(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 802 715 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
28.09.2016 Bulletin 2016/39

(21) Application number: **12824714.5**

(22) Date of filing: **21.12.2012**

(51) Int Cl.:
E04B 2/86 *(2006.01)*

(86) International application number:
PCT/IB2012/057580

(87) International publication number:
WO 2013/093866 (27.06.2013 Gazette 2013/26)

(54) **THRUST CONTAINMENT FRAME FOR A LOST FORMWORK.**

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(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

(30) Priority: **22.12.2011 IT BO20110755**

(43) Date of publication of application:
19.11.2014 Bulletin 2014/47

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Printed by Jouve, 75001 PARIS (FR)

Description

Technical field

[0001] This invention relates to a thrust containment frame for a disposable form. The invention applies to the building sector, and in particular to the construction of buildings with load-bearing partitions.

Background art

[0002] Numerous solutions are known in the prior art for the construction of multistorey residential buildings with load-bearing partitions by the installation of load-bearing panels provided with metal reinforcement (generally made of steel) embedded in a volume of construction material, such as concrete, mortar or the like.

[0003] Depending on the structural needs and the climatic-territorial characteristics of the construction area, it is possible to use so-called "single" panels, that is, which act as internal support for the outer casting (of concrete), or "double" panels, that is, which act as disposable form for the inner casting.

[0004] In this text reference will be made in particular to forms, and specifically to thrust containment frames to be mounted on the outside of panels so as to contain the hydrostatic thrusts of the concrete casting as the hollow space inside the form is filled.

[0005] In the prior art, such frames are mainly made in-place, by anchoring long horizontal metal bars which have a containment action on two or more adjacent panels.

[0006] The bars mainly press against wooden thrust containment sheets (usually recognisable by their yellow colour) which abut against the panel of the form to distribute the stresses.

[0007] The bars are usually fitted after vertical positioning of all of the panels (and therefore of the forms) and anchored using suitable tapered pins. Disadvantageously, that requires a considerable amount of time and effort by the operator who must mount, in a way that is certainly not easy, the horizontal (and vertical) chains of the thrust containment frame.

[0008] Moreover, considering that the bars are not made to measure, there are often gaps which are difficult to block at one or more of the corner zones of the building.

[0009] Moreover, it should be noticed that anchoring between the thrust containment structural work and the frame is produced using non-removable metal plates or bars, which after the casting are broken to allow removal of the panel structural work.

[0010] For example, thrust containment structure of the prior art are known form documents DE19643800 and US5375809.

Disclosure of the invention

[0011] The aim of this invention is to provide a thrust containment frame for disposable forms that overcomes the above-mentioned drawbacks of the prior art.

[0012] In particular, this invention has for an aim to provide a thrust containment frame for disposable forms which is very strong and easy to fit.

[0013] Moreover, this invention has for an aim to provide a thrust containment frame for disposable forms which is modular and fully reusable.

[0014] These aims are fulfilled by a thrust containment frame according to one or more of the claims.

Brief description of the drawings

[0015] This and other features of the invention will become more apparent from the following description of a preferred, non-limiting embodiment of it, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a thrust containment frame according to this invention;
Figure 2 is a perspective view of a form comprising the frame of Figure 1;
Figure 3 is a perspective view of a pair of forms which are connected to each other;
Figure 4 is a cross section of a form without the frame according to this invention;
Figure 5 is a top view of the frame of Figure 1;
Figure 6 is a top view of a form according to this invention, that is to say, provided with the frame according to this invention;
Figure 6a is an enlarged view of a detail from Figure 6.

Detailed description of the preferred embodiments of the invention

[0016] With reference to the accompanying drawings, the numeral 100 denotes a thrust containment frame for a disposable or non-reusable (construction) form according to this invention.

[0017] Each form 20 (or formwork) comprises a pair of construction panels 10. Preferably, each panel 10 is provided with a reinforcement mesh 1 to be embedded in the concrete after casting so as to create the reinforced concrete structure.

[0018] The mesh 1 comprises a plurality of metal bars 2, 3 (preferably made of construction steel) mutually arranged to create a grid of first 2 and second bars 3 intersecting each other.

[0019] Thus, the first bars 2 are at right angles to the second bars 3 and each second bar 3 is connected to all the first bars 2 at respective coupling nodes 4 (where the bars are jointed by a hook made of harmonic steel).

[0020] The mesh 1 comprises at a least a pair of first bars 2 and a plurality of second bars 3.

[0021] Both the first 2 and the second bars 3 are parallel with each other and spaced with a predetermined spacing.

[0022] In other words, the first bars 2 are parallel with, and at a predetermined distance from, each other.

[0023] Similarly, the second bars 3 are parallel with, and at a predetermined distance from, each other.

[0024] In use, the mesh is applied on the face of a panel 10 (which will be described in more detail below) preferably by arc-welding.

[0025] After installation, the first bars 2 are, again in use, orientated vertically, whilst the second bars 3 are oriented horizontally.

[0026] Thus, the first bars 2 define (in combination with the corresponding first bars 2 of a panel 10 above or below) the vertical chains of the partition. Similarly, the second bars 3 define (in combination with the corresponding second bars 3 of an adjacent panel 10) the horizontal chains of the partition.

[0027] In this regard, it should be noted that each second bar 3 extends along a respective main direction between a first end 3a and a second end 3b, each provided with a through socket 5.

[0028] In other words, each second bar 3 has two terminal portions having a through annular element 6.

[0029] More specifically, each end 3a, 3b is formed by a terminal portion 7 bent back on itself, for forming the socket 5, and in part superposed on the body of the second bar 3 for reinforcing it.

[0030] In other words, the terminal portions 7 of a single second bar 3 are folded back on themselves (by special folding means) for forming the socket 5, clousing on the intermediate section of bar nearest to the socket with a superposed portion of a predetermined length (in the embodiment illustrated 10 centimetres).

[0031] Preferably, a distance between the centres of the sockets 5 of each horizontal bar substantially corresponds to the width of the panel 10 on which the mesh 1 is mounted.

[0032] Moreover, each through socket 5 is substantially coaxial with the through sockets 5 of the corresponding ends 3a, 3b of the other second bars 3 (of the same mesh 1) so as to define a joining line.

[0033] Said joining line may run along a third bar 6 for the connection, during assembly, of two meshes 1 adjacent to each other.

[0034] n other words, the sockets 5 of the second ends 3b of the second bars 3 of a single panel 1) are aligned with each other along the above-mentioned joining line, which is vertical in use.

[0035] Similarly, the sockets 5 of the first ends 3a of the second bars 3 (of a single panel 1) are aligned with each other along the above-mentioned joining line, which is vertical in use.

[0036] Thus, during assembly, the meshes of two adjacent panels 10 are positioned in such a way that the sockets 5 of the second ends 3b of the second bars 3 of one mesh 1 are aligned with the sockets 5 of the first ends 3a of the second bars 3 of the other mesh 1.

[0037] As already indicated, this alignment allows the insertion in the sockets 5 of a third bar 6 for connection and stiffening of the building structure.

[0038] The third bar 6 preferably has a diameter (or, more generally, a cross-section) greater than that of the first and second bars 2, 3.

[0039] Still more preferably, the third bar 6 has a cross-section such that its shear strength is greater than the tensile/compressive strength of the first bars 2 and/or second bars 3.

[0040] In the embodiment illustrated, the first bars 2 and the second bars 3 are formed by deformed steel bars having a diameter of approximately 6 millimetres.

[0041] In accordance with that, the third bars 6 are formed by steel bars having a diameter of approximately 8 millimetres.

[0042] Advantageously, the presence of the sockets 5 allows prefabrication of the panels 10 already reinforced, thereby reducing the complexity of the work in situ.

[0043] Moreover, the possibility of connecting together the second bars 3 of each mesh 1 using the third bar 6 allows the number of vertical chains for each panel 10 to be increased, thereby increasing the strength of the partition. The first main function of the panel 10 is as a central support for receiving construction material 11 (mortar class C25/30, concrete preferably class C25/30 or compacted soil) on its outer faces in the "single panel" type or inside a hollow space between two panels, which act as a disposable (non-reusable) form, in the "double panel" type.

[0044] Moreover, the panel 10 also has the function of thermal protection for the walls, and its heat transmission must necessarily have a value less than, therefore better, than those set by the current regulations in the construction sector.

[0045] The panel 10, in the version illustrated, has a width of 1120 millimetres and a thickness of 100 millimetres. However, the dimensions of the panel can change considerably depending on the use and purposes of the building.

[0046] It should be noticed that each panel 10 has at least one first face 10a provided with a plurality of longitudinal (vertical) protrusions 11 (so as to form a sequence of grooves 12 in which the construction material (concrete or mortar) is inserted for gripping the panel 10.

[0047] These protrusions 11 are preferably in the shape of trapezoidal corrugations (in the embodiment illustrated having thicknesses of approximately 16 millimetres).

