



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
24.05.2017 Bulletin 2017/21

(51) Int Cl.:
E04G 11/06 (2006.01) **E04G 13/02** (2006.01)
E04G 17/04 (2006.01) **E04G 17/00** (2006.01)
E04G 17/065 (2006.01) **E04G 9/02** (2006.01)

(21) Application number: **16198897.7**

(22) Date of filing: **15.11.2016**

(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 MD

(71) Applicant: **Faresin Building Division S.p.A.**
36042 Breganze (VI) (IT)

(72) Inventor: **FARESIN, Guido**
36061 BASSANO DEL GRAPPA VI (IT)

(74) Representative: **Modiano, Micaela Nadia**
Modiano & Partners
Via Meravigli, 16
20123 Milano (IT)

(30) Priority: **17.11.2015 IT UB20155637**

(54) **FORMWORK**

(57) Formwork (10) for performing vertical castings for providing pillars, vertical walls and head closures of the type comprising a framework composed of metallic profiles having two posts (11, 12) and two cross-beams (13, 14); the perimetric edge of the framework being shaped so as to accommodate a sheet of material (27), for example made of wood, intended to form a surface for a concrete casting; the framework (10) comprising furthermore an additional plurality of metallic profiles; the additional plurality of metallic profiles comprises: a) a first plurality of transverse metallic profiles, termed closed profiles (19, 20, 21, 22), arranged parallel to the cross-beams (13, 14) of the framework (10); the closed profiles (19, 20, 21, 22) having one or more holes (44) preset to accommodate accessory components of the type of service shelves, connection devices, stiffening beams, steel bushes; the one or more holes (44) being arranged so that their axis is parallel to the longitudinal extension of the framework; b) a second plurality of transverse profiles (15, 16, 17, 18) with a substantially C-shaped cross-section, termed C-shaped profiles, having openings (36, 37) and holes (39), termed front slots, for the passage of interconnection elements; the front slots (36, 37, 39) being arranged so that their axis is perpendicular to the longitudinal extension of the framework; wherein the profile ends of the first and second plurality are fixed to opposite sides of the two posts (11, 12); a third plurality of reinforcement profiles (23, 24, 25, 26) adapted to connect one of the cross-beams (13, 14) of the framework to one of the C-shaped profiles (15, 16, 17, 18).

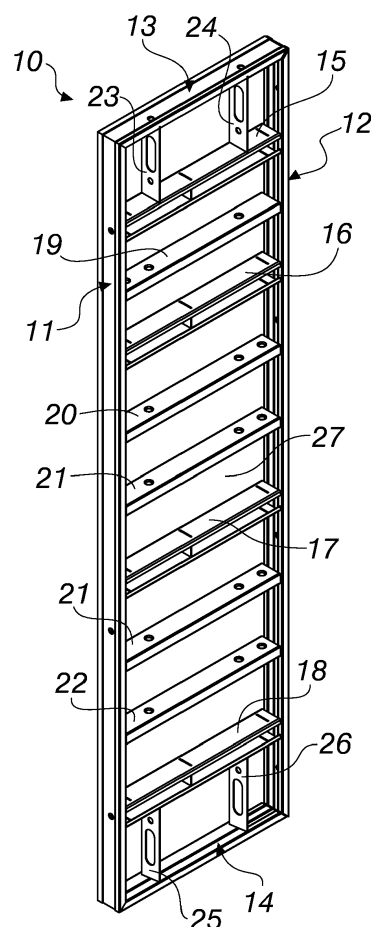


Fig. 1

Description

[0001] The present invention relates to a formwork, particularly formwork for performing vertical castings for providing pillars, vertical walls and head closures. The invention also relates to an assembly and a method that are consistent with the formwork.

[0002] Formwork units are known which are constituted by a series of panels of different width, assembled and installed to provide vertical concrete castings such as continuous walls, individual pillars, partitions, enclosed stairwells, and the like.

[0003] Known formwork systems are usually composed of a metallic supporting frame, to which a panel made of wood or other material (plastic, compacted wood, et cetera) is fixed, ensuring the provision of a planar and uniform concrete surface. Conventional formwork units comprise panels with a steel frame to which an element, made for example of wood, is applied in the part affected by the concrete casting. Typically, each type of object to be provided, be it continuous vertical walls, pillars, corners between continuous vertical walls, requires the use of various panels, each of which has particular characteristics. Furthermore, the provision of some objects by means of vertical concrete castings and formwork units of the background art requires further solutions.

[0004] In fact, if one intends to provide head closures, it is necessary to use and install, in addition to the panels, additional elements such as compensating members with elements made of wood, such as beams and decking made of wood, which entail operations that require a lot of time and considerable labor.

[0005] Furthermore, if the object to be provided by means of vertical castings provides for components that protrude at the upper ends (such as capitals, cornices, extra thick beams), none of the systems cited above is suitable fully and autonomously, therefore without the integration of other additional formwork panels of non-standard size, with dimensions to be created ad hoc, in addition to specially shaped panels composed of materials of a different kind (wood, steel, aluminum, etc). The same applies to pillars with parts that protrude at the upper ends (such as capitals, cornices), for which it is necessary to use additional material with respect to the provision of normal formwork panels and is, moreover, an operation that takes a lot of time and considerable labor.

[0006] The aim of the present invention is to overcome the limitations of the background art noted above, by proposing a formwork that is versatile and capable of providing various concrete objects efficiently.

[0007] Within this aim, an object of the present invention is to provide a formwork that does not require the use of additional wood compensation elements with respect to the panel made of wood or other material (plastic, compacted wood, et cetera).

[0008] A further object of the invention is to provide structures that can be assembled and are modular, so

as to allow to provide various objects that require a vertical casting by modifying only the arrangement of the formwork units and without altering their shape.

[0009] Another object of the present invention is to require the use of components that are easily commercially available.

[0010] Another object of the present invention is to have a structure that is simple, relatively easy to provide in practice, safe in use, effective in operation, and relatively modest in cost.

[0011] This aim and these and other objects that will become better apparent hereinafter are achieved by a formwork according to claim 1, an assembly according to claim 9 and a method according to claim 13.

[0012] Advantageously, the formwork of the present invention is easy to handle, lightweight and strong, and allows to provide in a versatile manner various types of object as a function of the manner in which it is assembled to another formwork unit of the present invention.

[0013] Conveniently, the formwork allows to ensure, for the space delimited inside it, a hermetic protection from the concrete casting.

[0014] Preferably, the dimensions of the formwork can vary.

[0015] Further characteristics and advantages of the invention will become better apparent from the detailed description that follows, given by way of nonlimiting example and accompanied by the corresponding drawings, wherein:

Figure 1 is a perspective view of a panel of a formwork for vertical castings according to the invention; Figure 2 is a front view of the formwork of Figure 1; Figure 3 is a sectional view of a perimetric metallic profile of the formwork of Figure 1; Figure 4 is a front view of the post of the framework of the formwork of Figure 1; Figure 5 is a front view of the cross-beam element of the framework of the formwork of Figure 1; Figure 6 is a perspective view of a transverse metallic profile having a C-shaped cross-section; Figure 7 is a front view of the metallic profile of Figure 6; Figure 8 is a sectional view of the metallic profile of Figure 6; Figure 9 is a front view of a sheet of material, which can be made for example of plywood; Figure 10 is a perspective view of another type of metallic profile, termed closed profile; Figure 11 is a front view of the metallic profile of Figure 10; Figure 12 is a sectional view of the metallic profile of Figure 10; Figure 13 is a front view of another type of metallic profile; Figure 14 is a sectional view of the metallic profile of Figure 13; Figure 15 is a perspective view of elements of plugs

that can be applied to a sheet of material;

Figure 16 is a perspective view of a threaded metallic bar of tension members;

Figure 17 is a perspective view of a metal locking plate;

Figure 18 is a perspective view of an alignment clamp;

Figure 19 is a perspective view of a closing plug;

Figure 20 is a perspective view of a metallic wedge that can be associated with the closing plug of Figure 19;

Figure 21 is a perspective view of a locking pin;

Figure 22 is a perspective view of an assembly of formwork units for providing a continuous wall;

Figure 23 is a perspective view of an assembly of formwork units for providing a single pillar;

Figure 24 is a front view and a side view of a formwork with a locking pin assembled;

Figure 25 is a perspective view of a formwork assembly for providing corners between continuous vertical walls;

Figure 26 is a plan view of the assembly of Figure 25;

Figure 27 is a front view of a formwork assembly for providing continuous walls and in particular for a detail application such as the head closure of said walls;

Figure 28 is a perspective view of an assembly of formwork units having a different height and connected by means of adapted connecting accessories;

Figure 29 is a perspective view of a formwork assembly for providing individual pillars with protruding parts at the ends (such as capitals, cornices).

[0016] With reference to the figures, a formwork for vertical castings according to the invention is generally designated by the reference numeral 10.

[0017] The formwork for vertical castings according to the invention comprises a closed and continuous perimetric structure or a metallic framework that comprises two posts 11, 12 constituted by longitudinal metallic profiles, to the ends of which cross-beams 13, 14 are connected which are constituted by metallic profiles that are perpendicular with respect to the posts.

[0018] The framework further comprises a plurality of additional metallic profiles. Said framework is reinforced by metallic profiles 15, 16, 17, 18 which are transverse with respect to the posts and have a cross-section "C" (hereinafter referenced as C-shaped profiles for the sake of simplicity) and by metallic profiles 19, 20, 21, 22 which are transverse to the posts (hereinafter termed closed profiles), which are arranged parallel to the cross-beams 13, 14.

[0019] Additional reinforcement profiles 23, 24, 25, 26, which preferably have a flattened shape, are arranged at the vertical ends of the formwork for vertical castings according to the invention and in particular between the cross-beams 13, 14 and the respective C-shaped profiles that are directly adjacent thereto, i.e., the profiles 15 and

18. Conveniently, the reinforcement profiles 23, 24, 25, 26 are arranged so as to mutually connect the cross-beams 13, 14 to the C-shaped profiles.

[0020] A sheet 27, made of plywood or other material, is applied to the metallic frame formed by the elements listed above, so that the surface of the formwork for vertical castings 10 according to the invention has a surface in contact with the concrete casting that is planar and uniform. The plywood sheet 27 is fixed to the frame in various manners, which can be for example by means of screws that pass through the sheet and pierce the frame in the perimetric metallic profiles 11, 12, 13, 14 or in the transverse profiles 19, 20, 21, 22, 23.

