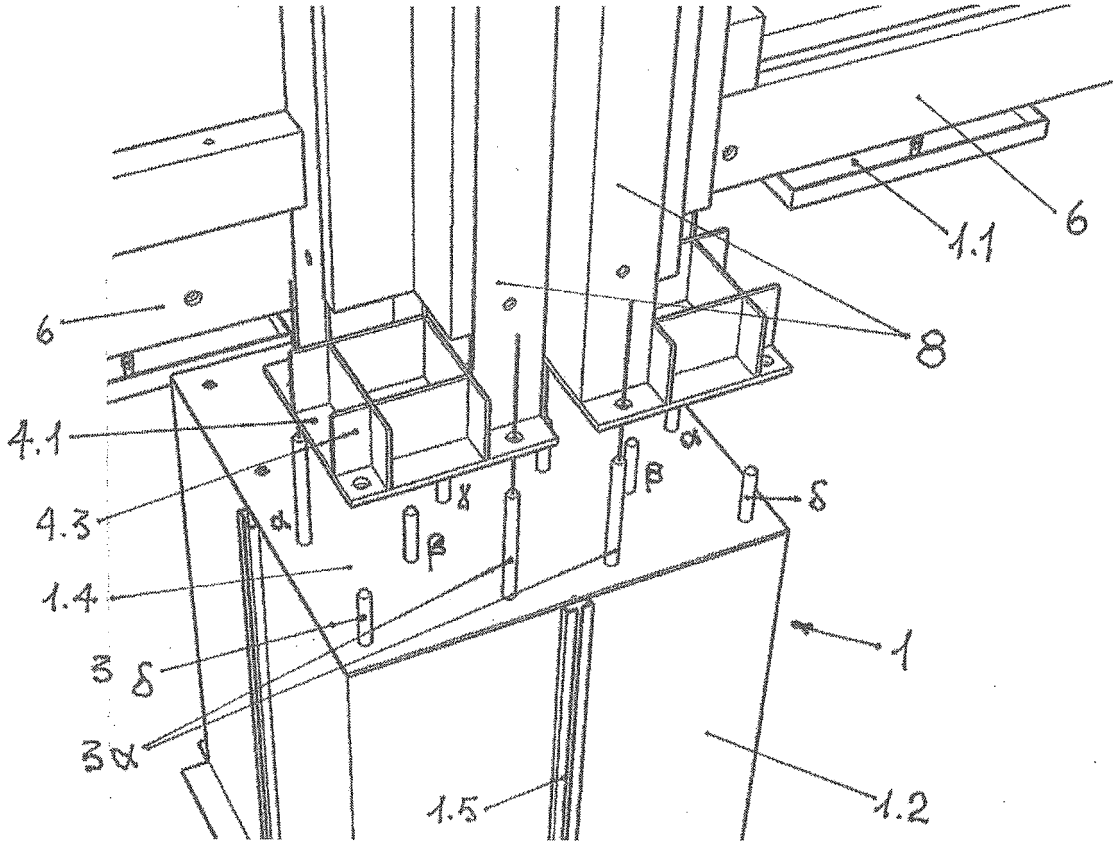


FIG. 10

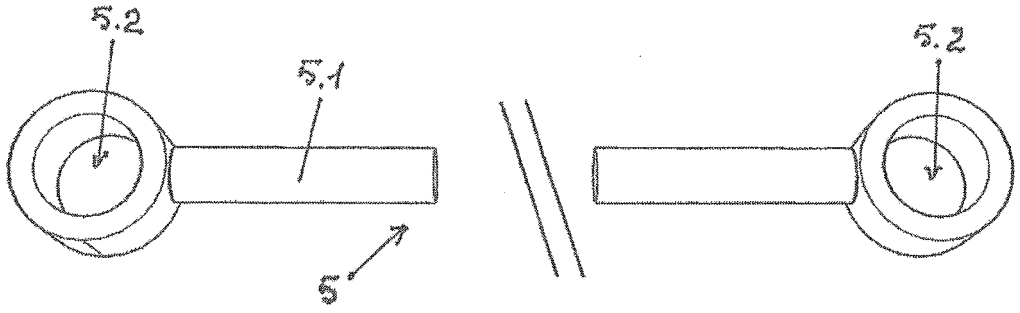
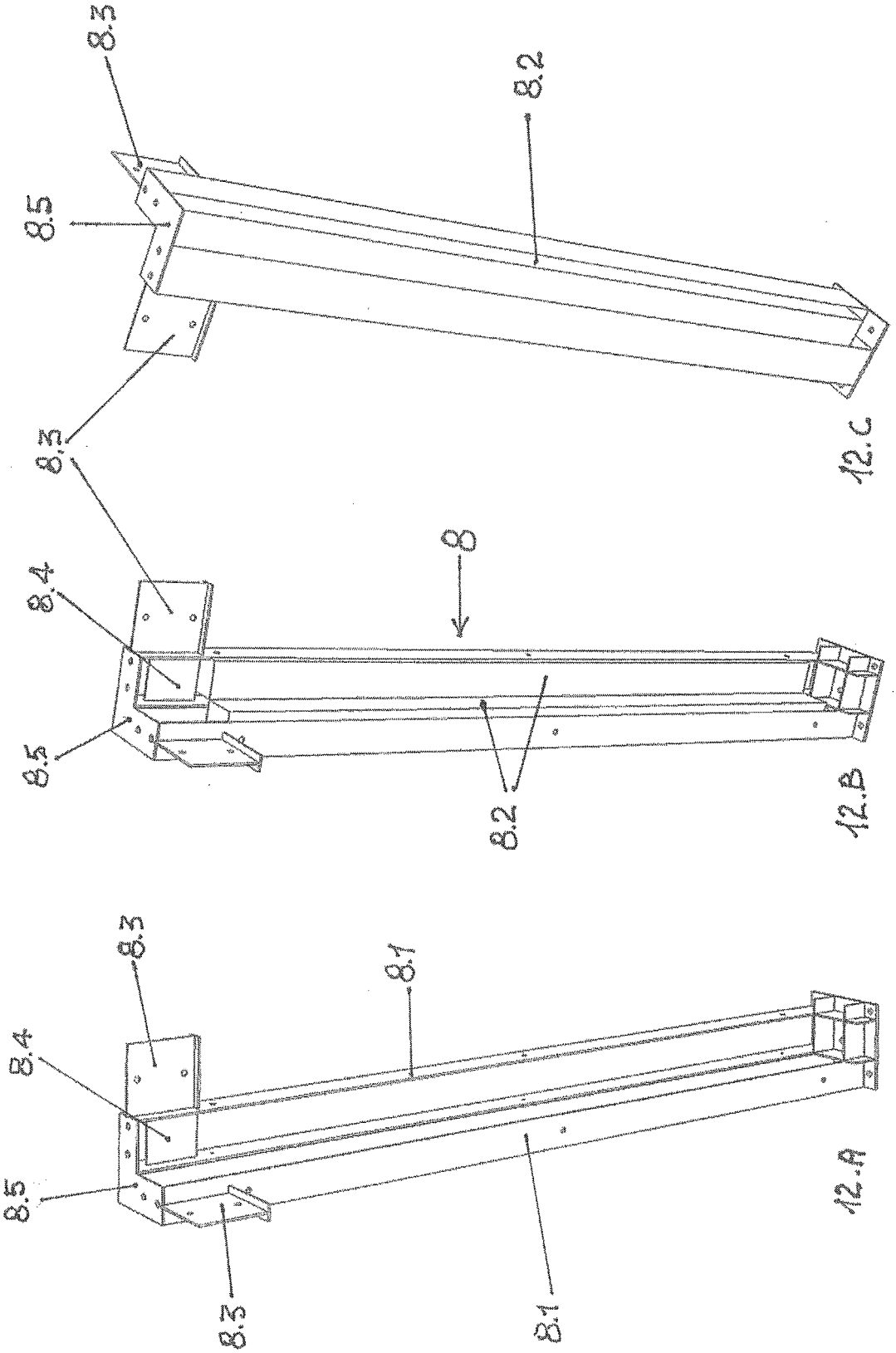