[0048] Moreover, the panel 10 comprises a second face 10b, opposite the first face 10a, provided with a roughness such that is forms a sequence of small grooves and apexes (preferably micro-corrugations) for promoting improved adherence of the plaster.

[0049] Preferably, a lightweight mesh (not illustrated) is embedded in the panel 10, designed to stabilise the panel, providing greater panel strength and reducing the likelihood of sliding between the two faces.

[0050] More precisely, the panel is made in two halves produced one after another (or separately) connected

together after interposing of the lightweight mesh.

[0051] In all its construction applications the panel 10 constitutes the wall of the buildings vertically joining one floor to the next.

[0052] This already has a defined height and a relative numbering during design and production, thus allowing an operator to position it without any confusion during the assembly of a wall.

[0053] Thus, the panels 10 arrive on site ready for assembly in accordance with an assembly diagram.

[0054] The construction steps start with the assembly of the panels 10 by tying them together, which is also facilitated by the overlapping of a spill over mesh (not illustrated). This is followed by alignment, vertical positioning, cross-bracing, if necessary, and casting.

[0055] As already indicated, for making the load-bearing partition, it is possible to use the panels 10 as a central core of the wall (single panel solution) or as a disposable form 20 defining a hollow space for receiving the casting (double panel solution).

[0056] In the form 20, or "double panel", assembly configuration, two panels 10 are mounted with the first faces 10a oriented in opposite directions (that is to say, facing each other) and spaced from each other so as to form a hollow space 21 for receiving the construction material (that is to say, the casting).

[0057] In other words, it comprises the same panels 10 used in the "single panel" type, but spaced and with the corrugations oriented in the opposite direction, that is, facing the inside.

[0058] In this configuration, the two panels 10 define a "disposable" or disposable form 20, since it is an integral part of the wall and not reusable. Preferably, the hollow space 21 has a variable thickness of between 12 and 22 centimetres, more preferably between 15 and 20 centimetres.

[0059] This provides a disposable form for constructing a wall made of reinforced concrete (class C25/30) which, for the purposes of the design, is considered to be lightly reinforced.

[0060] Preferably, for reasons which will be made clearer as this description continues, the panels 10 used for the form 20 are provided with a plurality of recesses 17 (or rather, conical flarings) on the second face 10b.

[0061] The recesses 17 are specially created in a half-part of the panel 10.

[0062] The panels 10, positioned opposite and spaced from each other, are connected by special through connectors 22 (preferably between 8 and 10 in number).

[0063] Each connector 22 comprises an elongate bar 23 extending along its own main axis between two end portions 23a, 23b and designed for passing through the form 20, transversally to it, from one panel 10 to the other.

[0064] The connector 22 also comprises a pair of contact elements 24 rigidly connected to the bar 23, at an intermediate portion 23c of the bar.

[0065] The contact elements 23 are located at a distance substantially corresponding to the distance between the meshes 1 of the two panels 1, so as to act as a spacer between the two.

[0066] In other words, the two contact elements 24 are located at a distance such that they keep the two panels 10 spaced from each other.

[0067] Preferably, the contact elements 24 are formed by two washers or bars welded on the bar 23 which abut and press the meshes 1 inside the form 20.

[0068] The welded bars are basically portions of reinforcement bars (similar to the first and second bars 2, 3 described above) folded into a "U" or cross shape and welded.

[0069] The contact elements 24 preferably act on the meshes 1 at the nodes 4. Advantageously, the presence of the lightweight mesh 18 distributes the action of the contact elements 24 along the entire surface of the panel 10.

[0070] Moreover, the connector 22 comprises adjustable pressing means 25 associated with the end portions 23a, 23b of the bar 23 for pressing each panel 10 and the respective mesh 1 against the respective contact element 24.

[0071] In other words, the connector 22 is substantially divided into three aligned portions.

[0072] An intermediate portion (interposed between the contact elements 24) acts as a spacer between the two panels 10 (and the two meshes 1), whilst the two end portions 23a, 23b act as fastening portions, keeping the panels 10 anchored to the respective meshes.

[0073] Preferably, both the end portions 23a, 23b of the bar 23 are provided with a thread 26 engageable with a suitable pressing nut 27.

[0074] The threads 26 and the respective nuts 27 thereby form the adjustable pressing means 25.

[0075] Alternatively, the pressing means could be formed by a snap-on or pressure coupling between a pressing body (similar to the nut 27) and the bar 23.

[0076] Preferably, the threads 26 (and thus the end portions 23a, 23b of the bar 23) cross the panel 10 at the recesses 17 (or conical flarings) mentioned previously.

[0077] In other words, the ends of the connector 22 have long threads which lead to the outside of the panels 10 at the recesses (specially created in a half-part of panel 10). Preferably, the depth of this recess 17 coincides with a gripping grid (not illustrated) inserted at the centre of the panel 10.

[0078] In use, the nut 27 of the pressing means is located inside the conical flaring, which is subsequently filled with concrete (or the like) to prevent the connector 22 from forming a "thermal bridge" between the outside and inside of the building.

[0079] A sufficient quantity of free thread 26 remains at the end portions 23a, 23b of the connector 22 to allow the anchoring to it of the thrust containment frame 100 according to this invention.

[0080] The thrust containment frame 100 is simply a piece of structural work needed to contain the thrust of the concrete casting.

[0081] Said frame 100, which is the subject matter of this invention, can be connected to the panel and in particular to an end portion 23a, 23b of the connector 22.

[0082] The thrust containment frame 100 comprises at least one upright 101 and a plurality of crosspieces 102, preferably tubular, extending parallel with each other between respective first ends 102a and second ends 102b along a direction of extension "A" which is at a right angle to the upright 101.

[0083] The crosspieces 102 are connected to the upright 101 at respective nodes 103.

[0084] Preferably, the frame 100 comprises a plurality of uprights 101, more preferably two.

[0085] In the embodiment illustrated, the frame 100 comprises five crosspieces 102.

[0086] In other words, the frame 100 substantially has a reticular structure.

[0087] As already indicated, the crosspieces 102 are tubular, therefore a through cavity 105 passes through them along their direction of extension "A". Preferably, the crosspieces 102 have a prismatic shape (that is to say, with a polygonal cross-section).

[0088] Therefore, each crosspiece 102 is formed by a plurality of lateral walls 102c which are interconnected to define the perimeter of the cavity 105.

[0089] It should be noticed that at least one of the lateral walls 102c is, in use, abutted against the panel 10 in such a way as to divide the hydrostatic loads in such a way that there is improved distribution of them.

[0090] For that purpose, it should also be noticed that the crosspieces 102 comprise an extension (in a direction parallel with the direction of extension "A") equal to the width of the panel 10 to which they are coupled.

[0091] Therefore, the distance between a terminal portion of the first end 102a and a terminal portion of the second end 102b of each crosspiece 102 is substantially equal to the width of the panel 10 on which the frame 100 is mounted.

[0092] In other words, the length of the crosspieces 102 (that is to say, the width of the frame 100) is equal to the width of the panel 10.

[0093] In the preferred embodiment, the crosspieces 102 have a substantially quadrilateral cross-section.

[0094] Similarly, the through cavity 105 in each crosspiece 102 has a quadrilateral cross-section.

[0095] Therefore, each crosspiece 102 has four lateral walls 102c, preferably parallel with each other in pairs.

[0096] In the embodiment illustrated, each crosspiece 102 has a cross-section which is approximately between 30mm x 20mm and 50mm x 40 mm, preferably being approximately 40mm x 30mm.

[0097] The thickness of each wall 102c is between 1 mm and 4 mm, preferably approximately 2mm.

[0098] As indicated, the uprights 101 extend orthogonally to the crosspieces 102 and preferably comprise an elongate body 106 with a curved cross-section comprising a base wall 106a and two lateral walls 106b which are facing each other.

[0099] The lateral walls 106b extend from the base wall 106a to form a "U"-shaped cross-section.

[0100] It should be noticed that the base wall 106a is oriented parallel with the tubular crosspieces 10 in such a way that it abuts against the panel 101 to divide the hydrostatic loads generated by the concrete casting.

[0101] In other words, the base wall is coplanar with the lateral walls 102c of the crosspieces 102 which, during use of the frame 10 (that is to say, when the frame 100 is mounted on the panel 10), are abutted against the panel 10.

[0102] Preferably, the uprights 101 have a length (corresponding to the height of the frame 100) which is less than the height of the panel 10, so that they do not interfere with the floor above the panel.

[0103] At each node 103 connecting the crosspieces 102 and the uprights 101, the frame 100 comprises removable anchoring means 104 designed for removably (that is to say, reversibly, between a coupled configuration and an uncoupled configuration) connecting the frame 100 and a panel 10 of the form 20.

