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REUSABLE MODULE FOR MANUFACTURING AT LEAST ONE PORTION
OF A REPEATEDLY DISMOUNTABLE WALL OF A CONSTRUCTION

TECHNICAL FIELD

5 The present invention relates to a reusable module
for manufacturing at least one portion of a repeatedly
dismountable wall of a construction.

 The present invention also relates to a method for
manufacturing a wall of a construction which can be
10 dismounted more than once.

 'Reusable' in this description means a module which
is not connected to further modules by means of
permanent connection means, such as cement, glue or
other chemical bonds.

15 In this manner, the dismountable wall made with the
reusable modules may be dismounted and remounted several
times, unlike traditional walls made of modules fixed to
one another by means of concrete, glue or other chemical
bonders.

20 BACKGROUND ART

 Reusable modules for making temporary walls, such
as partitions, outside walls or furniture components,
are known in the art, e.g. from patent application
WO2009/104047.

25 The modules described in this patent application

essentially comprise a parallelepiped body intended to define an outer surface of the aforesaid wall.

Furthermore, the body of each module comprises:

- an L-shaped protrusion arranged on an upper face
5 and on a first side face of the aforesaid body;
- an L-shaped groove arranged on a lower face and on a second side face, opposite to the first side face, of the aforesaid body at the aforesaid protrusion;
- a series of circular protrusions arranged on the
10 upper face of the aforesaid body; and
- a series of circular grooves obtained on the lower face in position corresponding to respective circular protrusions.

Each module is coupled to at least one further
15 module engaging the protrusions thereof in respective grooves of the further module and coupling the grooves thereof with respective circular protrusions of the further module.

Each module can be further coupled to the further
20 module superimposable on it by means of a pair of threaded tie-rods.

In particular, the threaded tie-rods extend between the superimposed rows of modules and are arranged at a median axis of the modules themselves.

25 Each tie-rod comprises, in particular, an

externally threaded stem crossing a respective module and a head of an upper end, onto which the stem of a further tie-rod crossing the further module is screwed.

The diameter of the head of each tie-rod is
5 slightly larger than the stem and cooperates with the module on one side and with the other module on the other side.

Because of the small diameter of the head, only an extremely small portion of the vertical downward loads
10 acting on the wall is transmitted to the tie-rods themselves.

In other words, the aforesaid tie-rods can exclusively withstand traction stresses bearing on the modules, i.e. can prevent the separation of the modules.

15 On the other hand, the compression stresses are prevalently relieved on the bodies of the modules. Such bodies must therefore have suitable mechanical properties.

Consequently, the bodies of the modules of known
20 type may be made only of compression resistant materials, in fact limiting the possible embodiments of known type.

For example, it is not possible to use materials having merely cosmetic function to make the modules.

25 Furthermore, the tie-rods extend between overlapped

rows of modules.

This is a further limitation to the possibility of manufacturing constructions or construction other than building constructions of particularly articulated or
5 imaginative shapes.

Patent application PCT/KR2005/001402 describes a system for connecting prefabricated modules according to the preamble of claim 1.

In particular, such a connection system comprises a
10 plurality of bolts extending along respective vertical axes connected to one another to form a plurality of vertical rows.

Each bolt comprises a head and a threaded stem. The head of each bolt defines a nut screw into which the
15 threaded stem of the upper bolt is screwed.

More specifically, the head of each bolt comprises a lower surface, which comes into contact with the lower module, and an upper surface, which is distanced from the upper module.

20 Because of such a conformation, the bolts have the exclusive function of preventing the separation of the modules, without withstanding the downward compression loads, e.g. due to weight, acting on the wall, which are absorbed by the modules only.

25 A very similar solution is described in patent

application FR-A-1062592.

The need is felt in the sector to use the same connection members for preventing the separation of the modules and for withstanding a significant portion of
5 the downward compression loads.

Patent applications EP-A-1498555 and US 2,700,295 illustrate modules connected to one another by casting a binder, e.g. cement.

Patent application US 599,864 describes modules
10 comprising respective downward tapering conical cavities and a connection system for connecting such superimposed modules to one another, essentially formed by downward tapering conical members inserted in respective conical cavities of the superimposed modules.

By virtue of such a conformation, the connection
15 system illustrated in patent US 599,864 does not oppose any resistance to the upwards distancing of the upper module from the lower module, making it entirely unsuitable to make temporary walls adapted to withstand
20 loads of a given entity.

It is further felt in the sector the need to guarantee maximum versatility with respect to the final configurations of the construction and/or to the choice of the material with which to make the modules.

25 It is further felt in the sector the need to allow

the assembly and disassembly of the constructions as simply and rapidly as possible and, in particular, without requiring the use of specialized manpower and/or demolitions/removal/landfill disposal operations.

5 Finally, it is felt in the sector the need to allow the implementation of technological networks, such as electrical systems or hydraulic networks, within the construction.

DISCLOSURE OF THE INVENTION

10 It is the object of the present invention to manufacture a reusable module for manufacturing at least one portion of a dismountable wall of a construction, which allows to satisfy at least one of the needs specified above.

15 The aforesaid object is reached by the present invention in that it relates to a reusable module for manufacturing at least one portion of a repeatedly dismountable wall of a construction, as defined in claim 1.

20 The present invention also relates to a method for manufacturing a repeatedly dismountable wall of a construction as defined in claim 27.

BRIEF DESCRIPTION OF THE DRAWINGS

25 For a better understanding of the present invention, three preferred embodiments will now be

described, by way of non-limitative example only and with reference to the accompanying figures, in which:

- figure 1 is a perspective view of a portion of a construction comprising a plurality of reusable modules according to a first embodiment of the present invention;

- figure 2 is a perspective view on a further magnified scale of a reusable module according to the present invention;

10 - figure 3 shows some components of the module in figures 1 and 2 on a highly magnified scale;

- figure 4 is an exploded view of the components in figure 3;

15 - figures 5 and 6 are perspective views from the top and bottom of a reusable module according to a second embodiment of the present invention, respectively;

- figure 7 is a section view of a portion of construction comprising a plurality of reusable modules according to a second embodiment of the present invention;

- figures 8 and 9 are perspective views from the top and bottom of a reusable module according to a third embodiment of the present invention, respectively; and

25 - figure 10 is a section view of a portion of

construction comprising a plurality of reusable modules according to a third embodiment of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

5 In figures 1 and 2, reference numerals 1a, 1b, 1c, 1d indicate a reusable dismountable module for manufacturing a wall 2, 3 of a construction 4 which can be dismantled several times.

In particular, the construction 4 could be used in
10 the building sector and in other sectors and could be a partition, an outer wall, a piece of furniture, a container, a piece of leisure equipment or an artistic creation.

Each module 1a, 1b, 1c, 1d can be reused several
15 times because it is not restrained to the further modules 1a, 1b, 1c, 1d by means of a permanent binder, such as for example cement, glue or chemical binders.

For this reason, the construction 4 can be mounted and dismantled several times.

20 In the illustrated case in point, the module 1a is vertically superimposed on a pair of modules 1c, 1b, and is arranged beneath a module 1d and a further module (not shown).

In particular, each module 1a is superimposed on two
25 mutually adjacent modules 1c, 1b and arranged beneath

mutually adjacent halves of the module 1d and the further module (not shown).

Each module 1a (1b, 1c, 1d) essentially comprises:

- a parallelepiped body 5; and
- 5 - a plurality of structural members 6a (6b, 6c, 6d).

More in detail, the body 5 comprises a lower face 8 and an upper face 9 opposite to each other and laying on respective horizontal planes which are parallel to each other in use.

10 The face 9 comprises a first and a second square relief 10, one of which engages a first groove (not shown) of a face 8 of the module 1d and the other of which engages a second groove of a lower face of the further module (not shown).

15 The face 8 comprises a first and a second square groove (not shown), one of which is engaged by a respective relief 10 of the module 1c and the other of which is engaged by a respective relief 10 of the module 1d.

20 The body 5 further comprises a pair of opposite faces 11 parallel to each other and vertically interposed between the faces 8, 9.

25 The body 5 finally comprises a pair of opposite faces 12 parallel to each other and vertically interposed between the faces 8, 9 and interposed between

the faces 11.

The faces 11 and 12 define respective portions of mutually the opposite walls 2, 3 of the construction 4.

The following may be identified for each module 1a
5 (1b, 1c, 1d) (Figure 2):

- a superimposition axis X of the modules 1a, 1b, 1c, 1d themselves arranged vertically in use; and
- a pair of axes Y, Z laying on face 9 and elongated along the projections of respective median symmetric
10 planes of the respective module 1a (1b, 1c, 1d) itself.

Furthermore, axes Y, Z are orthogonal to each other and to axis X.

Advantageously, the members 6a (6b, 6c, 6d) are carried in fixed manner by the respective bodies 5.

15 In greater detail, the members 6a (6b, 6c, 6d) of each module 1a (1b, 1c, 1d) extend along the axes X of the respective modules 1a (1b, 1c, 1d) and form a two-dimensional casing 13 in a section obtained on an orthogonal plan P arranged horizontally in use.

20 The members 6a, 6b, 6c, 6d are fixed to the body 5 at the extensions of the vertexes of the relief 10 itself.

In other words, the casing 13 extends on the plane P defined in directions X, Y in the aforesaid section.

25 Furthermore, the members 6a (6b, 6c, 6d), and thus

the casing 13, extend about the projection G of the centre of gravity of the respective module 1a (1b, 1c, 1d) on the plane P (Figure 2).

More in particular, the members 6a (6b, 6c, 6d) are
5 carried by the faces 11, 12 of the respective module 1a (1b, 1c, 1d).

