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

(11) EP 0 828 907 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
27.08.2003 Bulletin 2003/35

(21) Application number: **96911863.7**

(22) Date of filing: **08.05.1996**

(51) Int Cl.[7]: **E04G 11/08**, E04G 13/02, E04B 1/16, E04G 13/00

(86) International application number:
PCT/AU96/00279

(87) International publication number:
WO 96/037674 (28.11.1996 Gazette 1996/52)

(54) SEQUENTIAL FORMWORK SYSTEM FOR CONCRETE BUILDINGS

SYSTEM VON AUFEINANDERFOLGENDEN SCHALUNGEN FUR GEBAUDE AUS BETON

SYSTEME DE COFFRAGES SUCCESSIFS POUR CONSTRUCTIONS EN BETON

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE

(30) Priority: **25.05.1995 AU PN317395**

(43) Date of publication of application:
18.03.1998 Bulletin 1998/12

(73) Proprietor: **Newtec Concrete Constructions Pty. Limited**
Taree, NSW 2430 (AU)

(72) Inventor: **BRYANT, Stanley**
Taree, NSW 2430 (AU)

(74) Representative: **Ede, Eric**
Fitzpatricks,
4 West Regent Street
Glasgow G2 1RS, Scotland (GB)

(56) References cited:

WO-A-92/02701
AU-A- 7 360 891
CA-A- 1 188 126
FR-A- 911 523
FR-A- 2 239 892
FR-A- 2 265 941
FR-A- 2 537 192
GB-A- 1 438 636
US-A- 2 614 311
US-A- 4 210 305
US-A- 4 424 951

- **PATENT ABSTRACTS OF JAPAN, M-1212, page 134; & JP,A,03 260 234 (SHIMIZU CORP) 20 November 1991.**
- **PATENT ABSTRACTS OF JAPAN, M-975, page 21; & JP,A,02 061 238 (KAJIMA CORP) 1 March 1990.**

EP 0 828 907 B1

Printed by Jouve, 75001 PARIS (FR)

Description

Technical Field

[0001] This invention relates to methods of building construction using concrete. In particular it relates to a method using formwork and associated supports for the construction of walls, raked roof beams and columns, etc. for buildings formed of concrete material.

Description of Prior Art

[0002] There are disadvantages in the commonly used building practices used by builders, particularly for the construction of small buildings, where a large number of sub-contract trades people have to be managed.

[0003] The "concrete-tilt-up" system introduced over recent years leaves much to be desired. The preformed slabs used in such system can only be handled by the use of special lifting equipment, and, if sealing between the joints is not correctly performed, moisture and insects may ingress the building. Structural stability of the upright wall is a disadvantage in this system.

[0004] Timber places high demands on forests, which are being increasingly valued for their environmental and quality-of-life benefits, and also, is subject to termite attack.

[0005] Concrete has various inherent advantages, including strength, durability and supply and price stability, and is generally used where physically possible. Reinforced concrete is used in large scale constructions to an extent where it is almost universal, demonstrating its effectiveness as a building material.

[0006] Prior art construction methods of forming up and pouring concrete walls in-situ are cumbersome. The provision of formwork is labour intensive, having to be erected by tradesmen, and, a large proportion of such materials are non-reusable after the concrete is poured. The formwork on both sides of any wall is tied together using bolts passing through the wall cavity, which not only results in a wall having many holes passing through it requiring filling, but, the bolts are expensive and are labour intensive to insert and remove.

[0007] The disadvantage of the previous formwork systems conclude that they were cumbersome, and costly in the way in which upright formwork panels have to be assembled and manually supported in their upright position or tied together with bolts or steel ties.

[0008] Fixing removal ties rods to hold the pair of parallel opposing panels together is restrictive, and a two person job. Reliable quality control checking points and wall insulation are difficult to introduce in known fonnwork systems, and, the majority of the work in known formwork systems require at least two persons, or heavy lifting machinery.

[0009] More recently, there has been proposed a method and apparatus for constructing walls of a building or other structure from pourable concrete method which overcomes many of the disadvantages of the prior art concrete construction methods. That method, invented by the inventor of the present invention, is described in the Applicant's Australian Patent No. 647783.