FIG. 11

FIG 12



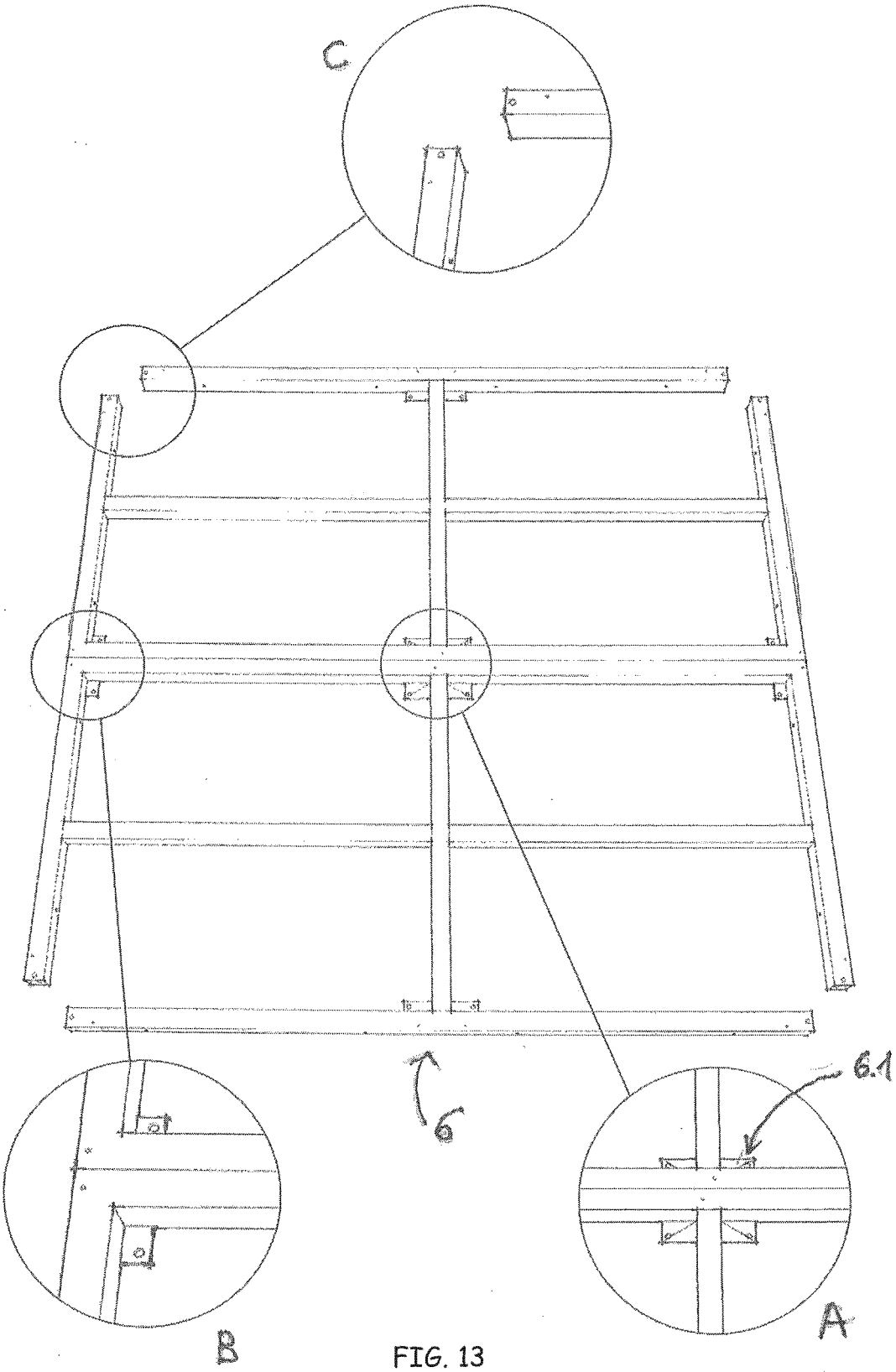
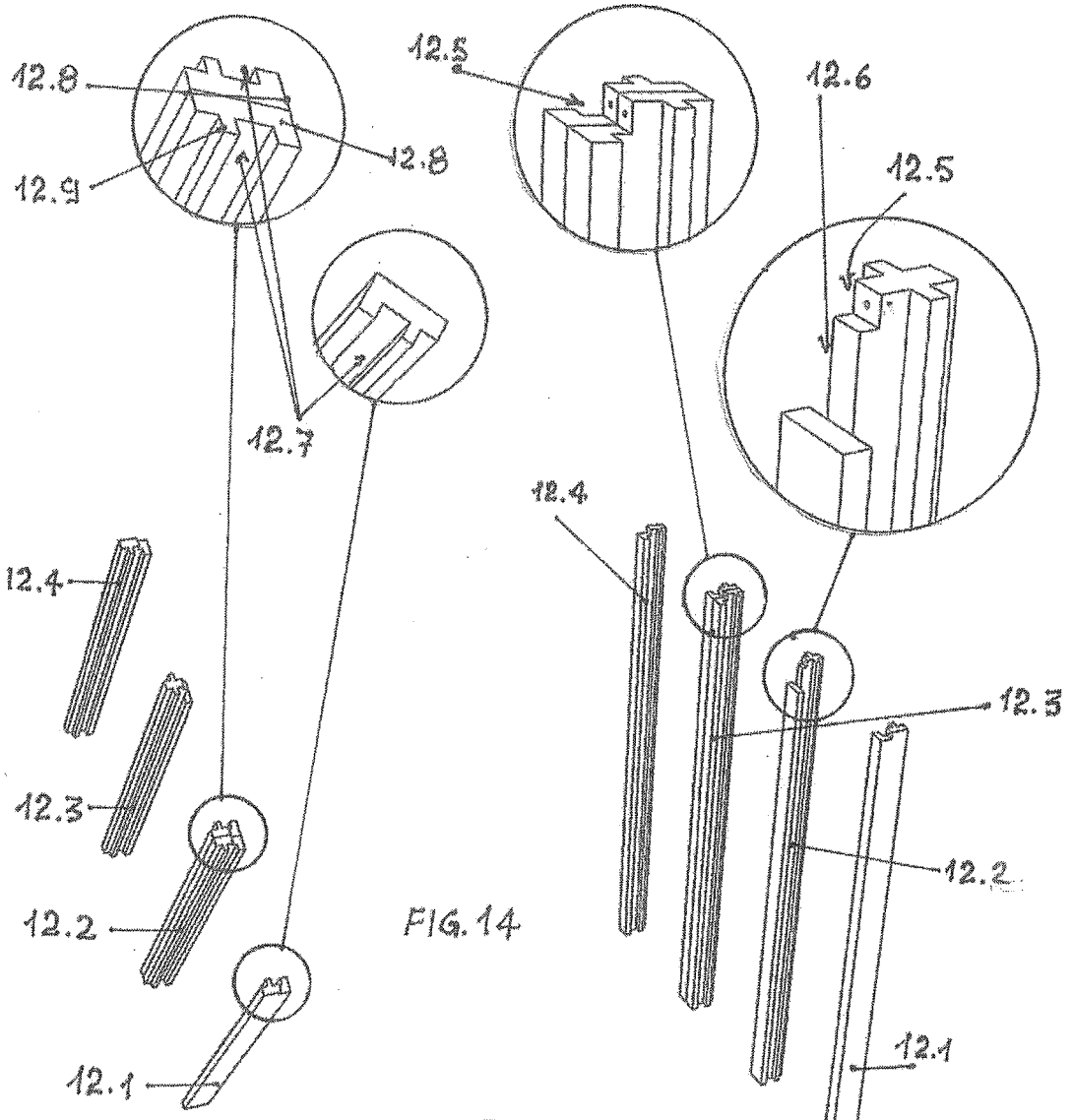


