



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.05.2016 Bulletin 2016/18

(51) Int Cl.:
E04B 1/26 (2006.01) E04C 3/36 (2006.01)

(21) Application number: **15192449.5**

(22) Date of filing: **30.10.2015**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA

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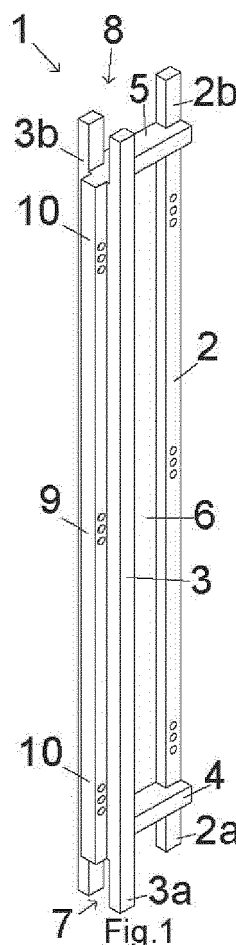
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(30) Priority: **31.10.2014 IT VR20140272**

(54) **SUPPORT ELEMENT FOR THE REALISATION OF HOUSING MODULES AND KIT CONTAINING SUCH SUPPORT ELEMENT**

(57) The present invention relates to a support element (1), particularly suitable for obtaining housing modules, comprising at least one first upright (2) having one lower end (2a) and one upper end (2b); at least one second upright (3) having one lower end (3a) and one upper end (3b); at least one first cross member (4) for connecting between the first and the second upright (2, 3) in proximity of their lower ends (2a, 3a); at least one second cross member (5) for connecting between the first and the second upright (2, 3) in proximity of upper their ends (2b, 3b); at least one through opening (6) being delimited between the first and the second upright. The section of the at least one second upright (2) comprised between the at least one first connection cross member (4) and the lower end (2a) delimits a first engagement seat (7) of such support element (1) and the section of such at least one second upright (2) comprised between such at least one second connection cross member (5) and the upper end (2b) delimits a second engagement seat (8) of the support element (1).



Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention relates to a support element, particularly suitable for obtaining housing modules for residential as well as commercial use. By housing module it can be intended a building, a warehouse, a greenhouse, a structural in general, adapted to house people, objects, plants or material of various types.

[0002] The present invention also relates to a kit containing one such support element.

STATE OF THE PRIOR ART

[0003] At the base of the present invention, there is the consideration that in order to build homes characterized by high levels of living comfort - with particular reference to aspects such as thermal insulation and thermal inertia - conventional construction systems are necessarily complex, since they must combine-fit together a certain number of different, independent construction technologies. In most cases, then, living comfort is often obtained by using building engineering as the only or main solution.

[0004] The combining-fitting of such various construction technologies cause high costs for the buildings thus built and high management costs for the maintenance of the living comfort, since there is no real integration of the employed technical solutions.

[0005] In addition, the lack of integration of such techniques does not always allow maintaining high living standards in all seasons and climates (cold or hot).

OBJECTS OF THE INVENTION

[0006] Therefore, the main object of the present invention is to improve the state of the art of the field of construction of housing modules.

[0007] Another object of the present invention is to provide a support element, particularly suitable for obtaining housing modules which can maintain high living comfort standards while limiting the manufacturing and management costs of the modules themselves limited.

[0008] A further object of the present invention is to provide a support element, particularly suitable for obtaining housing modules, which allows making housing modules with various configurations.

[0009] Still another object of the present invention is to provide a support element, particularly suitable for obtaining housing modules, which is easy to make. Not least object of the present invention is to provide a kit for obtaining housing modules.

[0010] According to a first of the present invention, a support element is provided that is particularly suitable for obtaining housing modules according to claim 1.

[0011] According to a further aspect of the present invention, a kit is provided for obtaining housing modules according to claim 7.

[0012] The dependent claims refer to preferred and advantageous embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Further characteristics and advantages of the present invention will be clearer from the detailed description of a preferred but not exclusive embodiment, of a support element, particularly suitable for obtaining housing modules, illustrated as a non-limiting example in the enclosed set of drawings, in which:

figure 1 is a slightly top perspective view of a first embodiment of a support element according to the present invention;

figures 2a, 2b, 2c, 2d respectively show a front view, a rear back and a right and left side view of the element of figure 1;

figure 3 illustrates a cross section view of the support element according to the present invention, taken along the line III-III of figure 2a;

figure 4 is a perspective view of a frame portion of a housing module, employing a plurality of elements like that of figure 1;

figure 5 is a slightly top perspective view of a first variant of the support element of figure 1;

figures 6a, 6b, 6c, 6d respectively show a rear view, a front view, a right and left side view of the element of figure 5;

figure 7 illustrates a cross section view of the support element of figure 5, taken along the line VII-VII of figure 6a;

figure 7a is a perspective view of a frame portion of a housing module, employing a plurality of elements like that of figure 5;

figure 8 is a slightly top perspective view of a second variant of the support element of figure 1;

figure 9 shows a perspective view of a frame part of a housing module, employing the support element of figure 8;

figure 10 illustrates a slightly top perspective view of a third variant of the support element of figure 1;

figure 11 shows a perspective view of a frame part of a housing module, employing the support element of figure 10;

figure 12 is a slightly top perspective view of a second embodiment of the support element according to the present invention;

figures 13a, 13b, 13c, 13d respectively show a front view, a rear view, a right and left side view of the support element of Figure 12;

figure 14 illustrates a cross section view of the element of figure 12, taken along the line XIV-XIV of figure 13a;

figure 15, is a top perspective view of a portion of the frame of a housing module, employing the support element of figure 12;

figure 16 is a slightly top perspective view of a first

auxiliary element employable in combination with an element like that in figure 1 for obtaining a housing module according to the present invention; figures 17a and 17b respectively show a front view and a right and left side view of the first auxiliary element of figure 16; figure 18 illustrates a cross section view of the element of figure 16, taken along the line XVIII-XVIII of figure 17a; figure 19 is a top perspective view of a portion of the frame of a housing module, employing a plurality of elements like the auxiliary element of figure 16; figure 20 is a slightly top perspective view of a second auxiliary element employable in combination with one or more elements like that in figure 1 for obtaining a housing module according to the present invention; figures 21a, 21b, 21c, 21d respectively show front view, a rear view, a right and left side view of the second auxiliary element of figure 20; figure 22 illustrates a cross section view of the auxiliary element of figure 20, taken along the line XXII-XXII of figure 21a; figure 23 is a slightly top perspective view of a third auxiliary element that can be coupled with at least one support element of figure 1; figures 24a and 24b show a front view and a rear view of the element of figure 23; figure 25 illustrates a cross section view of the auxiliary element of figure 23, taken along the line XXV-XXV of figures 24a and 24b; figure 26 is a slightly top perspective view of a fourth auxiliary element that can be coupled with at least one support element of figure 1; figure 27 shows a front view of the auxiliary element of figure 26; figure 28 illustrates a cross section view of the auxiliary element of figure 26, taken along the line XXVI-II-XXVIII of figure 27; figures 29 to 31 are embodiments of portions of a modular element, incorporating the first and the second auxiliary element of figures 23 and 26; figure 32 is a slightly top perspective view of a fifth auxiliary element, employable in combination with one or more elements like that in figure 1 for obtaining a housing module according to the present invention; figures 33a, 33b, 33c and 33d respectively show a front view, a rear view, a right and left side view of the auxiliary element of figure 32; figure 34 illustrates a cross section view of the fifth auxiliary element of figure 32, taken along the line XXXIV-XXXIV of figure 33a; figures 35a and 35b are two embodiments of a housing module portion, each employing a plurality of elements like the auxiliary element of figure 32; figures 36 and 37 show two side views of a lower panel that can be coupled with one or more support elements according to figure 1; figures 38 and 39 illustrate two side views of an upper

panel that can be coupled to one or more support elements according to figure 1; figure 40 is a representation of the frame of a housing module, employing a plurality of elements like that of figure 1, as well as an upper panel and a lower panel that can be coupled together; figures 41 to 43 each show a perspective view with parts removed of a housing module obtainable with the support element according to the present invention and, more particularly, a different climate-control mode obtainable with one such housing module; and figures 44a, 44b, 44c, 44d, 44e and 44f are perspective views illustrating the various steps for mounting a housing module obtainable by means of support elements according to the present invention; figure 45 is an enlarged detail of figure 1; and figure 46 is an exploded representation of one version of the support element of figure 1.

[0014] In the enclosed drawings, equivalent parts or components are marked with the same reference numbers.

EMBODIMENTS OF THE INVENTION

[0015] With particular reference therefore to the enclosed figures, it will be observed that a support element according to a first embodiment of the present invention, particularly suitable for obtaining housing modules, is generally indicated with reference number 1 and comprises at least one first upright 2 provided with end 2a, lower during use, and with end 2b, upper during use; at least one second upright 3 with end 3a, lower during use, and with end 3b, upper during use, transversely connected together by means of at least one first cross member 4 and one second cross member 5.

[0016] By housing module it can be intended a building, a warehouse, a greenhouse, a structure in general adapted to house people, objects, plants or material of various types.

[0017] More particularly, the first cross member 4 is comprised between the first upright 2 and the second upright 3 in proximity to their ends 2a and 3a, lower during use, while the second cross member 5 is comprised between the first upright 2 and the second upright 3 in proximity to their ends 2b and 3b, upper during use.

[0018] The first and the second upright, together with the cross members 4 and 5, during use delimit a through opening 6.

[0019] Advantageously, the support element according to the present invention delimits an engagement seat 7, lower during use, and an engagement seat 8, upper during use, both intended - as will be better described hereinbelow - to receive structural elements such as girders, etc. for obtaining a housing module.

[0020] In particular, the engagement seat 7, lower during use, of the support element 1 is provided in the section of the second upright 3 comprised between the first con-

nection cross member 4 and end 3a, lower during use, of such second upright 3, while the engagement seat 8, upper during use, of the support element 1 is provided in the section of the second upright 3 comprised between the second connection cross member 5, upper during use, and the end 3b, upper during use, of such second upright 3.

[0021] As will be observed, the support element 1 according to the present invention comprises at least one spacer element 9, with substantially longitudinal extension along the second upright 3 and, more particularly, on one section or on part of a section of a face 3c thereof opposite the first upright 2 and comprised between the first and the second cross member 4 and 5.

[0022] According to the present invention, the support element 1, and in particular the second upright 3, is self-supporting and/or load-bearing.

[0023] The second upright 3 in fact has a substantially flat shape in its central longitudinal part (with the exception of the engagement seats, lower 7 and upper 8 during use).

[0024] The central longitudinal part of the second upright 3 has a substantially rectangular shape.

[0025] The spacer element 9, associated with the second upright 3, with respect to the latter can instead be perforated in order to allow, for example, the housing and/or passage of the systems or components necessary for the operation of the systems of the housing module, such as the pipes or wires relative to the systems of the housing module. Naturally, such possible openings are also adapted for the passage of air, and can be additional or corresponding to the aeration openings 10.

[0026] However, the second upright 3, being load-bearing and/or self-supporting, may not be perforated for the passage and/or housing of the systems or components necessary for the operation of the systems of the housing module itself.

[0027] In one version of the invention, with first upright 2 and second upright 3 it is intended the elements which, during use, are used in a substantially vertical manner. In one version of the invention, the height of the support element 1 is substantially equal to that of a space of the housing module which the support element 1 is adapted to make.

[0028] In one version of the invention, the support element 1 has a substantially L-shaped transverse form, as is visible in figure 3.

[0029] In addition, in one version of the invention, the second upright 3 has a substantially H-shaped longitudinal form, in which its upper 3b and lower 3a ends (upper and lower during use) are substantially U-shaped or upside-down U-shaped.

[0030] The spacer element is extended from the face 3c of the second upright 3, moving away from the first upright 2, and comprises at least one aeration through opening 10. Also in the first upright 2, at least one aeration through opening 10 is provided for reasons that will be clearer hereinbelow. Preferably, the support element 1

according to the first embodiment of the present invention provides for a plurality of through openings and, more particularly, three groups, each with three through openings, e.g. holes, provided at a central section and at the ends, both of the first upright 2 and in the spacer element 9.

[0031] At any rate, as will be easily understood, the aeration through openings 10 can be obtained in the first upright 2 in any other suitable position, as long as they place the faces, lateral during use, of the upright itself in communication with each other.

[0032] This also holds true for the spacer element 9, which, as an alternative or additionally, could be made from two or more sections placed longitudinally at a distance from each other so as to delimit through openings of communication between the faces, lateral during use, of the spacer element 9 itself.