[0010] In short, that method comprises the following steps:

a) providing a foundation extending transversely on both sides of the wall to be formed;
b) providing at least one pair of parallel opposing panels for defining vertical surfaces of the wall to be formed along a wall line and for defining a wall cavity therebetween for receiving the pourable material;
c) securing top edges of the at least one pair of panels a preset distance apart with spacing means positioned outside of the wall cavity;
d) securing bottom edges of the at least one pair of panels to the foundation at the preset distance apart with securing means positioned outside of the wall cavity;
e) positioning reinforcing means outside of said wall cavity and securing the reinforcing means to outer surfaces of the at least one pair of panels; and,
f) pouring pourable material into the wall cavity to form said wall, whereby the wall so formed is free from unwanted passageways and/or cavities generated by clips or other structure reinforcing the panels

[0011] The apparatus described in Australian Patent No. 647783 in similar to that described in FR-A-2 265 941 and comprises a combination for forming such walls including:

at least one pair of parallel opposing panels for defining vertical surfaces of the wall to be formed and for defining a wall cavity therebetween for receiving the pourable concrete material;
spacing means secured to top edges of the at least one pair of panels outside of the wall cavity and spacing the top edges a present distance apart;
securing means secured to the foundation and bottom edges of the panels outside of the wall cavity securing the bottom edges of the panels the preset distance apart;
reinforcing means outside of the wall cavity and secured to outer surfaces of the at least one pair of panels;

whereby a wall formed in the wall cavity is free of unwanted passageways and/or cavities generated by the combination.

[0012] Whilst the method and apparatus described in the Applicant's Australian Patent No 647783 provided significant differences and advantages over therebefore known building methods and apparatus utilising poura-

ble concrete material, the inventor has now developed a significantly improved method an apparatus for building which has substantial advantages over the previous method.

[0013] The previous system relied on concrete foundations existing transversely on both sides of the wall to support pins that anchor the base of the external formwork. The system however has technical problems for small builders, as follows:

a) Using the concrete floor or foundations of the wall for pins to secure the base of the parallel opposing panels is unreliable, for three reasons;

i) concrete takes about 28 days to reach its strength;
ii) concrete mixes vary in strength from one supplier to another and when the concrete is not up to strength it allows the pins to blow out causing a concrete spill from the wall cavity; and,
iii) there is total reliance on the person placing and fitting the pins even if concrete strength is correct - one pin not upright or one hole not correct encourages a concrete blow out - this is unacceptable particularly for unskilled workers;

b) Setting up the formwork in its correct position is a cumbersome job and holding it in its correct position during the liquid concrete pour is a hit and miss situation, it is difficult to check if the formwork has moved slightly during the pour - an out of parallel wall is obvious only when internal door and cupboards are fitted;
c) When form panels are damaged slightly or particles of concrete are on the joining surfaces of the form panels, it causes a creep in the length of the wall when the panels are butted together, this in turn causes a problem in keeping the form panel wall to a specific lengths; and
d) The system is not flexible in that specific forms of different dimension are required for different length walls. The system does not allow for a variety of wall lengths without a change of form panel sizes.

[0014] US-A-2,614,311 by C. H. Shook describes a prior art arrangement for constructing footers and vertical walls of concrete. In that prior art arrangement, a footer 25 of inverted T-shape is firstly constructed using a formwork 10, and it is allowed to set before the vertical wall 40 is poured. In addition to this prior art technique being very time consuming, it utilises inserts (see ref no. 16 in Fig. 1) which are set into the footer portion, so as to hold bolts which are thereafter used in assembling the vertical wall sections. In comparison to US-A-2,614,311, the present invention reduces the time for poured concrete to set (because two pourings are reduced to one) and variations between mixes are eliminated (because only one mix is poured).

Summary of the Invention

[0015] The present invention therefore seeks to provide a building method and apparatus therefor which overcomes the known disadvantages of the prior art.

[0016] The present invention also seeks to provide a complete building method and apparatus to enable the new formwork to be used to pour columns, walls and beams. A raked roof beam may be poured in-situ connecting the walls of the building together giving greater stability and at the same time forming support for the roof purlins, roof claddings and ceiling materials.

[0017] The present invention also seeks to provide a complete building structure and method and apparatus therefor which reduces costs and reduces building time and gives greater structural stability.

[0018] The present invention also seeks to provide a building structure with quality control check points at various stages of the building method.

[0019] The present invention also seeks to provide a building method and apparatus therefor wherein all the formwork and assembly parts are reusable, and can be amortised over a long period of time.

[0020] The present invention also seeks to provide a building method and apparatus therefor wherein one person can carry out the majority of the work in erecting and dismantling the formwork.

[0021] The present invention also seeks to provide a building method and apparatus that will enable the door openings to be designed and moulded in shape to receive the door, thus providing a fire-rated door surround with the hinge base and striker plates insert moulded in position in the door surround.

[0022] The present invention also seeks to provide a building method and apparatus therefor, whereby the internal portion of the concrete wall can be used as a thermal mass to store and release energy. Insulation may be provided internally in the wall to thermally insulate the outside of the wall from the inside of the wall, to better resist the transfer of varying temperatures and noise through the walls and/or to prevent condensation from permeating the walls due to variation of inside and outside temperatures.