[0104] Preferably, the anchoring means 104 are (manually) adjustable, for setting the tightening (that is to say, the retaining force applied on the frame 100). Said anchoring means 104 are at least partly formed by a plurality of coupling seats 104a each located at one of the nodes 103.

[0105] More precisely, each coupling seat 104 is formed by a pair of through openings 107 opposite each other and aligned along an axis "B" passing through the tubular crosspiece which is at a right angle both to the crosspiece 102 itself and to the upright 101 (or uprights 101). In other words, at each node the two openings 107 form a corridor through each crosspiece 102 at a right angle to the direction of extension "A" of the crosspiece 102.

[0106] For that purpose, the anchoring means 104 are provided with connecting units 108 which can be associated with the coupling seats 104 and can be constrained to the panel 10 for anchoring the frame 100 to the panel 10.

[0107] Preferably, each connecting unit 108 has an elongate shape, so that it passes through the openings 107 (that is to say, the corridor 107a) and is anchored to the panel 10.

[0108] In particular, the connecting units 108 can be connected (in use, are connected) to the connector 22, and even more particularly to an end portion 23a, 23b of it.

[0109] More precisely, each connecting unit 108 comprises a portion 108a for connecting with the panel 10, sized to pass through the openings 107 (that is to say, the corridor 107a), and a contact portion 108b provided with a contact element 109.

[0110] The contact element 109 has an extension (that is to say, a cross-section) which is greater than the opening 107, so that it makes contact with the crosspiece 102 at the respective node, holding it in contact with the panel 10.

[0111] Therefore, the connecting portion 108a and the contact portion 108b are on opposite sides of the connecting unit 108.

[0112] In use, the connecting portion 108a and the contact portion 104b are on opposite sides of the crosspiece 102, each located on the outside of an opening 107, close to it.

[0113] In the preferred embodiment, the connecting unit 108 comprises a tubular body 28, threaded internally, and screwable with the thread 26 of a respective end portion 23a, 23b of the bar 23.

[0114] Each tubular body 28 is thus crossed by a threaded through cavity.

[0115] The thread forms the connecting portion 108a.

[0116] Alternatively, as in the case of the pressing means, the coupling could be obtained by a snap-on or pressure mechanism.

[0117] The tubular bodies 28 comprise an abutment shoulder 28a protruding radially (forming the contact element 109 of the contact portion 108b).

[0118] A space is thus formed between the abutment shoulder 28a and the second face 10b of the panel 10, the space being variable according to the coupling between tubular body 28 and bar 23 (in particular, according to the screwing of the tubular body 28 on the thread 26).

[0119] The abutment shoulder 28a is preferably formed by a body welded to the tubular body 28.

[0120] Alternatively, a thread outside the tubular body 28 can be provided to allow the screwing of a nut (provided with washer) so as to allow a better adjustment of the space between the abutment shoulder (in that case defined by the nut-washer pairing) and the panel 10.

[0121] A crosspiece 102 of the frame 100 can be positioned (and clamped) in that space.

[0122] Advantageously, the possibility of connecting the frame 100 directly to the panel 10 allows the form and the related thrust containment structural work (frame 100) to be assembled on the ground, without the need to assemble it all in situ (on site), which allows significant savings in terms of time and money.

[0123] Preferably, the tubular crosspieces 102 are distributed along the uprights 101 with a density decreasing from a first end 101a, in use the lower end, to a second end 101b, in use the upper end, of the upright 101.

[0124] In other words, close to the first end 101a of the upright 101, the distance between two successive crosspieces is less than the distance between two successive crosspieces 102 located close to the second end 101b.

[0125] In the preferred embodiment, the lower crosspiece 102 is approximately 35 cm from the first end 101 a of the upright 100 and approximately 55 cm from the next crosspiece.

[0126] From the second onwards, the crosspieces 102 are spaced by approximately 60 cm.

[0127] Advantageously, that increases the strength of the frame 100 which, due to the distribution of the pressures during the casting, is stressed more at the base of the panel 10.

[0128] The frame 100 also comprises connecting means 110 located at the second end 102b of each tubular crosspiece 102 and designed for anchoring said second end to the first end 102a of a corresponding tubular crosspiece 102 of an adjacent frame 100.

[0129] In other words, at the second end 102a of the crosspieces 102, the frame 100 comprises a connecting unit designed to connect two adjacent crosspieces 102 (of two adjacent frames).

[0130] Advantageously, in that way the frame 100 is of the modular type, that is to say, each frame 100 forms a single module of the structure for the containment of hydrostatic thrusts (that is to say, the whole structure consisting of the frames combined with each other to cover the perimeter of the building).

[0131] Therefore, the crosspieces 102 adjacent to one another and rigidly connected form a plurality of horizontal chains for containment of the hydrostatic thrusts.

[0132] The connecting means 110 comprise a plurality of extension elements 111 each slidably associated with the second end 102b of a tubular crosspiece 102 in such a way as to form a telescopic structure. Each extension element 111 is designed for coupling with the first end 102a of a corresponding tubular crosspiece 102 of an adjacent frame 100. Advantageously, in that way it is possible to position the frames, then connect them to one another afterwards.

[0133] It should be noticed that the possibility of rigidly connecting each crosspiece 102 to the crosspiece adjacent to it promotes the straightness of the wall and allows installation errors to be minimised.

[0134] In the preferred embodiment, each extension element 111 can be slidably inserted in a corresponding first end 102a of a tubular crosspiece 102 of the adjacent thrust containment frame 100.

[0135] Therefore, the extension elements 111 have a cross-section (transversal to the direction of extension "A" of the crosspiece 102) whose area is less than the cavity 105 at the first end 102a of the crosspiece 102. Alternatively, the coupling may be inverted, with the first end 102a of the crosspiece 102 insertable in the extension element, which in that case is hollow inside.

[0136] Preferably, the connecting means 110 comprise at least one locking element 112 for stopping sliding, which can engage with the extension element 111 for rigidly constraining it to the crosspiece 102 in at least one operating position.

[0137] In that operating position the extension element 11 is inserted in the crosspiece 102 of the adjacent frame 100.

[0138] Preferably, at the second end 102b, each crosspiece 102 comprises a longitudinal slot 115 extending parallel with the direction of extension "A". Therefore, the slot 115 is substantially straight.

[0139] Opposite the slot 115 (that is to say, on the lateral wall 102c opposite that in which the slot 115 is made), each crosspiece comprises at least one through hole 116 facing the slot 115.

[0140] Similarly, each extension element 111 comprises at least one through aperture 117 which can be aligned with the through hole 116 in such a way as to allow the insertion of a locking pin 114 (forming the locking element 112).

[0141] Alternatively (or in combination), there may be a through hole (not illustrated) made at the first end 102a of the crosspiece 102 and alignable with the through aperture 117 of the extension element 111.

[0142] In that way the pin 114 would be insertable in said through aperture 117 and through hole to define the operating position.

[0143] Advantageously, that makes it possible to prevent any play developed during the life of the frame from compromising the possibility of assembling it.

[0144] Preferably, the lateral wall 102c comprising the through hole 116 comprises a further through hole 116a.

[0145] Said further through hole 116a is aligned with the through hole 116 and distal from the second end 102b of the crosspiece 102 relative to it. In that way, it is possible to lock the extension element 111 in two different positions, the operating position, previously described, and a home position in which the extension element is inserted (substantially fully) in its crosspiece 102.

[0146] In that way, anchoring between two adjacent frames 100 is fast and easy. Preferably, each pin 114 is substantially hook-shaped.

[0147] In other words, each pin 114 comprises a straight portion 114a which can be inserted in the slot 115 and in the through holes 116, 116a and the through aperture 117, and a curved portion 114b shaped to (at least partly) encompass the perimeter of the tubular crosspiece 104.

[0148] Preferably, the pin 114 is at least partly elastic (flexible) so that it is deformable during insertion, gripping a lateral wall 102c (in use, the lower one) of the crosspiece 102 once in position.

[0149] In the embodiment illustrated, the curved portion 114b is substantially squared in such a way that it precisely encompasses the crosspiece 102, which has a quadrilateral cross-section.

[0150] Advantageously, the possibility of connecting the frames 100 to the panels 10 using removable units (for example, the tubular bodies 28), as well as that of connecting adjacent frames 100 using removable pins 114, renders fast and easy both the assembly and removal of the building containment structural work, which is fully reusable for buildings of the most diverse sizes.

[0151] In fact, once the structural work has been removed, there is no remaining race of the frames in the building, and to plaster the wall it is sufficient to apply on the walls small fibreglass meshes, which are available on the market and used in the plastering of cladding.

[0152] t should be noticed that, as an optional and auxiliary element, the extension elements of the frame 100 may be substituted with further angular extension elements (not illustrated), which are formed by a pair of straight portions that are angularly offset from each other and connected to define a predetermined angular value (preferably 90°).

[0153] Advantageously, in that way it is possible to rigidly connect together two frames of two separate walls, which are positioned transversally to one another.