FIG. 13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12.2
12.1

FIG. 14

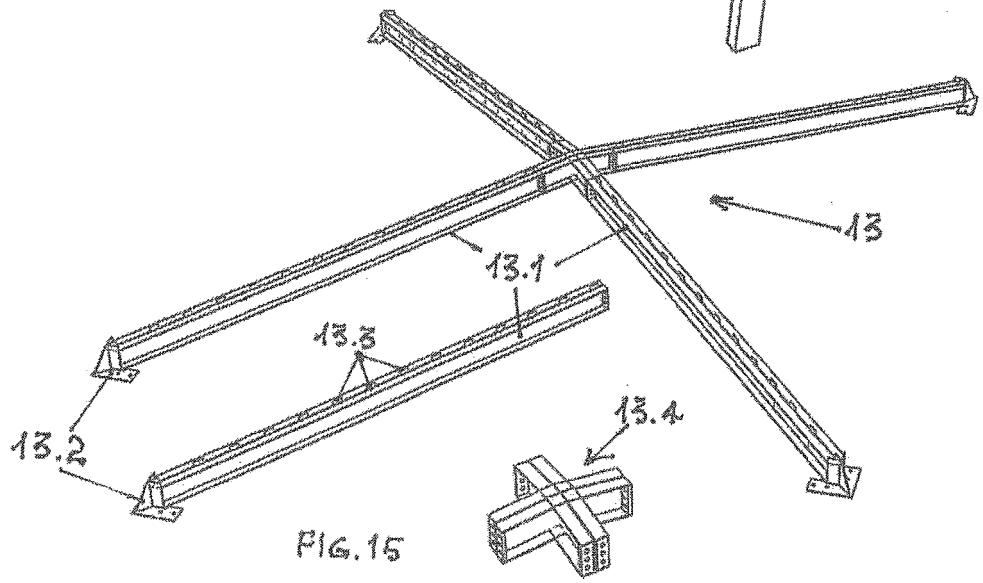
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FIG. 15