By virtue of such a configuration, the casing 13 defines an intrados and an extrados with respect to the loads generated by the weight and the working loads of
10 the construction 4.

Consequently, by virtue of such a configuration, the casing 13 supports both the traction forces and the compression forces deriving from the weight and the working loads of the construction 4.

15 The member 6a comprises (Figures 3 and 4), in particular:

- a stem 15 elongated along an axis A parallel to the axis X; and
- a pin 16 connected to the stem 15 and crossing two
20 holes 17 of the stem 15 itself.

In particular, the stem 15 is cylindrical, has axis A and a first and a second axial end 18, 19 opposite to each other.

The axial end 18 faces the module 1d and is thus
25 arranged above in use.

The axial end 19 faces the modules 1c, 1b and is thus arranged below in use.

The pin 16 is elongated along an axis B orthogonal to axis A and protrudes radially from axis A.

5 The holes 17, and thus the pin 16, are arranged in interposed position between the axial ends 18, 19 and closer to the axial end 19.

Each module 1a, 1b, 1c, 1d comprises a plurality of restraining members 7, each of which connects a
10 respective member 6a of the module 1a to a corresponding member 6b, 6c, 6d of the module 1b, 1c, 1d or of the further module (not shown) in releasable manner.

The restraining members 7 are arranged at the vertexes of the relief 10.

15 The restraining member 7 adapted to connect one of the members 6b of module 1b to the corresponding member 6a of module 1a is described by way of example in this description.

Each restraining member 7 is configured so as to:

20 - allow the sliding along axis A of the member 6b of the module 1b relatively to the member 6a of the module 1a to a first angular insertion position of the member 6b of the module 1b inside the restraining member 7 itself;

25 - allow the rotation about axis A of member 6b with

respect to member 6a to a second insertion position starting from the first angular insertion position; and

- prevent the relative sliding of the members 6a, 6b along said first axis A in the second insertion position.

In particular, the restraining member 7 defines a seat 20 which can be snap-locked by the pin 16 of the member 6b of the module 1b.

More specifically, the restraining member 7 is connected to the stem 15 in position adjacent to the axial end 18.

In the illustrated case in point, the restraining member 7 is tubular and has a greater diameter than that of the stem 15.

The seat 20 defines a cavity 21 of axis A engaged by the axial end 19 of the stem 15 of the module 1b.

The seat 20 further comprises:

- a pair of grooves 22 arranged radially with respect to the cavity 21, open axially in direction parallel to axis A and engaged by opposite radial ends 24, 25 of the pin 16 of the stem 15 of the module 1b in a step of inserting/extracting the aforesaid stem 15 in/from the module 1b arranged in the first angular insertion position with respect to axis A; and
- a pair of grooves 23 axially closed in direction

parallel to axis A, angularly adjacent and offset with respect to the corresponding grooves 22 and snap-locked by the respective ends 24, 25 of the pin 16 of the stem 15 of the module 1b in a step of locking of the stem 15
5 arranged in the second angular insertion position with respect to axis B.

In other words, the stem 15 of the module 1b is arranged in the first angular insertion position and inserted in the seat 20 parallel to axis A, so that the
10 ends 24, 25 of the pin 16 engage the respective grooves 22.

Afterwards, the stem 15 is turned about axis A so that the ends 24, 25 of the pin 16 snap-lock the grooves 23.

15 By virtue of the fact that the aforesaid grooves 23 are axially closed, the extraction of the stem 15 parallel to axis A is prevented when the stem 15 itself is arranged in the second angular position.

In the illustrated case in point, the stem 15 is
20 hollow and smooth, i.e. is not threaded on a surface 29 thereof.

The restraining member 7 further comprises a collar 30 defining the seat 20 connected to the stem 15 of the module 1a.

25 In greater detail, the collar 30 is connected to

the stem 15 by means of a pin 31 (Figures 3 and 4) extending radially to axis A. In particular, the pin 31 engages a pair of through circular seats 32 defined by the stem 15 itself and a pair of circular through seats
5 33 defined by the collar 30 and superimposed in the respective seats 32.

The diameter of the collar 30 is greater than that of the stem 15 and the collar 30 surrounds the stem 15 itself in position adjacent to the axial end 18 of the
10 stem 15.

The collar 30 comprises (Figure 4) a lower face 56 and an upper face 57 opposite to each other.

Advantageously, face 57 is arranged in contact with the module 1a (1d) arranged above.

15 Face 56 is arranged in contact with the module 1b, 1c (1a) arranged below.

In this manner, the vertical compression load due to the proper weight of the walls 2, 3 or to further vertical forces applied to the construction 4 are
20 transmitted from the module 1a (1d) arranged above to the collar 30, and from there to the stems 15 of the module 1b (1c) arranged below.

Each member 6a further comprises a collar 40, the diameter of which is greater than that of the stem 15
25 and which surrounds the stem 15 itself in position

adjacent to the axial end 19.

The collar 40 is connected to the stem 15 by means of a pin 35 (Figure 3), which extends radially to axis A.

5 A pin 35 engages a pair of circular through seats 34 defined by the stem 15 and a pair of circular through seats 36 defined by the collar 40.

The seats 36 are superimposed on the respective seats 34.

10 In particular, the seats 34 are interposed between the pin 16 and the seats 32 along axis A and are circumferentially offset with respect to the seats 32 about axis A.

The collar 30 of each member 6a (6b, 6c, 6d) abuts
15 against the collar 40 of the member 6b (6a, 6c, 6d) to which it is connected when the aforesaid members 6a, 6b were connected to each other by inserting the pin 16 of the member 6b (6a, 6c, 6d) into the grooves 23 of the restraining member 7.

20 In particular, the body 5 may be made of any one of the following materials: plastic, in particular PVC, nylon, Plexiglas, recycled plastic, or wood, brick or concrete.

In this manner, the walls 11, 12 define a lining of
25 the building 4 without needing further machining and/or

interventions thereon.

Furthermore, the body 5 comprises (Figures 1 and 2):

- a through hole 48, which extends between the faces 8 and 9 and has an axis parallel to the axes A, X; and
- 5 - a through hole 49, which extends between the faces 11 and has an axis parallel to axis Y.

The holes 48, 49 extend, in particular, orthogonal to faces 8, 9, and 11, respectively.

The holes 48, 49 are circular, in the illustrated
10 case in point.

The respective holes 48, 49 are superimposed and communicate with one another once the modules 1a, 1b, 1c, 1d and the further module are connected to one another.

15 In particular, the holes 48 superimposed on one another define a first duct arranged vertically in use. Similarly, the holes 49 superimposed on each other define a second duct arranged horizontally in use.

The aforesaid ducts define respective housings for
20 technological networks, such as for example hydraulic or electric networks.

In use, the construction 4 is made by arranging the modules 1a, 1b, 1c, 1d so as to form the walls 2, 3.

Each module 1a is connected to the modules 1b, 1c,
25 1d firstly by restraining the relieves 10 into the

corresponding grooves (not shown) of the modules 1b, 1c, 1d.

Afterwards, the members 6a of the module 1a are connected to the corresponding members 6b, 6c, 6d of the
5 modules 1b, 1c, 1d by means of the restraining members 7.

In greater detail, the collar 30 of each restraining module 7 is fixed to the respective stem 15 of the module 1a by virtue of the respective pin 31
10 which engages the seats 32 of the stem 15 itself.

Hereinafter, the present description describes how a member 6a is connected to the corresponding member 6b by way of example.

In greater detail, the stem 15 of the member 6b is
15 arranged in the first angular position and inserted parallel to axis A in the seat 20. At the end of such an insertion, the axial end 19 (arranged underneath in use) of the aforesaid stem 15 is inserted in the cavity 21 of the seat 20 of the restraining member 7.

20 More specifically, in the first angular position of the stem 15, the ends 24, 25 of the pin 16 engage the grooves 22 of the seat 20.

Hereinafter, the stem 15 is turned about axis A to reach the second angular position in which the ends 24,
25 25 of the pin 16 snap-lock the grooves 23 in the seat

20.

The extraction of the stem 15 from the member 6b is prevented by virtue of the fact that the grooves 22, 23 are axially closed.

5 The collar 30 of the member 6a is abuttingly arranged against the collar 40 of the member 6b once the pin 16 of the member 6b is locked inside the grooves 24, 25 of the restraining member 7.

10 The further members 6a of the module 1a are connected to the corresponding further members 6b of the module 1b in manner similar to that described above so as to fix module 1b to module 1a in stable manner.

15 Similarly to what described above, module 1a is fixed to modules 1c, 1d and to the further module so as to form the construction 4. Once the construction 4 is formed, the members 6a, 6b, 6c, 6d form the casing 13 of the construction 4 itself.

20 Furthermore, once the construction 4 is formed, the holes 48, 49 define the first and the second duct, respectively, which may be used to accommodate the technological networks, such as for example the hydraulic or electric utility networks of the construction 4 itself.

25 The traction and compression loads generated by the weight and the working loads of the construction 4 are

supported by the casing 13, i.e. by the members 6a, 6b, 6c, 6d of the modules 1a, 1b, 1c, 1d.

Furthermore, the casing 13 defines both an intrados and an extrados which withstand the aforesaid
5 compression and traction loads.

Furthermore, by virtue of the fact that the faces 57 of the collars 30 of the modules 1b (1c) arranged below are in contact with the faces 8 of the modules 1a (1d) arranged above, the vertical downward compression loads
10 are transmitted by the module 1a (1d) arranged above to the stems 15 and must not therefore be supported by the bodies 5.

The modules 1a, 1b, 1c, 1d are disassembled from one another when the construction needs to be dismantled.