[0154] In this way no gaps are created in the corner zones of the building and the containment of the thrusts is more efficient.

[0155] Therefore, during concrete casting, the casting containment structure comprises a plurality of forms 20 positioned side by side to define the walls of a building and a first and a second plurality of frames 100 as described above.

[0156] The frames 100 of the first plurality are side by side and rigidly connected to form a building inner containment chain.

[0157] The frames 100 of the second plurality are side by side and rigidly connected to form a building outer containment chain.

[0158] The method for making a disposable form therefore comprises the following steps:

- preparing a first and a second construction panel (made of polystyrene or other material);
- preparing a reinforcement mesh for each panel;
- connecting the reinforcement mesh to the respective panel using suitable joints;
- connecting the two panels to each other to produce a form (preferably using the connector 22 described above);
- preparing a first and a second frame 100 according to this invention (therefore, as described above);
- fixing the first frame to the first panel (preferably using the tubular bodies 28 previously described);
- fixing the second frame to the second panel (preferably using the tubular bodies 28 previously described).

[0159] That method is repeated a plurality of times to produce a number of forms. It should be noticed that in that way it is possible to produce forms 20 already reinforced and provided with the respective thrust containment structural work (frames 100) on the ground, that is to say before installation.

[0160] At this point, the operator can:

- install a first form 20a;
- vertically position that first form 20a;
- install a second form 20b;
- vertically position that second form 20b;
- connect the frames 100 of the first form 20a (or the first frames 100) to the frames of the second form 100b (or second frames).

[0161] Preferably, that connection is made by inserting extension elements 111 of the first frames in the crosspiece 102 of the second frames.

[0162] The first and second frames are anchored to

one another by inserting pins in the special holes 113, 116, slots 115 and apertures 112.

[0163] By repeating said operations a plurality of times, the operator produces a substantially closed enclosure forming a room or building.

[0164] Therefore, at this point the concrete can be cast.

[0165] Once the concrete has dried, it is possible to remove the frames 100 by uncoupling the nodes 104 from the panel 10 (preferably by unscrewing the tubular bodies 28).

[0166] Advantageously, in that way the frames 100 according to this invention are perfectly recoverable and reusable for panels with the same dimensions (or multiples of them).

[0167] The invention achieves the preset aims and brings important advantages. In fact, thanks to the devices according to this invention it is possible to make buildings in a short time and with low costs, since there is a significant reduction in the time required for assembly and disassembly of the thrust containment frames (structural work).

[0168] Moreover, the even distribution of the structural work over the entire surface of the panel makes the division of hydrostatic loads particularly efficient and the structure reliable.

[0169] In addition, thanks to the modularity of the parts, it is possible to mount each frame to the corresponding panel already at the panel assembly step (that is to say, on the ground or in the machine), saving time and effort when the panel is vertically positioned in situ.

[0170] In fact, the assembly simplicity and the use of telescopic arms mean that the panels can be transported individually, then adjacent panels can be connected to one another directly in situ.

Claims

1. A thrust containment frame for a disposable construction form (20), comprising:

   - at least one upright (101);
   - a plurality of tubular crosspieces (102) extending parallel with each other between respective first ends (102a) and second ends (102b) along a direction of extension (A) which is at a right angle to the at least one upright (101); the crosspieces (102) being connected to the upright (101) at respective nodes (103);
   - removable anchoring means (104) designed for removably connecting the frame and a panel (10) of the form (20) and which can be switched between a coupling configuration and an uncoupling configuration; the anchoring means (104) being positioned and distributed at the nodes (103);

   characterised by comprising connecting means (110) located at the second end (102b) of each tubular crosspiece (102) and designed for anchoring said second end (102b) to the first end (102a) of a corresponding tubular crosspiece (102) of an adjacent frame, wherein the connecting means (110) comprise a plurality of extension elements (111) each slidably associated with the second end (102b) of a tubular crosspiece (102) in such a way as to form a telescopic structure and designed for coupling with the first end (102a) of a corresponding tubular crosspiece (102) of an adjacent frame.

2. The thrust containment frame according to claim 1, **characterised in that** the anchoring means (104) comprise a plurality of coupling seats each located at one of the nodes (103) and comprising a pair of through openings (107) opposite each other and aligned along an axis (B) passing through the tubular crosspiece (102); said axis (B) being at a right angle both to the crosspiece (102) itself and to said at least one upright (101); the anchoring means (104) also comprising a plurality of connecting units (108) each of which may be associated with a respective coupling seat and may be constrained to the panel (10) for anchoring the frame (100) to the panel (10).

3. The thrust containment frame according to claim 1, **characterised in that** the connecting means (110) comprise at least one locking element (112) for preventing sliding which can be engaged with the extension element (111) for rigidly constraining it to the crosspiece (102) in at least one operating position.

4. The thrust containment frame according to claim 3, **characterised in that** each tubular crosspiece (102) comprises, at its second end (102b), a longitudinal slot (115) extending parallel with the direction of extension (A) of the crosspiece (102) itself and, opposite said slot (115), at least one through hole (116); the locking element (112) comprising a pin (114) which can be inserted in the slot (115) and in the corresponding through hole (116) when the extension element (111) is in the operating position.

5. The thrust containment frame according to claim 4, **characterised in that** each pin (114) is substantially hook-shaped and comprises a straight portion (114a) which can be inserted in the slot (115) and in the through hole (116) and a curved portion (114b) shaped to at least partly encompass the perimeter of the tubular crosspiece (102).

6. The thrust containment frame according to any of the preceding claims, **characterised in that** each extension element (111) can be slidably inserted in a corresponding first end (102a) of a tubular crosspiece (102) of an adjacent thrust containment frame.

7. The thrust containment frame according to any of the foregoing claims, **characterised in that** the tubular crosspieces (102) are distributed along said at least one upright (101) with a density decreasing from a first end (101 a), in practice the lower end, to a second end (101b), in practice the upper end, of the upright (101).

8. A hydrostatic thrust containment structure for forms, comprising:

- at least a first and a second frame (100) according to any of the foregoing claims, **characterised in that** each second end (102b) of the crosspieces (102) of the first frame (100) is connected to the first end (102a) of a corresponding crosspiece (102) of the second frame (100) by means of an extension element (111); each extension element being inserted in the first end (102a) of the crosspiece (102) of the second frame (100).

9. A system for making a reinforced concrete wall, comprising:

- a disposable form, comprising:

  a pair of panels (10) parallel to each other and spaced at a predetermined distance so as to form a hollow space (21) between them for receiving construction material, each of the panels (10) being provided with a reinforcement mesh (1) at its face (10a) inside the hollow space (21);
  a plurality of connectors (22) comprising an elongate bar (23) extending along its own main axis between two end portions (23a, 23b) and designed for passing through the form (20) from one panel (10) to the other transversally to it;

- a pair of thrust containment frames (100) according to any of the claims from 1 to **7**, each connected to a respective panel (10) of the form (20); the anchoring means (104) for the frames (100) comprising a plurality of reversible connecting units (108) each anchored to an end portion (23a) of one of the connectors (22).

Patentansprüche

1. Sicherheitshalterahmen für eine verlorene Bauform (20), umfassend:

- mindestens einen Pfosten (101);
- eine Vielzahl an rohrförmigen Kreuzverstrebungen (102), die sich parallel zueinander zwischen jeweiligen ersten Enden (102a) und zweiten Enden (102b) entlang einer Ausdehnungsrichtung (A) erstrecken, die in einem rechten Winkel zu dem mindestens einen Pfosten (101) angeordnet sind, wobei die Kreuzverstrebungen (102) mit dem Pfosten (101) an entsprechenden Knotenpunkten (103) verbunden sind;
- entfernbare Verankerungsmittel (104), die ausgestaltet sind, um den Rahmen und ein Paneel (10) der Form (20) lösbar zu verbinden und die zwischen einer Kupplungskonfiguration und einer Entkupplungskonfiguration gewechselt werden können, wobei die Verankerungsmittel (104) an den Knotenpunkten (103) positioniert und verteilt sind, **dadurch gekennzeichnet, dass** er Verbindungsmittel (110) umfasst, die am zweiten Ende (102) einer jeden rohrförmigen Kreuzverstrebung (102) angeordnet sind, und ausgestaltet, um das zweite Ende (102b) am ersten Ende (102a) einer entsprechenden Kreuzverstrebung (102) eines angrenzenden Rahmens zu verankern, wobei die Verbindungsmittel (110) eine Vielzahl an Ausdehnungselementen (111) umfassen, die jeweils verschiebbar mit dem zweiten Ende (102b) einer rohrförmigen Kreuzverstrebung (102) assoziiert sind, sodass eine Teleskopstruktur gebildet wird, und ausgestaltet, um mit dem ersten Ende (102a) einer entsprechenden rohrförmigen Kreuzverstrebung (102) eines angrenzenden Rahmens gekuppelt zu werden.