FIG. 16.C

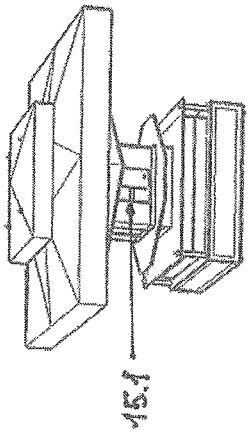


FIG. 16.B

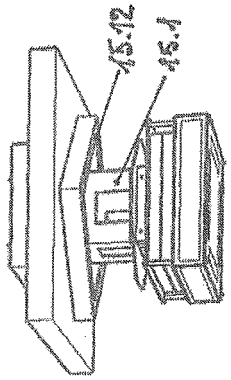
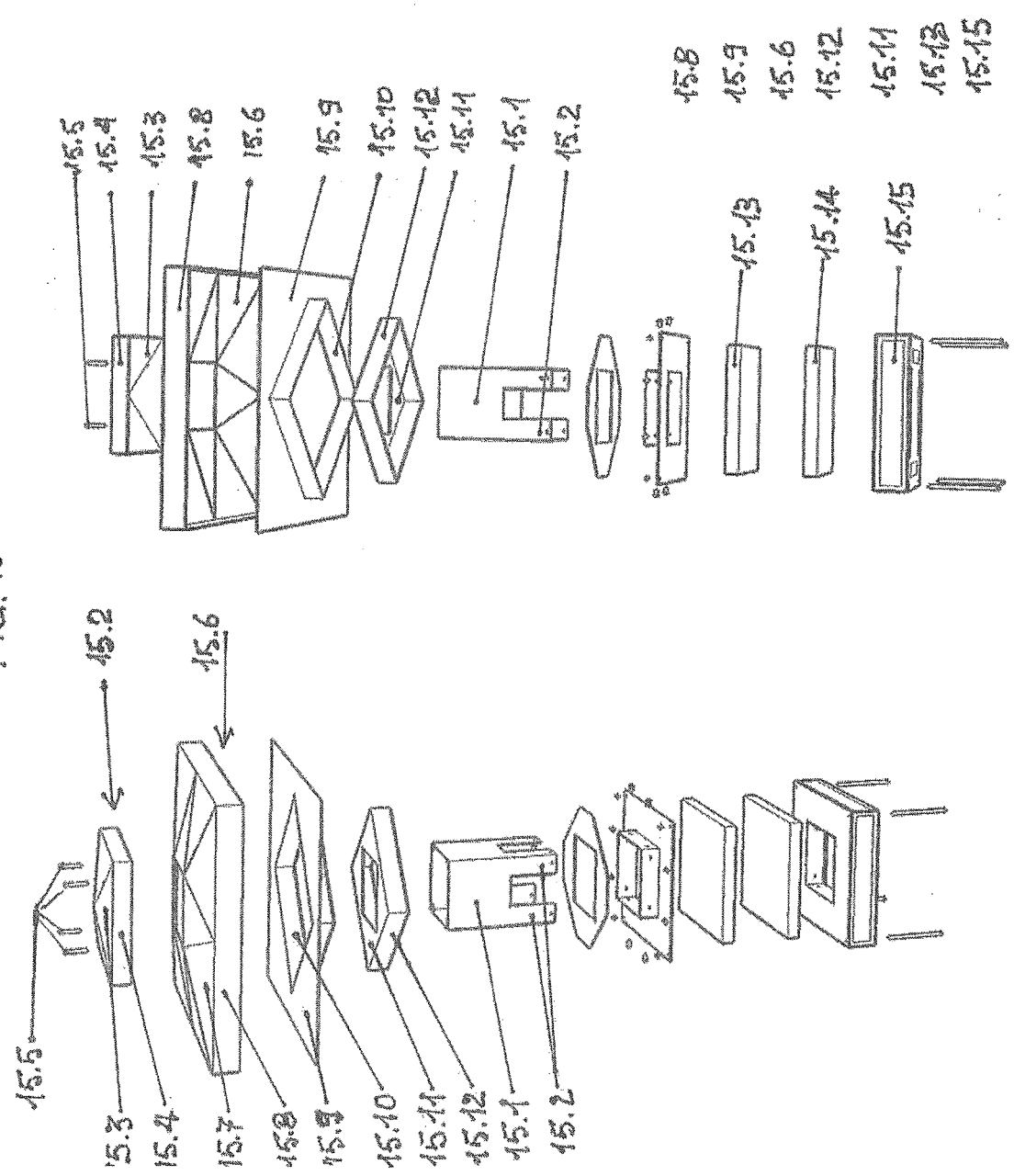
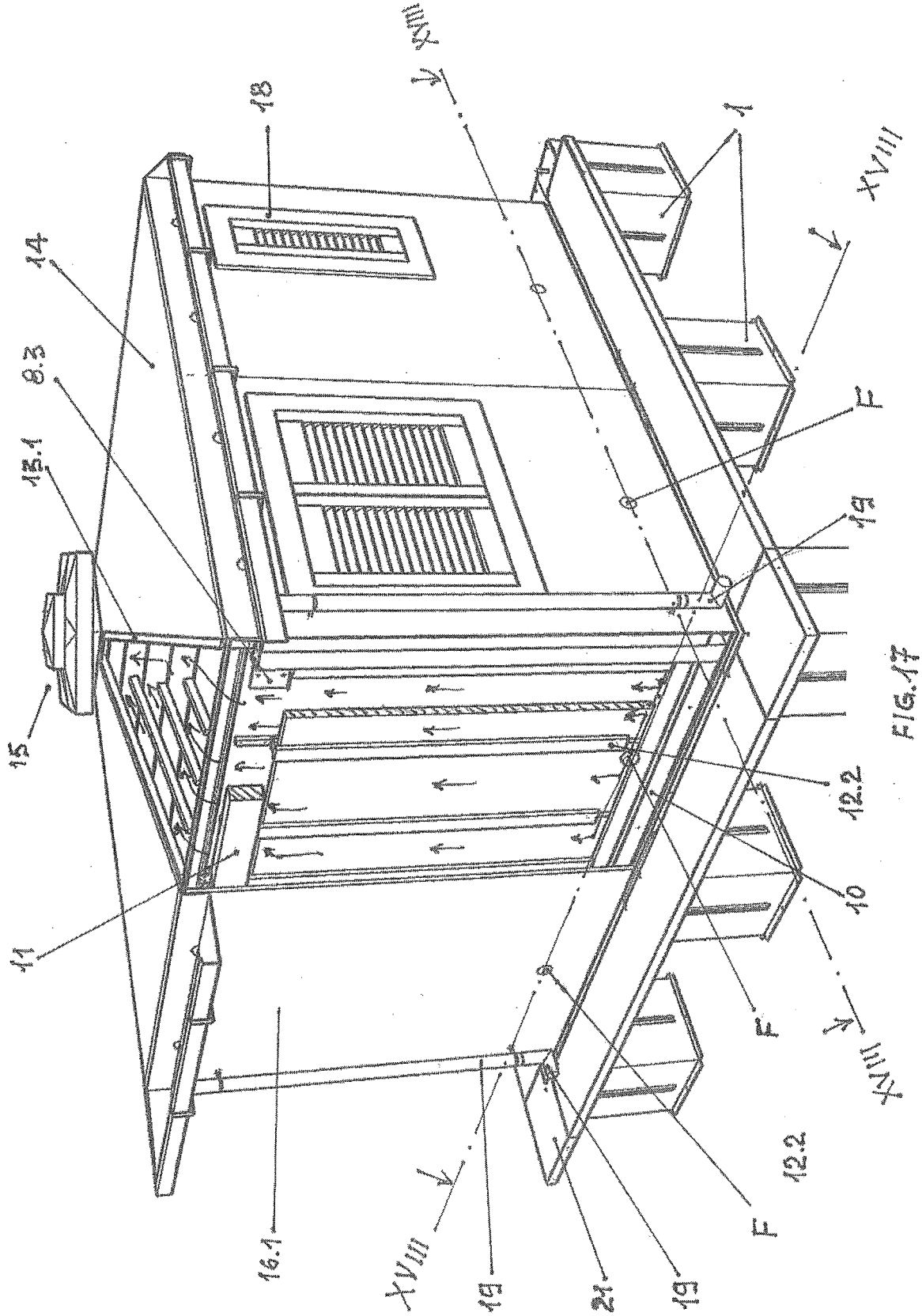