[0021] The metallic profiles that compose the perimeter of the formwork for vertical castings 10 according to the invention or the two longitudinal metallic profiles 11, 12 and the cross-beams 13, 14 are composed of a cross-section, shown in Figure 3, which has two concave regions 28, 29 separated by a central convex region 30. In the upper part of the profile there is a protrusion 31 that is adapted to form a perimetric containment edge for the sheet 27.

[0022] The two posts 11, 12 have holes 33 applied in the central region 32 of the profile which are adapted for the passage of accessories that are needed to mutually connect the panels and smaller holes 34 applied to the ends of said profile.

[0023] The two cross-beams 13, 14 are provided with holes 35 formed in the central region of the profile and adapted for the passage of accessories that are needed for the connection between formwork units.

[0024] The C-shaped transverse metallic profiles 15, 16, 17, 18 have openings 36, 37 in the continuous central part 38 and at the ends thereof in a symmetrical position. Holes 39 are provided centrally in the continuous central part 38 and are arranged at an appropriate center distance. Openings 36 and 37 and holes 39 are termed "front slots". The C-shaped transverse metallic profiles 15, 16, 17, 18 are provided with one or more stiffening plates 40 which are arranged transversely with respect to the direction of longitudinal extension of the profile. In the plywood sheet 27 there are holes 41, 42 arranged at the ends and holes 43 arranged in the central part, so that when the sheet is assembled to the framework the holes 41, 42 and 43 coincide perfectly with the slots 36, 37 and the circular holes 39.

[0025] The closed transverse metallic profiles 19, 20, 21, 22 are provided with holes 44 in an appropriate number, arranged at an equally appropriate center distance and applied on the sides 45 of the profile that are horizontal in the configuration for use. In order to reinforce the cross-section of the closed transverse metallic profile 19, 20, 21, 22, which otherwise is weakened where the hole is provided, advantageously there is a steel bush 46, which has the function of stiffening the passage formed by the holes 44. Such passage formed by the holes 44 has the function of creating provisions for complementary accessories (such as service shelves, con-

nection devices, stiffening beams, etc.) to be applied to the formwork.

[0026] The vertical profiles 23, 24, 25, 26 have the function of stiffening the ends of the formwork and are composed of appropriately shaped metallic plates, inside which there are holes 47 in an appropriate number and with appropriate dimensions or there are wider openings 48 adapted for the movement of the panels.

[0027] Plugs 49 made of preferably plastic material are applied to the sheet 27. The holes at the ends 41, 42 and the holes 43 of the central part are in fact used for the passage of the tension members, preferably made of steel, which, when applied to the system, allow its stability. The position of said plugs can be changed so as to allow at the same time a different arrangement of the tension members and therefore allow a large number of assembly combinations.

[0028] The described formwork is a fundamental unit, which, when assembled with other formwork units, allows to provide assemblies that allow to provide different concrete objects. Assembly can be provided by using various known auxiliary devices, such as clamps, brackets, tension members of various kinds, plates of a different kind, shoring elements, pins, screws.

[0029] The assembly of a series composed of individual formwork units in order to provide continuous walls, as in Figure 22, occurs by using some elements that belong to the background art, such as threaded metallic bars of tension members 50, metal locking plates 51, alignment clamps 52, closing plugs 53 and respective wedges 54. In this case, the assembly between the formwork units 10 that are adjacent and compose a first formwork wall 55 occurs by means of alignment clamps 52, closing plugs 53 and respective wedges 54 in the number and combination deemed most appropriate.

[0030] The mutual assembly of formwork units arranged in an opposite manner, as shown in Figure 28, between which there is a space intended for the casting of the continuous vertical wall, occurs by means of threaded metallic bars of tension members 50, at the ends of which and proximate to the framework the metal locking plates 51 are placed as a retention element, in a number that is usually twice the number of the former, in the positions and quantities deemed most appropriate. This locking system belongs to the background art, since retention is ensured by the coupling performed by the thread of the threaded metallic bars of tension members 50 on the metallic locking plates 51, which in turn have a threaded passage hole 51A which is compatible with the thread of the bars. This coupling that has just been described in practice blocks the horizontal translation induced by the fluid concrete casting on the formwork parts, which is applied as a traction force on said threaded metallic bars of tension members 50 and is absorbed by the coupling itself.

[0031] The threaded metallic bars of tension members 50 in this particular configuration being described are arranged through the holes at the ends 41, 42, but the over-

all system does not exclude the possibility to utilize for this purpose, in some applications, the holes in the central part 43.

[0032] Any hole applied to the sheet 27, be it the holes 41, 42 at the ends or the holes 43 in the central part, which does not provide for the passage of the threaded metallic bars of tension members 50, is closed with plastic plugs in order to ensure the hermetic seal of the system during the casting of the concrete.

[0033] The assembly of a series composed of formwork units for vertical castings 10 according to the invention, in order to provide the vertical casting of individual concrete pillars, as in Figures 23 and 24, occurs by using four individual units of the formwork system for vertical castings 10 according to the invention, which are arranged in a vertical position and so that two adjacent and successive elements are arranged at right angles in plan view, so that one of the two posts 11, 12 of the first element is adjacent to the sheet 27 made of plywood (or other material) of the subsequent element in an appropriate manner, i.e., so that part of the holes 33 of the two posts 11, 12 of the first element coincide, and are actually aligned, with the similar holes at the ends 41, 42 and holes 43 in the central part of the sheet of plywood, or other material, of the subsequent element. In order to complete the assembly of the formwork system that is being described, other elements that belong to the background art are used, such as locking pins 56 and metal locking plates 51, omitting here some equipment that is often used for installation and that has just been described, such as for example building cranes, shoring elements, service ladders, scaffolding etc.

[0034] In this case, the mutual assembly of formwork units 10 occurs by placing the locking pin 56 within the C-shaped transverse metallic profiles 15, 16, 17, 18 so that the first element can slide within the second one until it encounters the two posts 11, 12 and in particular the holes 33. The number of pins can vary depending on the height of the formwork panel, without having a preset number of elements. In order to permanently fix the formwork system being described, it is necessary to apply to the end of the locking pin 56 that passes through the individual formwork unit 10 at right angles to the sliding direction thereof, i.e., the threaded end thereof 56B - while in a similar manner the opposite end 56A is provided with a protrusion that has an appropriate shape, which can be rectangular or contoured at will and which in any case is suitable to create a stop element for the stroke of the pin - with a metal locking plate 51, which is coupled to the locking pin 56 so that the elements are compatible and allowed to actually constitute a fixed coupling once they are installed.

[0035] The assembly of a series of formwork units 10, in order to provide the vertical casting of corners between continuous vertical walls, as shown in Figures 25 and 26, occurs by using formwork units 10 which are arranged in a vertical position, as described previously for the provision of continuous walls in two perpendicular plan di-

rections which meet at a corner. In this configuration, a formwork unit according to the present invention and designated by the reference numeral 58 is connected to another formwork unit according to the present invention and designated by the reference numeral 59 in similar manners for the vertical casting of individual pillars, therefore by using locking pins 56 and metal locking plates 51. The other elements that compose the assembly are connected in the same manner provided for the vertical casting of continuous walls by using elements that belong to the background art, such as threaded metallic bars of tension members 50, metal locking plates 51, alignment clamps 52, closing plugs 53 and respective wedges 54.

[0036] The assembly of a series composed of individual formwork units 10, in order to provide continuous walls and in particular for a detail application such as the head closure of said walls, as shown in Figure 27, occurs by using individual units of the formwork system for vertical castings 10, 10a, 10b, 10c and 10d according to the invention, which are arranged in a vertical position as described previously for the provision of continuous walls. This assembly is delimited laterally by connecting a formwork unit 10 in the vertical position and arranged at right angles to the arrangement defined by the two assembled walls as described previously. Head closure is performed therefore by using elements such as locking pins 56 and metal locking plates 51. The connection between the parallel continuous walls and the head panel that is perpendicular to them occurs by means of the connection system described previously for the provision of the individual pillar, i.e., by arranging the locking pin 56 inside the C-shaped transverse metal profiles 15, 16, 17, 18, in this case on both opposite panels that compose the parallel formwork planes, so that the first element can slide within the second element until it encounters the two posts 11, 12 and in particular the holes 33. The number of pins can vary depending on the height of the formwork panel. In this case also, the application of metal locking plates 51, coupled to a locking pin 56 in the manner described previously for the provision of the individual pillar, ensures adequate stability.

[0037] The assembly of a series of formwork units for vertical castings 10 according to the invention for the provision of vertical castings that have parts that protrude at the upper ends (such as capitals, cornices, extra thick beams), as in Figure 28, occurs by using individual units of the formwork system for vertical castings 10 and 10a according to the invention having a different vertical height. In this case, these formwork units 10 and 10a have all the characteristics and particularities provided and described previously, with the refinement of providing adapted connections for the accessories that are necessary for the installation of the formwork system. The assembly in this case consists of formwork units 10 having a different vertical height, threaded metal bars of tension members 50, metal locking plates 51 and special formwork elements 57 which are contoured appropriately in order to obtain the shape that one wishes to give to

the upper end (such as capitals, cornices, extra thick beams) made of concrete. This special contoured formwork element is provided so as to provide for the connection of all of the accessories adapted to ensure the static stability and hydraulic tightness of the formwork.

[0038] The assembly of a series composed of formwork units 10 for the execution of vertical castings which provide for the provision of individual pillars with parts that protrude at the upper ends (such as capitals and cornices), as in Figure 29, occurs by using formwork units for vertical castings 10 according to the invention which are arranged in a vertical position, as described previously for the provision of individual pillars. In this case the assembly of the system occurs by means of individual units of the invention of different height, for example lower ones 60 and taller ones 61. The assembly in this case is composed of formwork units, designated by the reference numerals 60 and 61, which have a different vertical height, but are provided with an appropriate combination of the elements of the invention described so far, of threaded metallic bars of tension members 50, metal locking plates 51 and special formwork elements which are shaped appropriately so as to obtain the shape that one wishes to give to the upper end (such as capitals, cornices) made of concrete.

[0039] It has thus been shown that the method and the system described achieve the intended aim and objects. In particular, it has been shown that the system thus conceived allows to overcome the qualitative limitations of the background art. By virtue of the formwork according to the invention it is possible to obtain assemblies that allow to provide, following the execution of vertical concrete castings, different types of objects, such as continuous vertical walls, individual pillars, head closures, even with parts that protrude at the ends, such as capitals, cornices, extra thick beams. The system according to the present invention allows to provide all the types of formwork required to provide the elements listed above with a single type of formwork unit, whereas currently a specific type is necessary for each one of the types listed above. This simplification entails evident advantages which relate both to simplification of the provision of equipment required, gaining space, ease of assembly and, not least, economic saving. Furthermore, the present invention increases the level of safety of workers during work, due to the overall weight reduction, and therefore increases the maneuverability of the overall formwork system.