[0033] As is visible in figure 46, in one version of the invention the first and/or the second cross member 4, 5 have a substantially T-shaped form, in which a first section of the T has a lengthwise extension equal to the distance between the first upright 2 and the second upright 3.

[0034] The second section of the T, however, has lengthwise extension equal to the distance between the face 3c of the second upright 3 and a face 2c of the first upright 2 placed on opposite sides with respect to the second upright 3.

[0035] The difference of length between the first section and the second section of the T-shaped configuration of the first and/or of the second cross member 4, 5 determine the formation of two ends 4x, 4y and/or 5x, 5y. The end 4x and/or 5x is inserted in a suitable cavity of the second upright 3, in proximity to its lower 3a and/or upper 3b end (lower and/or upper end during use), in order to be positioned flush with the face 3c of the second upright itself. The ends 4y and/or 5y are adapted to be constrained to the first upright 2, so as to be positioned flush with the face 2c of the first upright 2.

[0036] In such a manner, the ends 4x and/or 4y determine and constitute the central longitudinal part having substantially rectangular form of the second upright 3.

[0037] Naturally, each component of the support element 1 can be made in a single piece or two or more components assembled together, for example, when the element is made of wood, in two or more laminated components or strips. In a still further version, such components can be obtained from one piece, which is suitably shaped.

[0038] With particular reference to figures 1 to 4, it will be observed that according to a first preferred embodiment, the first and the second cross member 4 and 5 are connected orthogonally both to the first 2 and to the second upright 3 and have the same longitudinal extension. In this case, the first and the second upright 2 and 3 are parallel to each other.

[0039] It will be observed that according to a first variant of the support element, illustrated in figures 5 to 7a, the

first and the second cross member 4 and 5 are connected orthogonally to the second upright 3 but not orthogonally to the first upright 2, such that the first and the second upright are not parallel to each other. In this case, the first cross member 4 and the second cross member 5 have different longitudinal extensions.

[0040] With reference to a second variant of the support element, illustrated in figures 8 and 9, it will be observed that the first cross member 4 is connected orthogonally both to the first and to the second upright while the second cross member 5 is not orthogonally connected - neither to the first nor to the second upright. Also in this case, the first cross member 4 and the second cross member 5 have different longitudinal extensions.

[0041] In the above-described support element 1 and in the variants pursuant to the figures 5 to 9, the end 3b, upper during use, of the second upright 3 is substantially "U"-shaped, such that the second engagement seat 8 of such element 1 is delimited between the first upright 2, an upper face (upper during use) of the second cross member 5 and the parallel sections of such "U".

[0042] Likewise, the end 3a, lower during use, of the second upright 3 is substantially upside-down "U"-shaped such that the first engagement seat 7 of the support element 1 is delimited between the first upright 2, a lower face (lower during use) of the first cross member 4 and the parallel sections of such upside-down "U".

[0043] A third variant of the support element according to the present invention, illustrated in figures 10 and 11, substantially coincides with the above-described support element illustrated in figures 1 to 4, in which however the end 3a, lower during use, of the second upright 3 is configured so as to be complementary to the respective end 3b, upper during use, such that it is possible to vertically engage together two such support elements, as will be quite clear hereinbelow.

[0044] The support element according to a second preferred embodiment of the present invention is illustrated in figures 12 to 15 and comprises, as in the first embodiment described above, at least one first upright 2 provided with end 2a, lower during use and with end 2b, upper during use; at least one second upright 3 with end 3a, lower during use, and with end 3b, upper during use, transversely connected together by means of at least one first cross member 4 and at least one second cross member 5.

[0045] More particularly, the first cross member 4 is comprised between the first upright 2 and the second upright 3 in proximity to their ends 2a and 3a, lower during use, while the second cross member 5 is comprised between the first upright 2 and the second upright 3 in proximity to their ends 2b and 3b, upper during use.

[0046] In the embodiment illustrated in figures 12 to 15, the support element according to the invention comprises two cross members 4, lower during use, and two cross members 5, upper during use, angularly offset from each other around the first upright 2. As will be observed, the second upright 3 has a substantially curved cross

section, such that the cross members 4 and 5 intercept it at its lateral ends. The man skilled in the art will easily understand that the cross members, lower 4 and upper 5 during use, can have a configuration that can also be different, for example they can be made by means of plate-like elements with plan configuration substantially with circular sector, whose curved perimeter edge has progression substantially corresponding to the progression of the face of the second upright 3 facing towards the first upright 2.

[0047] The support element 1 according to the second embodiment of the present invention comprises at least one spacer element 9, with substantially longitudinal extension along the second upright 3, applied to such second upright 3 in a section or part of a section of one face 3c thereof opposite the first upright 2 and comprised between the first and the second cross members 4 and 5. The spacer element 9 has a substantially curved cross section extended, at least in one or more sections, from the face 3c of the second upright 3, moving away from the first upright 2. As in the first embodiment, the spacer element 9 comprises at least one aeration through opening 10. Also in the first upright 2, which in this case has L-shaped cross section, in each section of the L at least one aeration through opening 10 is provided, configured as described above.

[0048] In the support element 1 according to the second embodiment of the present invention, a plurality of through openings, and more particularly three groups of three openings are provided at a central section and at the ends both of the first upright 2 and in the spacer element 9.

[0049] With one such support element, the first upright 2 and the second upright 3 delimit a through opening 6 or interspace while the first engagement seat 7, lower during use, is delimited between one end 9a, lower during use, of the spacer element 9 and the first end 3a of the second upright 3, and the second engagement seat 8, upper during use, of the support element 1 is delimited between one end 9b, upper during use, of the spacer element 9 and the second end 3b, upper during use, of the second upright 3.

[0050] As already stated above, the support element according to the present invention is particularly suitable for being employed in making housing modules. For such purpose it can be advantageously included in a kit for obtaining a housing module, comprising at least one plurality of support elements 1 as described above; and at least one plurality of girders (indicated in the figures with references TI or TS, see for example figure 4) provided with cross section insertable in the first engagement seat 7, lower during use, or in the second engagement seat 8, upper during use, of at least one of the support elements of such plurality.

[0051] In one version of the invention, the girder TI corresponds with a cement block or foundation strip for example corresponding with the conventional foundations of a housing module.

[0052] As is in fact evident, in particular from figures 4, 7a, 9, 11 and 15, the above-described support elements 1 can be engaged with each other in pairs by means of a respective pair of girders, one TI lower during use and one TS upper during use. More particularly, reference is made to figure 4 and 9, the first uprights 2 of the support elements 1 of each pair are arranged at a certain distance from each other substantially coinciding with the longitudinal extension of the girders TI and TS of each pair of girders, and with the respective second uprights 3 facing towards each other. As will be observed, in this case, the pairs of support elements 1 connected by the respective girders TI and TS can, during use, be arranged together with the respective girders parallel, hence in order to delimit an internal volume V usable as a housing space.

[0053] With particular reference instead to figure 15, when the above kit comprises at least one support element according to the second embodiment of the present invention, such support element 1 is provided engageable with one or more support elements 1 according to the first embodiment, in which the first upright 2 (of such one or more support elements according to the first embodiment) and the second upright 3 (of the support element according to the second embodiment) are arranged at a certain distance from each other substantially coinciding with the length of the respective girders TI and TS. The respective second uprights 3 are facing towards each other. In this case, the support element 1 according to the second embodiment of the present invention can be coupled to a plurality of elements according to the first embodiment, with the respective girders TI and TS angularly offset from each other around an axis substantially coinciding with the first upright 2 of the support element according to the second embodiment. The girders and the support elements thus delimit an internal volume V usable as a housing space.

[0054] The kit according to the present invention can also comprise one or more support elements according to the third variant illustrated in Fig 10. In this case, one such support element 1 can be vertically employed with at least one other support element with its end 2a, lower during use, vertically supported by the end 2b, upper during use, of a support element 1 according to the first embodiment and its end 3a, lower during use, inserted in the engagement seat 8 of one such support element.

[0055] Clearly, both support elements 1 will have to be sized (length and section of the respective uprights 2 and 3), if necessary, so as to allow a suitable coupling thereof.

[0056] With one such configuration, it will be easily understood that, with a kit as described above, it is possible to make a frame of a housing module, with plan that is polygonal, oval, circular or a combination thereof, with walls that are substantially vertical or oblique (tapered upward or downward), with one or more floors.

[0057] For such purpose, a kit for obtaining housing modules can also comprise at least one plurality of panels P (see for example figure 4 or figures 41 to 43) which

can be applied to the support elements 1 of the kit, side-by-side each other, so as to delimit at least one interspace between each first and each second upright 2 and 3.

[0058] According to a particularly preferred embodiment of the invention, the panels P can advantageously be applied on opposite sides with respect to the first upright 2 and/or to the second upright 3 of each support element 1, thus delimiting an intermediate lateral interspace 11 of the space V, comprised between the first upright 2 and the second upright 3, which is interposed between an external lateral interspace 12, including the first upright 2 and an internal lateral interspace 13, including the second upright 3. Advantageously, the intermediate lateral interspace 11 is intended to be filled with any suitable insulating material, which can be selected in accordance with the insulation needs required by the climate where the housing module will be built. Hence, for example, the insulating material will have very low conductivity in cold climates, while it must ensure high thermal inertia in the hottest climates.

[0059] The kit for obtaining housing modules according to the present invention can also comprise a plurality of cross members 14, illustrated in particular in figure 36 to 40, each provided with at least one aeration through opening 10, intended to support and/or be supported by the connection girders TI, lower during use, of the kit, comprised between pairs of support elements 1, at the first engagement seats 7 thereof, lower during use.

[0060] Analogously, the kit comprising a plurality of cross members 14, each provided with at least one aeration through opening 10, intended to be applied on the lower part and/or be supported by the upper connection girders TS of the kit, comprised between pairs of support elements 1, at the second engagement seats 8 thereof, upper during use.

[0061] Indeed, analogous to the support elements 1 of the kit for making the housing module, also the girders TI and TS are during use intended to be covered with panels P in order to obtain at least one interspace according to the modes that will be explained hereinbelow.

[0062] The kit according to the invention, in fact, can also comprise a plurality of panels P which can be applied to the cross members 14 in order to delimit at least one interspace between the girders TI or TS of the housing module. With one such kit, it is in fact possible to delimit an intermediate interspace 111, both on the upper part and lower part, on opposite sides with respect to the lower connection girders TI and to the upper connection girders TS; such intermediate interspace is interposed between an internal interspace 113, between the lower connection girders TI and the cross members 14 supported thereby and between the upper connection girders TS and the cross members 14 applied below them. An external interspace 112 is also advantageously delimited between the lower connection girders TI and the cross members supporting such girders and between the upper connection girders TS and the cross members supported thereby.

[0063] Advantageously, the external lateral interspace

12 is in fluid communication with the external interspace 112 and the internal lateral interspace 13 is in fluid communication with the internal interspace 113 by means of the aeration through openings 10.

[0064] The intermediate interspace 111 is also intended to be filled with any suitable insulating material such that on opposite sides with respect thereto an internal interspace 13-113 and an external interspace 12-112 are obtained, both including the housing space V of the module, in which air can circulate, which as is known has a thermal insulation and a natural climatic control power.

[0065] For such purpose, in the housing module built by means of the above-described kit, the external interspaces 12-112 and/or internal interspaces 13-113 are in fluid communication both with the external environment and with the space V of the housing module, by means of any suitable ducts C made laterally and/or at the bottom and/or at the top in the housing module. Such ducts C will be intended for conveying the air flow into the space V and/or to the outside; such air will circulate in the ducts and in the interspaces according to different modes in accordance with the seasons and the daily cycle. For example, three modes are provided for, according to a summer day cycle, a summer night cycle and a winter cycle, which are respectively depicted in the figures 41, 42 and 43.

[0066] With reference to figure 41 relative to the summer day cycle, provision is made for making air enter from the lower ducts C and making it exit from the top part of the module. Thus, a "ventilation channel" is obtained which will bring benefits during the day, by opposing the solar irradiation and facilitating the thermal lag, the attenuation of the heat wave, according to known ventilated facade principles.

[0067] Figure 42 instead illustrates the air flow according to the summer night mode. In this case, the so-called "solar chimney" can be implemented, with a duct that draws air from outside and conveys it into the module in a lower zone of the housing module. The air that has entered into the space is then directed into the internal interspace 13-113. From here, the air flows upward and exits by means of ducts placed at the top of the housing module. The effects of the "solar chimney" are evident during the night hours (when the summer heat is attenuated).