15 By way of example, the module 1b is disassembled from the module 1a, by releasing the members 6b from the corresponding members 6a and, afterwards, by moving the module 1b away from the module 1a so as to release the grooves (not shown) of the module 1b from the relieves
20 10 of the module 1a.

More in detail, each member 6b is turned about axis A from the second angular position to the first angular position, so as to remove the ends 24, 25 of the pin 16 from the corresponding grooves 23 of the seat 20 and to
25 accommodate the aforesaid ends 24, 25 of the pin 16 in

the corresponding grooves 22 of the seat 20.

At this point, each member 6b is extracted in direction parallel to the respective axis A from the seat 20 of the respective restraining member 7.

5 In figures from 5 to 7, reference numerals 1a', 1b' indicate a reusable module according to a second embodiment of the present invention.

In figure 7, module 1b' is arranged below module 1a'.

10 Module 1a', 1b' is similar to module 1a, 1b, 1c, 1d and only the differences will be described; corresponding or equivalent parts of modules 1a', 1b' and 1a, 1b will be indicated by the same reference numbers where possible.

15 In particular, module 1a', 1b' differs from module 1a, 1b, 1c, 1d in that it comprises a pair of structural members 6' and a pair of through holes 58' adapted to be engaged by respective structural members 6'.

In particular, the structural members 6' and the
20 holes 58' extend along respective axes E' parallel to direction X.

Each structural member 6' is arranged within a respective half 60' of the respective module 1a', 1b'.

Each axis E' defines a symmetry axis of the
25 respective half 60' of the corresponding module 1a',

1b', and lays on a middle plane of the module 1a', 1b' equally distanced from the faces 12 of the module 1a', 1b' itself.

Each structural member 6' comprises:

5 - a threaded stem 50' elongated along an axis E' parallel to direction X and accommodated with clearance in the hole 58';

 - a head 51' defining an end arranged above the stem 50' in use and defining a nut screw 52';

10 - an end 53' axially opposite to head 51'.

In the illustrated case in point, the diameter of the head 51' is greater than the diameter of the stem 50'.

15 The stems 50' of the modules 1b' defining a lower row of the wall 2, 3 have respective ends 53' screwed into a nut 54' the diameter of which is greater than that of the hole 58'' (Figure 7).

The nut 54' fixes each member 6' to the respective module 1a', 1b'.

20 The stems 50' of the modules 1a' are superimposed over the modules 1b', (1a') have the respective ends 53' screwed into the nut screws 52' of the heads 51' of the screws 50' associated to the modules 1b' (1a').

Each stem 50' comprises a flange 55' transversally protruding from the axis E' having a lower face 56' in use and an upper face 57' in use opposite to face 56'.

In the illustrated case in point, the diameter of the flange 55' is 1.5 times greater than the diameter of the head 51', and preferably equal to twice the diameter of the head 51'.

Advantageously, the face 57' is arranged in contact, either directly or indirectly, with the face 8' of the module 1a' arranged above.

The face 56' is arranged in contact, either directly or indirectly, with the module 1b' arranged below.

In such a manner, the downward loads and the loads due to the weight of the walls 2, 3 or to the load bearing on the construction 4 on the walls themselves is distributed by the modules 1a' (and by the modules superimposed thereon) and on the members 6' making the member 6' itself collaborate in the mechanical strength of the construction, similarly to the behavior of steel casing and concrete in reinforced concrete structures.

In greater detail, each flange 55' extends orthogonally to axis E'.

More specifically, each flange 55' protrudes from the head 51'.

Each flange 55' is further interposed between the face 9 of the module 1b' arranged below and the face 8 of the module 1a' arranged above.

More specifically, a ring 59' made of elastic
s material or with a corrugated surface and having locking function is interposed (Figure 7) between the face 57' of the member 6' and the face 8 of the module 1a' arranged above.

In addition to preventing the loosening of the stem
10 50' of the upper connection member 6' from the head 51' of the lower connection member 6', the ring 59' transmits the load from the face 8 of the module 1a' to the flange 55' of the lower connection member 6'.

Each module 1a', 1b' further differs from the
15 module 1a, 1b, 1c, 1d in that it comprises a pair of cavities 65' with cylindrical axis E' open at the face 8 thereof (Figures 6 and 7).

The cavities 65' are contiguous to the holes 58' and are adapted to accommodate the heads 51' of the
20 screws 50' associated to the lower modules or to the nuts 54'.

Furthermore, the module 1a', 1b' differs from the module 1a, 1b, 1c, 1d in that it comprises a plurality, four in the case in point, of through holes 80' having
25 respective axes parallel to axis E for each half 60a'.

The holes 80' are arranged symmetrically about axis E' of the respective half 60' and according to two rows parallel to each other and to direction Y.

The modules 1a', 1b' are connected to one another
5 by means of a plurality of connection members 85' extending parallel to the axes E' and engaging half of the respective holes 80 of the module 1b' and half of the respective holes 80 of the module 1a'.

In the illustrated case in point, the connection
10 members 85' are made of plastic material, preferably PVC.

The operation of the module 1a', 1b' is essentially identical to the operation of the module 1a, 1b, 1c, 1d and is therefore not described in detail.

15 In figures 8, 9 and 10, reference numerals 1a'', 1b'' indicate a reusable module according to a third embodiment of the present invention.

Module 1a'', 1b'' is similar to module 1a', 1b' and only the differences will be described; corresponding or
20 equivalent parts of modules 1a'', 1b'' and 1a', 1b' will be indicated by the same reference numbers where possible.

Module 1a'', 1b'' differs from module 1a', 1b' in that each structural member 6'' comprises:

- a stem 50'' elongated along axis E'' adapted to be accommodated in the hole 58'';

- a head 51'' defining an axial end of larger diameter arranged above the stem 50'' in use; and

5 - a threaded portion 53'' defining an axial end of the stem 50'' opposite to the head 51''.

The stem 50'', the head 51'' and the portion 53'' are defined by a single member in the illustrated case in point.

10 In the illustrated case in point, the diameter of the stem 50'' is smaller than the diameter of the head 51''. The diameter of the stem 50'' is, in turn, greater than the diameter of the portion 53''.

The module 1a'', 1b'' differs from the module 1a', 1b', in that it comprises a plurality of restraining members 7'' each adapted to connect two structural members 6'' superimposed on each other, and hereinafter named upper and lower structural member 6''.

15 In particular, each restraining member 7'' comprises:

- a flange 55'' defining a threaded hole 69'' of axis E'' adapted to be engaged by the portion 53'' of the upper structural member 6''; and

25 - a body 71'' protruding beneath from the flange 55'' having diameter smaller than the flange 55'' itself

and defining a seat 72'' for the head 51'' of the lower structural member 6''.

In particular, the body 71'' comprises:

- a wall 73'' overhangingly protruding from the flange 55'', having extension parallel to axis E'' and extending annularly about axis E'' for less than 360 degrees so as to define an opening 75'' of the seat 72'' offset with respect to axis E''; and

- a wall 74'' orthogonal to axis E'' and defining a U-shaped opening 76' delimiting the seat 72'' on the side axially opposite to the flange 55''.

The dimensions of the opening 76'' are smaller than the diameter of the head 51'' and greater than the diameter of the stem 50'' in direction radial to axis E''.

The member 6'' carried by the lower module 1b'' is coupled to the restraining member 7'', by inserting the head 51'' in the seat 72'' by means of the opening 75'' and by axially locking the head 51'' against the wall 74''.

Afterwards, the portion 53'' of the member 6'' carried by the upper module 1a'' is screwed into the member of the threaded hole 69'', thus making the upper and lower members 6'' integral.

The flange 55'' of each restraining member 7'' comprises a face 56'' arranged above in use and a face 57'' arranged below in use (Figure 10).

Advantageously, the face 57'' is arranged in
5 contact with the module 1a'' (Figure 10) arranged above.

The face 56'' is arranged in contact with the upper face 9 of the module 1b'' arranged below.

In particular, the lower face 56'' is in contact with a seat 73'' defined by the upper face 9'' of the
10 module 1b''.

The upper face 57'' is in contact with the lower face 8'' of the module 1a''.

The module 1a'', 1b'' further differs from the module 1a', 1b' in that it comprises a plurality, four
15 in the case in point, of holes 48'' defining respective vertical ducts for each half 60''.

The holes 48'' are arranged symmetrically about axis E'' of the respective half 60'' and according to two rows parallel to each other.

Furthermore, each member 6'' is preferably fixed to
20 the respective module 1a'', 1b'' by interposing a nut 53''.

The operation of the module 1a'', 1b'' is essentially identical to the operation of the module 1a, 1b, 1c, 1d and is therefore not described in detail.
25

The advantages that the present invention allows to obtain are apparent from an examination of the module 1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b''.

In particular, the collar 30 (flange 55', 55'')
5 comprises a face 57, 57', 57'' cooperating, either directly or indirectly, with the module 1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'' arranged above.

Therefore, the downward loads due, for example, to the weight of the wall 2, 3 are transmitted by the
10 module 1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'' to the collar 30 (55', 55'') and are transmitted from the latter to the member 6a, 6b, 6c, 6d; 6', 6'' thus engaging the module 1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b''.

15 In this manner, the module 1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'' does not need to perform any load-bearing functions and may be made of a material with mediocre mechanical properties, thus making it possible to use materials with particular cosmetic or
20 soundproofing or thermal insulation properties. In this manner, the flexibility of the constructions 4 which can be made with the module 1a, 1b, 1c, 1d is much greater than in the solution described in patent application WO2009/104047.

25 Consequently, the flexibility of the constructions

4 which can be made with the module 1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'' is much greater than in the solution described in patent application WO2009/104047.