[0040] Clearly, numerous modifications are evident and can be performed promptly by the person skilled in the art without abandoning the protective scope of the appended claims.

[0041] Therefore, the scope of the protection of the claims must not be limited by the illustrations or preferred embodiments shown in the description by way of example, but rather the claims must comprise all the characteristics of patentable novelty that reside in the present invention, including all the characteristics that would be

treated as equivalents by the person skilled in the art.

[0042] The disclosures in Italian Patent Application no. 102015000073231 (UB2015A005637), from which this application claims priority, are incorporated herein by reference.

[0043] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A formwork (10) for performing vertical castings for providing pillars, vertical walls and head closures of the type comprising a framework composed of metallic profiles having two posts (11, 12) and two cross-beams (13, 14); the perimetric edge of said framework being shaped so as to accommodate a sheet of material (27) intended to form a surface for a concrete casting; said framework comprising furthermore an additional plurality of metallic profiles; said formwork (10) being **characterized in that** said additional plurality of metallic profiles comprises:

- a first plurality of transverse metallic profiles, termed closed profiles (19, 20, 21, 22), arranged parallel to the cross-beams (13, 14) of said framework; said closed profiles (19, 20, 21, 22) having one or more holes (44) preset to accommodate accessory components preferably of the type of service shelves, connection devices, stiffening beams, steel bushes; said one or more holes (44) being arranged so that the axis that passes through said holes (44) is parallel to the longitudinal extension of said framework;
- a second plurality of transverse profiles (15, 16, 17, 18) with a substantially C-shaped cross-section, termed C-shaped profiles, having openings (36, 37) and holes (39), termed front slots, for the passage of interconnection elements; said front slots (36, 37, 39) being arranged so that their axis is perpendicular to the longitudinal extension of said framework; wherein the profile ends of said first and second plurality are connected to opposite sides of said two posts (11, 12);
- a third plurality of reinforcement profiles (23, 24, 25, 26) adapted to connect one of said cross-beams (13, 14) of said framework to one of said C-shaped profiles (15, 16, 17, 18).

2. The formwork (10) according to claim 1, **characterized in that** said posts (11, 12) have a cross-section provided with two protrusions (28, 29) separated by

a metallic portion (32) provided with holes for the passage of elements for interconnection to the framework of a second formwork (10); at the ends of said posts (11, 12) there being holes (34) for connection to said cross-beams (13, 14) of said framework.

3. The formwork (10) according to claim 1 or 2, **characterized in that** each C-shaped profile (15, 16, 17, 18) has an edge that is fixed to one side of one of said two posts (11, 12) of said framework; said edge having an opening, termed lateral opening; each one of said two posts (11, 12) having, at said lateral opening, a corresponding slot (33) for the passage of an interconnection element (56) adapted to be inserted in said lateral opening and to protrude at least partially from the slot (33) of said post (11, 12).
4. The formwork according to one or more of the preceding claims, **characterized in that** each one of said C-shaped profiles comprises one or more rigid elements (40) arranged between two opposite faces of said C-shaped profile.
5. The formwork (10) according to one or more of the preceding claims, **characterized in that** it comprises bushes (46), preferably made of steel, arranged in the holes (44) of said closed profiles (19, 20, 21, 22).
6. The formwork (10) according to one or more of the preceding claims, **characterized in that** said reinforcement profiles have a substantially flattened shape and comprise openings (48) designed to interface with means adapted to move the formwork.
7. The formwork (10) according to one or more of the preceding claims, **characterized in that** it comprises a sheet of material (27), preferably multilayer wood, having a surface equal to the surface delimited by said framework, said sheet having a plurality of holes (41, 42, 43) arranged so that in a configuration in which said sheet (27) is resting on said framework the holes (41, 42, 43) of said sheet (27) correspond at least to one portion of the front slots (36, 37, 39) of said C-shaped profiles.
8. The formwork (10) according to claim 7, **characterized in that** part of said holes (41, 42, 43) of said sheet (27) accommodate threaded metallic bars of tension members (50), each one of said bars (50) passing through at least one hole (41, 42, 43) of said sheet (27) and through the two front slots (36, 37, 39) that correspond to said hole (41, 42, 43); the remaining part of said holes (41, 42, 43) accommodating plugs (49), preferably made of plastic.
9. An assembly of formwork units (58, 59) according to

one or more of the preceding claims 1 to 8, **characterized in that** said formwork units (58, 59) are interconnected by means of at least one interconnection element preferably of the type of: threaded metallic bars of tension members (50) optionally associated with metal locking plates (51), alignment clamps (52), closing plugs (53), wedges (54); said interconnection elements being accommodatable in at least part of said front slots (36, 37, 39) and in at least part of said lateral openings of said C-shaped profiles (15, 16, 17, 18).

10. The assembly according to claim 9, **characterized in that** it comprises a pair of aligned formwork units; an interconnection element, preferably of the type of a locking pin (56), being accommodated within a slot (33) of a post of one of said pair and a slot of the other post (11, 12); said interconnection element being inserted at least partially within a respective C-shaped profile (15, 16, 17, 18) of said formwork units; the ends of said interconnection element that protrude from said posts (11, 12) being locked by means of a locking element, preferably of the type of a metal plate (51).

11. The assembly according to claim 10, particularly for providing head closures, **characterized in that** it comprises two pairs of formwork units; the first pair being arranged parallel to the second pair; a further formwork unit being connected to at least one formwork unit of said pairs; at least one first interconnection element passing through a front slot (39) of said additional structure and the lateral opening of a C-shaped profile (15, 16, 17, 18) belonging to one of said units of said pairs.

12. The assembly according to one or more of claims 9 or 10 or 11, **characterized in that** it comprises at least two formwork units arranged in a parallel manner; an interconnection element, preferably of the type of threaded metal bars of tension members (50), being accommodated between two front slots (39) of a respective C-shaped profile (15, 16, 17, 18) of said formwork units and so as to protrude at least partially from said formwork units; said bar (50) being locked on said formwork units by means of a locking element, preferably of the type of a metal plate (51).

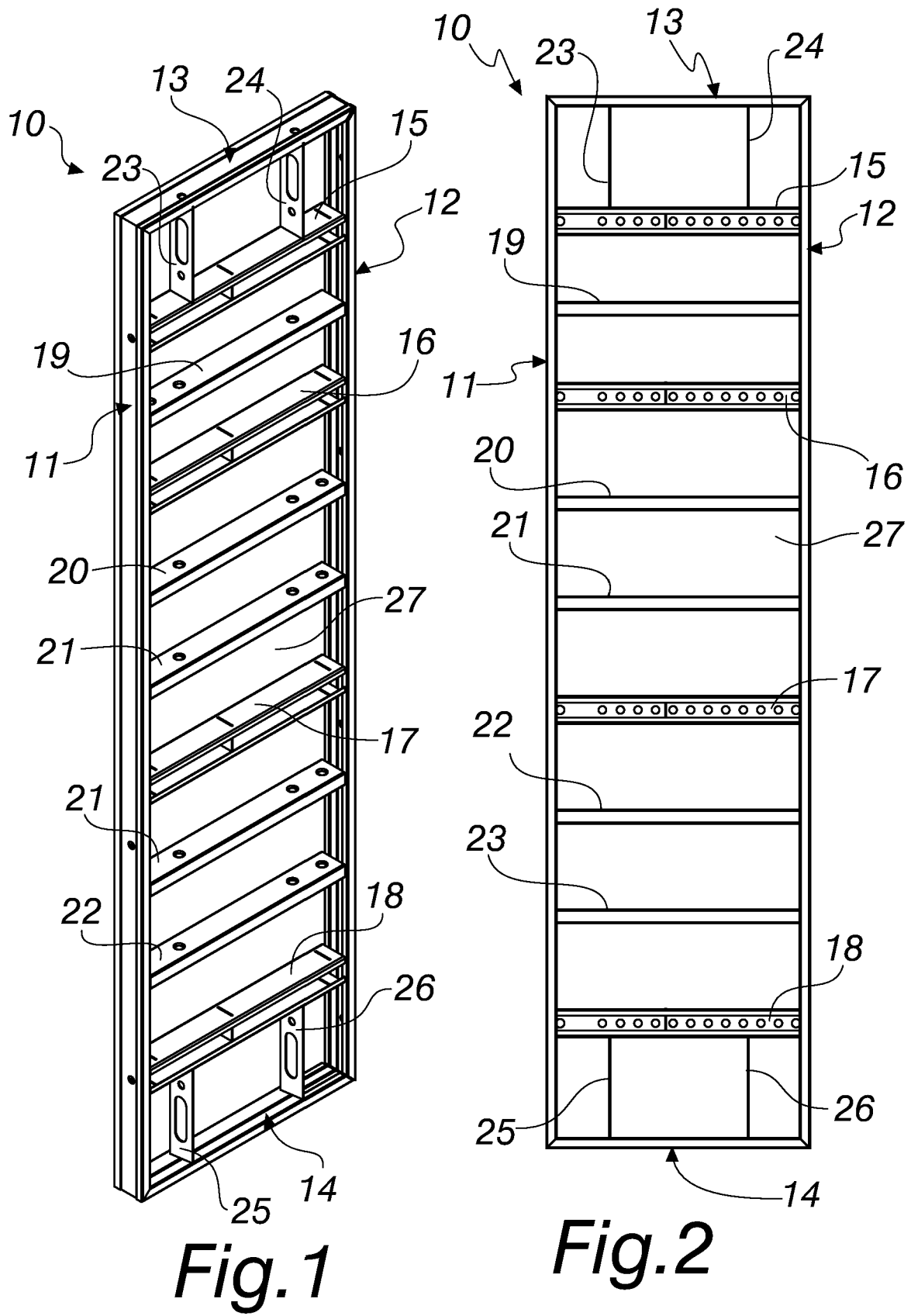
13. A method for assembling one or more formwork units (10) according to one or more of claims 1 to 8 so as to obtain an assembly of formwork units preferably according to one or more of claims 9 to 12, which comprises connecting any two formwork units according to one or more of the following steps:

- aligning two formwork units and making an interconnection element, preferably of the type of a locking pin (56), pass between two respective

C-shaped profiles (15, 16, 17, 18) of said formwork units;

- arranging two formwork units transversely and making a threaded metallic bar of tension members (50) pass between a lateral opening of a C-shaped profile (15, 16, 17, 18) and a front slot (36, 37, 39) of a C-shaped profile (15, 16, 17, 18) of the other formwork unit;

- arranging two formwork units in a parallel manner and making an interconnection element, preferably of the locking pin (56) type, pass between the front slot (36, 37, 39) of a C-shaped profile of one of said formwork units and a front slot (36, 37, 39) of a C-shaped profile of the other formwork unit.