FIG. 16.A




XVIII
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12.2
F
16.1
XVIII
19
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19

FIG.17

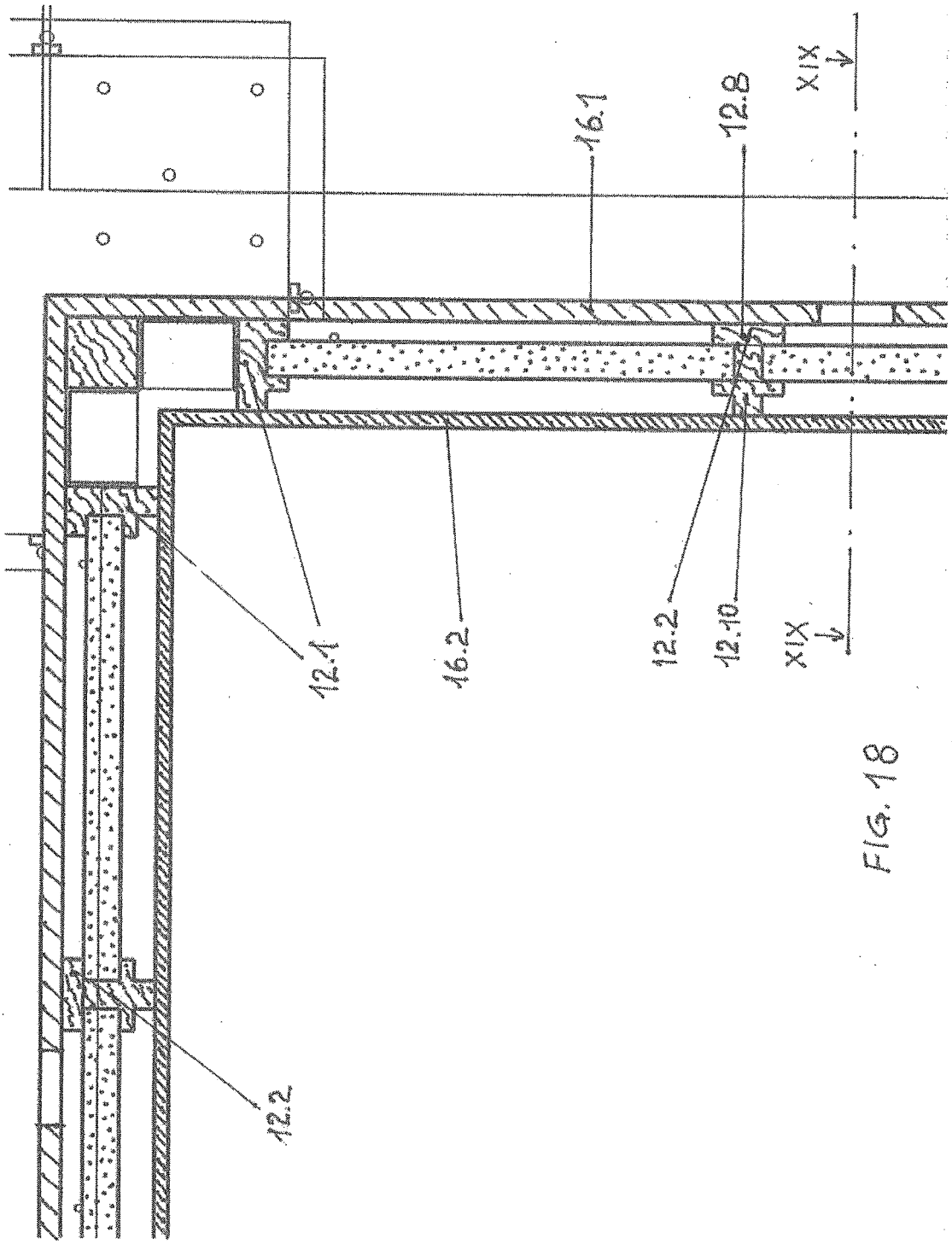

FIG. 18