2. Sicherheitshalterahmen nach Anspruch 1, **dadurch gekennzeichnet, dass** die Verankerungsmittel (104) eine Vielzahl an Kupplungsaufnahmen umfassen, die jeweils an einem der Knotenpunkte (103) angeordnet sind, und umfassend ein Paar Durchführungsöffnungen (107), die gegenständig zueinander angeordnet und entlang einer Achse (B) ausgerichtet sind, führend durch die rohrförmige Kreuzverstrebung (102), wobei die Achse (B) in einem rechten Winkel sowohl zur Kreuzverstrebung (102) als auch zum mindestens einen Pfosten (101) angeordnet ist, wobei die Verankerungsmittel (104) zudem eine Vielzahl an Verbindungseinheiten (108) umfassen, von denen eine jede mit einer entsprechenden Kupplungsaufnahme assoziiert und fest mit dem Paneel (10) verbunden werden kann, um den Rahmen (100) am Paneel (10) zu verankern.

3. Sicherheitshalterahmen nach Anspruch 1, **dadurch gekennzeichnet, dass** die Verbindungsmittel (110) mindestens ein Verriegelungselement (112) umfassen, um das Verschieben zu verhindern, das mit dem Ausdehnungselement (111) in Eingriff gelangen kann, um dieses fest an der Kreuzverstrebung (102) in mindestens einer Betriebsposition zu fixieren.

4. Sicherheitshalterahmen nach Anspruch 3, **dadurch gekennzeichnet, dass** eine jede rohrförmige Kreuzverstrebung (102) an ihrem zweiten Ende (102b) eine Längsnut (115) umfasst, die sich parallel zur Ausdehnungsrichtung (A) der Kreuzverstrebung (102) erstreckt, und gegenständig zu dieser Nut (115) angeordnet mindestens eine Durchführungsöffnung (116), wobei das Verriegelungselement (112) einen Zapfen (114) umfasst, der in die Nut (115) und in die entsprechende Durchführungsöffnung (116) eingesetzt werden kann, wenn sich das Ausdehnungselement (111) in der Betriebsposition befindet.

5. Sicherheitshalterahmen nach Anspruch 4, **dadurch gekennzeichnet, dass** ein jeder Zapfen (114) im Wesentlichen hakenförmig ist und einen geraden Abschnitt (114a) aufweist, der in die Nut (115) und in die Durchführungsöffnung (116) eingesetzt werden kann, und einen gekrümmten Abschnitt (114b), der geformt ist, um mindestens teilweise den Umfang der rohrförmigen Kreuzverstrebung (102) einzufassen.

6. Sicherheitshalterahmen nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** ein jedes Ausdehnungselement (111) verschiebbar in ein entsprechendes erstes Ende (102a) einer rohrförmigen Kreuzverstrebung (102) eines angrenzenden Sicherheitshalterahmens eingesetzt werden kann.

7. Sicherheitshalterahmen nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die rohrförmige Kreuzverstrebungen (102) entlang des mindestens einen Pfostens (101) mit einer Dichte verteilt sind, die von einem ersten Ende (101a), in der Praxis dem unteren Ende, zu einem zweiten Ende (101b), in der Praxis dem oberen Ende, des Pfostens (101) abnimmt.

8. Hydrostatischer Sicherheitshaltestruktur für Formen, umfassend: mindestens einen ersten und einen zweiten Rahmen (100) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** ein jedes zweite Ende (102b) der Kreuzverstrebungen (102) des ersten Rahmens (100) mit dem ersten Ende (102a) einer entsprechenden Kreuzverstrebung (102) des zweiten Rahmens (100) mittels eines Ausdehnungselements (111) verbunden ist, wobei das Ausdehnungselement in das erste Ende (102a) der Kreuzverstrebung (102) des zweiten Rahmens (100) eingesetzt wird.

9. System zur Herstellung einer Stahlbetonwand, umfassend eine verlorene Form, umfassend:

- ein Paar Paneele (10), die parallel zueinander angeordnet und in einem vorgegebenen Abstand beabstandet sind, um einen Hohlraum (21) zwischen ihnen zu bilden, um Baumaterial aufzunehmen, wobei ein jedes der Paneele (10) mit einer Baustahlmatte (1) an ihrer Seite (10a) im Hohlraum (21) versehen ist;
- eine Vielzahl an Verbindern (22), umfassend einen länglichen Stab (23), der sich entlang seiner eigenen Hauptachse zwischen zwei Endabschnitten (23a, 23b) erstreckt und ausgestaltet ist, um durch die Form (20) von einem Paneel (10) zum anderen quer gerichtet dazu zu führen;
- ein Paar Sicherungshalterahmen (100) nach einem der Ansprüche 1 bis 7, jeweils verbunden mit einem jeweiligen Paneel (10) der Form (20), wobei die Verankerungsmittel (104) für die Rahmen (100) eine Vielzahl an reversiblen Verbindungseinheiten (108) umfassen, die jeweils an einem Endabschnitt (23a) von einem der Verbinder (22) verankert sind.

Revendications

1. Cadre de confinement de poussée pour un coffrage jetable (20), comprenant :

- au moins un montant (101) ;
- une pluralité de traverses tubulaires (102) se prolongeant de façon parallèle les unes aux autres entre des premières extrémités (102a) et des secondes extrémités (102b) respectives le long d'une direction d'extension (A) étant à angle droit par rapport à l'au moins un montant (101) ; les traverses (102) étant reliées au montant (101) au niveau de noeuds (103) respectifs ;
- des moyens d'ancrage amovibles (104) conçus pour relier de façon amovible le cadre et un panneau (10) du coffrage (20) et pouvant passer d'une configuration d'accouplement à une configuration de désaccouplement ; les moyens d'ancrage (104) étant positionnés et répartis au niveau des noeuds (103) ; **caractérisé en ce qu'**il comprend des moyens de raccordement (110) situés au niveau de la seconde extrémité (102b) de chaque traverse tubulaire (102) et conçus pour fixer ladite seconde extrémité (102b) à la première extrémité (102a) d'une traverse tubulaire correspondante (102) d'un cadre adjacent, dans lequel les moyens de raccordement (110) comprennent une pluralité d'éléments d'extension (111), chacun associé de façon coulissante à la seconde extrémité (102b) d'une traverse tubulaire (102) de manière à former une structure télescopique et conçu pour s'accoupler à la première extrémité (102a) d'une traverse tubulaire correspondante (102) d'un

cadre adjacent.

2. Cadre de confinement de poussée selon la revendication 1, **caractérisé en ce que** les moyens d'ancrage (104) comprennent une pluralité de sièges d'accouplement chacun situé à un des noeuds (103) et comprenant une paire d'ouvertures passantes (107) opposées l'une à l'autre et alignées le long d'un axe (B) passant à travers la traverse tubulaire (102) ; ledit axe (B) étant à angle droit à la fois avec la traverse (102) elle-même et avec ledit au moins un montant (101) ; les moyens d'ancrage (104) comprenant aussi une pluralité d'unités de raccordement (108) chacune pouvant être associée à un siège d'accouplement respectif et peut être solidaire du panneau (10) pour fixer le cadre (100) au panneau (10).

3. Cadre de confinement de poussée selon la revendication 1, **caractérisé en ce que** les moyens de raccordement (110) comprennent au moins un élément de verrouillage (112) pour empêcher le coulissement pouvant se mettre en prise avec l'élément d'extension (111) pour le fixer rigidement à la traverse (102) dans au moins une position de fonctionnement.

4. Cadre de confinement de poussée selon la revendication 3, **caractérisé en ce que** chaque traverse tubulaire (102) comprend, à sa seconde extrémité (102b), une fente longitudinale (115) se prolongeant parallèlement à la direction d'extension (A) de la traverse (102) elle-même et, à l'opposé de ladite fente (115), au moins un trou passant (116) ; l'élément de verrouillage (112) comprenant une cheville (114) pouvant être insérée dans la fente (115) et dans le trou passant correspondant (116) lorsque l'élément d'extension (111) se trouve dans la position de fonctionnement.

5. Cadre de confinement de poussée selon la revendication 4, **caractérisé en ce que** chaque cheville (114) est substantiellement en forme de crochet et comprend une portion rectiligne (114a) pouvant être insérée dans la fente (115) et dans le trou passant (116) ainsi qu'une portion incurvée (114b) façonnée pour au moins en partie englober le périmètre de la traverse tubulaire (102).

6. Cadre de confinement de poussée selon l'une quelconque des revendications précédentes, **caractérisé en ce que** chaque élément d'extension (111) peut être inséré de façon coulissante dans une première extrémité correspondante (102a) d'une traverse tubulaire (102) d'un cadre de confinement de poussée adjacent.