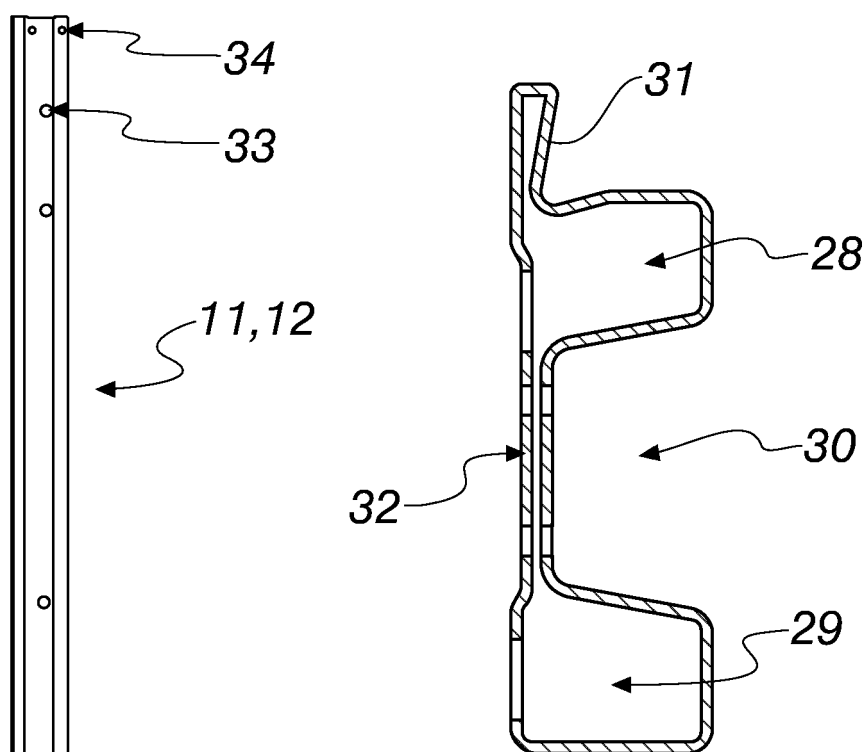


Fig.3

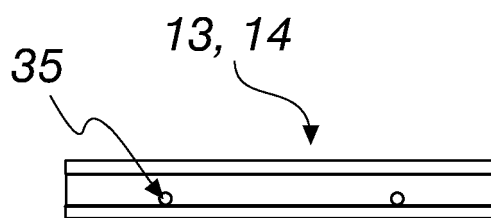


Fig.5

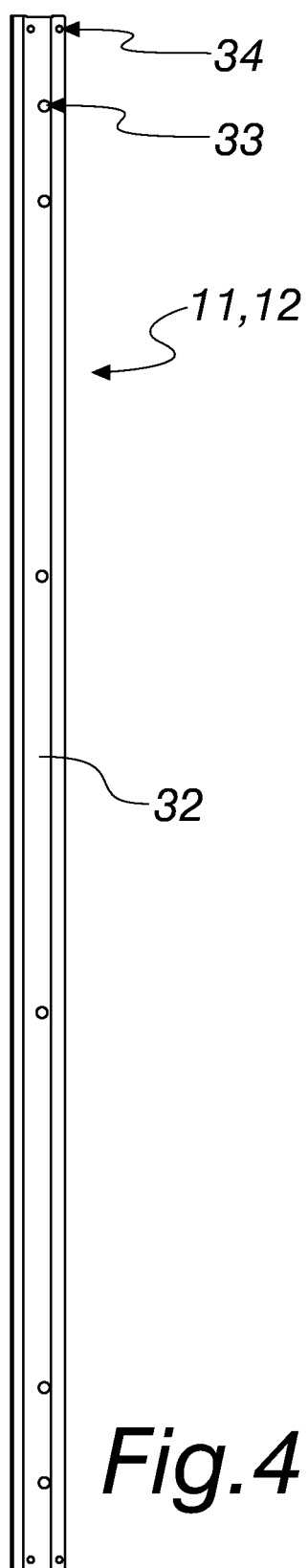
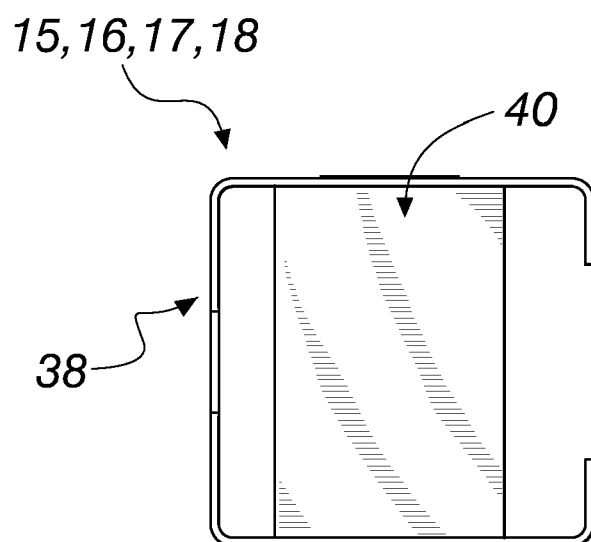
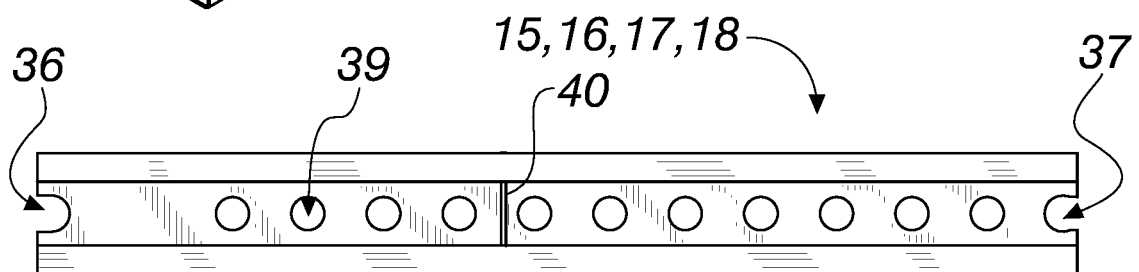
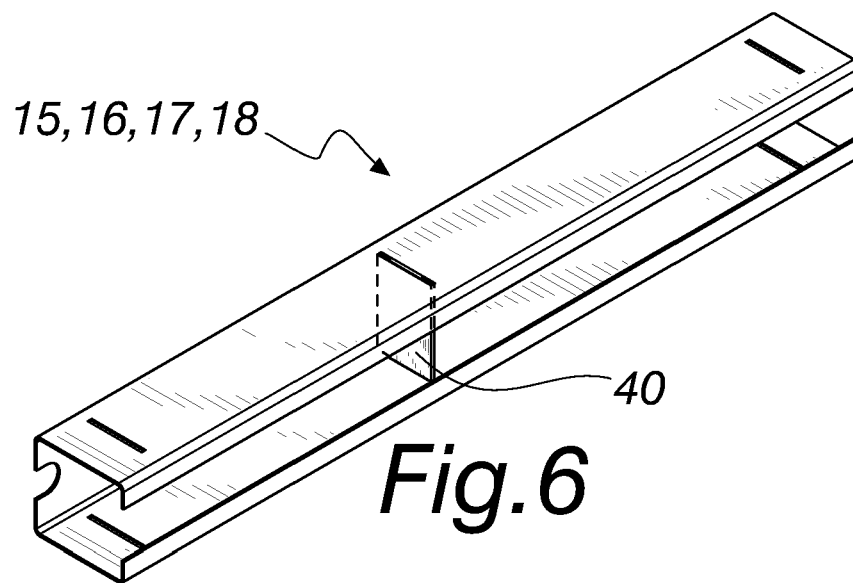
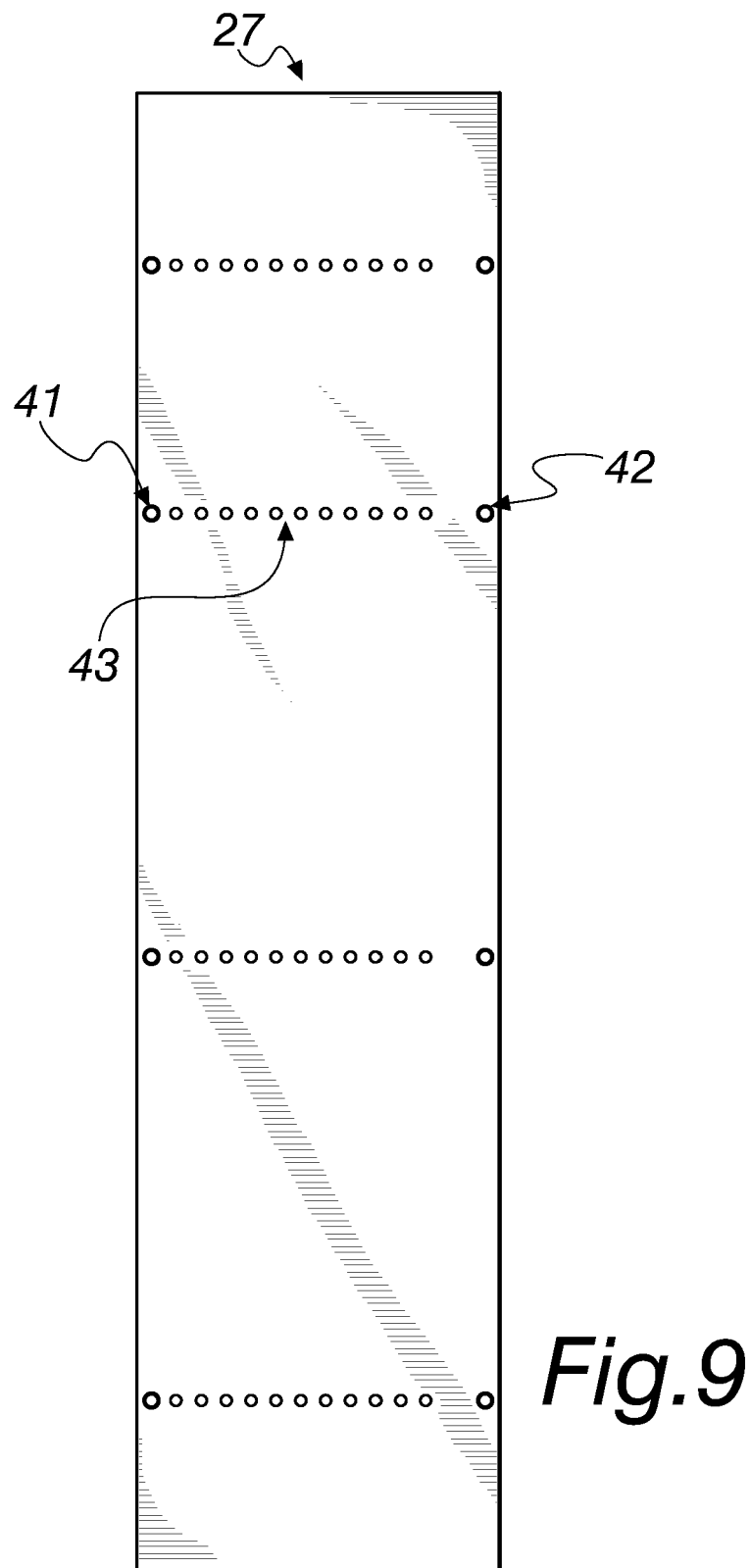