[0023] In one broad form, the present invention provides a method of forming a concrete structure using pourable concrete material, comprising the steps of:

(a) positioning and securing a removable base portion formwork on top of a foundation, the base portion formwork being comprised of a pair of opposing base panels defining base portion surfaces of the concrete structure to be formed;
(b) positioning and securing a removable upper portion formwork on top of the base portion formwork, the upper portion formwork being comprised of at least one pair of substantially parallel opposing up-

per panels defining the upper portion surfaces of the concrete structure;
(c) removably securing the upper portion formwork and the base portion formwork in position with detachable spacing and securing means located outside the base and upper panels;
(d) pouring concrete material into the formwork; and
(e) detaching the spacing and securing means and removing the base portion and upper portion formwork after the poured concrete material has been allowed to set; characterised in that the pourable concrete material is concurrently supplied between both the base portion framework and the upper portion formwork so that both the base and upper wall portions are poured at the same time and allowed to set together and in that the height of the base portion formwork that defines the height of the base wall portion is relatively low in comparison with the height of the upper portion formwork that defines the height of the upper wall portion.

[0024] Preferably, prior to pouring the concrete material, opening blanking panels are provided at predetermined positions in the formwork such that the concrete material is moulded into desired shapes and prevented from being poured into the predetermined positions, wherein the opening blanking panels are separately secured to the upper and base panels by clamps.

[0025] Also preferably, the opening blanking panels are embodied by a pair of blanking members for each side of the opening, wherein, the ends of abutting blanking members are terminate in a correspondingly shaped transverse manner to permit easy assembly and disassembly of the blanking members.

[0026] Also preferably, the base portion formwork comprises a pair of parallel opposing base support frames, each support frame having a lower end adapted to engage with the foundation, and an upper end adapted to receive the upper portion formwork, the support frames defining an exterior concrete surface.

[0027] Also preferably, the support frames further comprise a pressure release means provided in the upper ends of the support frames.

[0028] In a preferred form, opposed base support frames are retained in position by locking pins, the pins preferably being tapered for ease of removal thereof after the concrete material is set.

[0029] Preferably, the parallel opposing upper panels are retained in position by being secured together on top of the base portion formwork by at least one removable support bracket outside the base portion formwork.

[0030] Also preferably, the parallel opposing upper panels are retained in position by a removable wall spacing support bracket located outside the top of the upper portion formwork.

[0031] In a preferred form, the method further includes the step of providing insulation within the formwork.

[0032] Preferably, the foundation is comprised of foundation piers and the lower end of each base support frame engages a blanking panel.

[0033] Also preferably, the method comprises the step of:

providing formwork for at least one beam into which concrete material can be poured in-situ on top of the upper portion formwork.

[0034] Also preferably, the method further comprises the step of insert moulding door hinge supports and striker plates into the concrete material.

Brief Description of the Drawings

[0035] The present invention will become more fully understood from the following detailed description of the preferred but non-limited embodiment thereof, described in connection with the accompanying drawings, wherein:

Fig. 1, in Figs. 1A to 1E, illustrate the basic steps of forming a building structure, in accordance with a preferred embodiment of the present invention;

Fig. 2 shows, in Figs. 2A and 2B, end and elevational views of the base portion formwork resting on a pier;

Fig. 3 shows end views of the wall base portion in contact with onto various substrate/foundation surfaces, Fig. 3A showing the base portion directly on a substrate surface, Fig. 3B on an edge portion of a concrete slab, and, Fig. 3C on top of an existing concrete wall;

Fig. 4 illustrates, in a plan view, the components required to construct the base channels and/or the form panels of a T-shaped column;

Fig. 5 details the components required to construct the base channels and/or the form panels of an L-shaped column;

Fig. 6 details in Figs. 6A to 6G plan and elevational views of the various wall formwork panels used in the method of the present invention;

Fig. 7 illustrates an exploded perspective view of the base portion components used to construct base portions of the walls;

Fig. 8 illustrates a plan view of the components forming the intermediate wall portions between columns/corners;

Figs. 9A to 9C illustrate elevational, end and a de-

tailed view of the components to form the intermediate wall portions, providing for a window or like opening;

Fig. 10 shows a cross sectional view of the components to form a wall, with external bracing used for support during construction;

Figs. 11A to 11C detail various alternative uses of blanking panels;

Fig. 12 illustrates a plan view of a door opening showing the hinge support bracket and door striker plate set in position;

Fig. 13 illustrates a perspective view of the formwork constructed to permit a quality control check to be carried out, showing the reinforcement in position;

Fig. 14 details, in Figs. 14A and 14B, a C-clamp; and,

Figs. 15A to 15C detail the locking pin used in the present invention.

Detailed Description of Preferred Embodiments

[0036] Throughout the drawings; like numerals will be utilised to identify similar features, except where expressly otherwise indicated.

[0037] In reading this specification, it is assumed that the reader is well aware of standard building techniques. It is also assumed that the reader has read and understood the Applicant's Australian Patent No. 647783.

[0038] As shown in the drawings, the components of the building system in accordance with the present invention, comprise a number of sub-components. The primary components will be more fully described hereinafter.

[0039] In Fig. 1, five primary steps of the building method, in accordance with a preferred embodiment of the invention, are shown in Figs. 1A to 1E.