7. Cadre de confinement de poussée selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les traverses tubulaires (102) sont réparties le long dudit au moins un montant (101) avec une densité décroissante à partir d'une première extrémité (101a), en pratique l'extrémité inférieure, jusqu'à une seconde extrémité (101b), en pratique l'extrémité supérieure, du montant (101).

8. Structure de confinement de poussée hydrostatique pour coffrages, comprenant : au moins un premier et un second cadre (100) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** chaque seconde extrémité (102b) des traverses (102) du premier cadre (100) est relié à la première extrémité (102a) d'une traverse correspondante (102) du second cadre (100) au moyen d'un élément d'extension (111) ; chaque élément d'extension étant inséré dans la première extrémité (102a) de la traverse (102) du second cadre (100).

9. Système destiné à réaliser un mur en béton armé, comprenant un coffrage jetable, comprenant :

- une paire de panneaux (10) parallèles l'un à l'autre et espacés à une distance prédéfinie de manière à former une espace creux (21) entre eux pour recevoir du matériau de construction, chacun des panneaux (10) étant pourvu d'un maillage renforcé (1) au niveau de son côté (10a) à l'intérieur de l'espace creux (21) ;
- une pluralité de raccords (22) comprenant une barre allongée (23) se prolongeant le long de son propre axe principal entre deux portions d'extrémité (23a, 23b) et conçus pour passer à travers le coffrage (20) d'un panneau (10) à l'autre transversalement à celui-ci ;
- une paire de cadres de confinement de poussée (100) selon l'une quelconque des revendications de 1 à 7, chacun relié à un panneau respectif (10) du coffrage (20) ; les moyens d'ancrage (104) pour les cadres (100) comprenant une pluralité d'unités de raccordement réversibles (108) chacune reliée à une portion d'extrémité (23a) d'un des raccords (22).

FIG. 1

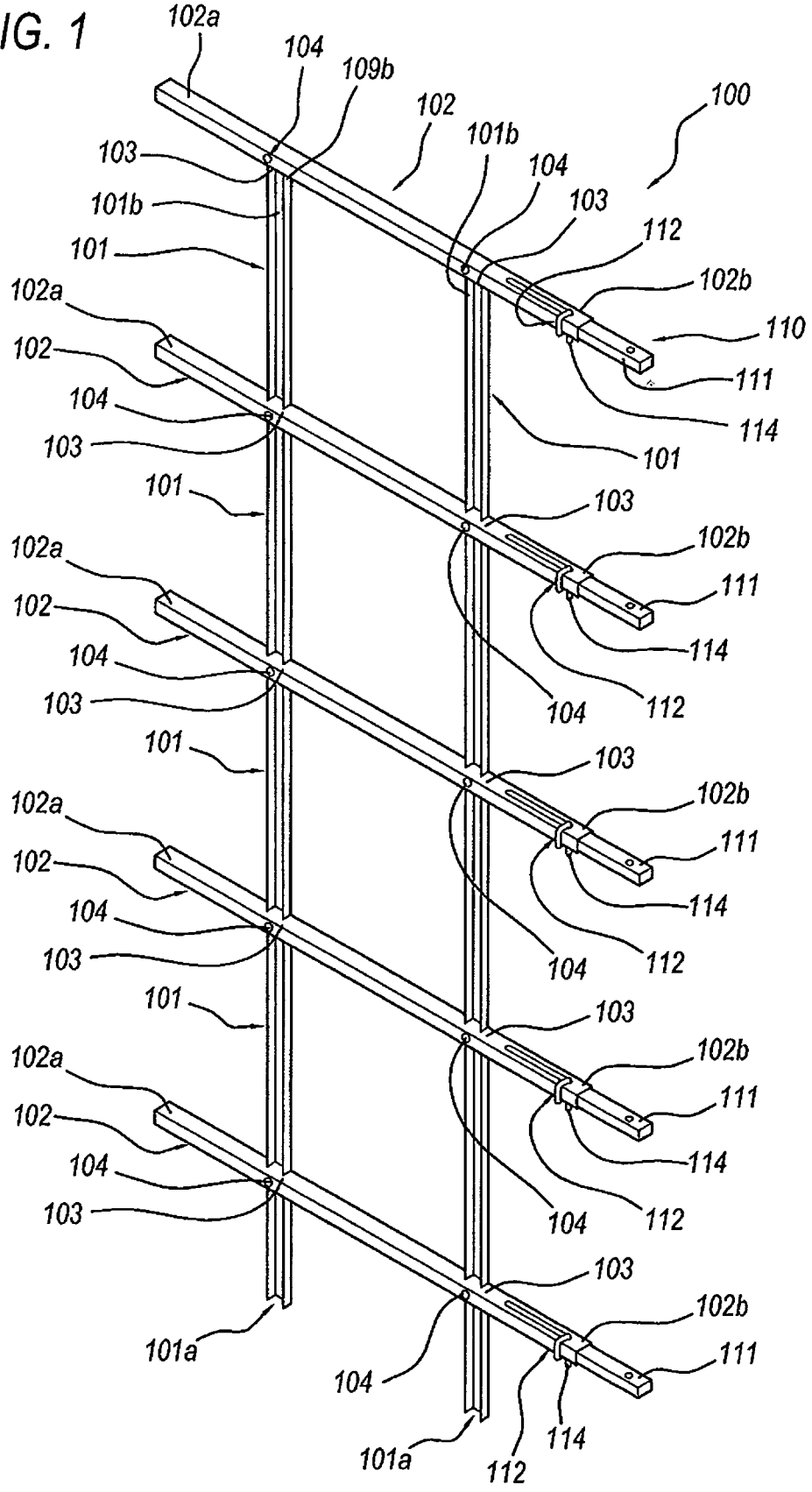

102a
104
109b
102
100
101b
103
104
103
112
101b
102b
101
110
102a
111
102
114
104
101
103
101
103
102b
102a
111
102
114
104
103
104
112
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102b
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102b
102a
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102
114
104
103
104
112
101
103
102b
102a
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102
114
104
103
104
112
101
103
102b
111
104
114
101a
112

FIG. 2

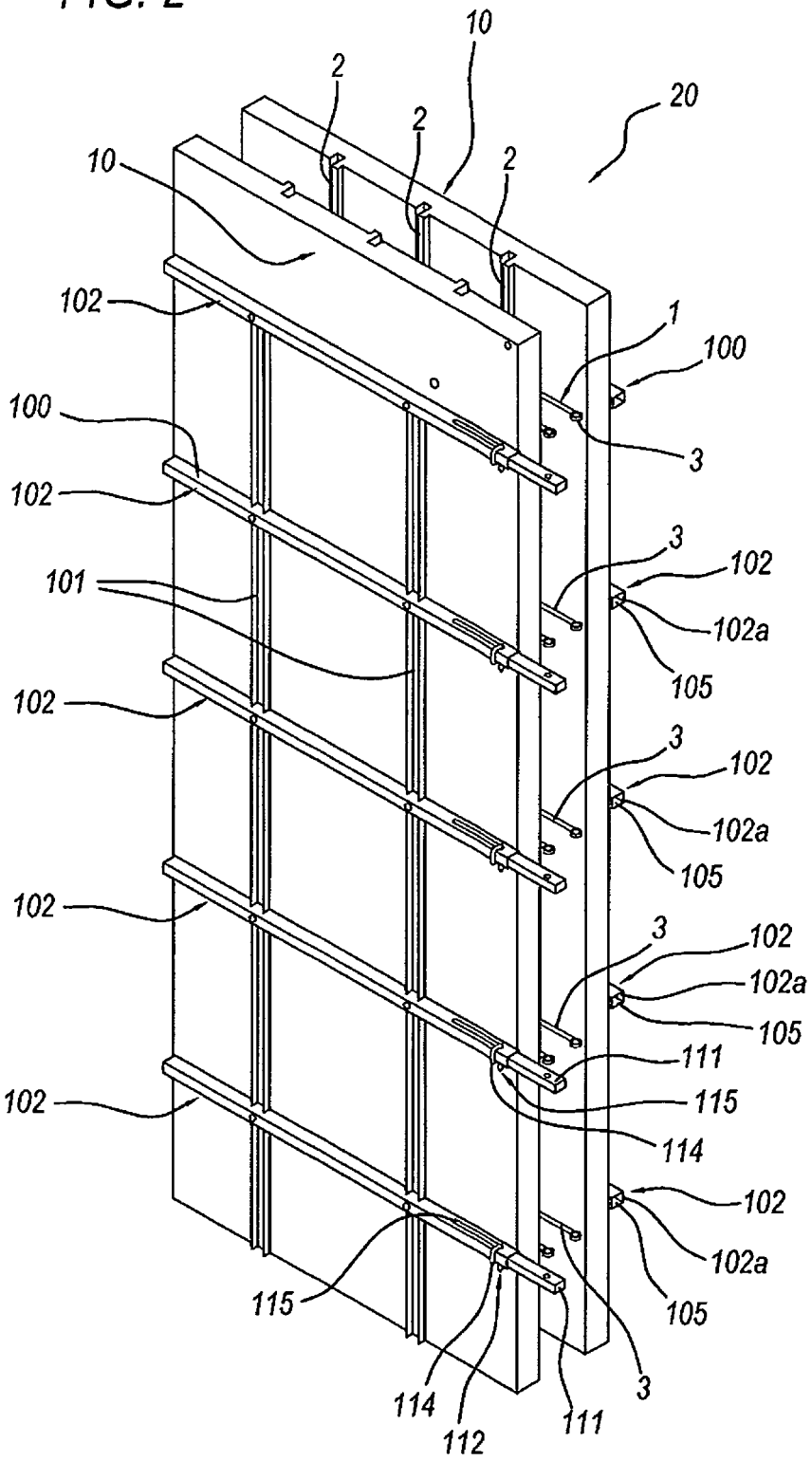

10
2
2
2
20
10
102
1
100
100
3
102
3
102
101
102a
105
102
3
102
102a
105
102
3
102
102a
105
111
102
115
114
102
102a
105
115
3
114
112
111