Fig.4





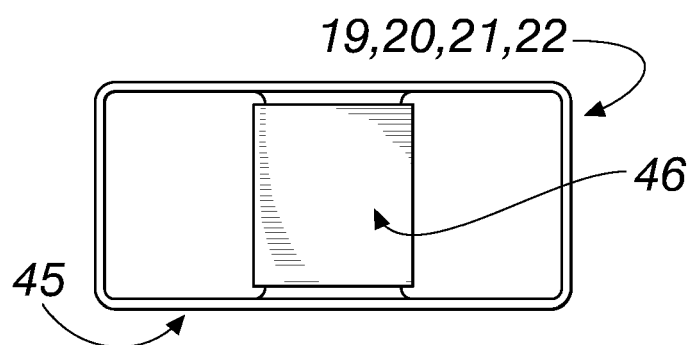
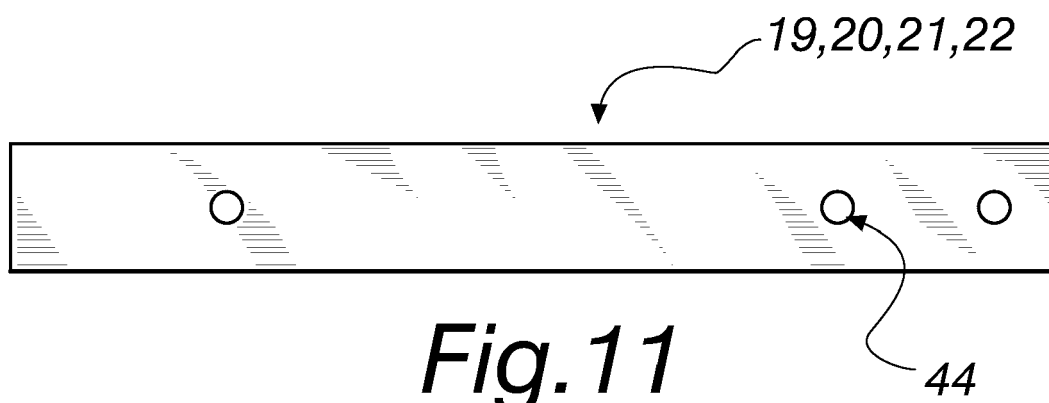
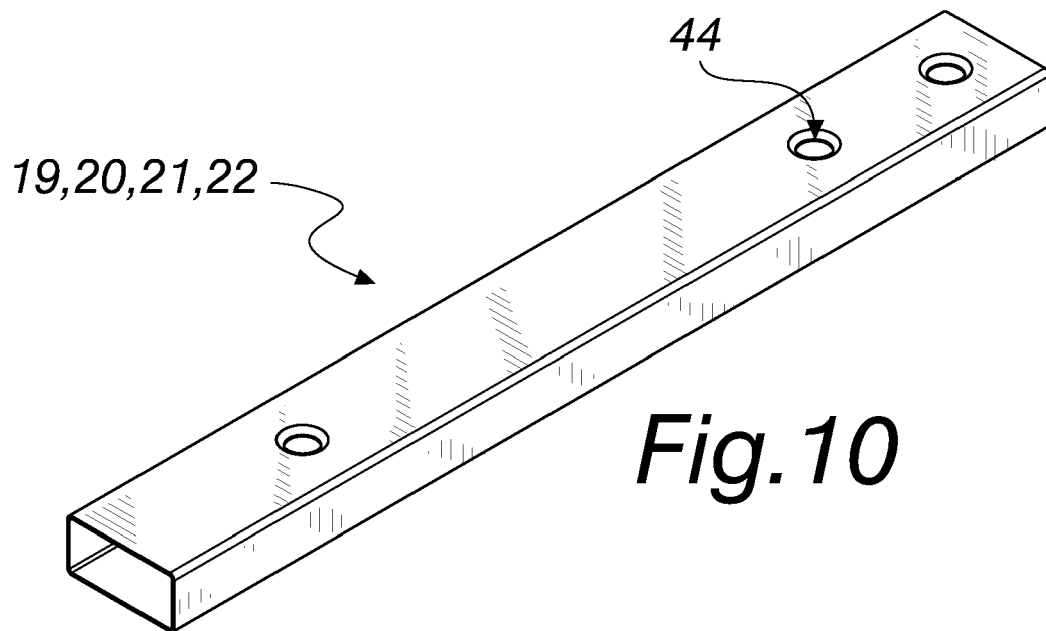