[0068] For such purpose, the man skilled in the art can easily understand that the air flow will be adjustable by means of opening/closing means for the ducts C of any suitable mechanical or electromechanical type, e.g. controlled by a temperature probe that will allow the passage of air towards the housing module only when the external temperature has fallen below a specific threshold.

[0069] With reference then to figure 43, relative to the winter mode, provision is made for recovering as much hot air as possible coming from a source outside the space V, e.g. from a suitable generator, making it enter from suitable lateral ducts C in a lower zone of the housing module. The hot air introduced into the space V will nat-

urally flow upward and will enter into the internal interspace 13-113, where it will be forced downward and re-introduced in the space V by means of suitable access mouths provided at the lower part in the housing module.

[0070] Clearly, the flow of hot air provided with this operation mode can be controlled mechanically or in a natural manner depending on the size of the rooms. In this case, it is provided that the hot air generator means is connected to an environmental thermostat.

[0071] The above-described kit for obtaining a housing module can comprise one or more auxiliary elements, which allow personalizing the arrangement of the rooms and accesses into the above-described housing module.

[0072] With reference, for example, to figures 16 to 19, it will be observed that the kit according to the present invention can comprise a first auxiliary element 15, provided for subdividing a housing module into separate settings or rooms. Such first auxiliary element 15 comprises a first upright 16 having one end 16a, lower during use, and one end 16b, upper during use; at least one second upright 17 having one end 17a, lower during use, and one end 17b, upper during use; at least one first cross member 18 for connecting between the first and the second upright in proximity to their ends 16a and 17a, lower during use; and at least one second cross member 19 for connecting between the first and the second upright in proximity to their ends 16b and 17b, upper during use. The first and the second upright delimit, with the first and the second cross member, at least one through opening 20. Between the connection cross member 18, lower during use, and the ends, lower during use, of the uprights 16 and 17, a first engagement seat 21, lower during use, of such first auxiliary element 15 is delimited; between the second connection cross member 19, upper during use, and the ends, upper during use, of the uprights 16 and 17, a second engagement seat 22, upper during use, of such first auxiliary element 15 is delimited.

[0073] The first auxiliary element has its engagement seat 22, upper during use, "U"-shaped and its engagement seat 21, lower during use, upside-down "U"-shaped, both sized so as to allow the insertion to size therein of a lower TI or upper TS girder of the above kit.

[0074] As seen in figure 19, one or more of the first above-described auxiliary elements 15 can be engaged with a pair of girders TI and TS and in the through opening 20, comprised between the first and the second upright 16 and 17, two or more panels P can be applied of the above-described type in order to form an interspace in fluid communication with the internal interspace 13-113 of the housing module.

[0075] With reference now to figures 20 to 22, it will be observed that a kit according to the present invention can also include a second auxiliary element 23, during use intended to be placed at one or more corners of a housing module (see in particular figures 44c and 44d). Such second auxiliary element 23 comprises a first upright 24, having one end 24a, lower during use, and one end 24b, upper during use; at least one second upright 25 having

one end 25a, lower during use, and one end 25b, upper during use; at least one first cross member 26 for connecting between the first and the second upright in proximity to their ends 24a and 25a, lower during use; at least one second cross member 27 for connecting between the first and the second upright in proximity to their ends 24b and 25b, upper during use; at least one through opening 28 being delimited between the first and the second upright. The first and the second upright have substantially flat configuration and are also fit next to each other along a respective longitudinal side, angularly offset by about 90°.

[0076] The second auxiliary element 23 also comprises a connection upright 29 longitudinally extended between the two cross members 26 and 27 and substantially parallel to the first and to the second upright 24 and 25. The connection upright 29 and the first and the second upright are provided with aeration through openings 10 as described above. Analogous openings are provided, with reference to figures 21a to 21 d, also on the cross members 26 and 27. The cross member 27 can comprise a panel 27a, to which a top framework 27b is fixed at the top, in any suitable manner; on such framework 27b, aeration through openings 10 are obtained.

[0077] With one such configuration of the second auxiliary element, it can be easily understood that this is easily couplable to the support elements 1 according to the invention, maintaining the possibility to make the above interspaces (central 11-111, internal 13-113 and external 12-112) without having the drawback of heat bridges or undesired thermal discontinuities in the housing module.

[0078] Figures 23 to 25 and 26 to 28 respectively illustrate a third and a fourth auxiliary element of a kit according to the present invention, couplable to the above support elements 1 in order to allow making vertical access openings (e.g. doors or windows) in a housing module.

[0079] More particularly, there are two frameworks 30 and 31, transversely insertable between two support elements 1 side-by-side each other, as illustrated in figures 29 to 31. The framework 30, comprising four sections A1, B1, C1 and D1, arranged together to form a rectangular frame, is provided to be engaged between two side-by-side support elements 1, at their second uprights 3 and carries out the function of delimiting the height - by means of its section D1, facing downward during use - of an access opening with the outside of the housing space. The framework 30 has no load-bearing function. The framework 30 is also provided with a longitudinal element E1, arranged centrally and parallel with the sections A1 and B1, provided with aeration through openings 10.

[0080] The framework 31, like the framework 30, comprises four sections A2, B2, C2 and D2, arranged together to form a rectangular frame, as well as one or more transverse elements E1 and E2 in figure 27, intended to delimit the height - whether at the upper part or lower part - of the outside access opening. The framework 31 has load-bearing function and it is provided to be en-

gaged between two side-by-side support elements 1, at their first uprights 2. Also this framework carries out the function of delimiting the height of the outside access opening of the housing space. For such purpose it will be observed that the framework 30 and the framework 31 will be mounted between the two side-by-side support elements 1 with the section E1 (and/or D1) and E2 at a same distance from the girders T1. The section E2, when provided, has the function of delimiting, on the lower part, an outside access point for window use.

[0081] Figures 32 to 35 illustrate an additional fifth auxiliary element 32 of the kit according to the present invention.

[0082] Such additional element 32 comprises four sections A3, B3, C3, D3, arranged together to form a rectangular frame. The sections C3 and D3, respectively lower and upper during use, are transversely extended, at a same side, beyond the section B3 orthogonally connected therebetween, thus delimiting (as will be understood hereinbelow) an engagement zone, lower F3a and upper F3b during use, for corresponding girders T1 and TS.

[0083] On each section of such element, at least one aeration through opening 10 is obtained, like those described above. More particularly, the longitudinal section B3 is fit with another longitudinal element E3 provided with the aforesaid aeration through openings 10. The section B3 and E3, nevertheless, could be made in a single piece.

[0084] The additional fifth element 32 carries out the function of allowing the subdivision of a space. It is a non-load-bearing external element which, due to the aeration through openings 10 obtained therein, allows maintaining the continuity between the interspaces of the housing module. In addition, the engagement seats F3a and F3b advantageously allow the additional fifth element 32 to maintain in position the girders T1 and TS of a housing module fit thereto (see in particular figures 35a and 35b).

[0085] By way of example, figures 44a to 44f are provided with schematic representations of the main steps for mounting a housing module obtainable by means of the use of the support element 1 according to the present invention and of some above-described auxiliary elements. It is intended that many other various configurations of the housing module are possible, which in addition to the support element 1 can comprise an alternative combination of the above-described elements.

[0086] As is clear, one proceeds with making the bottom of the module (figure 44a) with the girders T1, lower during use. In a subsequent step, the support elements 1 according to the invention and one or more of the above-described auxiliary elements (in the specific case 30 and 31) are applied so as to obtain one or more lateral walls provided with the openings necessary for windows and module access doors. Then, the panels P are applied so as to delimit the desired interspaces (figure 44b). Subsequently, the upper panel is mounted so as to close the top of the housing module (figure 44c), and then the mod-

ule is laterally closed by making the lateral walls, if desired, by means of the use of auxiliary elements 23 and 32.

[0087] In the subsequent step, figure 44e, one proceeds with the application of the panels P for delimiting the interspaces 13-113, 12-112 and 11-111 and for the laying of the thermal insulation in the interspace 11-111 and finally the desired coverings are mounted (figure 44f).

[0088] The support element 1 and the kit as described above fully resolve the abovementioned technical problems.

[0089] It is in fact possible to obtain a housing module that can be made with natural materials and hence is biocompatible, which due to the interspaces around the space V of the housing module allows thermally insulating the space V with optimal values in terms of energy efficiency, especially in the summer cycle.

[0090] For such purpose, the bottom of the housing module can be advantageously raised from the ground, in order to facilitate the flow of air into the external interspace 12-112 and maintain the module itself dry.

[0091] In addition, one or more housing modules as described above can be provided at underground tanks for the collection of rain water, provided with suitable (overflow) control systems for the level of the water contained therein, and placed in fluid communication with such tanks. In this manner, the hot air exiting from the housing module can be conveyed in any suitable manner into such tanks, above the level of the water contained therein. The introduced air can then undergo a sudden temperature change and be conveyed to the outlet of the tanks themselves at lower temperature, in order to be once again introduced into the housing module or modules.

[0092] In this manner, in addition to achieving, with the above-described invention, an effectively insulated housing module at limited costs, it is possible to efficiently adjust the humidity levels inside the module itself, thus obtaining high living comfort at limited costs and in a simple manner.

[0093] The invention therefore solves the above-indicated objects, since it creates a housing module that has a so-called "dynamic covering" - i.e. due to its structure, its form, the uniformity of the external partitions, its simplicity and the essentiality of the construction technique - able to pick up, depending on the place and climate where the housing module is installed, the most favorable external input and transmit it to the interior in order to reduce consumption, eliminate heat bridges, make the insulation uniform without differentiating vertical walls and horizontal walls, thus increasing the living comfort, respecting the environment, creating new living spaces/forms at limited costs and in a healthy relationship with the environment. The housing module, attainable with the support element and the kit according to the invention, therefore becomes a valid instrument for bioclimatic architecture. The above-described support ele-

ment 1 as well as the kit are susceptible of numerous modifications and variations within the protective scope of the following claims.

[0094] Thus, for example, they can be made of a material that is not wood, e.g. metal, and the various components of each support element or of the kit, can be made in a single piece or in multiple pieces, e.g. of laminated material, assembled together in a manner known for the man skilled in the art of the field, e.g. by means of gluing.

[0095] One embodiment of such assembly is visible for example in figures 45 and 46.

[0096] The support elements 1 according to the invention have been described according to preferred embodiments; it is intended, however, that many other combinations are possible. For example, the following falls within the scope of the present invention: a support element 1 according to the above-described second variant of the first embodiment, in which the engagement seat 7, lower during use, is shaped as in the third variant, i.e. with configuration complementary to the respective seat 8, upper during use.

Claims

1. Support element (1), particularly suitable for obtaining housing modules, comprising:

- at least one first upright (2) having one end (2a), lower during use, and one end (2b), upper during use;
- at least one second upright (3) having one end (3a), lower during use, and one end (3b), upper during use, wherein said second upright (3) has a face (3c) opposite said first upright (2);
- at least one first cross member (4) for connecting between said first and said second upright (2, 3) in proximity to said lower ends (2a, 3a) thereof, lower during use;
- at least one second cross member (5) for connecting between said first and said second upright (2,3) in proximity to said upper ends (2b, 3b) thereof, upper during use;

at least one through opening (6) being delimited between said first and said second upright and the section of said at least one second upright (2) comprised between said at least one first connection cross member (4), lower during use, and said end (2a) thereof, lower during use, delimits a first engagement seat (7), lower during use, of said support element (1) and

the section of said at least one second upright (2) comprised between said at least one second connection cross member (5), upper during use, and said end (2b) thereof, upper during use, delimits a second engagement seat (8), upper during use, of

said support element (1),

characterized in that

said second upright (3) comprises at least one substantially longitudinal spacer element (9) at one section thereof or part of one section thereof comprised between said at least one first and at least one second cross member (4, 5), at said face (3c) opposite said first upright (2), wherein said spacer element (9) is extended from said face (3c) of said second upright (3), moving away from said first upright (2).

2. Support element according to claim 1, wherein at least one aeration through opening (10) is obtained in said at least one first upright (2) and/or in said at least one spacer element (9) and/or wherein at least one aeration through opening (10) is transversely obtained in said at least one first upright (2) and/or in said at least one spacer element (9).

3. Support element according to claim 1 or 2, wherein said at least one first and said at least one second cross member (4, 5) are connected orthogonally to said second upright (3) and/or wherein said at least one first and said at least one second cross member (4, 5) are connected orthogonally to said first upright (2) or wherein said at least one first and said at least one second cross member (4, 5) are not connected orthogonally to said first upright (2) such that said first and said second upright are not parallel to each other or wherein said at least one first cross member (4) is connected orthogonally to said first and to said second upright (2, 3) and wherein said at least one second cross member (5) is connected in a non-orthogonal manner to said first and to said second upright (2, 3).