[0040] The first step in the construction method, a shown in Fig. 1A, is to set out the building position and decide on the type of foundation. Various types of foundation may be used, including a slab, a raft slab, piers, beams between piers, or, a subterrain surface. The position of the wall corners and columns, both external and internal, are then determined and the corner/column base channel formwork is positioned atop of the foundation, as illustrated.

[0041] The upper corner or column formwork panels are then constructed, and then concrete material is poured into the base and upper formwork and permitted to set at the same time, as shown in Fig. 1B. Once the corners are set, the corner formwork is removed.

[0042] The third step, as shown in Fig. 1C, is to position the wall base support channels between the wall corners/columns. The wings of the wall corners are the same thickness as the wall cavity. This allows for a slidable adjustment of the base support channels to fit between the corners to suit variations in the distances of the wall lengths, enabling standard length formwork to suit varying wall lengths, as will be described hereinafter with reference to Fig. 8.

[0043] Once the base formwork is fixed in position and secured to the corners, the wall panel formwork is simultaneously formed and then both the base and the upper wall portion are poured at the same time and allowed to set together, as shown in Fig. 1D. Once the wall concrete is set the wall and base formwork are removed.

[0044] A final step, as shown in Fig. 1E, is to attach beams atop the walls, to provide added stability and strength to the building structure. The beams may also support the roof and ceiling materials.

[0045] Further and fuller details of the components and the method of construction will be hereinafter described.

[0046] As briefly mentioned hereinbefore, the first step in the best known system of the present invention, as shown in Fig. 1A, is to position the base portion formworks 1 and 2 atop the foundations 3. As shown, the base portion formworks are generally T-shaped, as shown by numeral 1, or L-shaped, as shown by numeral 2. Of course, other shaped columns and corners may alternatively be utilised. The foundation 3 may comprise a slab type foundation made of concrete or another type of substrate surface. Alternatively, foundation piers may be provided at the appropriate positions under the corner and/or column base channels. Further details of the base formworks are shown in Figs. 2, 3, 4 and 5, and will be described hereinafter.

[0047] The second step in the method is to provide the upper portion formworks for the columns and/or channels such that ultimately the columns and channels 4 and 5 are formed on the foundation 3. Once again, the columns are generally constructed to be of T-shaped 4, or L-shaped 5, but could be of any other shape, depending upon the geometrics of the building and the rooms. The upper portions of the columns and/or corners are poured simultaneously with the base portions. That is, the upper portion formwork is attached to the base channel formwork, and then the concrete is poured into both the base and upper formworks simultaneously, and then allowed to set. Once the corners and columns have set, the positioning of the intermediate base channel portions 6 of the intermediate wall sections may easily be performed, as shown in Fig.1C. The upper portion formwork 7 of the intermediate wall portions is positioned atop the base portion formwork and then concrete poured simultaneously in both the base portion formwork and then concrete poured simultaneously in both the base and upper formworks of the intermediate wall portions, with the resulting configuration as shown in

Fig. 1D.

[0048] Beams, either horizontal or raked, identified by the reference numeral 8 in Fig. 1E may then be formed. These beams give added stability and strength to the building structure, and may also support the roof and ceiling materials. Step 5 as shown in Fig. 1E is basically the final step in the casting procedure. It will be obvious to persons skilled in the art that windows, doors, roof, ceiling materials, and other features may then be added in accordance with normal building practices.

[0049] Figs. 2A and 2B illustrate end and elevational views of the base portion formwork 10 resting on a pier 11. As seen, the blanking panel 12, forming the underside of the formwork, stops short of the pier 11. Fig. 2A shows how C-clamps 13 and tapered locking pins 14, details of which are shown in Figs. 14 and 15, are used to retain the various base formwork panels 12 and 15 in position whilst the concrete is poured. Figs. 2A, 3A to 3C, and 15A shows the pins 14 being tapered for ease of removal thereof after the concrete material has set.

[0050] Fig. 3 illustrates the different types of foundations upon which the base frameworks 10 may be situated, Fig. 3A illustrating base formwork 10 on a substrate surface 16, Fig. 3B illustrating the base formwork 10 on the edge of a concrete slab 17, and Fig. 3C illustrating the base formwork 10 on an existing wall 18. Other modifications of the attachment of the base formwork 10 to other types of foundations or substrate surfaces will become obvious to persons skilled in the art.

[0051] Figs. 4 and 5 illustrate more detailed plan views of the formwork used in the base and/or upper sections of the columns or corners, Fig. 4 illustrating the formwork for constructing a T-column and corner section, and Fig. 5 illustrating the formwork for constructing an L-shaped corner or column. It will be noted that C-clamps 13 are used to retain end panels 22 to the corner or column formwork.