Fig. 12

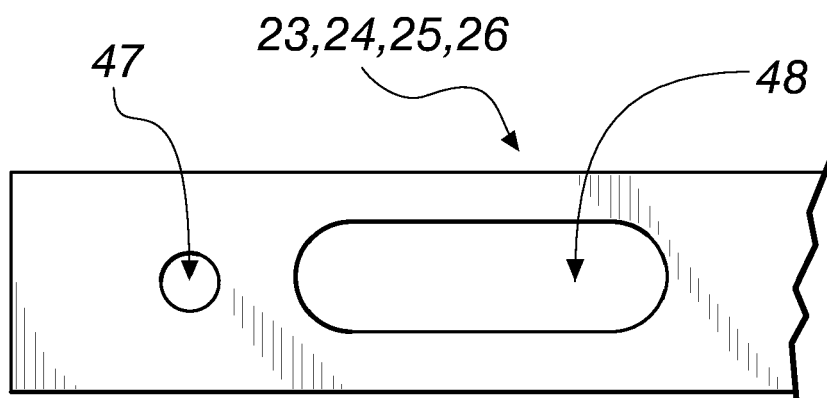


Fig. 13

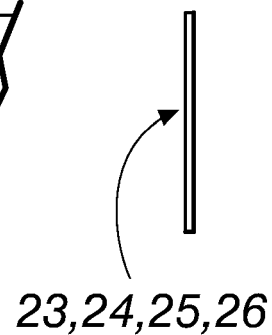


Fig. 14

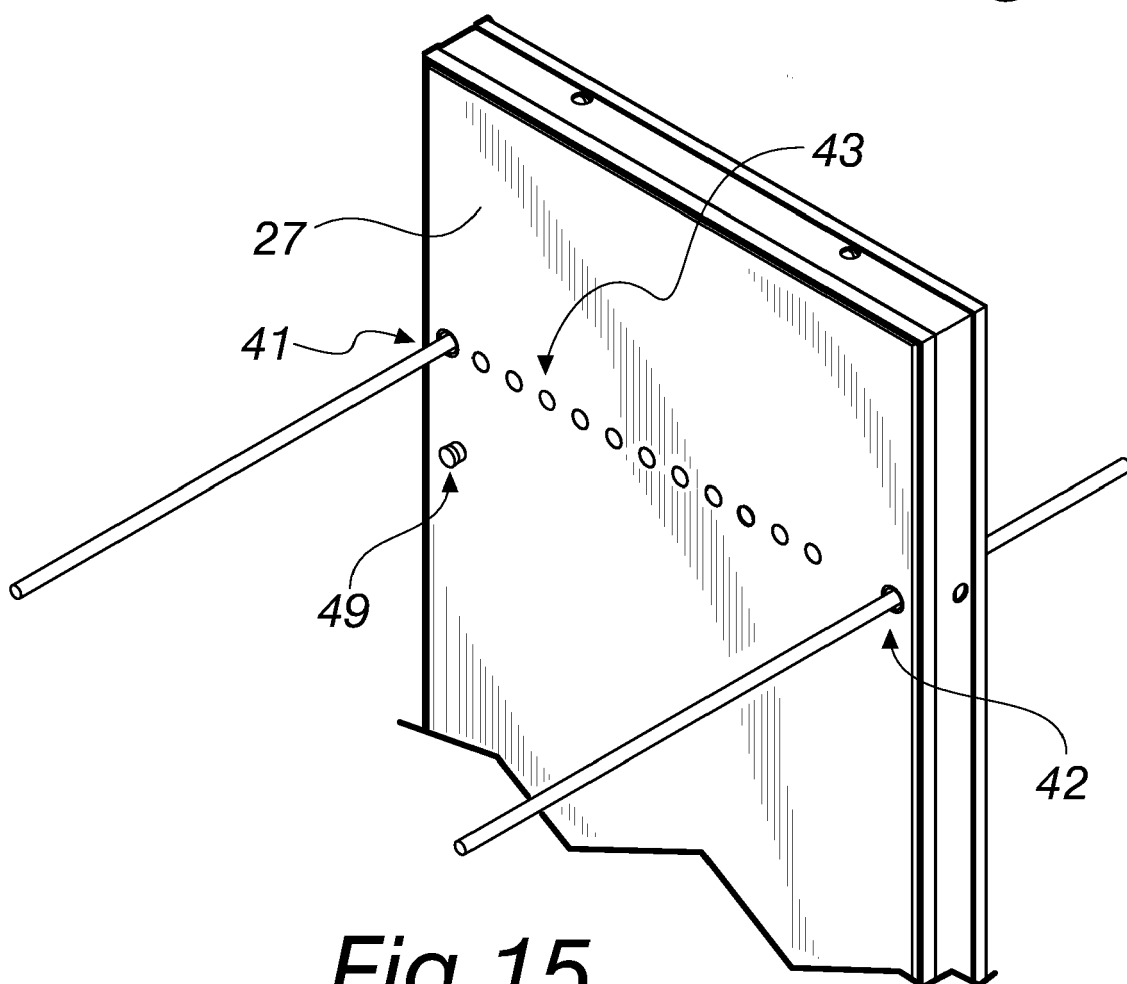
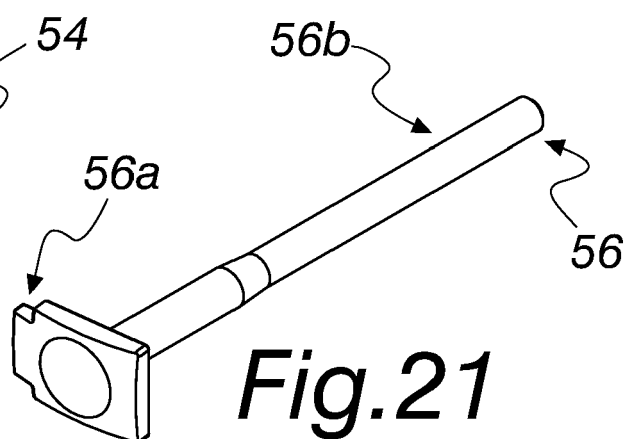
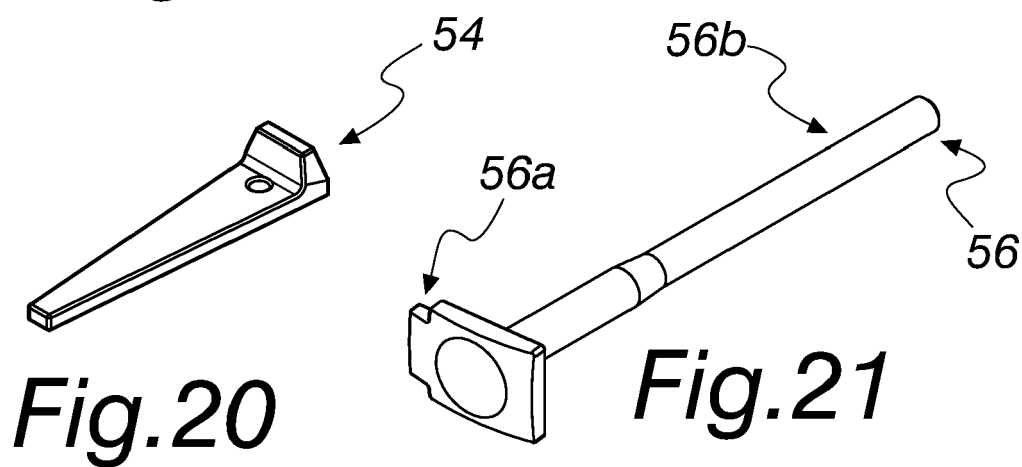
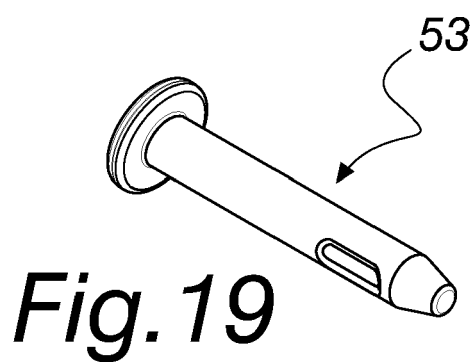
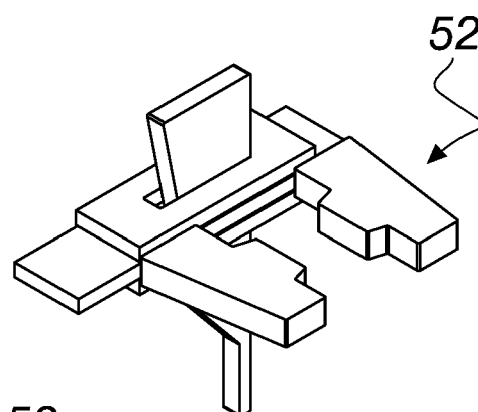
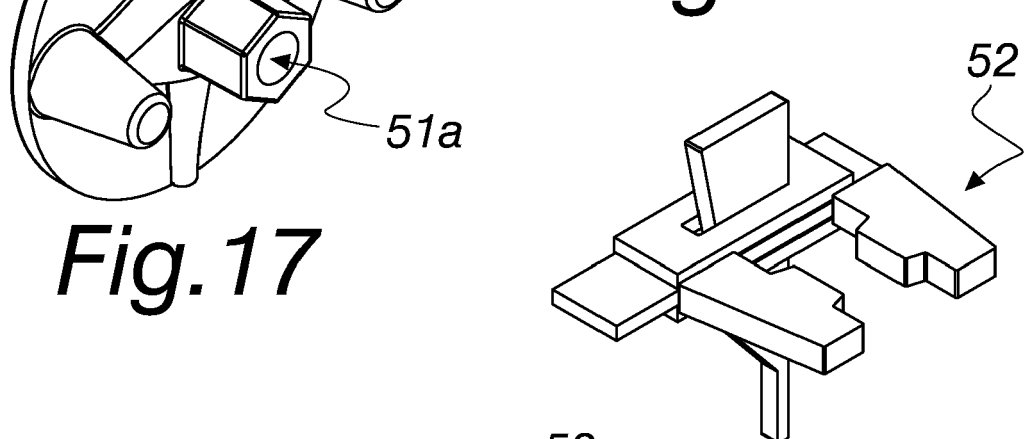
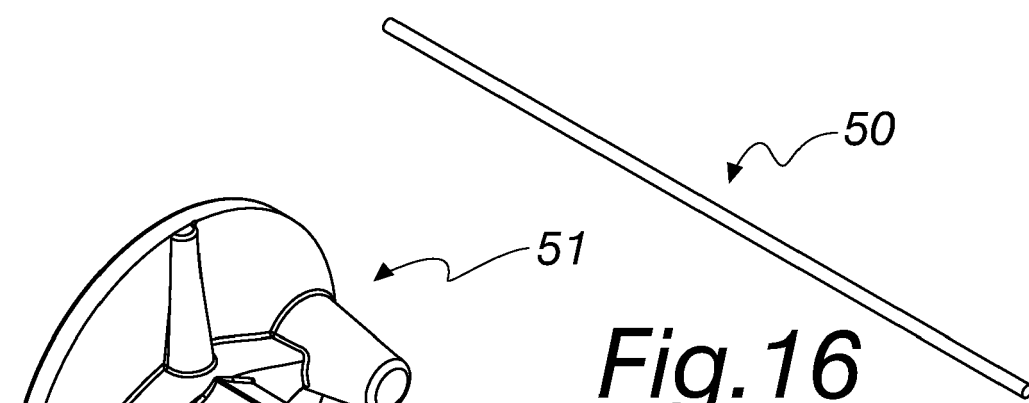