4. Support element according to any one of the preceding claims, wherein said end (3b), upper during use, of said second upright (3) is substantially "U"-shaped such that said second engagement seat (8) of said element (1) is delimited between said at least one first upright (2), one face, upper during use, of said at least one second cross member (5) and the sections of said "U" and/or wherein said end (3a), lower during use, of said second upright (3) is substantially upside-down "U"-shaped such that said first engagement seat (8) of said element (1) is delimited between said at least one first upright (2), one face, lower during use, of said at least one first cross member (4) and the sections of said upside-down "U" or wherein said end (3a), lower during use, of said second upright (3) is configured to be complementary to the respective end (3b), upper during use, such that two support elements (1) can be vertically engaged with each other at said ends (3a, 3b) of said second upright (3).

5. Support element according to any one of the preceding

ing claims, wherein said at least one second upright (3) has a substantially curved cross section and said first engagement seat (7), lower during use, of said support element (1) is delimited between one end (9a), lower during use, of said spacer element (9) and said first end (3a), lower during use, of said second upright (3) and said second engagement seat (8), upper during use, of said support element (1) is delimited between one end (9b), upper during use, of said spacer element (9) and said second end (3b), upper during use, of said second upright (3).

6. Support element according to the preceding claim, wherein said spacer element (9) has a curved cross section.

7. Kit for obtaining a housing module, comprising:

- at least one plurality of support elements (1) according to any one of the claims from 1 to 6; and

- at least one plurality of girders (TI, TS) having cross section suitable for being inserted in said at least one first engagement seat (7), lower during use, or in said at least one second engagement seat (8), upper during use, of at least one support element (1) of said plurality of support elements.

8. Kit according to claim 7, wherein said support elements (1) of said plurality are engageable in pairs by means of a respective pair of girders (TI, TS) of said plurality of girders, the first uprights (2) of the support elements of each pair being arranged at a certain distance from each other, substantially coinciding with the length of said respective pair of girders, and the respective second uprights (3) facing towards each other and/or comprising at least one support element according to claim 5 engageable with one or more support elements (1) of said plurality, the first upright (2) of said one or more support elements and the second upright (3) having substantially curved cross section being arranged at a certain distance from each other substantially coinciding with the length of said respective pair of girders, the respective second uprights (3) facing towards each other.

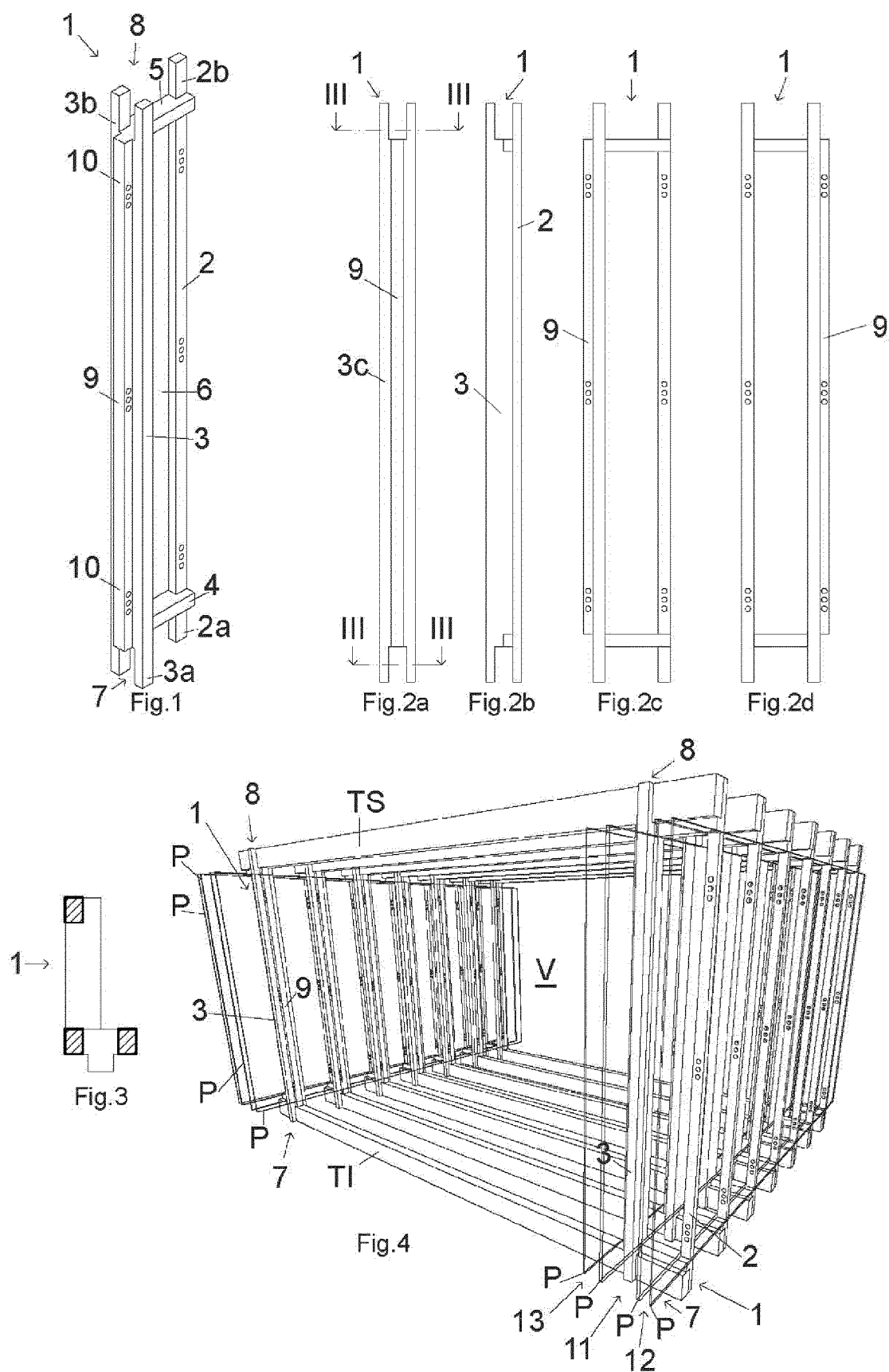
9. Kit according to claim 8, wherein said pairs of said support elements (1) connected by said respective girders (TI, TS) can, during use, be arranged together with the respective girders parallel, in order to delimit an internal volume (V) usable as a housing space and/or wherein said at least one support element according to said claim 5 and said at least one or more support elements (1) of said plurality can be arranged together with the respective girders (TI, TS) angularly offset from each other, in order to delimit

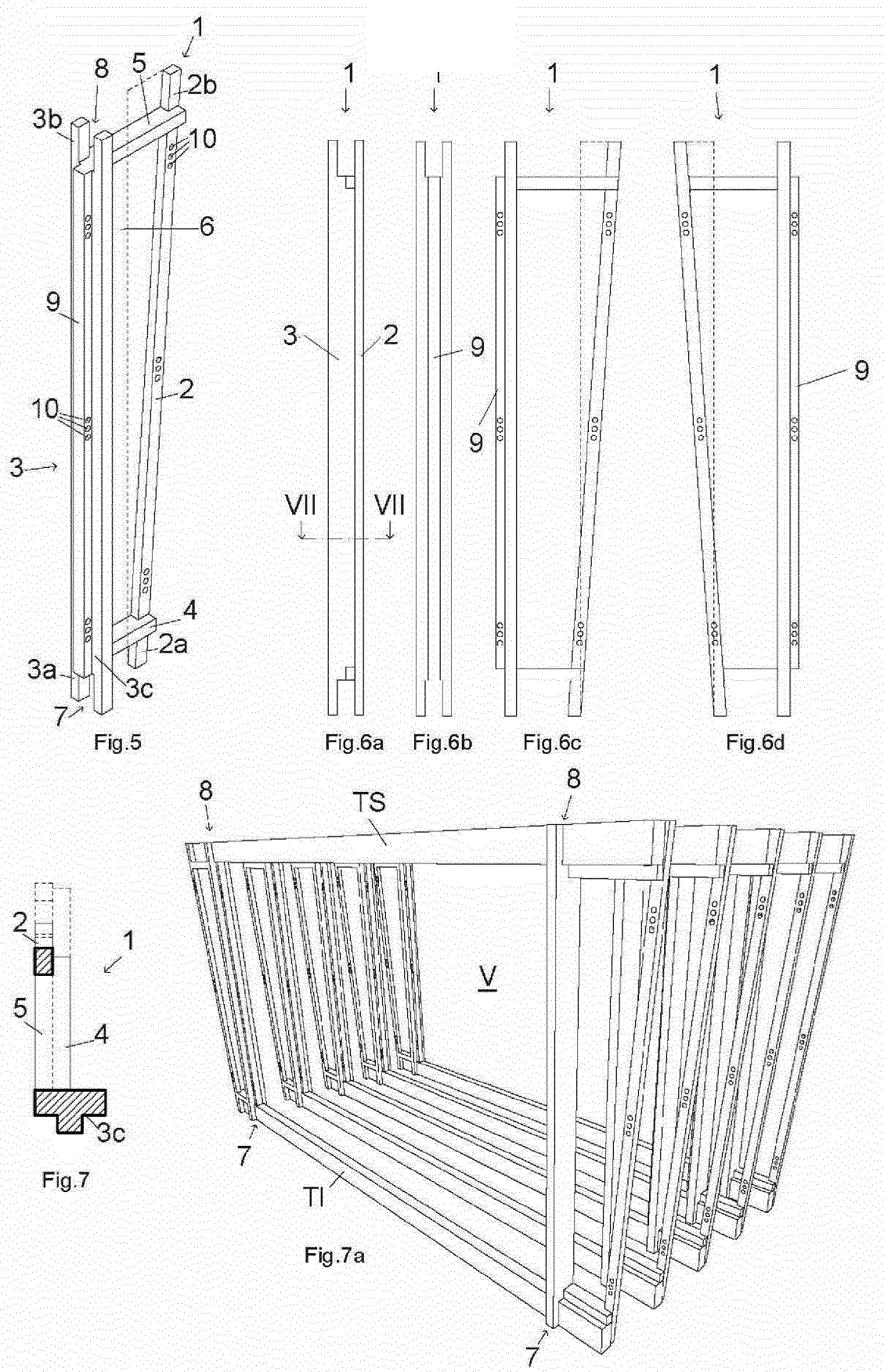
an internal volume (V) usable as a housing space.