Indeed, the diameter of the collar 30 (flange 55, 55') is considerably greater than the diameter of the head of the tie-rods described in patent application 2009/104047, and the collar 30 (flange 55, 55') may consequently withstand and distribute a greater load to the member 6a, 6b, 6c, 6d; 6', 6''.

In particular, the bodies 5 may be made with a cosmetic finish on the faces 11 and/or 12, so that the construction 4 may be readily finished. This is particularly advantageous when the construction 4 is intended for a use very different from that of a construction, e.g. for a walk-in closet, a sliding construction on wheels or for assembling a trade show stand.

Furthermore, the body 5 carries the member 6a, 6b, 6c, 6d; 6', 6'' in fixed manner.

By virtue of this, it is possible to make constructions 4 of particularly articulate, imaginative shape, also in fields different from constructions.

Differently, the solution described in patent application WO2009/104047 includes the use of tie-rods not carried by the modules, but accommodated inside the

holes of the modules themselves and interposed between superimposed rows of modules.

Therefore, the solution described in patent application WO2009/104047 allows to essentially make
5 regular walls of conventional type.

Furthermore, the connection members 85' allow to connect the modules 1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'' to one another without requiring protrusions obtained directly on the body 5.

10 Furthermore, the members 6a, 6b, 6c, 6d form the casing 13, which extends from both sides of the axes Y, Z of symmetry of the module 1a, 1b, 1c, 1d.

Consequently, the members 6a, 6b, 6c, 6d are located at the intrados and the extrados of the wall 2,
15 3. Consequently, the casing 13 can withstand both traction forces and compression forces generated by the weight and the working load of the wall 2, 3.

By virtue of the presence of the holes 48, 49, 48'', the wall 2, 3 may accommodate the technological
20 networks in the respective first and second duct.

By virtue of the presence of the restraining members 7, the construction 4 is easy to assemble and disassemble, without requiring specialized manpower and without producing waste, dust or rubble.

25 It is finally apparent that changes and variants

can be made to the module 1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'' described and illustrated herein without departing from the scope of protection of the present invention.

5 In particular, the module 1a, 1b, 1c, 1d; 1a'', 1b'' may be provided with connection members 85' and respective holes 80', instead of relieves 10.

The module 1a', 1b' may comprise the holes 48, 48''.

CLAIMS

1.- A dismountable module (1a, 1b, 1c, 1d; 1a', 1b';
1a'', 1b'') for manufacturing at least one portion of a
repeatably dismountable wall (2, 3) of a construction (4),
5 comprising:

- a first body (5) adapted to define an outer surface
(7) of said wall (2, 3); and

- at least one structural member (6a, 6b, 6c, 6d; 6';
6'') adapted to withstand the loads generated by said wall
10 (2, 3);

characterized in that said structural member (6a, 6b,
6c, 6d; 6'; 6'') comprises a main body (15; 50'; 50'')
elongated along a first axis (A, X; E', E''), arranged
vertically in use, and a thickening (30; 55'; 55'')
15 protruding from said main body (15; 50'; 50'')
transversally to said first axis (A, X; E', E'');

said thickening (30; 55'; 55'') defining:

- a first face (56, 56', 56''); and
- a second face (57, 57', 57'') opposite to said first
20 face (56, 56', 56'') and adapted to cooperate, either
directly or indirectly, with a further module (1a, 1b, 1c,
1d; 1a', 1b'; 1a'', 1b''), superimposable on said module
(1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'') according to said
first axis (A, X, E', E''), so as to transfer a load from
25 said further module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'')

to said structural member (6a, 6b, 6c, 6d; 6'; 6'').

2.- A module according to claim 1, characterized in that said first face (56, 56', 56'') cooperates, either directly or indirectly, with said module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'').

3.- A module according to claim 2, characterized in that said first face (56, 56', 56'') comes into contact with said module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'') and said second face (57, 57', 57'') comes into contact with said further module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'').

4.- A module according to any one of the preceding claims, characterized in that it can be coupled to said further module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'') without using a casting of binding material.

5.- A module according to any one of the preceding claims, characterized in that said first body (15) defines a through passage (48, 49; 48''), which can be crossed by technological networks and is arranged adjacent to a further passage (48, 49; 48'') of said further module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b''), when said module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'') and said further module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'') are connected to each other by said restraining means (7, 7'').

6.- A module according to any one of the preceding claims, characterized in that said first body (5) is made

of plastic material, in particular PVC, nylon, Plexiglas, recycled plastic, or wood, brick or concrete.

7.- A module according to any one of the preceding claims, characterized in that it comprises at least one
5 connection member (85') distinct from said module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'') and adapted to couple said module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'') to said further module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'').

8.- A module according to claim 7, characterized in
10 that said connection member (85') is inserted, at least in part, in a respective hole (80') defined in said module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'') and is insertable, at least in part, in a respective further hole (80') defined by said further module (1a, 1b, 1c, 1d; 1a', 1b';
15 1a'', 1b'').

9.- A module according to claim 7 or 8, characterized in that said connection member (85') is made of plastic material, preferably PVC.

10.- A module according to any one of the preceding
20 claims, characterized in that said first body (5) carries said structural member (6a, 6b, 6c, 6d; 6'; 6'') in fixed manner.

11.- A module according to any one of the preceding claims, characterized in that said structural member (6',
25 6'') comprises:

- a stem (50', 50'') engaging a first hole (58', 58'') of said module (1a', 1b'; 1a'', 1b''); and

- a head (51', 51'') of diameter larger than said stem (50', 50'') and a threaded portion (53', 53'') arranged on
5 mutually opposite axial ends of said stem (50', 50'');

said first hole (58', 58'') being couplable with said threaded portion (53', 53'') of a further structural member (6', 6'') carried by a further said module (1a', 1b'; 1a'', 1b'').

10 12.- A module according to claim 11, characterized in that said thickening (55'; 55'') is distinct from said head (51', 51'').

13.- A module according to claim 11 or 12, characterized in that it comprises a restraining member
15 (7'') adapted to connect said structural member (6'') to a further structural member (6'') associated to said further module (1a'', 1b'');

said restraining member (7'') defining said thickening (55', 55'').

20 14.- A module according to claim 13, characterized in that said restraining member (7'') defines:

- a flange (55'') with a second threaded hole (69''), on which the further said structural member (6'') can be screwed; and

25 - a seat (72'') engageable by said head (51'');

said restraining member (7'') comprising:

- a first wall (73''), annular with respect to the first axis (E'') and protruding from said flange (55'') along said first axis (E''); and

5 - a second wall (74''), transversal to said first axis (E'') and folded towards said first axis (E'') and arranged on the opposite side of said first wall (73'') with respect to said flange (55'');

said first wall (73'') defining a first opening
10 (75'') of said seat (72'') eccentric with respect to said first axis (E'') and through which said head (51'') can be inserted into said seat (72'');

said second wall (74'') defining a second opening (76'') of said seat (72'') transversal to respect to said
15 first axis (E''), crossable by said stem (50'') and adapted to lock said head (51'') in said seat (72'').

15.- A module according to claim 13 or 14, characterized in that said thickening (55'') abuts against a shoulder (79'') defined by a face (8) of said module
20 (1a', 1b'; 1a'', 1b'').

16.- A module according to any one of claims from 1 to 11, characterized in that said thickening (55') is defined by a flange (55') resting on a face (8) of said module.

17.- A module according to any one of the claims from
25 1 to 11, characterized in that said head (51') defines a

nut screw (52') which can be coupled with said threaded portion (53') of said further structural member (6').

18.- A module according to any one of the claims from 1 to 11, characterized in that it comprises an elastic ring
5 (59'') abutting against said second face (57'').

19.- A module according to any one of the claims from 1 to 9, characterized in that it comprises a plurality of said structural members (6a; 6b, 6c, 6d), which extend along said first axis (X, A) and form a two-dimensional
10 casing (13) in a section obtained on a plane (P) transversal to said first axis (X, A); said casing (13) being shaped so as to withstand traction and compression loads.

20.- A module according to claim 19, characterized in
15 that said structural members (6a; 6b, 6c, 6d) are arranged in offset position with respect to a second longitudinal extension axis (Y, Z) of said body (5) and are carried by faces (12) of said body (5);

the second axis (Y, Z) being transversal to said first
20 axis (A, X).

21.- A module according to any one of the claims from 1 to 9, characterized in that it comprises restraining means (7) adapted to connect said structural member (6a; 6b, 6c, 6d) in releasable manner to a further structural
25 member (6b, 6c, 6d; 6a) of a further module (1b, 1c, 1d;

1a);

said restraining means (7) being configured so as to:

- allow the relative sliding between said further structural member (6b, 6c, 6d; 6a) and said structural member (6a; 6b, 6c, 6d) along said first axis (X, A) to a first insertion position of one of said further structural member (6b, 6c, 6d; 6a) and said structural member (6a; 6b, 6c, 6d) within said restraining means (7);

- allow the relative rotation about said first axis (X, A) between said structural member (6b; 6a, 6c, 6d) and said further structural member (6b, 6c, 6d; 6a) from said first insertion position and up to reach a second insertion position; and

- prevent the relative sliding between said structural member (6a; 6b, 6c, 6d) and said further structural member (6b, 6c, 6d; 6a) along said first axis (X, A), at a second insertion position.