Fig. 15



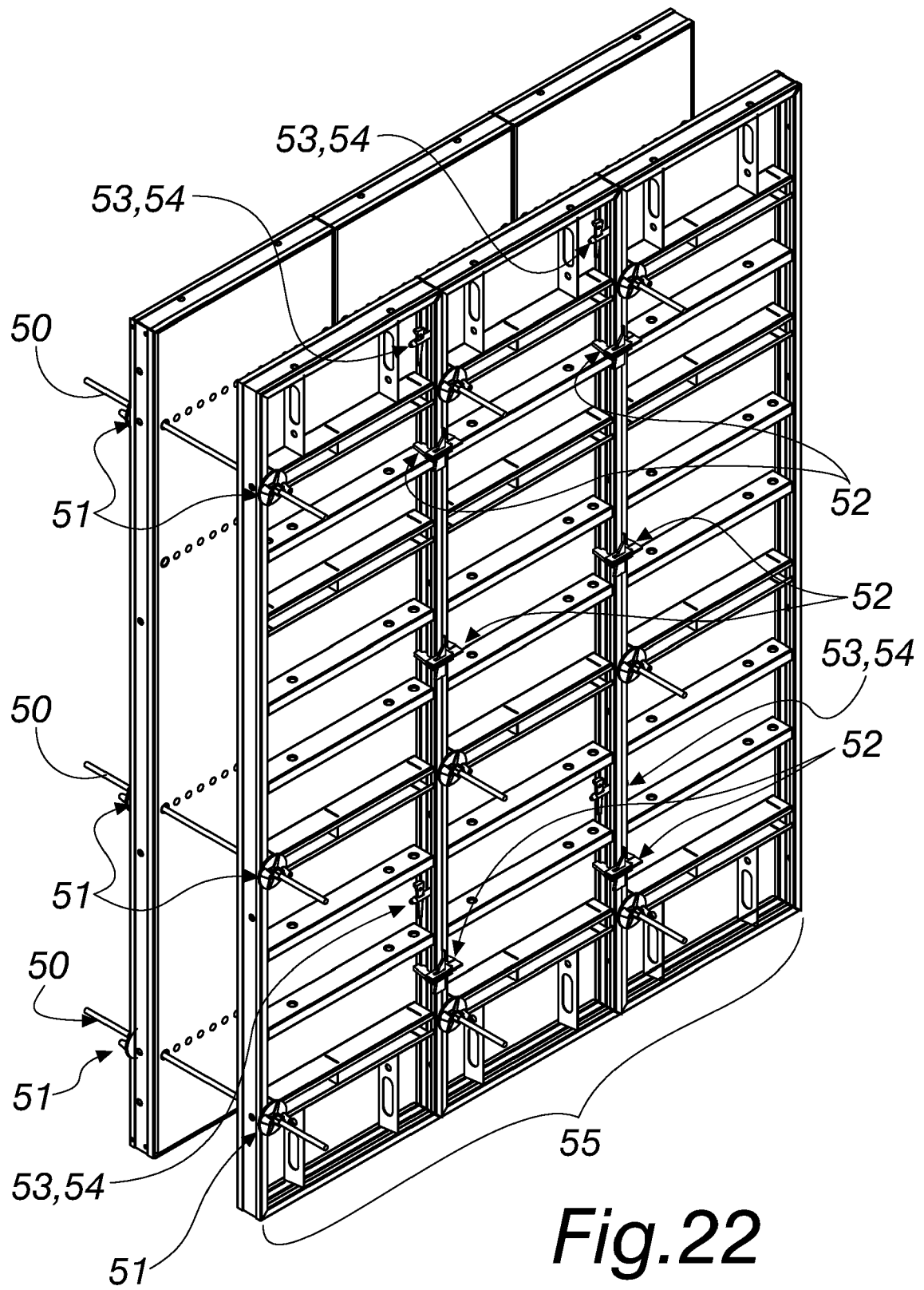


Fig. 22

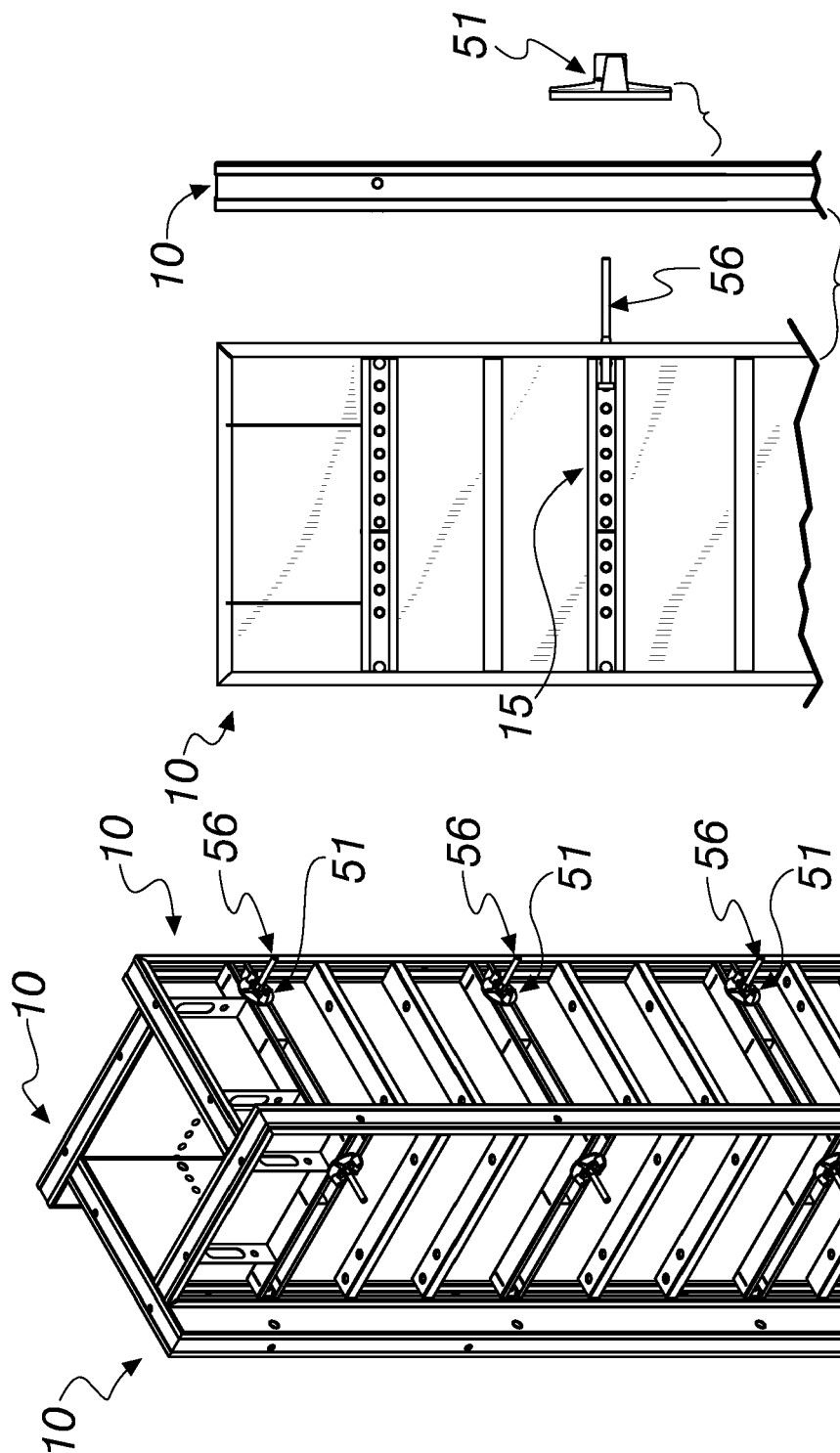


Fig. 24

Fig. 23

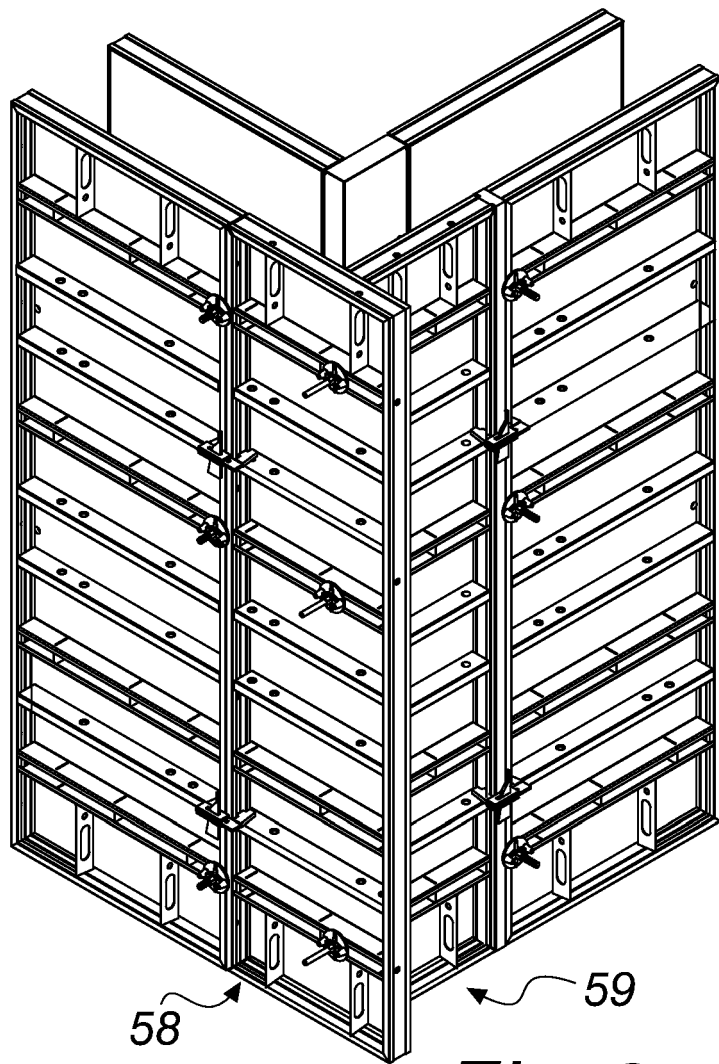


Fig. 25

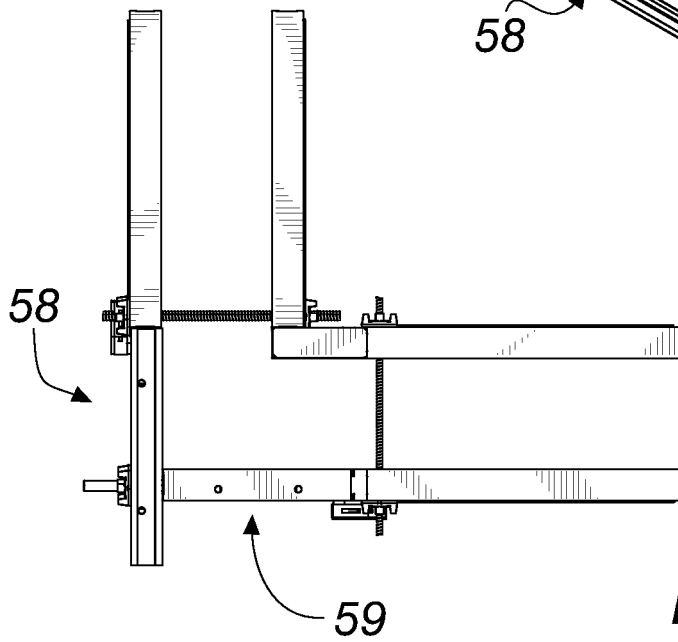


Fig. 26

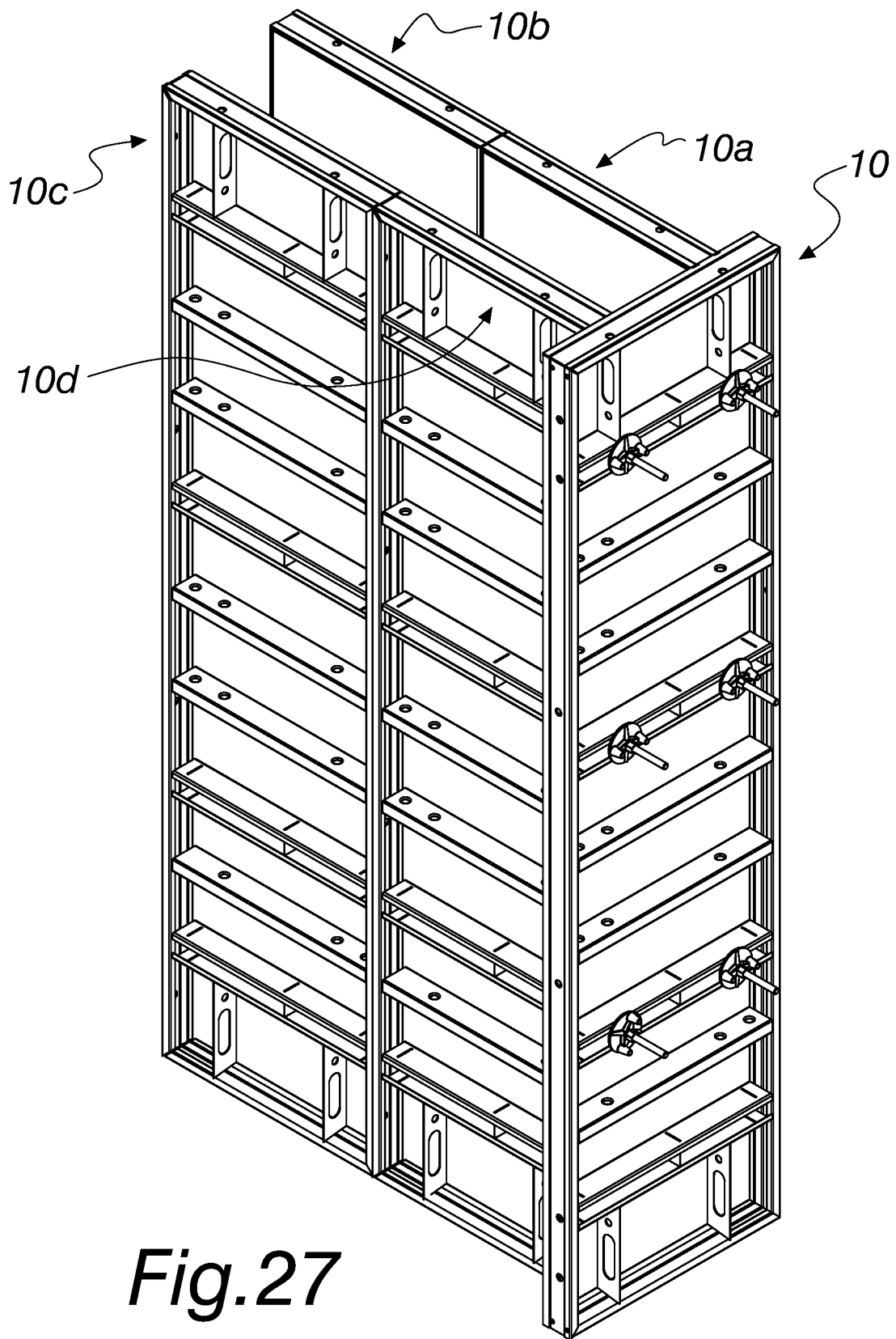


Fig.27

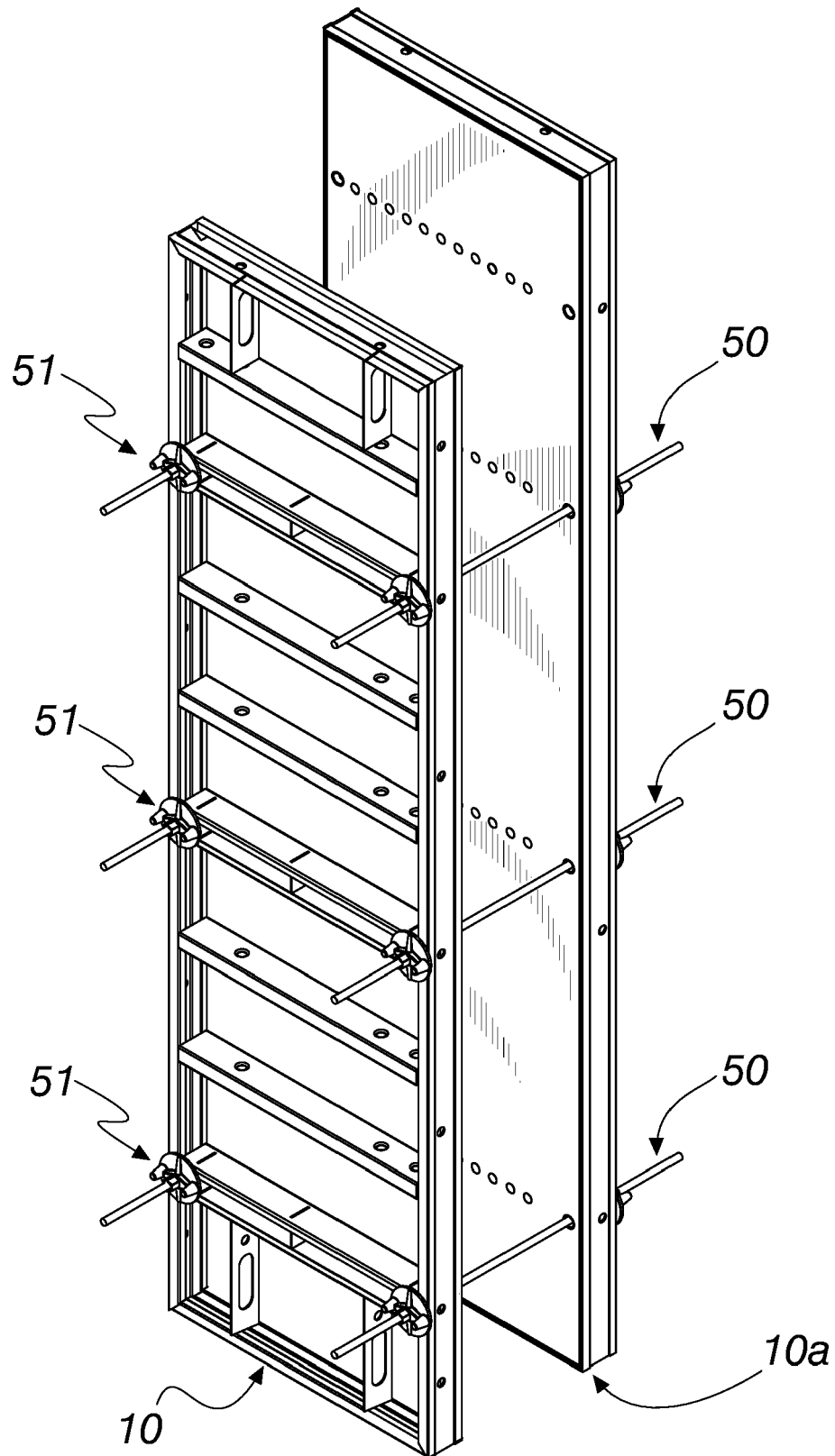


Fig.28

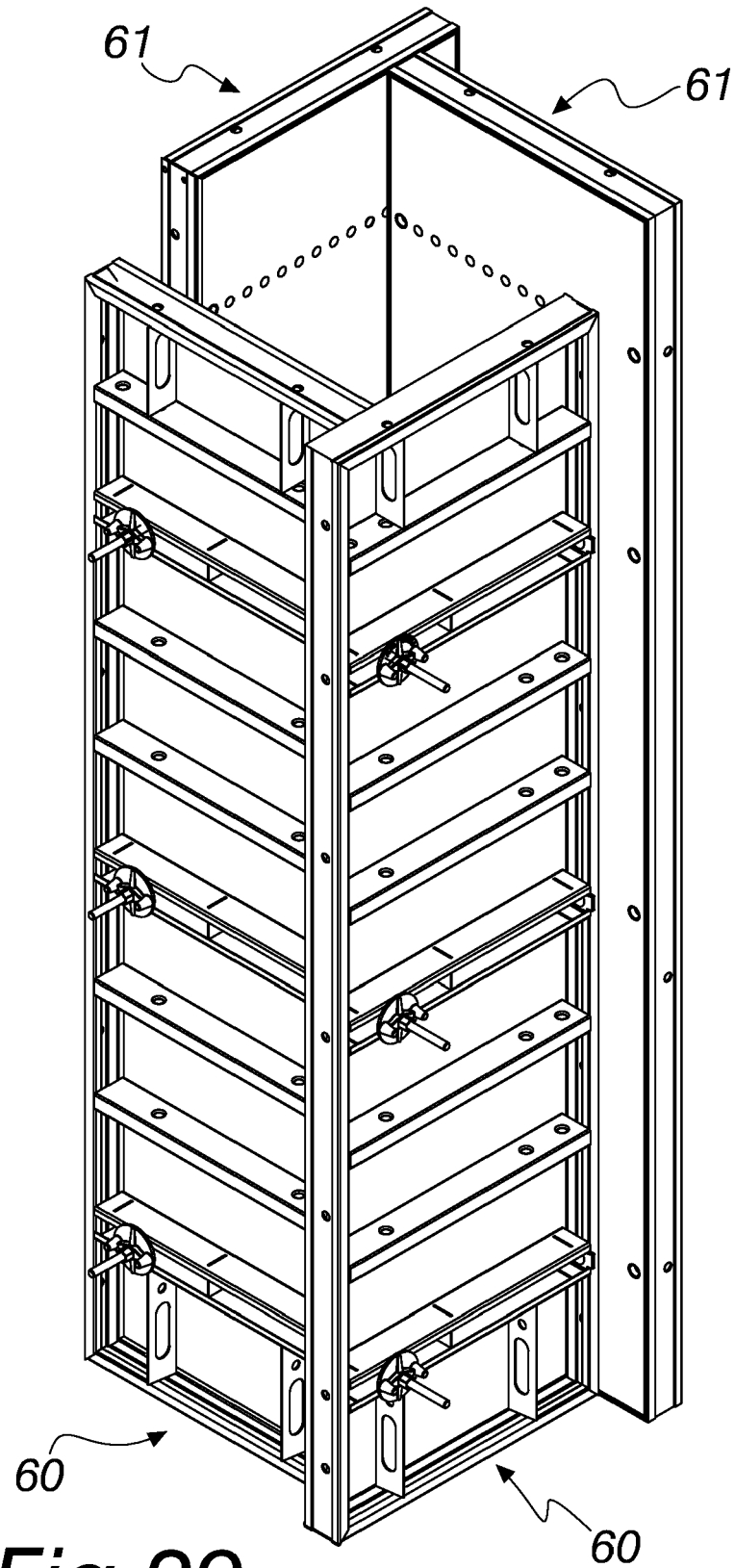


Fig.29



EUROPEAN SEARCH REPORT

Application Number
EP 16 19 8897

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	ES 1 016 653 U (MAQUIOBRAS,S.A.) 16 November 1991 (1991-11-16)	1,4,5,7,9-13	INV. E04G11/06
Y	* the whole document *	6	E04G13/02
A	-----	2,3	E04G17/04
			E04G17/00
X	US 4 708 315 A (CARLSON MICHAEL G [US] ET AL) 24 November 1987 (1987-11-24)	1-3,7-13	E04G17/065
A	* column 3, line 51 - column 4, line 68; figures 1,3,5 *	4-6	E04G9/02

A	ES 2 329 747 A1 (SISTEMAS TECN ENCOFRADOS SA [ES]) 30 November 2009 (2009-11-30)	1-13	
	* column 2, line 5 - column 4, line 2; figures 1,3,5 *		

Y	WO 2009/055691 A2 (WESTERN FORMS INC [US]; BREWKA ROMAN [US]; CARLSON MICHAEL G [US]) 30 April 2009 (2009-04-30)	6	