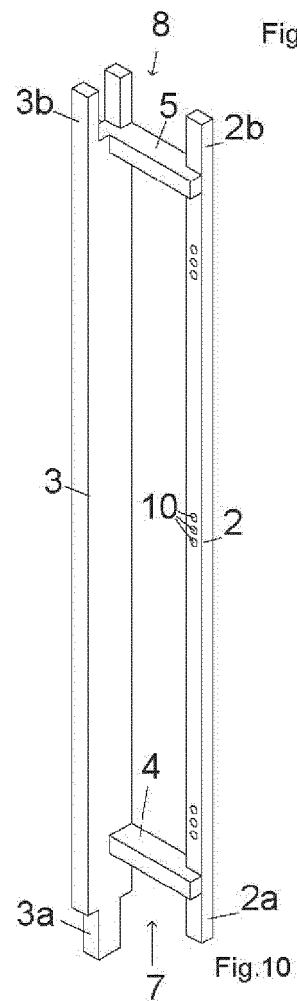
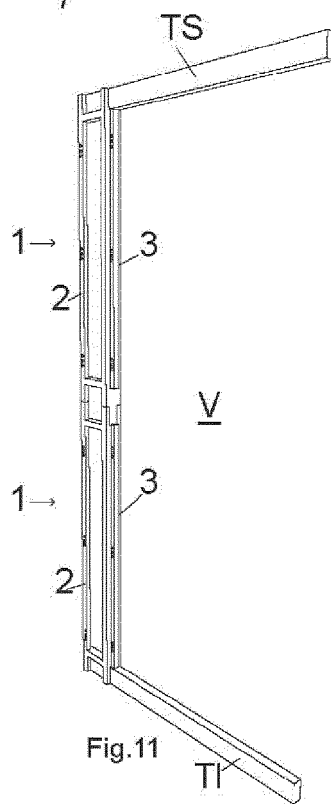
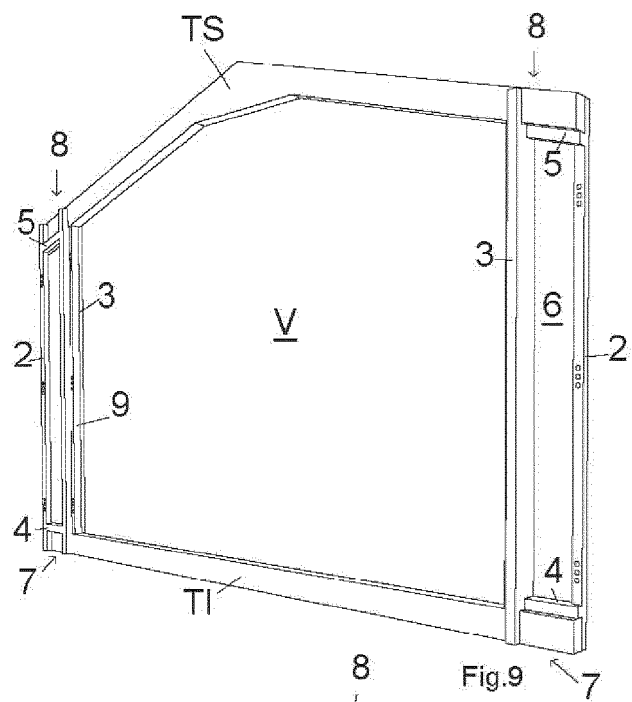
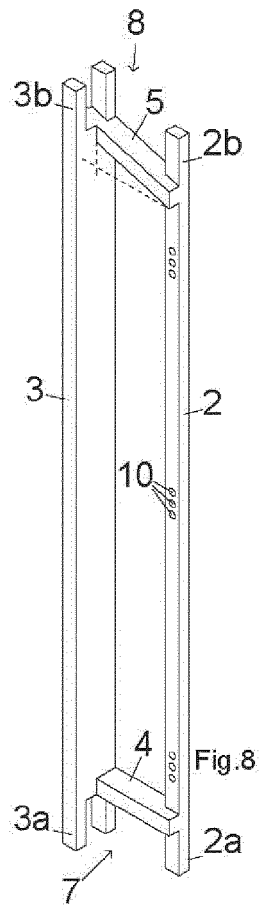
10. Kit according to any one of the claims from 7 to 9, comprising at least one plurality of panels (P) which can be applied to support elements (1) of said plurality of elements side-by-side each other, so as to delimit at least one lateral interspace (11, 12, 13) between each first and each second upright (2, 3) and said plurality of panels, and/or wherein said panels (P) of said plurality of panels can be applied to said first and said second upright of each support element of said plurality of support elements and/or wherein said panels of said plurality of panels (P) can be applied on opposite sides with respect to said first upright (2) and to said second upright (3) of each support element (1), thus delimiting an intermediate lateral interspace (11), comprised between said first upright (2) and said second upright (3), interposed between an external lateral interspace (12), including said first upright (2) and an internal lateral interspace (13), including said second upright (13).
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11. Kit according to the preceding claim, wherein said intermediate lateral interspace (11) is intended to be filled with at least one insulating material.
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12. Kit according to any one of the claims from 7 to 11, comprising at least one plurality of cross members (14), each provided with at least one aeration through opening (10), said cross members being intended to support and/or be supported by girders (TI) for connecting said plurality of girders, comprised between pairs of support elements (1), at said first engagement seats (7), lower during use, and/or said cross members being intended to be applied on the lower part and/or be supported by girders (TS) for connecting said plurality of girders, comprised between pairs of support elements (1), at said second engagement seats (8), upper during use.
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13. Kit according to claim 25 or 26, comprising at least one plurality of panels (P) which can be applied to said cross members (14) and/or to said girders (TI, TS) so as to delimit at least one interspace (111, 112, 113) therebetween and/or comprising at least one plurality of panels (P) which delimit an intermediate interspace (111) between said girders, interposed between an internal interspace (113), between said lower girders (TI) and said cross members (14) supported by said lower girders (TI) and said upper girders (TS) and said cross members (14) applied below them, and an external interspace (112), between said lower girders (TI) and said cross members (14) supporting said lower girders (TI) and said upper girders (TS) and said cross members (14) supported by said upper girders (TS).
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14. Kit according to claims 10 and 13, wherein said ex-

ternal lateral interspace (12) is in fluid communication with said external interspace (112) and said internal lateral interspace (13) is in fluid communication with said internal interspace (113) by means of said aeration through openings (10).

15. Housing module obtained by means of at least one kit according to claims 10 and 14, comprising a living space (V) delimited laterally, at the top and at the bottom by said interspaces (11-111, 12-112, 13-113), wherein said external interspace (12-112) and said internal interspace (13-113) are in fluid communication with the outside and/or with said living space by means of suitable aeration ducts (C).