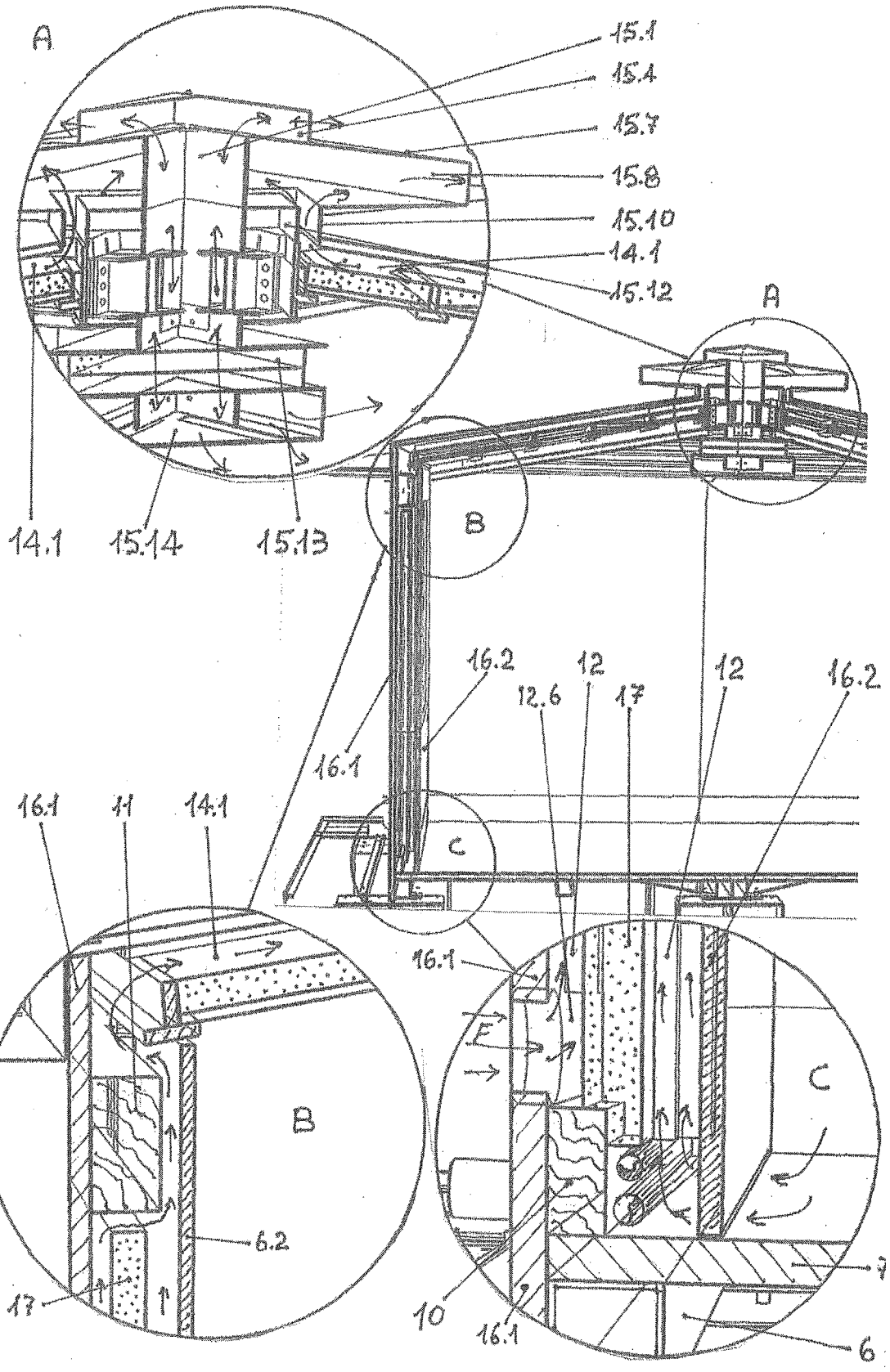
A
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FIG. 19

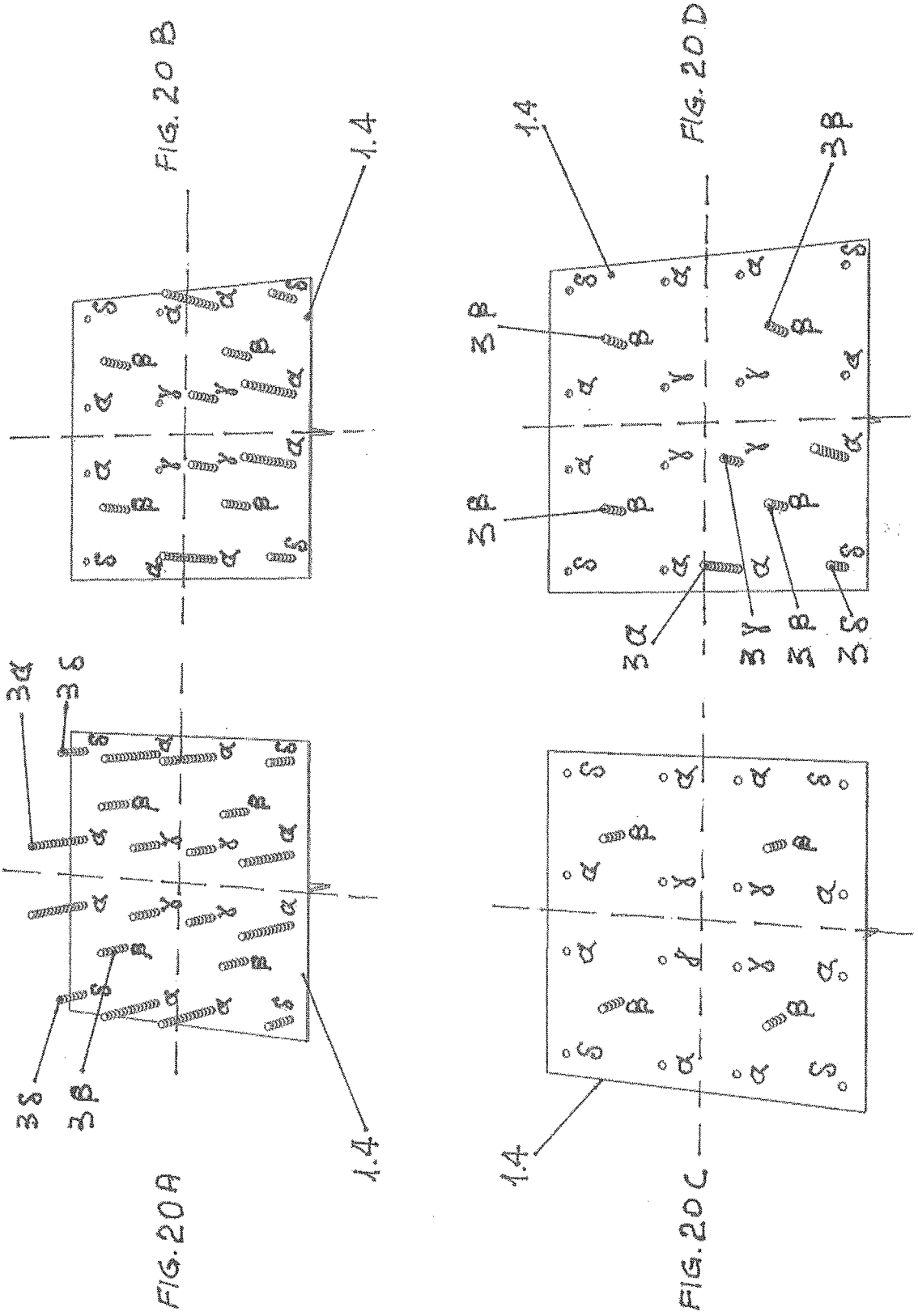
FIG. 20B
1.4
3α
3δ
3β
FIG. 20A
FIG. 20D
3β
3γ
FIG. 20C