A	* page 8, line 7 - line 34; figures 1,5,5a,6 *	1-5,7-13	

A	WO 2014/048908 A1 (HARSCO INFRASTRUCTURE SERVICES GMBH [DE]) 3 April 2014 (2014-04-03)	1-13	TECHNICAL FIELDS SEARCHED (IPC)
	* page 15, line 31 - page 17, line 16; figures 1-4 *		E04G

A	DE 32 25 827 A1 (STEIDLE GMBH & CO EMIL [DE]) 12 January 1984 (1984-01-12)	1,5	
	* page 8; figures 1-3 *		

The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 23 January 2017	Examiner Manera, Marco
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 19 8897

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

23-01-2017

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
ES 1016653 U	16-11-1991	NONE	
US 4708315 A	24-11-1987	NONE	
ES 2329747 A1	30-11-2009	ES 2329747 A1 PT 104329 A	30-11-2009 13-07-2009
WO 2009055691 A2	30-04-2009	US 2010242403 A1 WO 2009055691 A2	30-09-2010 30-04-2009
WO 2014048908 A1	03-04-2014	DE 102012217689 A1 EP 2900885 A1 US 2015267421 A1 WO 2014048908 A1	03-04-2014 05-08-2015 24-09-2015 03-04-2014
DE 3225827 A1	12-01-1984	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- IT 102015000073231 [0042]
- JP UB2015005637 A [0042]