[0052] Fig. 6 illustrates details of various preferred embodiments of the upper formwork panels, showing the constructional details therefor and the features thereof for interconnection. Figs. 6A and 6B show elevational and plan views, respectively, of a standard form panel, Figs. 6C and 6D show elevational and plan views of an internal corner panel, Figs. 6E and 6F show elevational and plan views of an external corner panel, and, Fig., 6G shows a perspective view of a blanking end panel.

[0053] As shown in Fig. 7, each of the base panels are adapted to be interlocked together by means of suitable interlocking means 23. Numerous different variations to the interlocking means will become apparent to persons skilled in the art, and all such variations should be considered to be within the scope of the invention. The arrangement of panels shown in Fig. 7 shows a base channel with a corner for a T-section, and a blanking end.

[0054] Fig. 8 illustrates how once the corners and/or columns 24 and 25 are cast, the intermediate section formworks are attached thereto, for ultimate casting of concrete within the cavity 28. A plurality of panels 27 are secured together by suitable clamps 13. End panels 30 are also provided where needed.

[0055] As shown in Fig. 9A to 9C, as window opening 31 may be provided in a wall by provision of appropriate panels 32, to prevent the concrete from being provided in the area 31. Once again, this may be achieved in various ways, as will be clearly understood to persons skilled in the art. Figs. 9A and 9B illustrate elevational and cross-sectional views of the window opening 31, showing that each side of each door, window or the like is provided with a pair of panels 32. The abutting ends of each pair of panels or blanking members is shown in Figs. 9A and 9B to terminate in a correspondingly shaped transverse member to permit easy assembly/disassembly. Fig. 9C details the connection between the side and top/bottom panels, showing that a small gap is provided to enable disassembly of the panels. As will be understood to persons skilled in the art, concrete contracts when it hardens. Therefore, provision of the gap, together with forming a break point in the side panels, permits the easy disassembly of the panels once the concrete has hardened. The break point may be formed with an angle join as shown in Fig. 9A, or, by an analogous means which may be obvious to a person skilled in the art.

[0056] Fig. 10 illustrates how trusses 29 are provided on the exterior of the formwork to maintain the formwork in position during pouring of the concrete. Fig. 10 also illustrates the provision of the reinforcing bars 33 and thermal insulation 34 within the cavity. Steel support chairs 35 may be provided to maintain the reinforcing steel 33 in position. Fig. 10 further illustrates how a top end of each parallel opposed wall section formwork is retained in position by a wall-spacing support clip.

[0057] Fig. 11 illustrates details of various blanking panels and how they are interconnected to form columns and beams. It will be understood that where windows, doors and other openings are required, blanking panels, such as shown in Fig. 11 are provided at appropriately predetermined positions. The blanking panels may be provided in various lengths, depending upon the size of the opening. Appropriate clamps and wedges may be utilised to secure the blanking panels into position. Fig. 11A illustrates upper and lower form panels, and said blank panels, joined to form column formwork, Fig. 11B illustrates panels joined to form base channel beam formwork, and Fig. 11C illustrates alternative beam formwork panels.

[0058] In Fig. 12, is illustrated a cross-sectional plan view of the way in which a door opening may be formed. The left half of Fig. 12 shows the provision of L-shaped steel or like section 40, being provided between the form panels 27, retained by a timber support 42. Also shown is a shaped member 43, which, after casting, provides an insertion slot to provide a felt, rubber, or like seal, giving a smoke proof seal and enabling a smooth door

closing action. Once the concrete is cast and the formwork panels are removed, it will be appreciated that the L-section 40 remains, allowing attachment of the door hinges thereto. Likewise, the right half of Fig. 12 shows the positioning of a striker plate 44.

[0059] Fig. 13 illustrates a partial assembly of the formwork components, including reinforcement steel 33, spacers 35 therefor, and service connections for plumbing, electrical, wiring, etc., ready for a quality control inspection. It will be appreciated that by leaving one side panel of the formwork missing from the components, such components may be easily inspected by regulatory authorities, etc., prior to the pouring of the concrete.

[0060] Also illustrated in Fig. 13 is the provision of a pressure release slot 49.

[0061] As the inventor has identified, pourable concrete material is prone to escape from the desired cavity space 45, and particularly underneath the lower edge of the front base panel, to create a hydraulic lifting action especially desired pressure release gap 49 may optionally be provided in an upper portion of the base formworks 10 to allow escape of such liquid concrete, and consequently prevent the base formwork 10 from being displaced from its desired position.

[0062] In Fig. 14 is shown, in Figs. 14A and 14B, side and end views of a C-clamp 13 which may be used for joining various panels in the present invention.

[0063] In Fig. 15 is shown, in Figs. 15A, 15B and 15C, elevational, end and top views of a tapered locking pin 14 and its support ends, which may be used for joining opposed formwork panels in the present invention.