22.- A module according to claim 21, characterized in that said structural member (6a; 6b, 6c, 6d) comprises:

- a stem (15) elongated along said first overlapping axis (X, A) of said module and further module (1b, 1c, 1d; 1a); and

- a pin (16) protruding from said stem (15) along a third axis (B) transversal to said first axis (X, A);

said restraining means (7) being operatively connected

to said stem (15) and comprising a seat (20) to receive a further pin (16) of a further said structural member (6b; 6s, 6b, 6c);

said seat (20) allowing the sliding movement of said further pin (16) and, thus, of said further stem (15) of said further module (1b, 1c, 1d; 1a) along said first axis (X; A), at a first angular position of said further stem (15) with respect to said first axis (X; A);

said seat (20) preventing the sliding movement of said further pin and stem (16, 15) at a second angular position of said further stem (15), so as to lock said further stem (15) in said second angular position.

23.- A module according to claim 22, characterized in that said seat (20) comprises:

- a cavity (21) to receive one end (19) of said further stem (15);

- at least one first groove (22) radially outside said cavity (21), open in parallel to said first axis (X, A) to allow the insertion/extraction of said further pin (16) in/from said seat (20) during a step of coupling/uncoupling said module (1a; 1b, 1c, 1d) with/from said further module (1b, 1c, 1d; 1a); and

- at least one second groove (23) angularly adjacent to said first groove (22) to allow the rotation of said pin (16) and, thus, of said stem (15) about said first axis (X;

A), and axially closed in parallel to said first direction to snap-lock said pin (16) in said seat (20) and lock said further module (1b, 1c, 1d; 1a) with respect to said module (1a; 1b, 1c, 1d).

5 24.- A module according to claim 22 or 23, characterized in that it comprises a second body (30) releasably connected to a first end of said stem (15) and defining said seat (20).

10 25.- A module according to claim 24, characterized in that it comprises a third body (40) releasably connected to said stem (15) in a position interposed between said pin (16) and said second body (30);

15 said second body (30) being adapted to abut against a further third body (40) of said further stem (15), once said further pin (16) is snap-locked in said seat (20).

26.- A dismountable wall (2, 3) comprising:

20 - a module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'') according to any one of the preceding claims; and
 - at least one further module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'').

25 27.- A method for manufacturing a repeatedly dismountable wall (2, 3) formed by at least one first module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'') and one second module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'') superimposable on said first module (1a, 1b, 1c, 1d; 1a',

1b'; 1a'', 1b'');

each said first and second module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'') comprising:

- a first body (5) adapted to define an outer surface
s (7) of said wall (2, 3); and

- at least one structural member (6a; 6b, 6c, 6d; 6'; 6'') adapted to withstand the loads generated by said wall (2, 3);

said structural member (6a, 6b, 6c, 6d; 6'; 6'')
10 comprises an elongated main body (15; 50'; 50'') arranged vertically in use along a first axis (X; A; E', E''), and a thickening (30; 55'; 55'') protruding from said main body (15; 50'; 50'') transversally to said axis (X; A; E', E'');

said method comprising the step of connecting the
15 structural members (6a; 6b, 6c, 6d; 6'; 6'') of said first and second module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'') to one another without casting any binder between said first and second module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'');

said method being characterized in that it comprises
20 the steps of placing a first face (57, 57', 57'') of said thickening (30, 55', 55'') either directly or indirectly into contact with said second module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b''), so as to transfer the loads bearing on said wall (2, 3) of said second module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'') to said structural member (6a; 6b,
25

6c, 6d; 6'; 6'') associated to said first module (1a, 1b, 1c, 1d; 1a', 1b'; 1a'', 1b'').