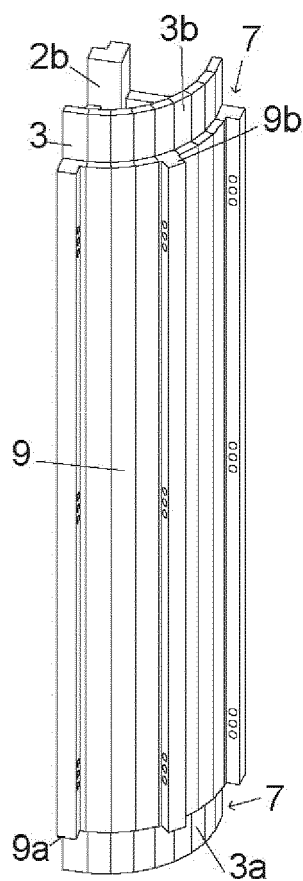


Fig. 12

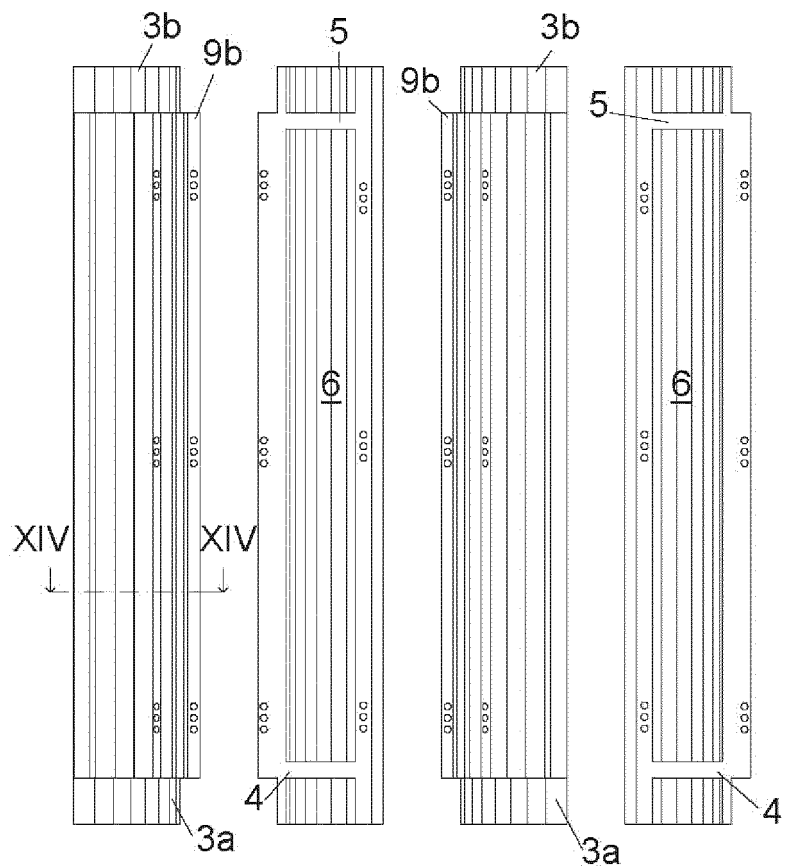


Fig. 13a

Fig. 13b

Fig. 13c

Fig. 13d

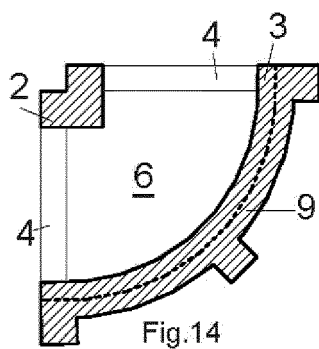


Fig. 14

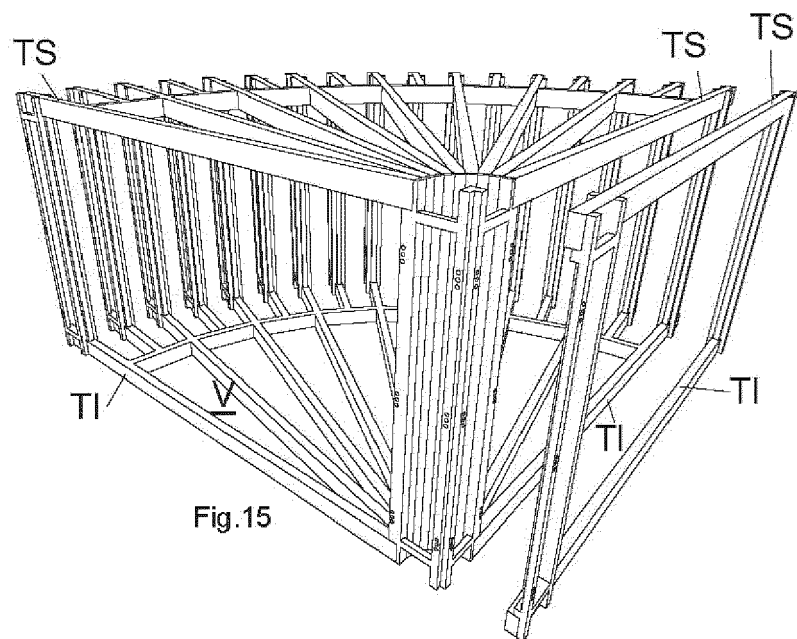
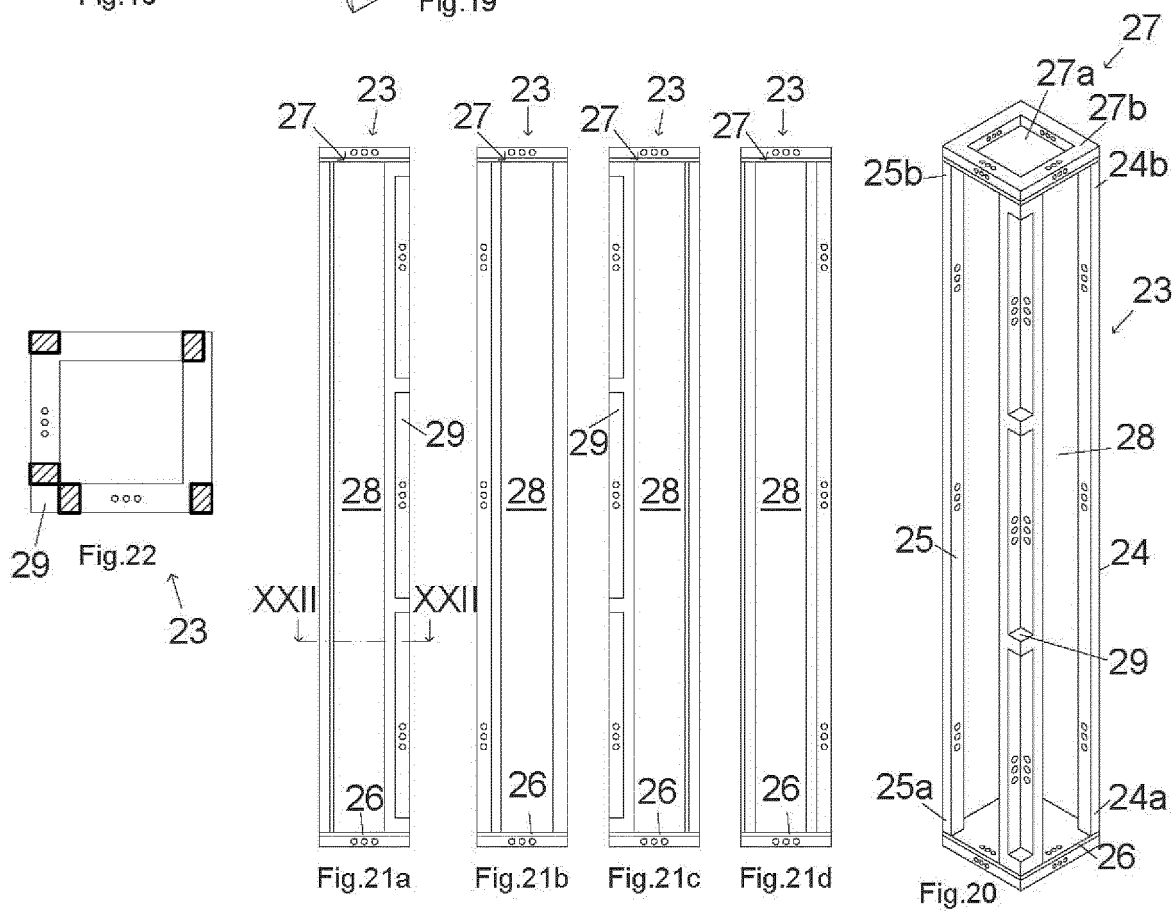
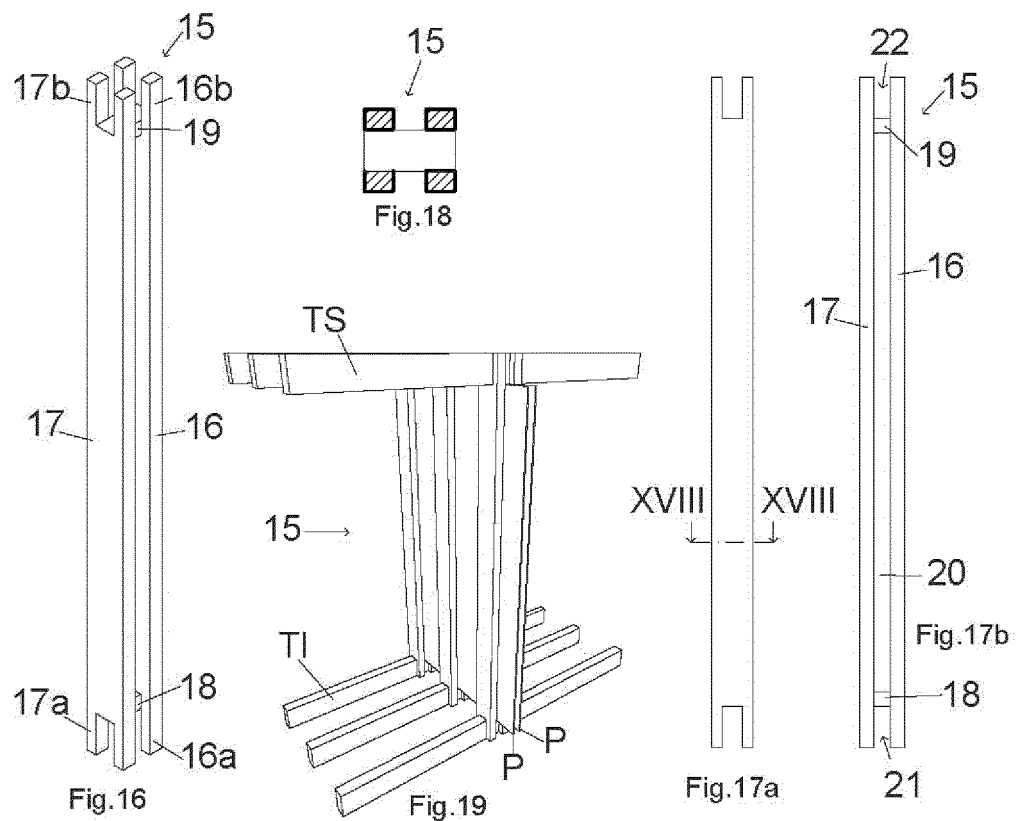
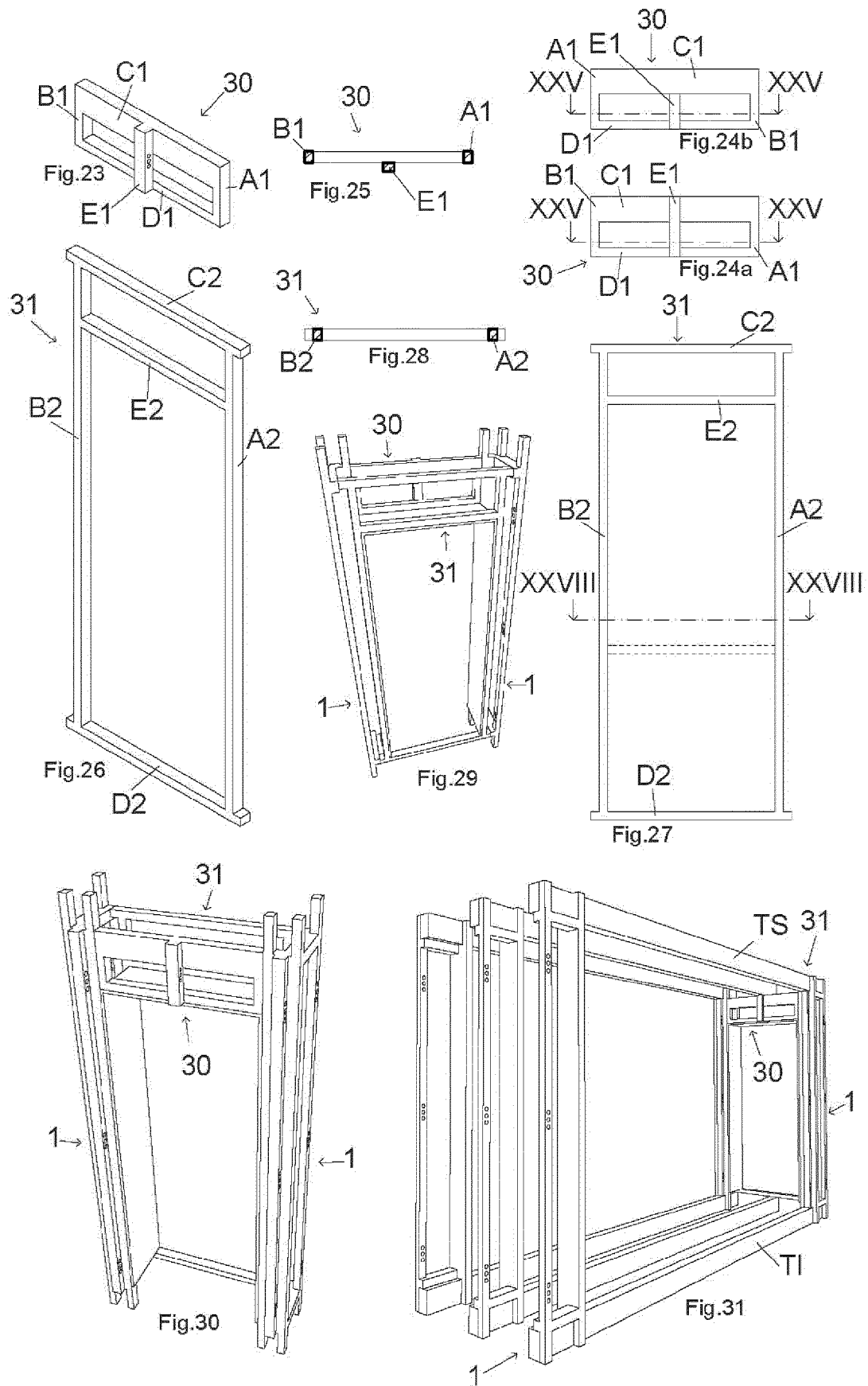
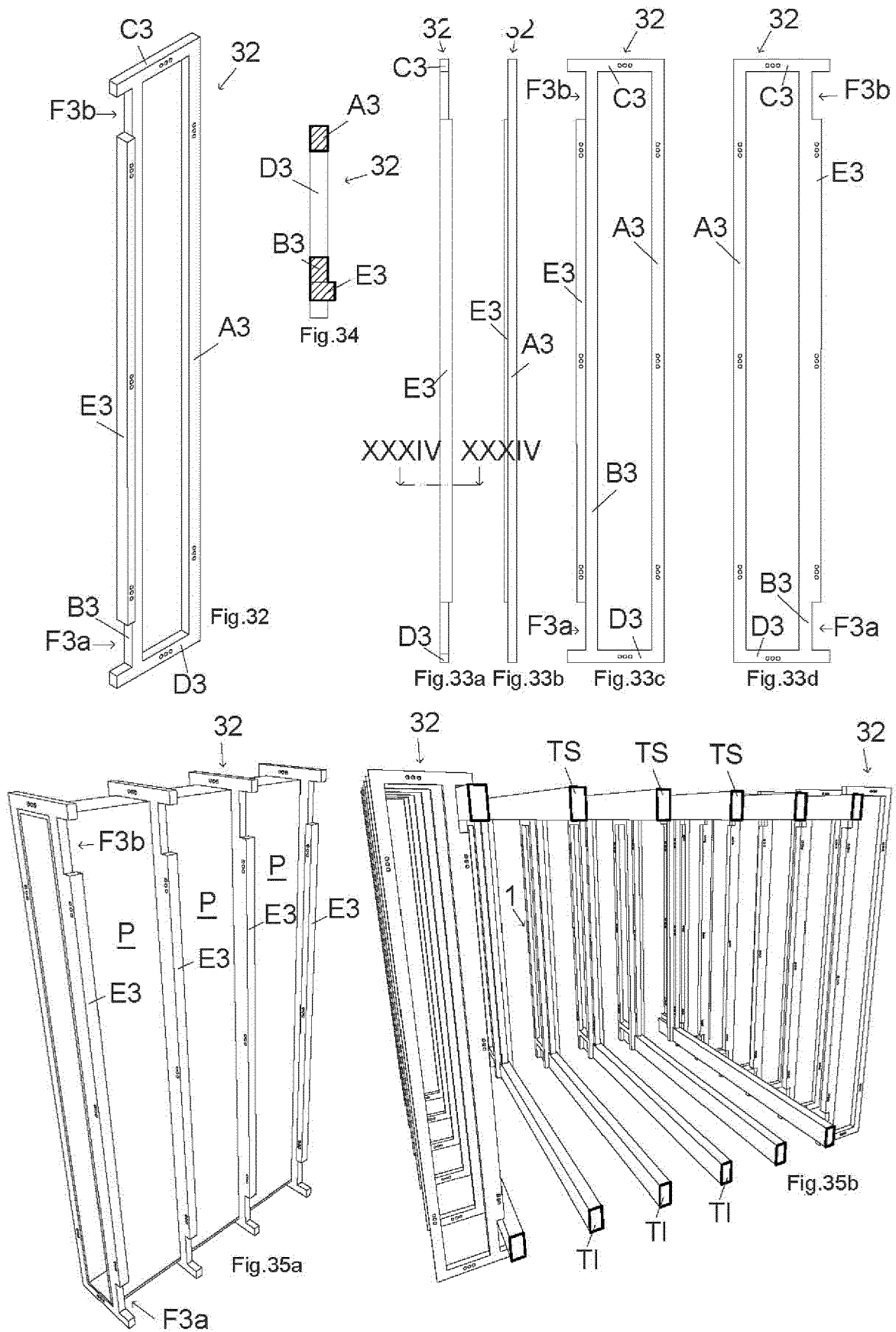
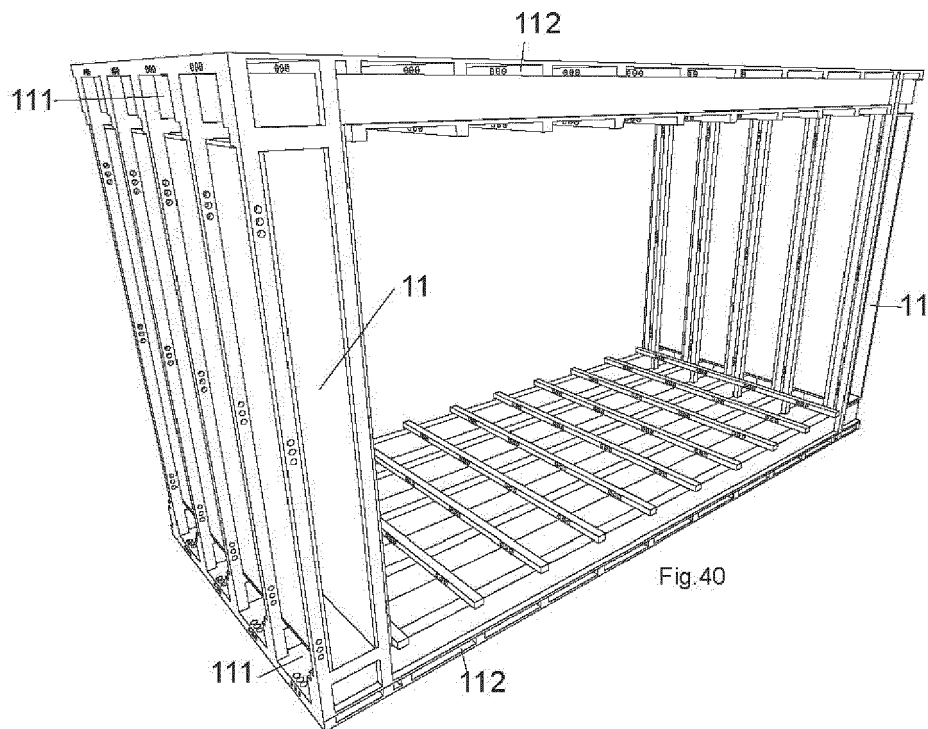
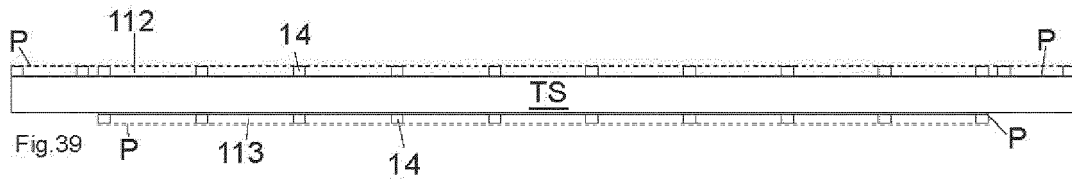
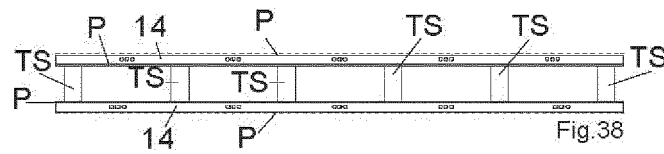
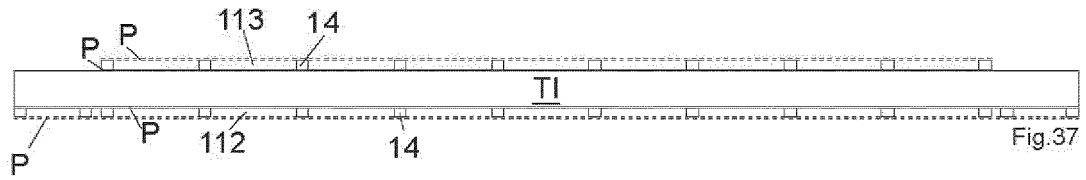
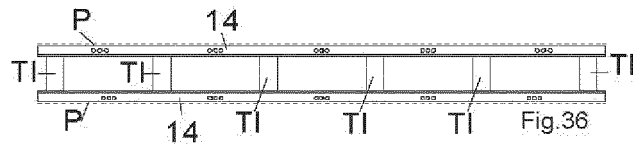