[0064] It will be appreciated that by constructing the building in this step-by-step configuration, utilising standardised components, significant advantages over the prior art are achieved. Not only is appropriate alignment and levelling of the walls much easier than by prior art processes, such as described in Australian Patent No. 647783, but the formwork may be re-used on alternative building sites, consequently reducing costs and material wastage. It will be appreciated that the base formwork can be formed out of steel, sheet metal, or rigid plastics material, whereby the system components are removable and re-usuable.

[0065] The building constructed in accordance with the method of the invention has various advantages compared to former known concrete construction methods with timber, plaster, and other methods. Such advantages include the fact that they are cheaper to heat and cool, and are ideally suited to solar passive designs, they have higher noise insulative properties, and a higher fire resistance, resistance to earthquake, wind loads, weather and termites. Notably however, they provide a less expensive form of construction, and items such as door hinges may be insert moulded in position.

[0066] It will be appreciated that variations and modifications to the exemplary building method and apparatus as hereinbefore described will fall within the scope of the invention as claimed hereinafter.

Claims

1. A method of forming a concrete structure using pourable concrete material, comprising the steps of:

   (a) positioning and securing a removable base portion formwork (1; 10) on top of a foundation (3; 11; 16; 17; 18), the base portion formwork (1; 10) being comprised of a pair of opposing base panels (15) defining base portion surfaces of the concrete structure to be formed;
   (b) positioning and securing a removable upper portion formwork (27) on top of the base portion formwork (1; 10), the upper portion formwork (27) being comprised of at least one pair of substantially parallel opposing upper panels (27) defining the upper portion surfaces of the concrete structure;
   (c) removably securing the upper portion formwork (27) and the base portion formwork (1; 10) in position with detachable spacing and securing means located outside the base (15) and upper panels (27);
   (d) pouring concrete material into the formwork; and
   (e) detaching the spacing and securing means and removing the base portion (1; 10) and upper portion formwork (27) after the poured concrete material has been allowed to set; whereby the pourable concrete material is concurrently supplied between both the base portion formwork and the upper portion formwork so that both the base and upper wall portions are poured at the same time and allowed to set together, **characterised in that** the height of the base portion formwork that defines the height of the base wall portion is low in comparison with the height of the upper portion formwork that defines the height of the upper wall portion.

2. A method of forming a concrete structure as claimed in claim 1, wherein prior to pouring the concrete material, opening blanking panels (31) are provided at predetermined positions in the formwork (27) such that the concrete material is moulded into desired shapes and prevented from being poured into the predetermined positions, wherein the opening blanking panels (31) are separately secured to the upper and base panels by clamps.

3. A method of forming a concrete structure as claimed in claim 2, wherein the opening blanking panels (31) are embodied by a pair of blanking members (32) for each side of the opening, wherein

the ends of abutting blanking members (32) are terminated in a correspondingly shaped transverse manner, and wherein the blanking members (32) can be assembled and disassembled.

4. A method of forming a concrete structure as claimed in claim 1, wherein the base portion formwork (1; 10) comprises a pair of parallel opposing base support frames (10); each support frame (10) having a lower end adapted to engage with the foundation (3; 11; 16; 17; 18), and an upper end adapted to receive the upper portion formwork (27), the support frames (10) defining an exterior concrete surface.

5. A method of forming a concrete structure as claimed in claim 4, wherein the support frames (10) further comprise a pressure releases means (49) provided in the upper ends of the support frames (10)

6. A method of forming a concrete structure as claimed in claim 4, wherein opposed base support frames (10) are retained in position by locking pins (14), the pins (14) being tapered for ease of removal thereof after the concrete material is set.

7. A method of forming a concrete structure as claimed in claim 1, wherein the parallel opposing upper panels (27) are retained in position by a removable wall spacing support bracket located outside the top of the upper portion formwork (27).

8. A method of forming a concrete structure as claimed in claim 1, further comprising the step of providing insulation (34) within the formwork.

9. A method of forming a concrete structure as claimed in claim 4, wherein the foundation is comprised of foundation piers (11) and the lower end of each base support frame (10) engages a blanking panel (12).

10. A method of forming a concrete structure as claimed in claim 1, further comprising the step of:

providing formwork for at least one beam (8) into which concrete material can be poured insitu on top of the upper portion formwork (27).

11. A method of forming a concrete structure as claimed in claim 2, further comprising the step of insert moulding door hinge supports and striker plates into the concrete material.