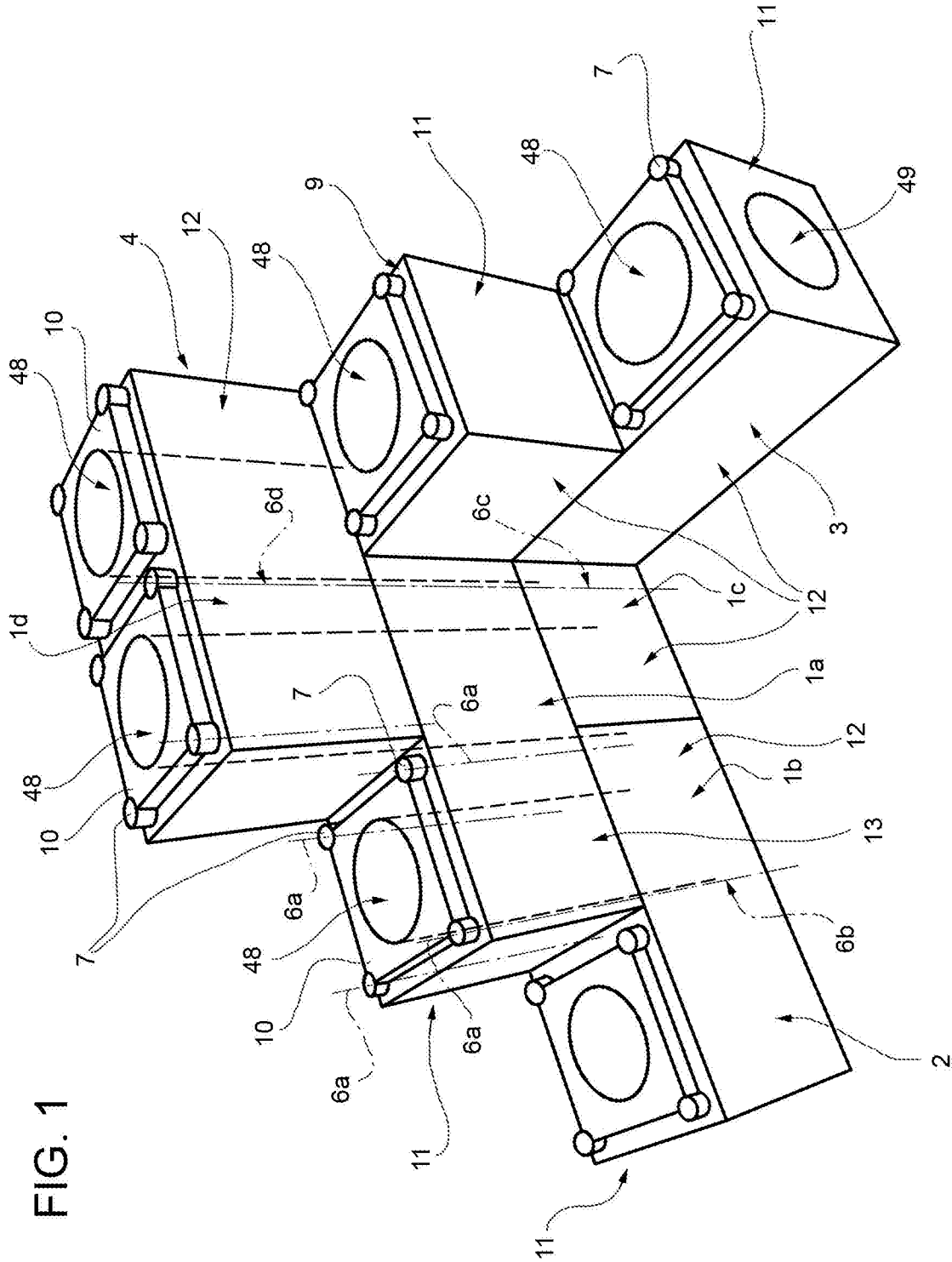


FIG. 2

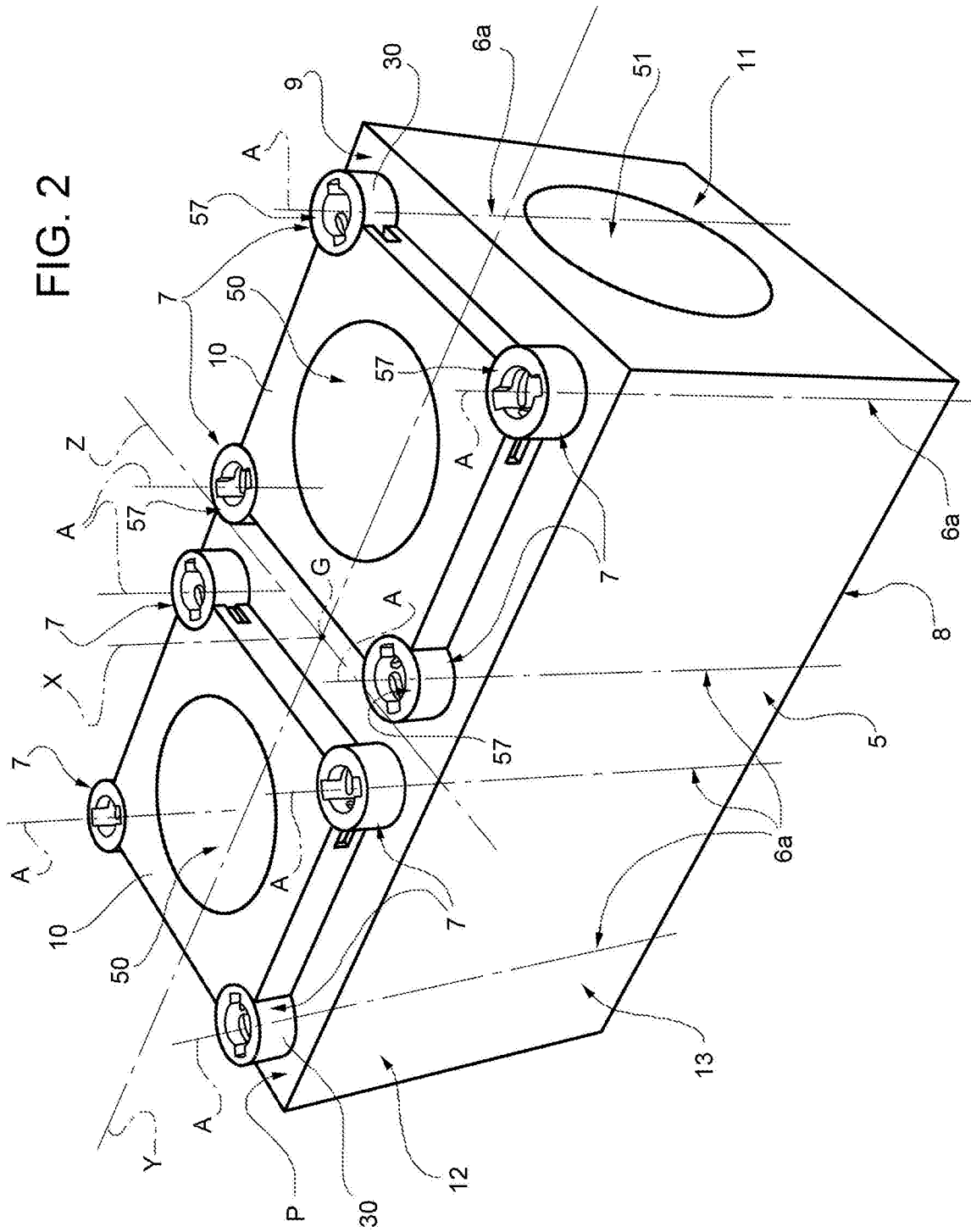


FIG. 3

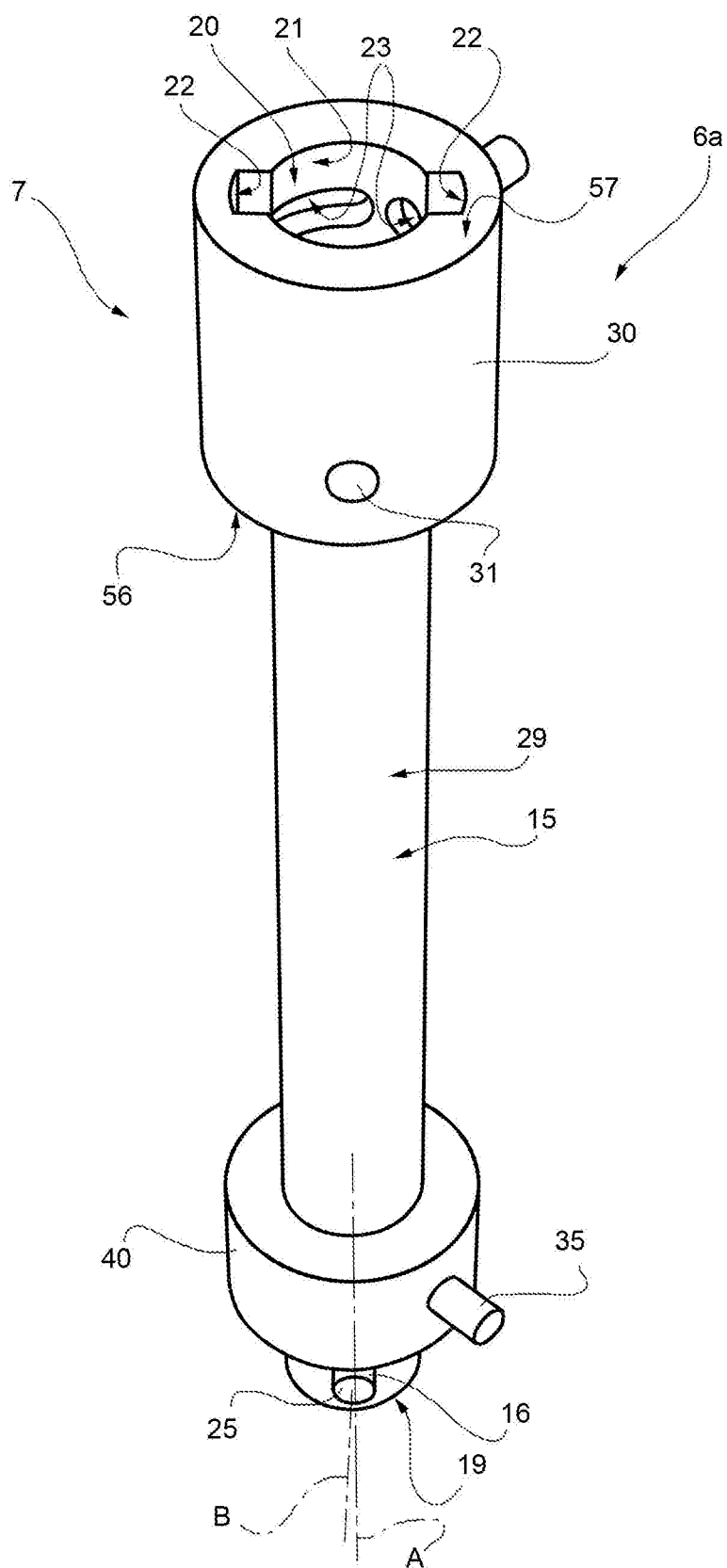


FIG. 4

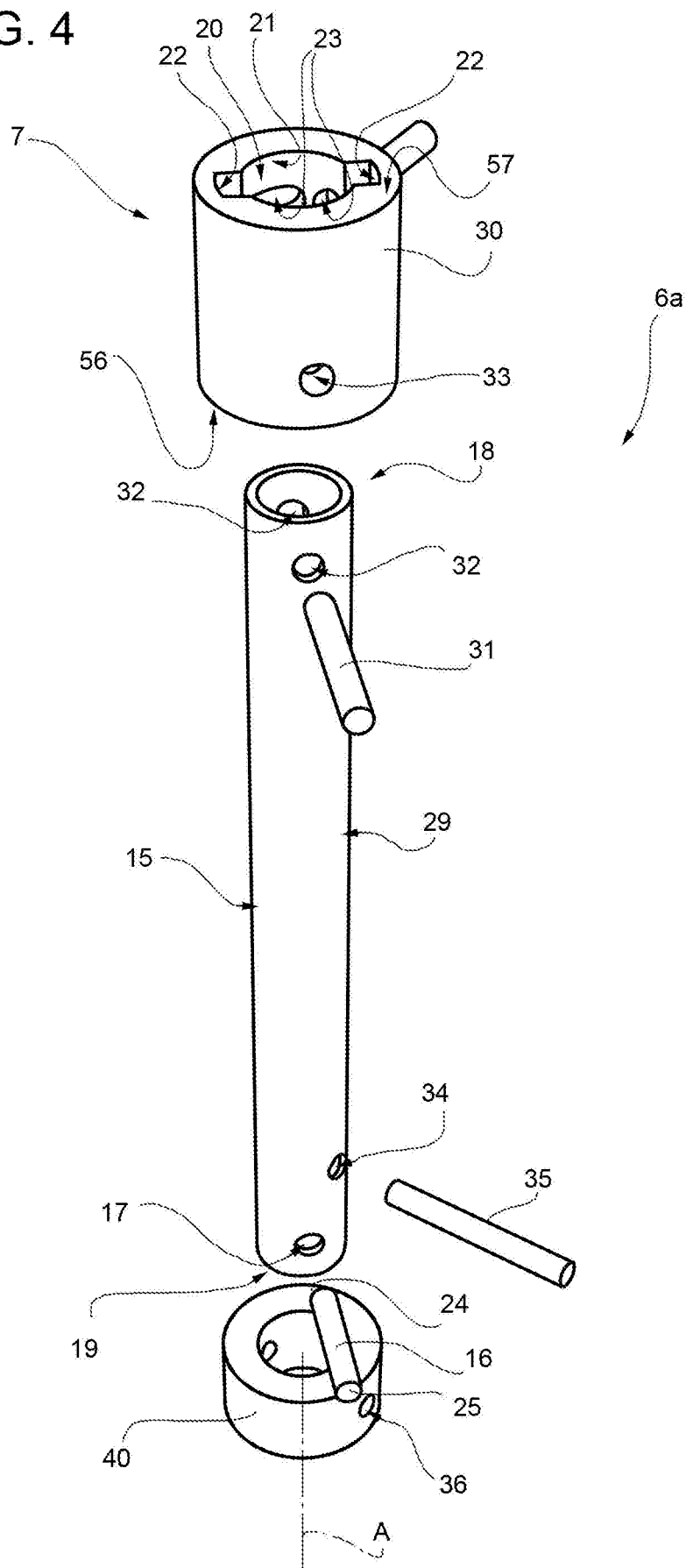


FIG. 5

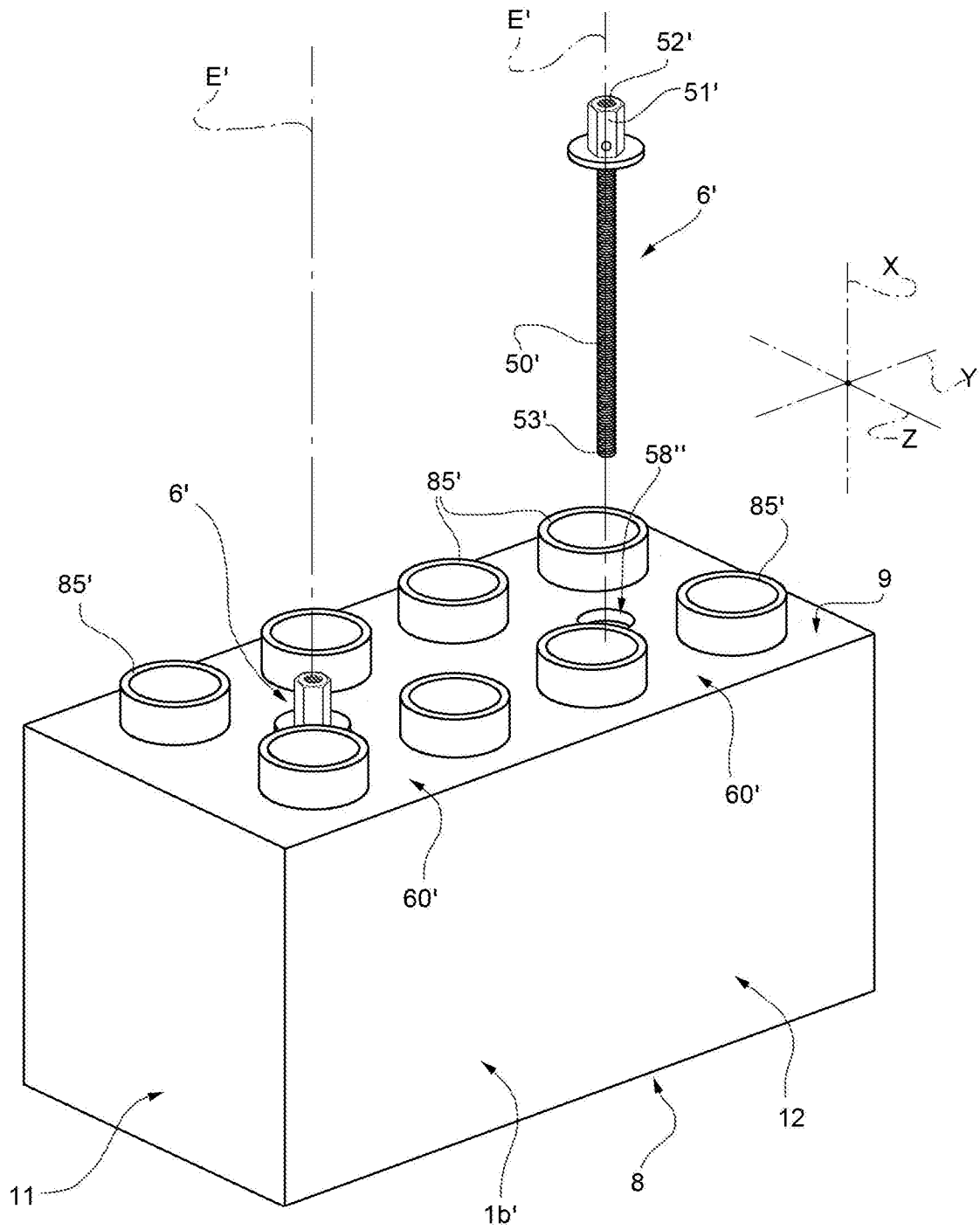


FIG. 6

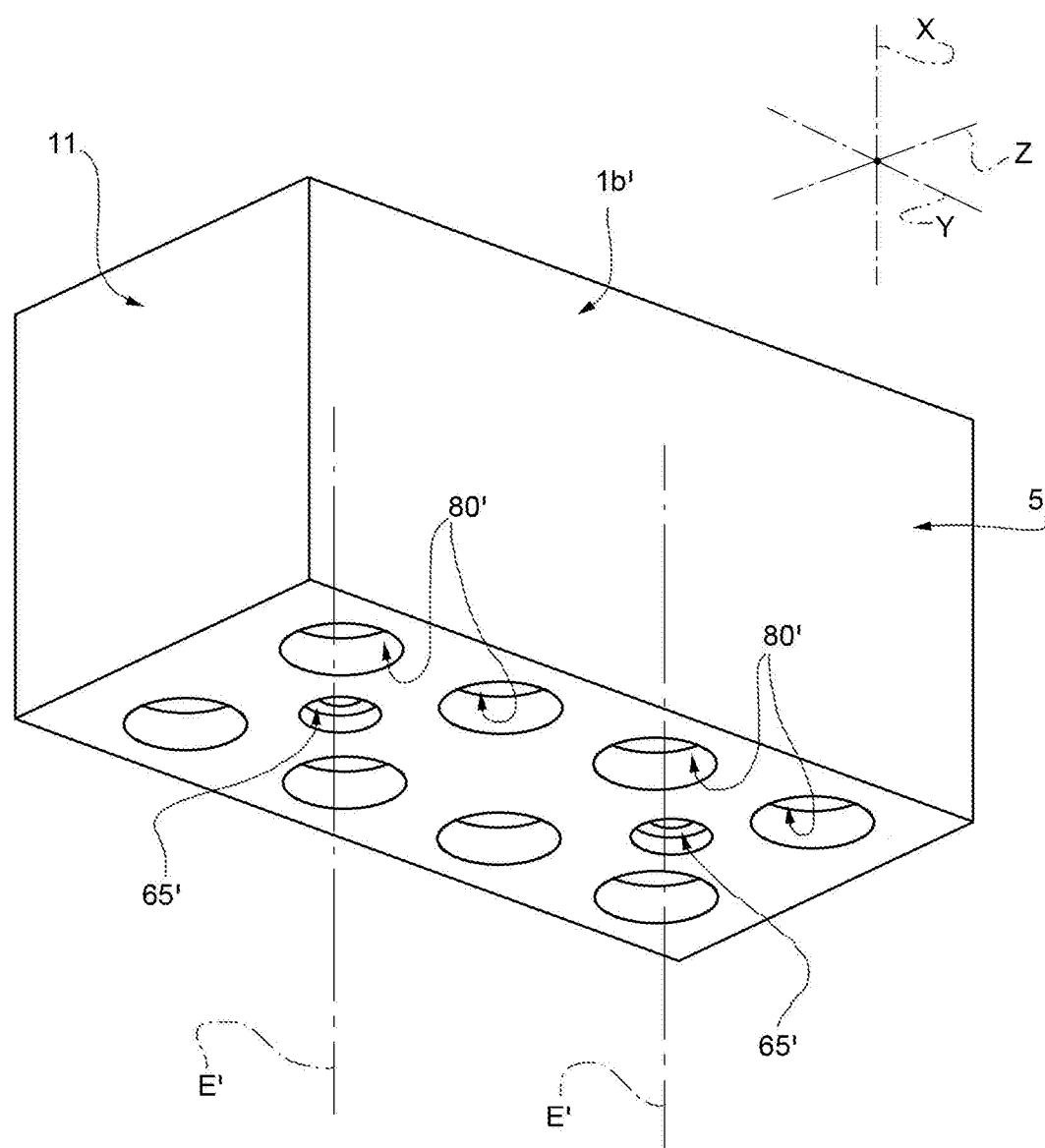


FIG. 7

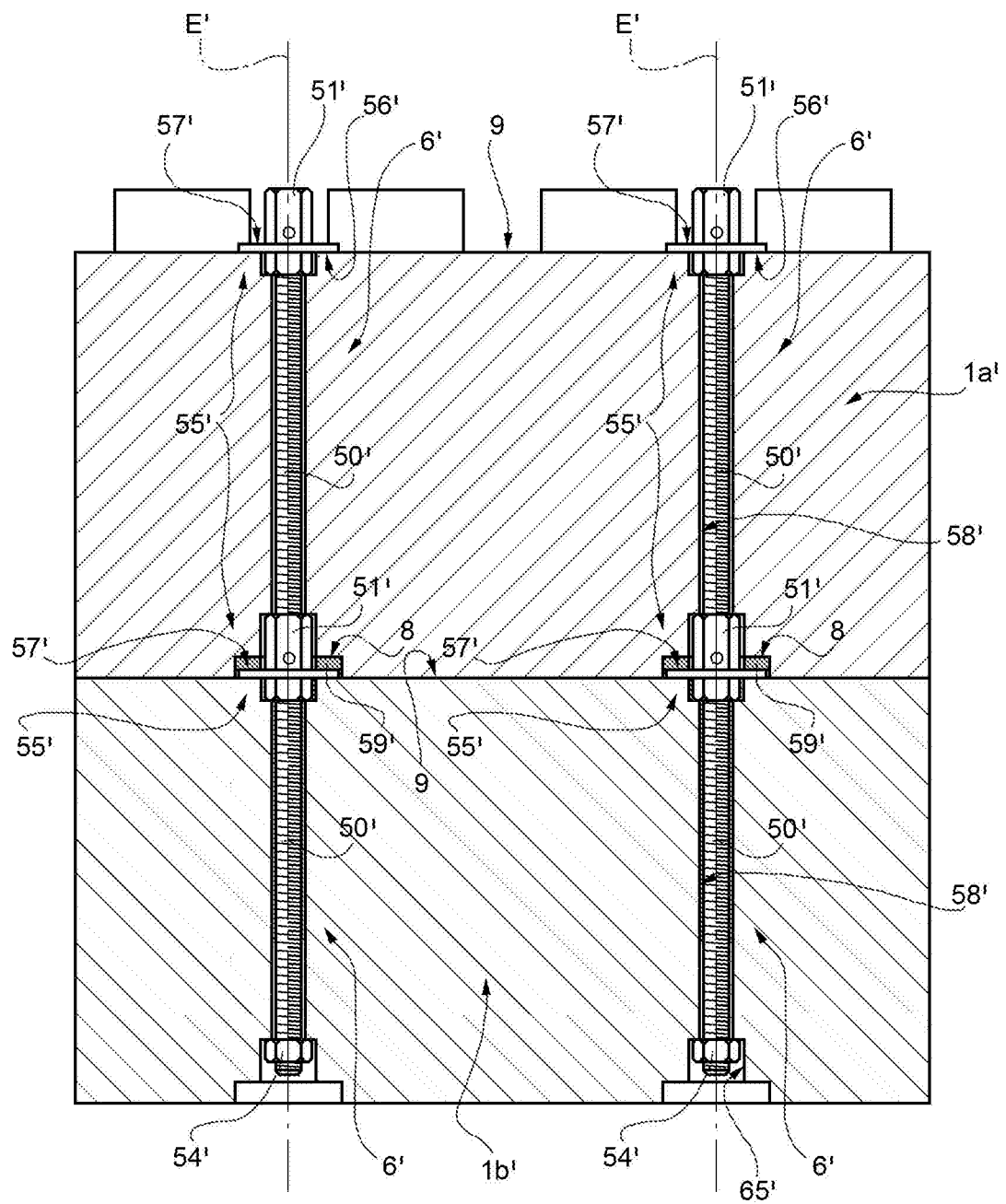


FIG. 8

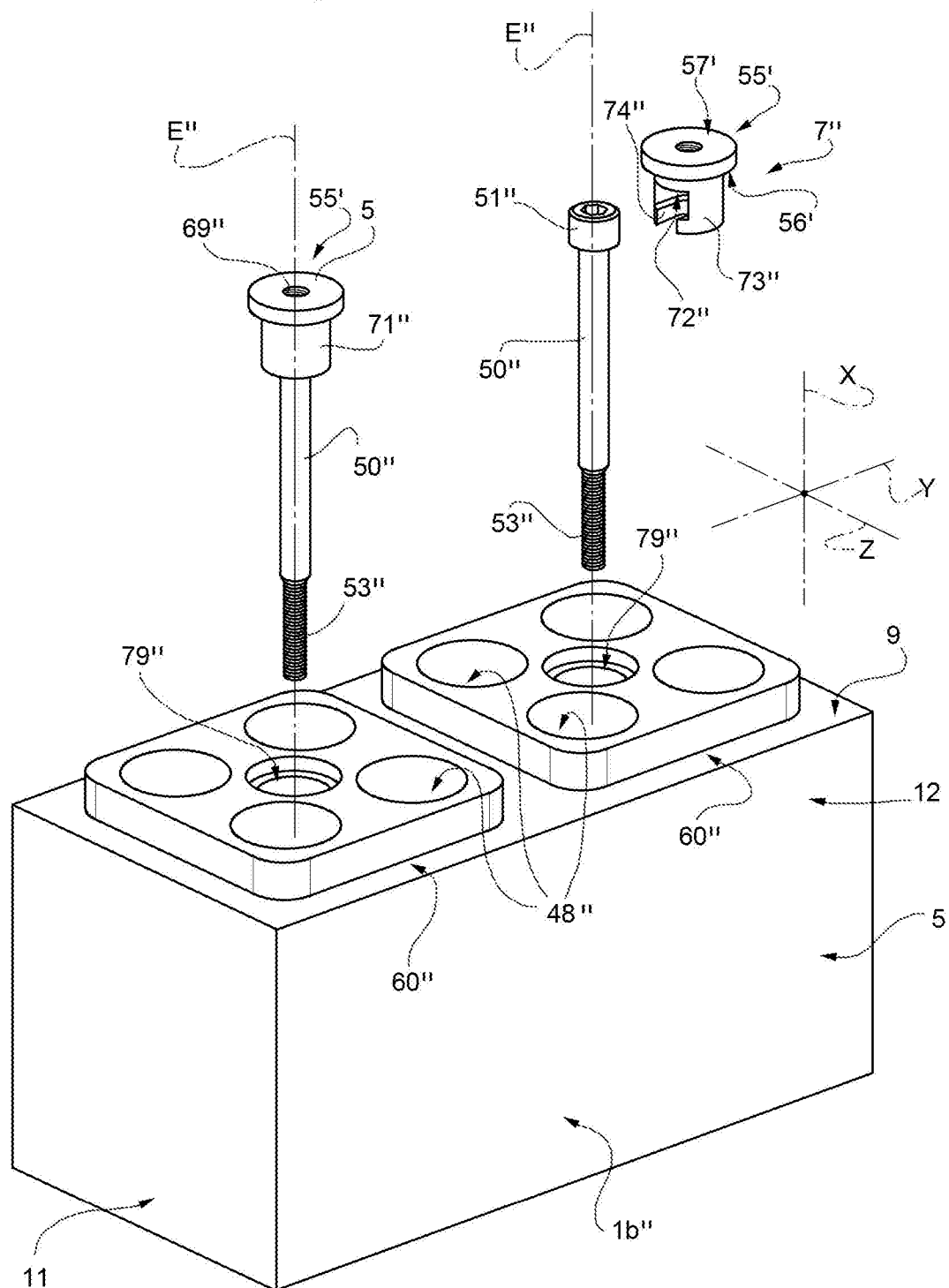
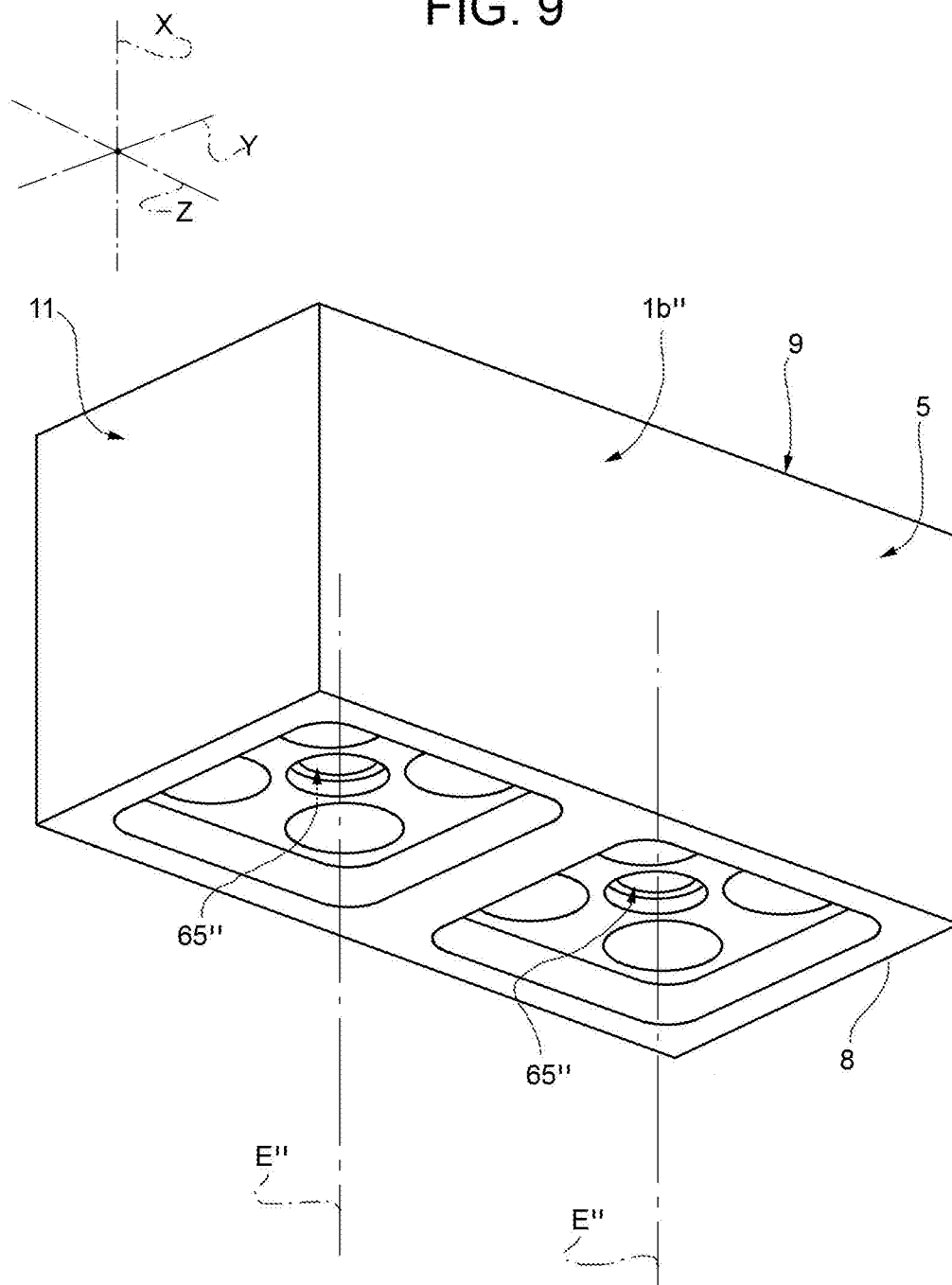


FIG. 9



INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2013/060643

A. CLASSIFICATION OF SUBJECT MATTER

INV. E04B2/06 E04C1/39
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E04B E04C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 498 555 A2 (VAN DEN BERKMORTEL HERR HUBERT [LU]) 19 January 2005 (2005-01-19)	1-6,10, 19,20, 26,27
Y	paragraph [0013] - paragraph [0022]; figures 1,2,5,6	7-9,11, 12
X	US 1 444 554 A (EDMOND QUILLET) 6 February 1923 (1923-02-06)	1-6,10, 19,20, 26,27
Y	the whole document	7,8
X	US 2 700 295 A (ROLF GILDE) 25 January 1955 (1955-01-25) figures 1-3, 6	1-3,10
	-/--	

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

12 March 2014

Date of mailing of the international search report

19/03/2014

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INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2013/060643

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	WO 2006/075827 A1 (HEO JONG-SAM [KR]) 20 July 2006 (2006-07-20) figures 1, 3 -----	11
A	FR 1 062 502 A (BERGERIOUX) 23 April 1954 (1954-04-23) figures 15-17 -----	11

INTERNATIONAL SEARCH REPORT

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International application No

PCT/IB2013/060643

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