FIG. 3

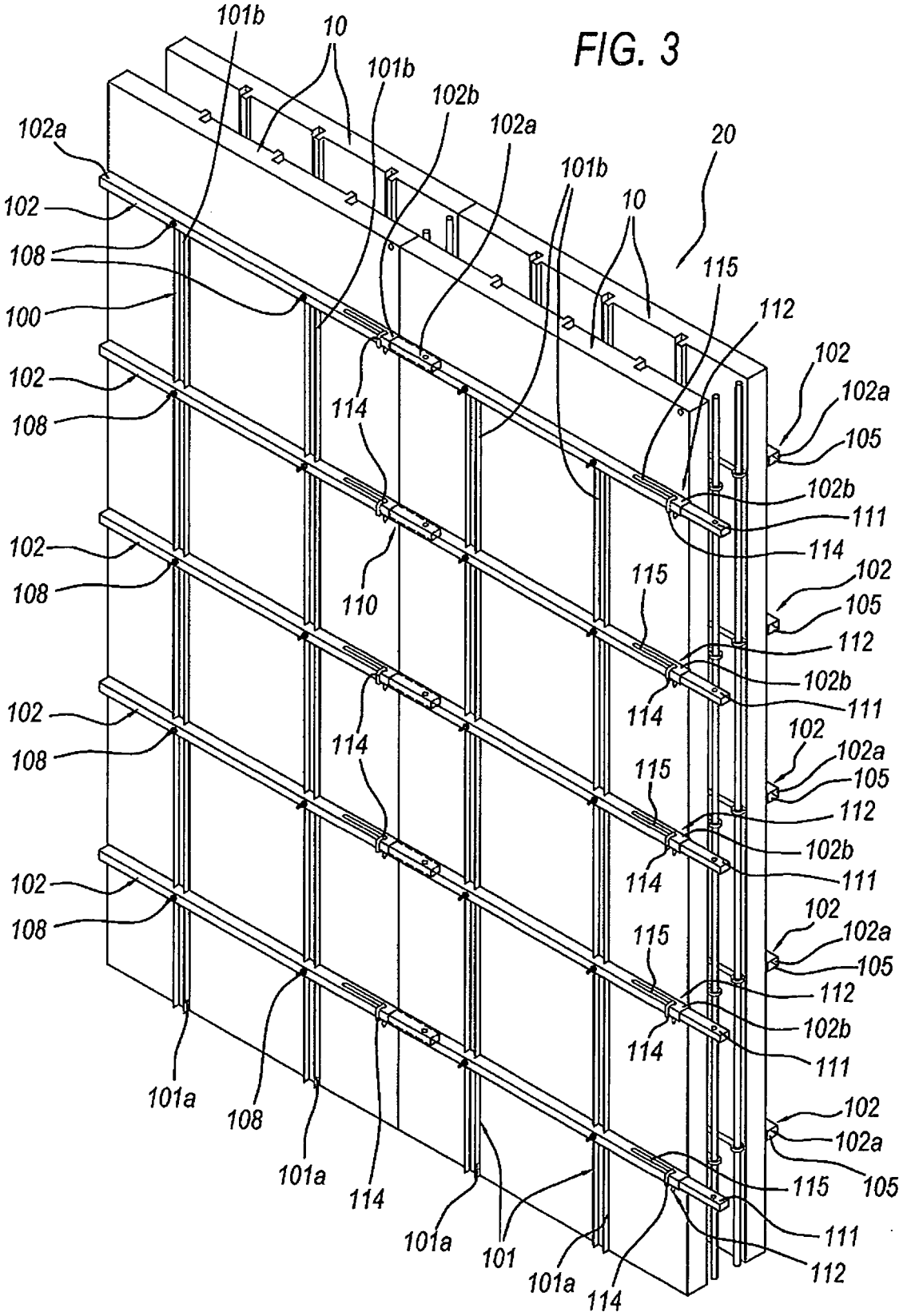

101b
10
101b
102b
102a
20
102a
101b
10
102
108
100
115
112
102
102a
105
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108
114
102b
111
114
102
105
102
108
110
115
112
102b
111
102
108
114
102
102a
115
105
112
102b
102
108
111
114
102
102a
115
105
112
102b
111
114
102
102a
105
112
102b
111
101a
108
101a
114
101a
101
101a
114
102
102a
115
105
111
112