Patentansprüche

1. Ein Verfahren zur Bildung einer Betonstruktur unter Verwendung von gießbarem Betonmaterial, umfassend die folgenden Verfahrensschritte:

(a) Anordnen und Sichern eines entfernbaren Schalungsbasisteils (1; 10) auf der Oberseite eines Fundaments (3; 11; 16; 17; 18), wobei das Schalungsbasisteil (1; 10) aus einem Paar von sich gegenüberliegenden Basisplatten (15) besteht, die Basisteiloberflächen der zu bildenden Betonstruktur definieren;
(b) Anordnen und Sichern eines entfernbaren Schalungsoberteils (27) auf dem Schalungsbasisteil (1; 10), wobei das Schalungsoberteil (27) aus zumindest einem Paar von im wesentlichen sich parallel gegenüberliegenden oberen Platten (27) besteht, die die Oberflächen des oberen Teils der Betonstruktur definieren;
(c) entfernbar in Stellung Sichern des Schalungsoberteils (27) und des Schalungsbasisteils (1; 10) mit entfernbaren Abstands- und Sicherungseinrichtungen, die außerhalb der Basisplatten (15) und oberen Platten (27) angeordnet sind;
(d) Gießen von Betonmaterial in die Schalung; und
(e) Abnehmen der Abstands- und Sicherungseinrichtungen und Entfernen des Schalungsbasisteils (1; 10) und des Schalungsoberteils (27), nachdem dem Betonmaterial ein Aushärten ermöglicht wurde, wobei das gießbare Betonmaterial gleichzeitig zwischen sowohl dem Schalungsbasisteils als auch dem Schalungsoberteil zugeführt wird, so daß sowohl das Basis- als auch das obere Wandteil zur gleichen Zeit gegossen und das gemeinsame Aushärten ermöglicht wird, **dadurch gekennzeichnet, daß** die Höhe des Schalungsbasisteils, das die Höhe des Basiswandteils definiert, im Vergleich mit der Höhe des Schaltungsoberteils niedrig ist, welches die Höhe des oberen Wandteils definiert.

2. Ein Verfahren zur Bildung einer Betonstruktur nach Anspruch 1, wobei vor dem Gießen des Betonmaterials Öffnungsabdeckplatten (31) an vorbestimmten Positionen der Schalung (27) vorgesehen sind, so daß das Betonmaterial in gewünschte Formen gegossen und daran gehindert wird, in die vorbestimmten Positionen gegossen zu werden, wobei die Öffnungsabdeckplatten (31) separat an der oberen und der Basisplatte durch Klammern befestigt sind.

3. Ein Verfahren zur Bildung einer Betonstruktur nach Anspruch 2, wobei die Öffnungsabdeckplatten (31)

durch ein Paar von abdeckenden Gliedern (32) für jede Seite der Öffnung gebildet sind, wobei die Enden von aneinanderstoßenden abdeckenden Gliedern (32) in einer entsprechend geformten transversalen Art und Weise beendet sind, und wobei die abdeckenden Glieder (32) zusammengesetzt und auseinandergenommen werden können.

4. Ein Verfahren zur Bildung einer Betonstruktur nach Anspruch 1, wobei das Schalungsbasisteil (1; 10) ein Paar von parallel sich gegenüberliegenden Basisstützrahmen (10) umfaßt, wobei jeder Stützrahmen (10) ein unteres Ende aufweist, das so ausgeführt ist, daß es mit dem Fundament (3; 11; 16; 17; 18) in Eingriff treten kann, und ein oberes Ende, das so ausgeführt ist, daß es das Schalungsoberteil (27) aufnehmen kann, wobei die oberen Stützrahmen (10) eine äußere Betonoberfläche definieren.

5. Ein Verfahren zur Bildung einer Betonstruktur nach Anspruch 4, wobei die Stützrahmen (10) weiterhin eine Drucklöseeinrichtung (49) umfassen, die in den oberen Enden der Stützrahmen (10) vorgesehen ist.

6. Ein Verfahren zur Bildung einer Betonstruktur nach Anspruch 4, wobei sich gegenüberliegende Basisstützrahmen (10) durch Blockierstifte (14) in Position gehalten werden, wobei die Stifte (14) zur Erleichterung ihrer Entfernung nach dem Aushärten des Betonmaterials abgeschrägt sind.

7. Ein Verfahren zur Bildung einer Betonstruktur nach Anspruch 1, wobei die parallel sich gegenüberliegenden oberen Platten (27) durch einen entfernbaren Wandabstandsstützbügel in Position gehalten werden, der außerhalb der Oberseite des Schalungsoberteils (27) angeordnet ist.

8. Ein Verfahren zur Bildung einer Betonstruktur nach Anspruch 1, weiterhin umfassend den Verfahrensschritt des Lieferns einer Isolierung (34) innerhalb der Schalung.

9. Ein Verfahren zur Bildung einer Betonstruktur nach Anspruch 4, wobei das Fundament aus Fundamentstützen (11) besteht und das untere Ende eines jeden Basisstützrahmens (10) eine Abdeckplatte (12) in Eingriff nimmt.

10. Ein Verfahren zur Bildung einer Betonstruktur nach Anspruch 1, weiterhin umfassend den Verfahrensschritt des Lieferns von Schalung für zumindest einen Balken (8), in die Betonmaterial in-situ auf das Schalungsoberteil (27) gegossen werden kann.

11. Ein Verfahren zur Bildung einer Betonstruktur nach Anspruch 2, weiter umfassend den Verfahrensschritt des Einsatzgießens von Türscharnierstützen und Anschlagplatten in das Betonmaterial.