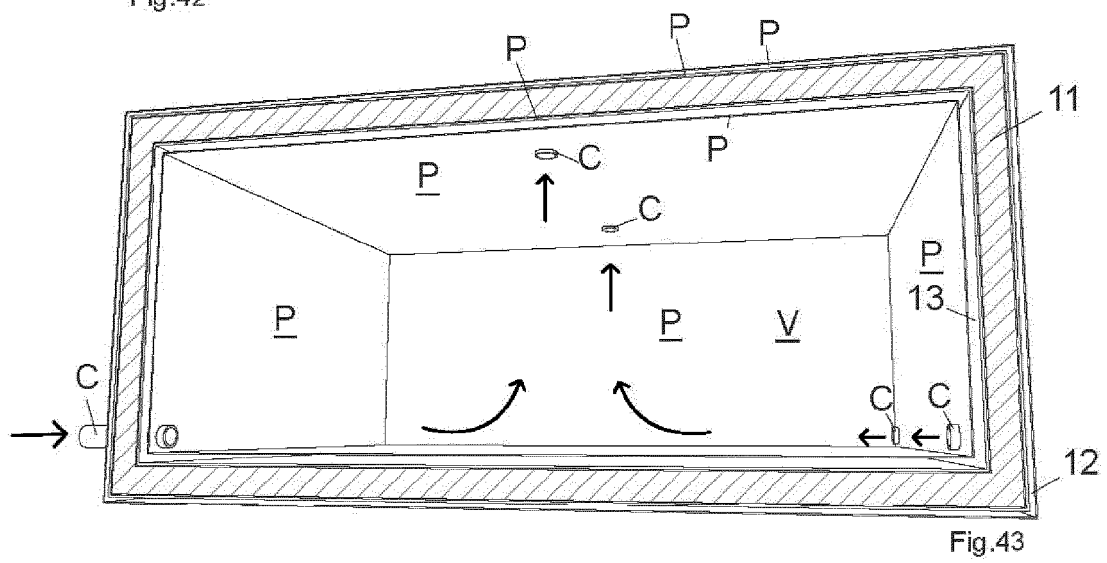
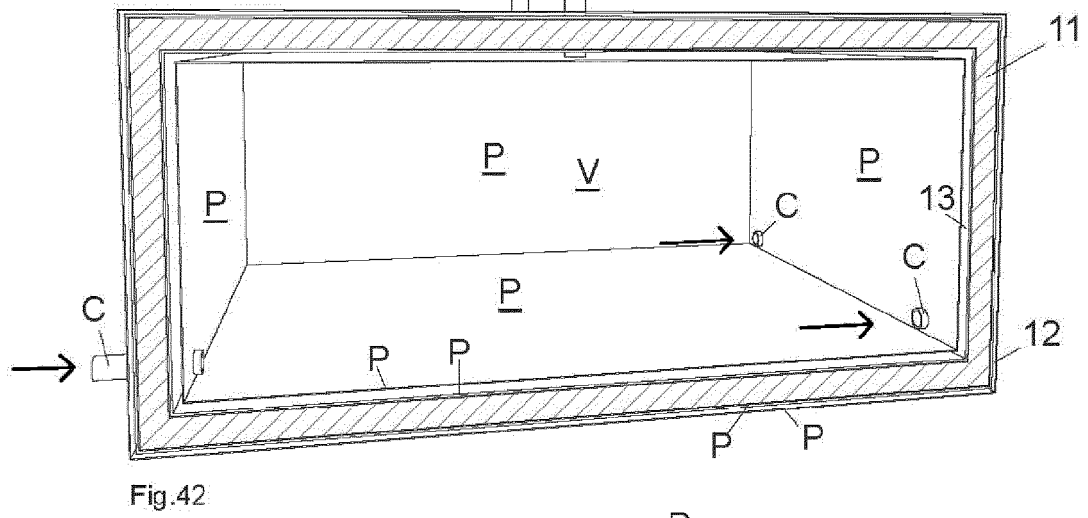
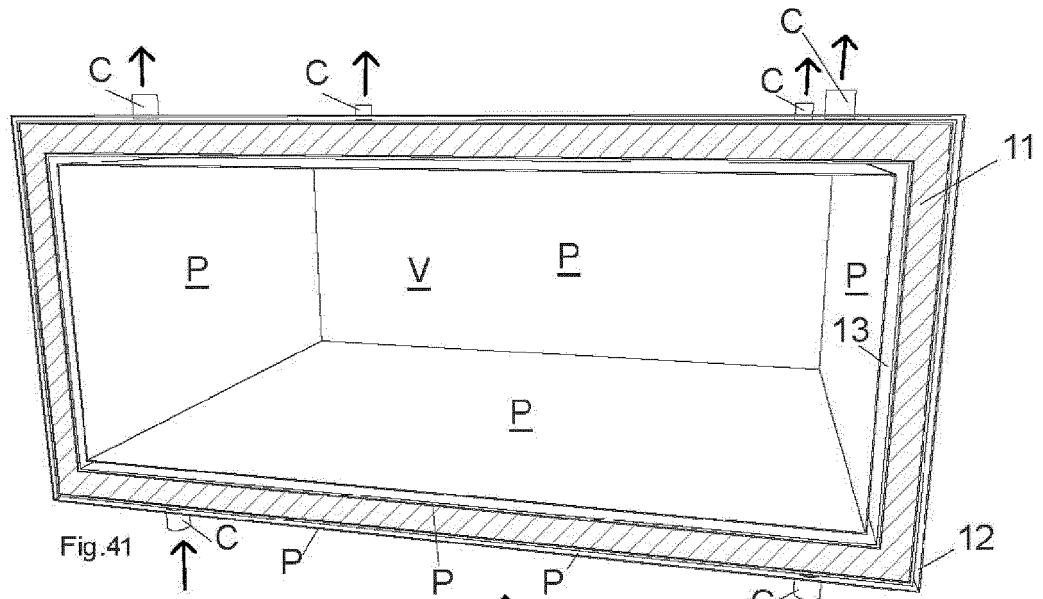
Fig. 15

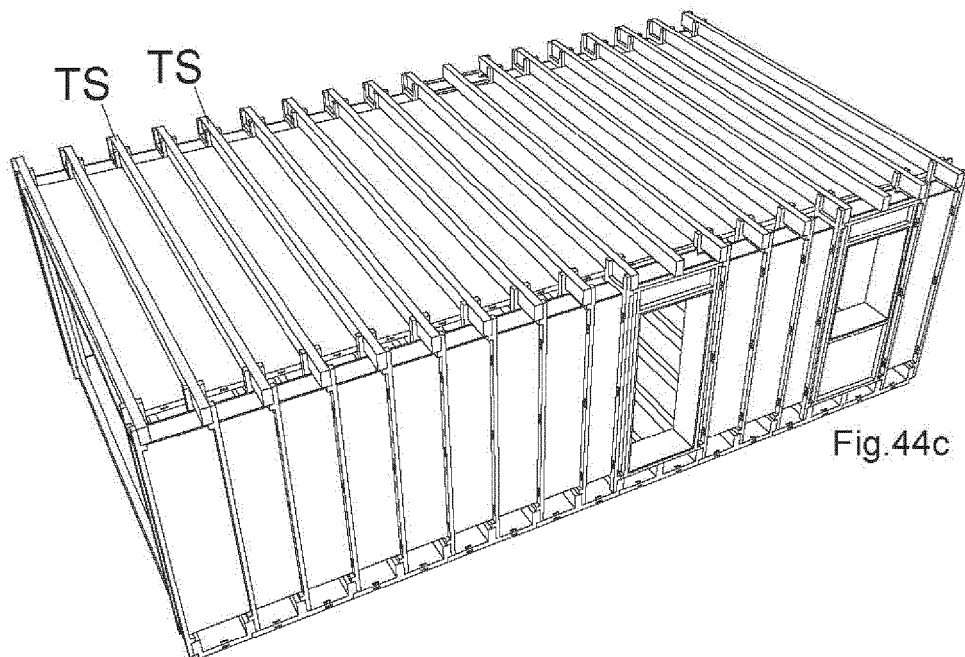
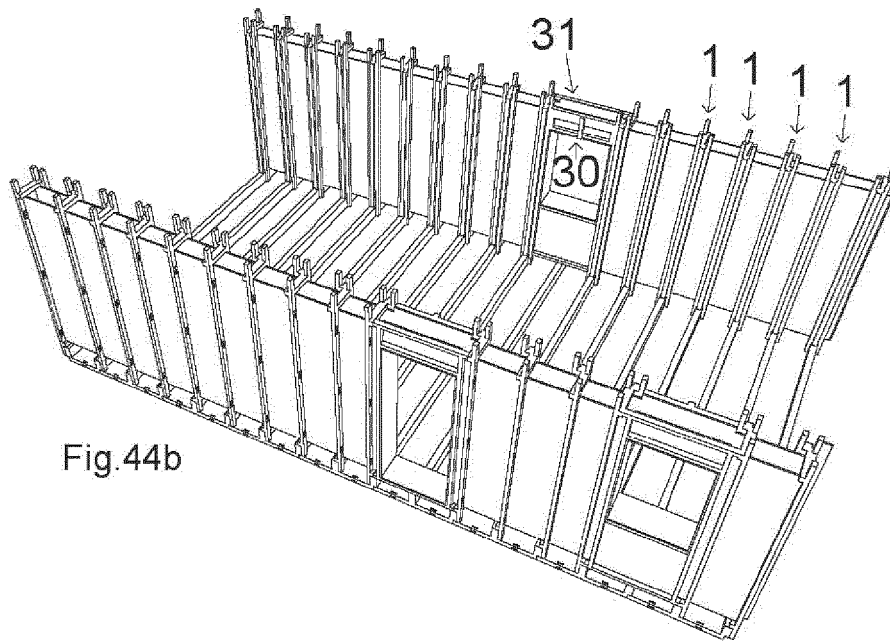
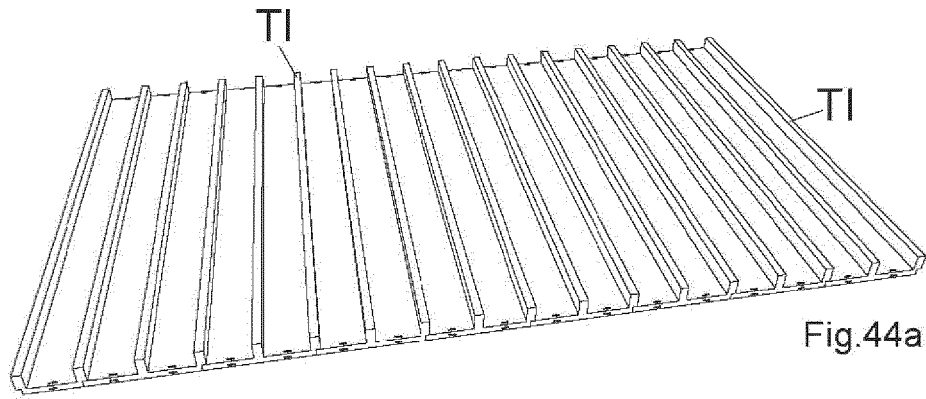