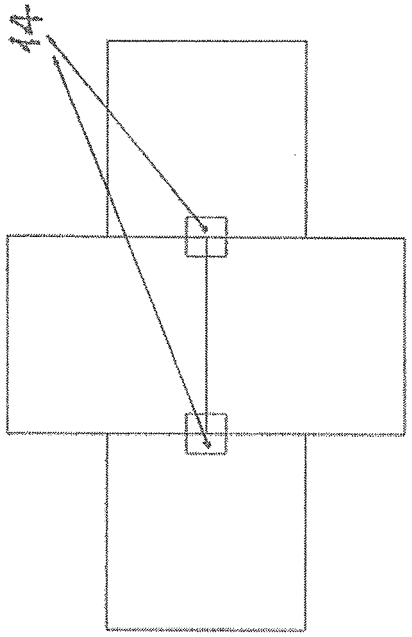

FIG.21B

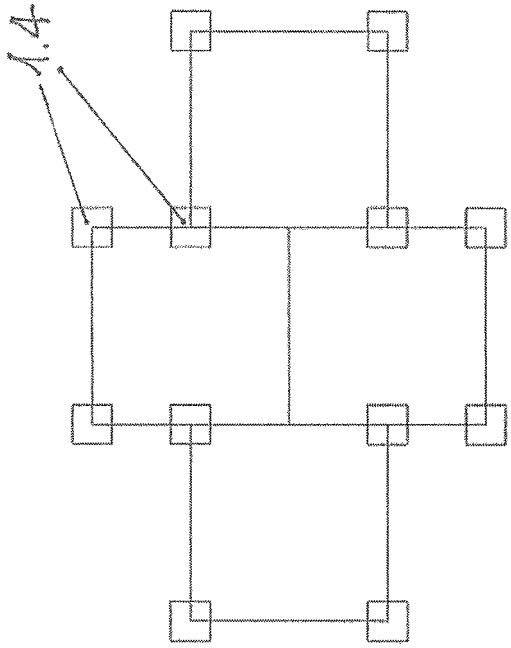

FIG.21D

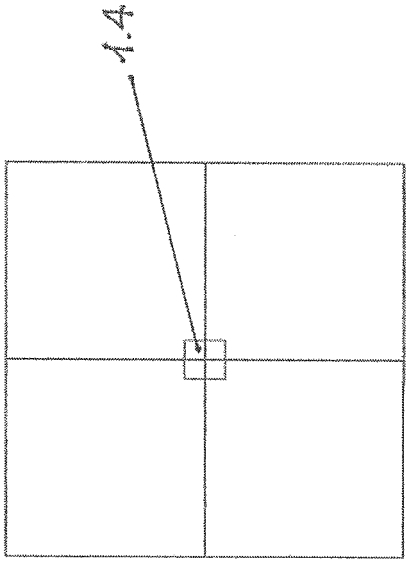

FIG.21A

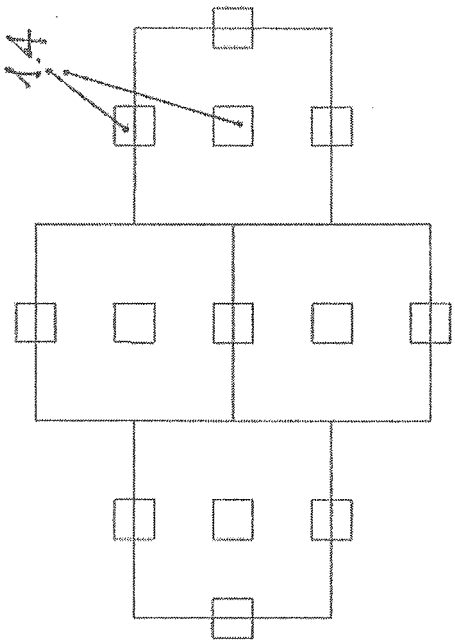

FIG.21C

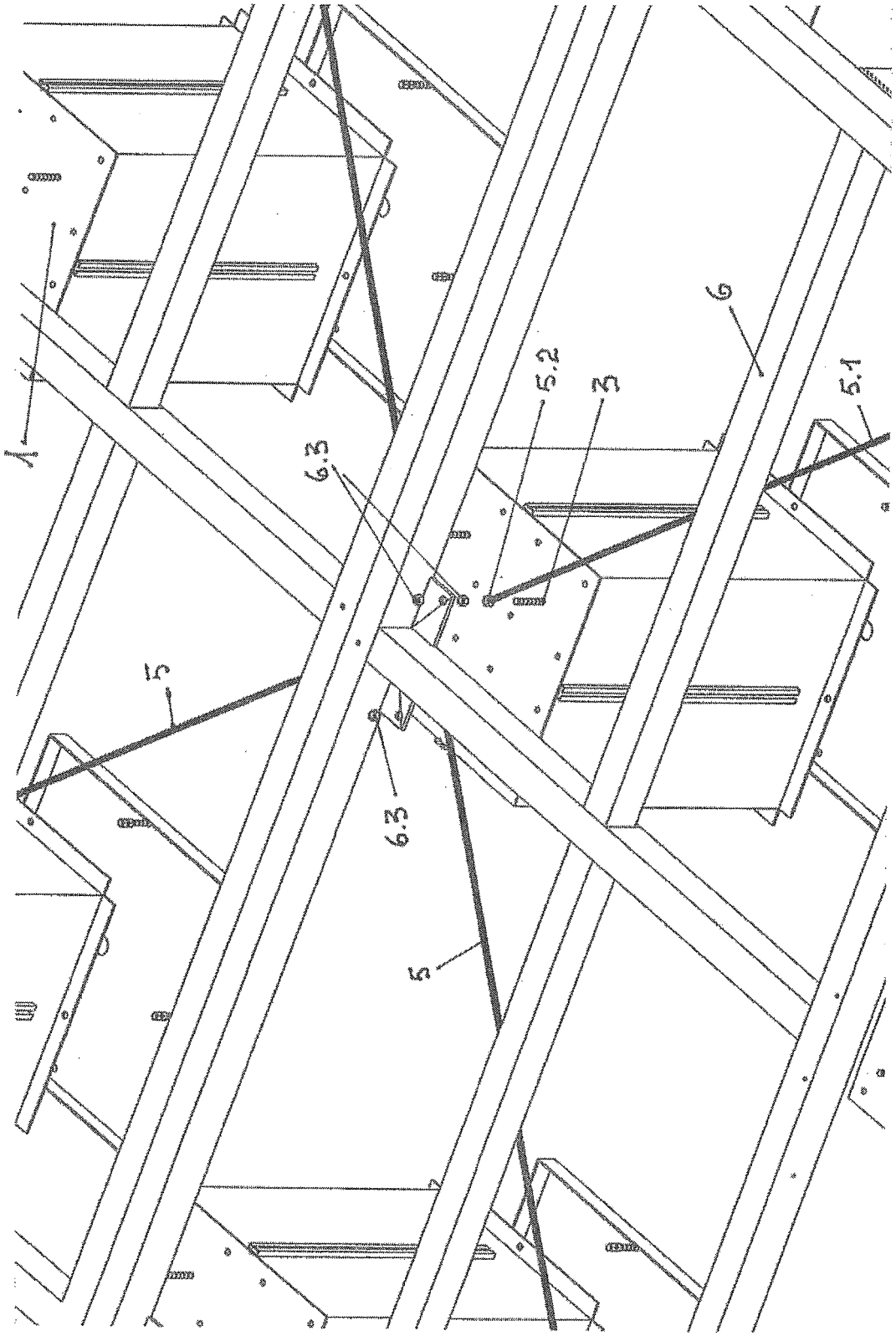