FIG. 4

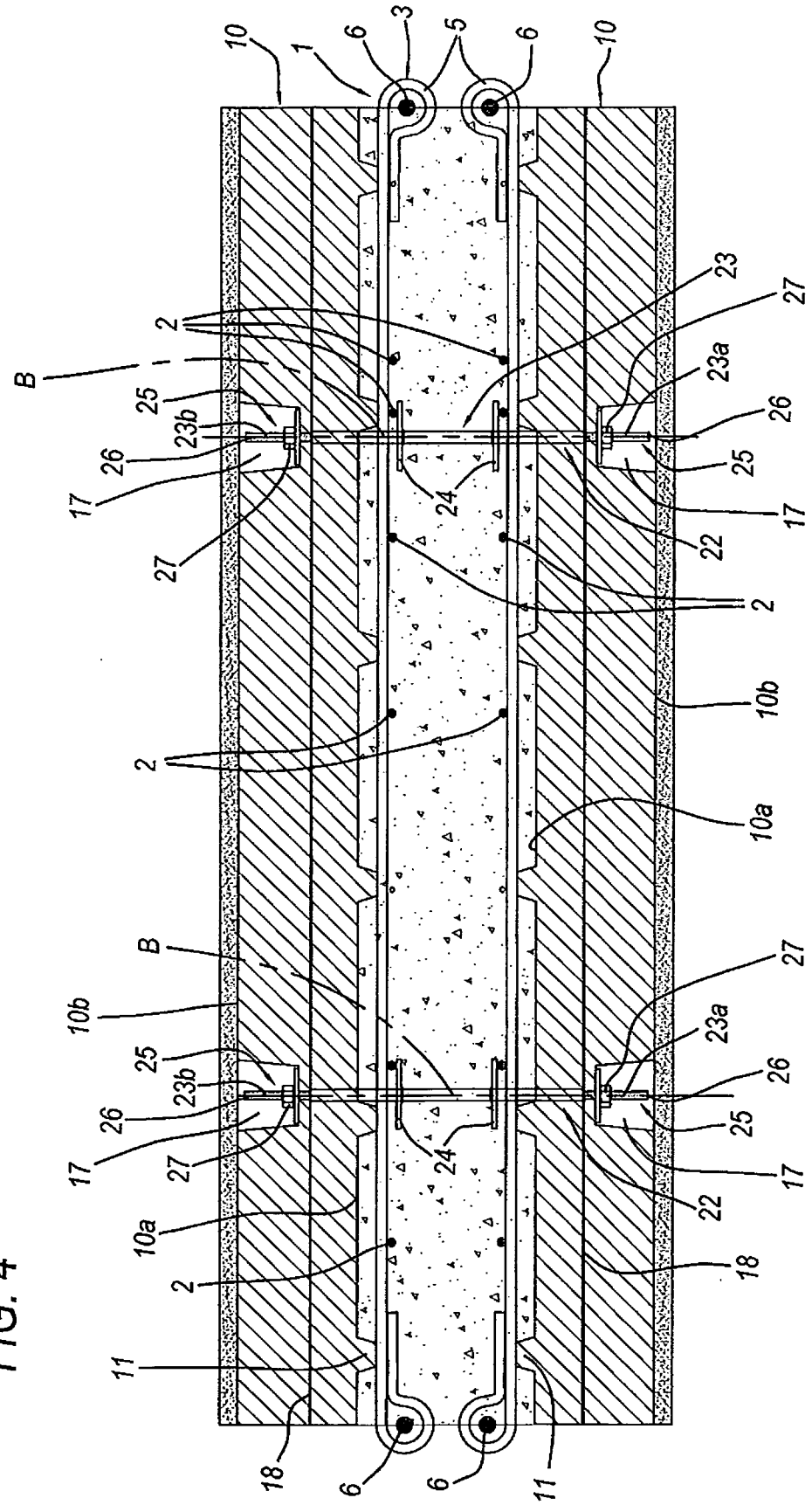

10
1
6
3
5
6
10
B
2
25
23b
26
17
27
24
23
27
23a
26
25
17
22
2
10b
10a
18
11

FIG. 6

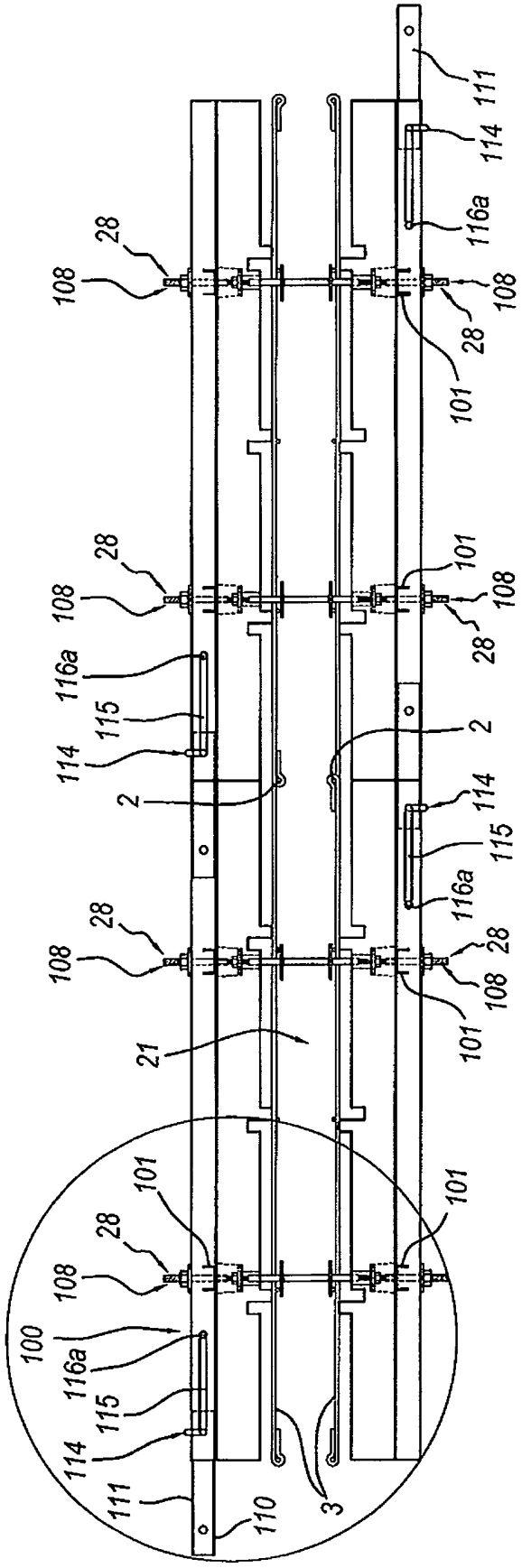
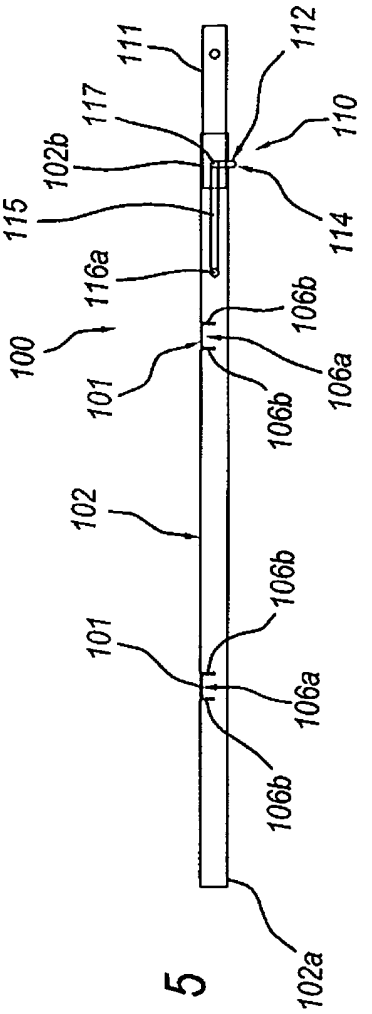

111
114
116a
108
28
101
2
115
21
100
110
3

FIG. 5


111
112
117
102b
110
115
114
116a
100
106b
101
106a
102
102a

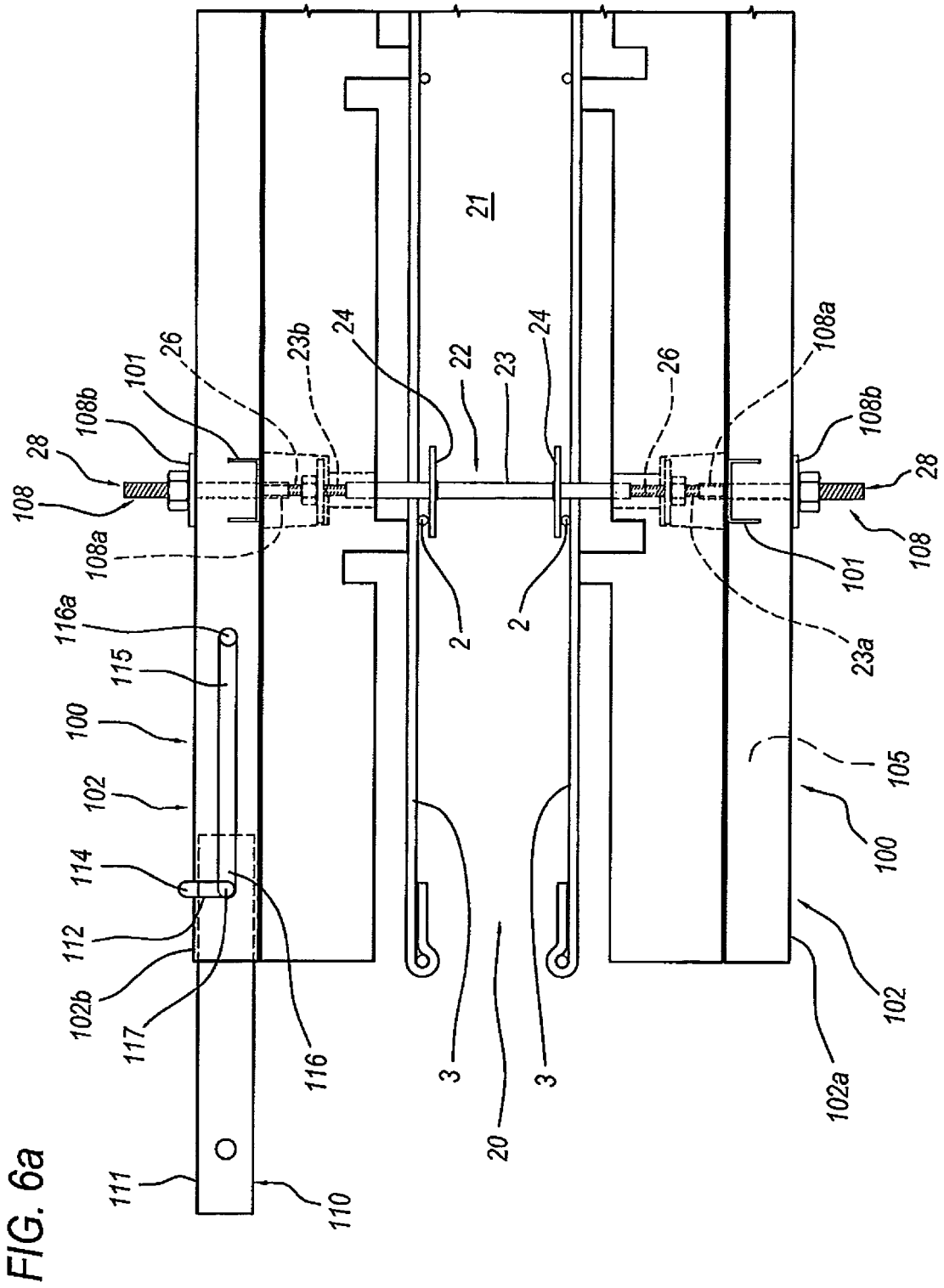

21
22
23
24
26
23b
101
108b
28
108
108a
116a
115
100
102
114
112
102b
117
116
3
20
2
23a
105
102a
110
111

FIG. 6a

REFERENCES CITED IN THE DESCRIPTION

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