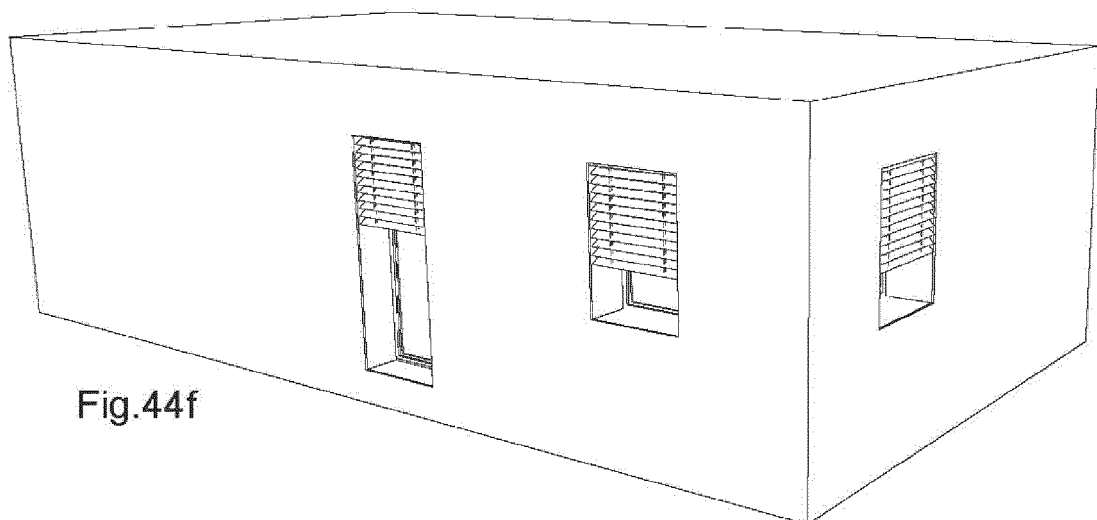
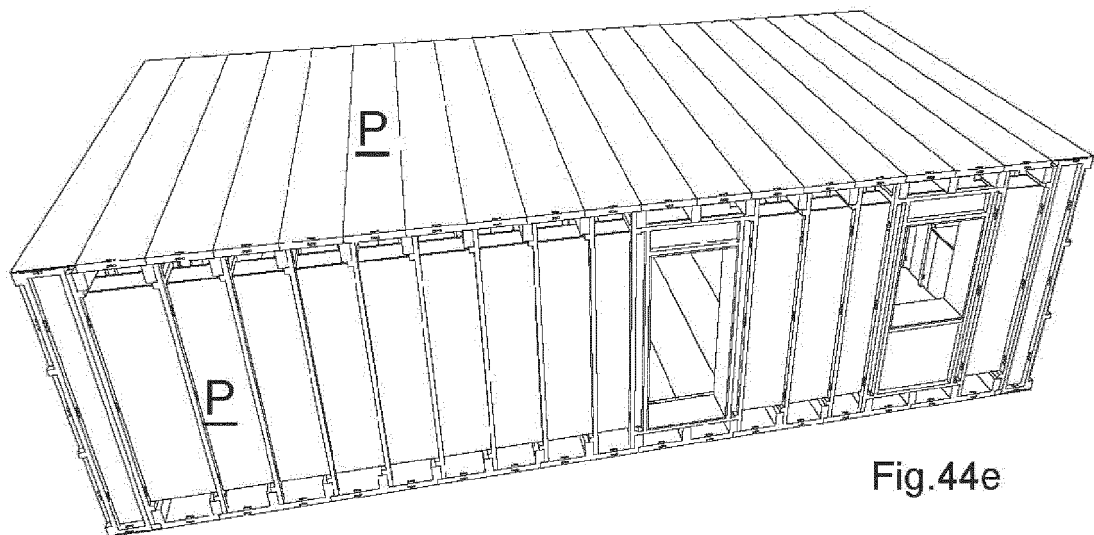
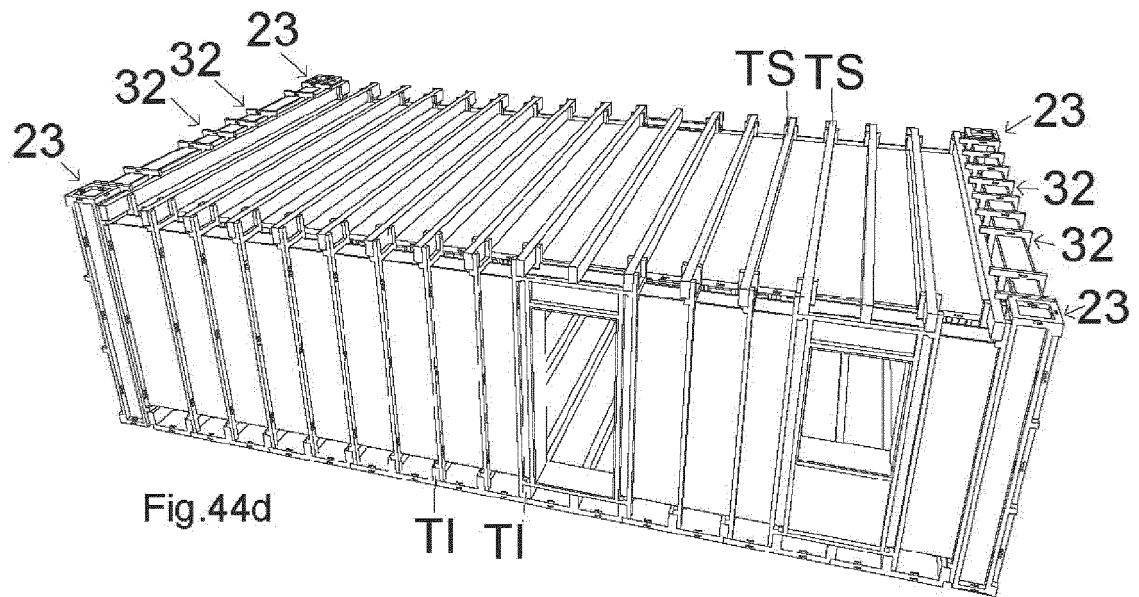


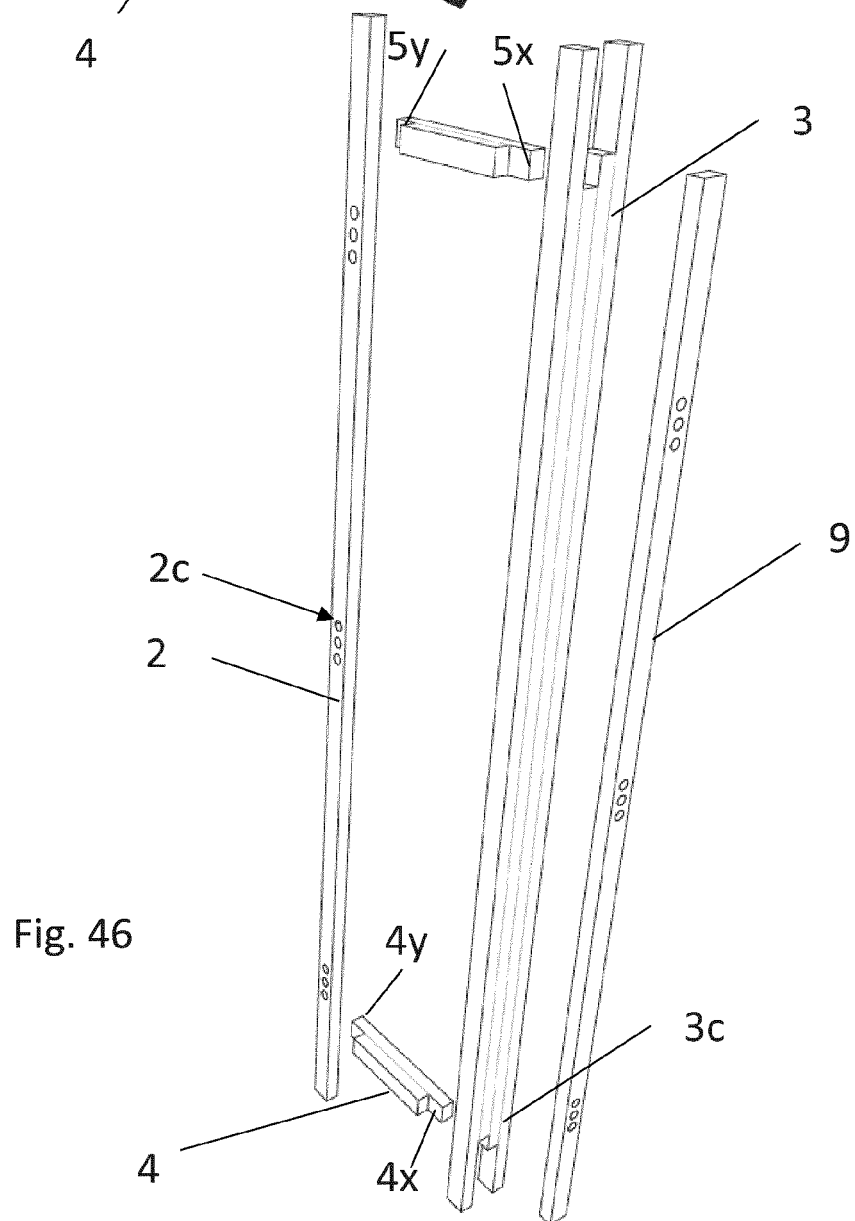
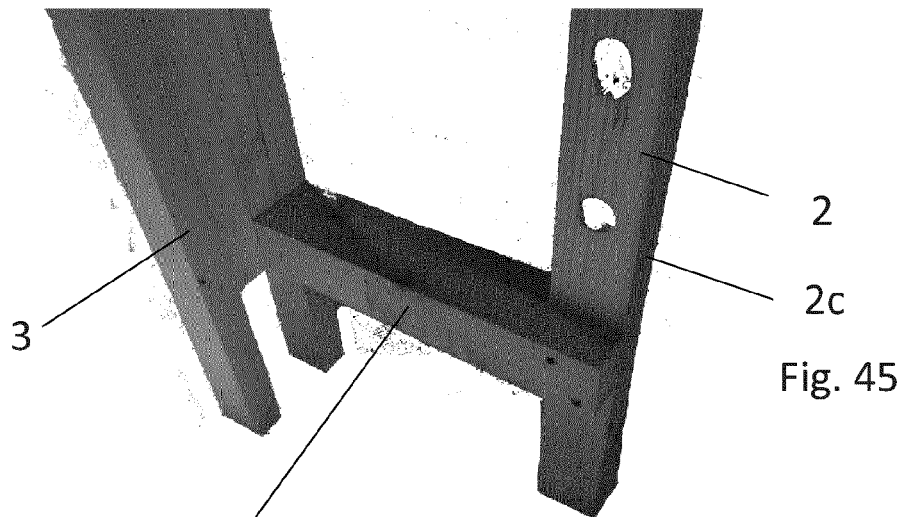














EUROPEAN SEARCH REPORT

 Application Number
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 29 January 2016	Examiner Galanti, Flavio
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