FIG. 22

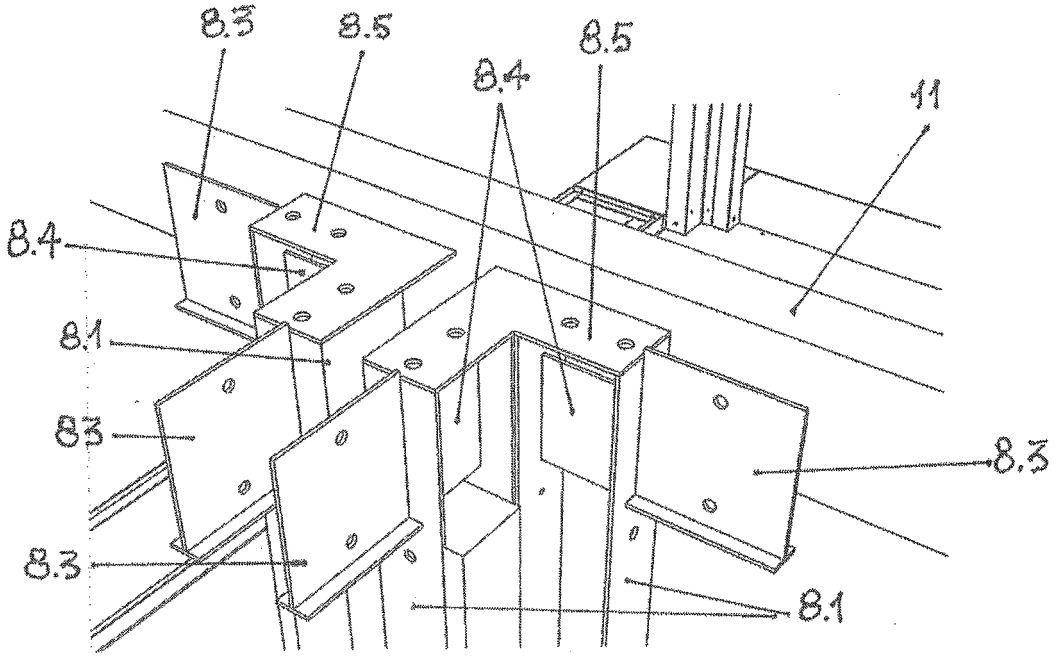

FIG. 23

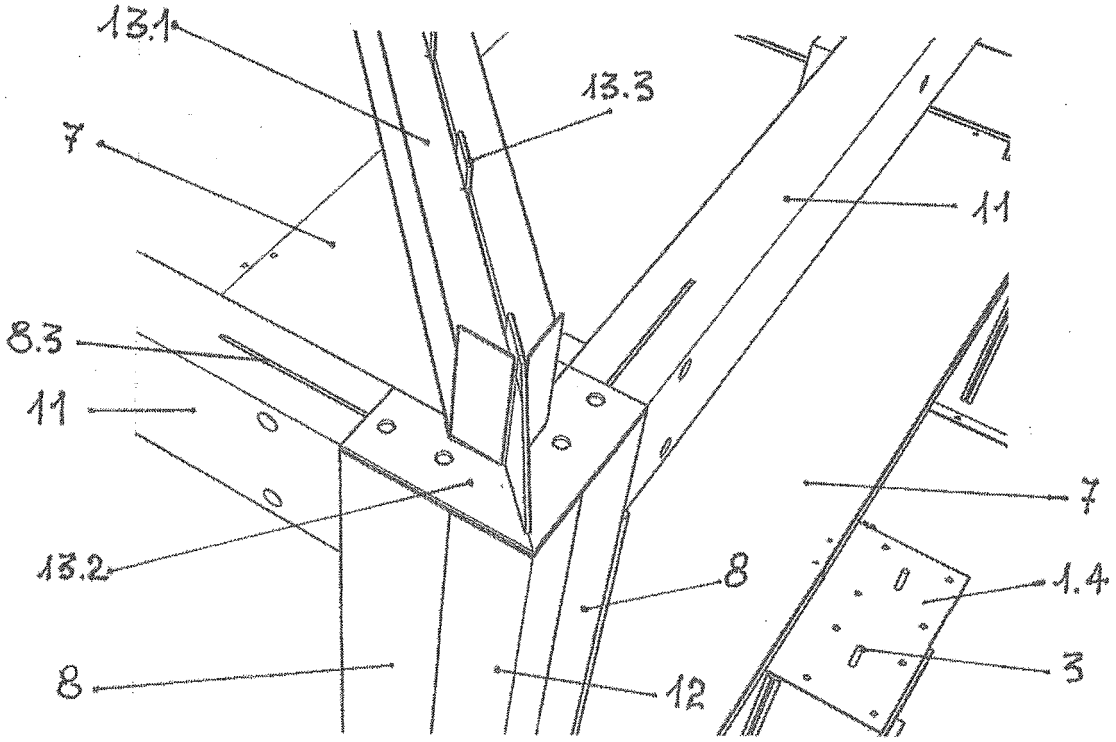

FIG. 24

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- DE 3609776 **[0005]**
- US 4123884 A **[0006]**