Revendications

1. Procédé de conformation d'une structure de béton utilisant un matériau de béton liquide, comprenant les étapes de :

(a) positionnement et de fixation d'un coffrage amovible de la partie inférieure (1 ; 10) sur des fondations (3 ; 11 ; 16 ; 17 ; 18), le coffrage de la partie inférieure (1 ; 10) étant composé d'une paire de panneaux inférieurs opposés (15) définissant des surfaces de la partie inférieure de la structure en béton devant être conformée ;
(b) de positionnement et de fixation d'un coffrage amovible de la partie supérieure (27) au-dessus du coffrage de la partie inférieure (1 ; 10), le coffrage de la partie supérieure (27) étant composé d'au moins une paire de panneaux supérieurs opposés sensiblement parallèles (27) définissant les surfaces de la partie supérieure de la structure de béton ;
(c) de fixation de manière amovible du coffrage de la partie supérieure (27) et du coffrage de la partie inférieure (1 ; 10) en place avec des moyens d'espacement et de fixation détachables situés à l'extérieur des panneaux inférieurs (15) et supérieurs (27) ;
(d) de coulage d'un matériau de béton dans le coffrage ; et
(e) de démontage des moyens d'espacement et de fixation et de retrait du coffrage de la partie inférieure (1 ; 10) et de la partie supérieure (27) une fois que le matériau de béton coulé est pris ; dans lequel le matériau de béton liquide est fourni simultanément entre le coffrage de la partie inférieure et le coffrage de la partie supérieure, de sorte que les parties inférieures et supérieures des murs soient coulées en même temps et puissent prendre ensemble ; **caractérisé en ce que** la hauteur du coffrage de la partie inférieure qui définit la hauteur de la partie inférieure du mur soit plus basse par rapport à la hauteur du coffrage de la partie supérieure qui définit la hauteur de la partie supérieure du mur.

2. Procédé de conformation d'une structure de béton selon la revendication 1, dans lequel avant de couler le matériau de béton, des panneaux d'obturation ouvrants (31) sont fournis à des emplacements prédéterminés dans le coffrage (27) de manière à ce que le matériau de béton soit moulé dans des formes désirées et ne puisse être coulé dans les emplacements prédéterminés, dans lequel les pan-

neaux d'obturation ouvrants (31) sont fixés séparément aux panneaux supérieurs et inférieurs par des attaches.

3. Procédé de conformation d'une structure de béton selon la revendication 2, dans lequel les panneaux d'obturation ouvrants (31) ont la forme d'une paire d'éléments d'obturation (32) pour chaque côté de l'ouverture, dans lequel les extrémités des éléments d'obturation (32) venant en butée se terminent d'une manière transversale de forme correspondante, et dans lequel les éléments d'obturation (32) peuvent être assemblés et désassemblés.

4. Procédé de conformation d'une structure de béton selon la revendication 1, dans lequel le coffrage de la partie inférieure (1 ; 10) comprend une paire de cadres de support inférieurs opposés parallèles ; chaque cadre de support (10) ayant une extrémité inférieure adaptée pour s'engager dans les fondations (3 ; 11 ; 16 ; 17 ; 18), et une extrémité supérieure adaptée pour recevoir le coffrage de la partie supérieure (27), les cadres de support (10) définissant une surface de béton extérieure.

5. Procédé de conformation d'une structure de béton selon la revendication 4, dans lequel les cadres de support (10) comprennent en outre des moyens de détente de la pression (49) fournis aux extrémités supérieures des cadres de support (10).

6. Procédé de conformation d'une structure de béton selon la revendication 4, dans lequel les cadres de support (10) inférieurs opposés sont maintenus en place par des tiges de blocage (14), les tiges (14) se terminant en pointe pour faciliter leur retrait une fois le matériau de béton pris.

7. Procédé de conformation d'une structure de béton selon la revendication 1, dans lequel les panneaux supérieurs opposés parallèles (27) sont maintenus en place par un support d'espacement des murs amovible situé à l'extérieur du haut du coffrage de la partie supérieure (27).

8. Procédé de conformation d'une structure de béton selon la revendication 1, comprenant en outre l'étape de fournir une isolation (34) à l'intérieur du coffrage.

9. Procédé de conformation d'une structure de béton selon la revendication 4, dans lequel les fondations sont composées de palées de fondation (11) et l'extrémité inférieure de chaque cadre de support inférieur (10) est engagée dans un panneau d'obturation (12).

10. Procédé de conformation d'une structure de béton selon la revendication 1, comprenant en outre l'étape de fournir un coffrage pour au moins une poutre (8) dans lequel le matériau de béton peut être coulé in-situ sur le coffrage de la partie supérieure (27).

11. Procédé de conformation d'une structure de béton selon la revendication 2, comprenant en outre l'étape d'insérer le moulage de supports de charnière de porte et de gâches dans le matériau de béton.

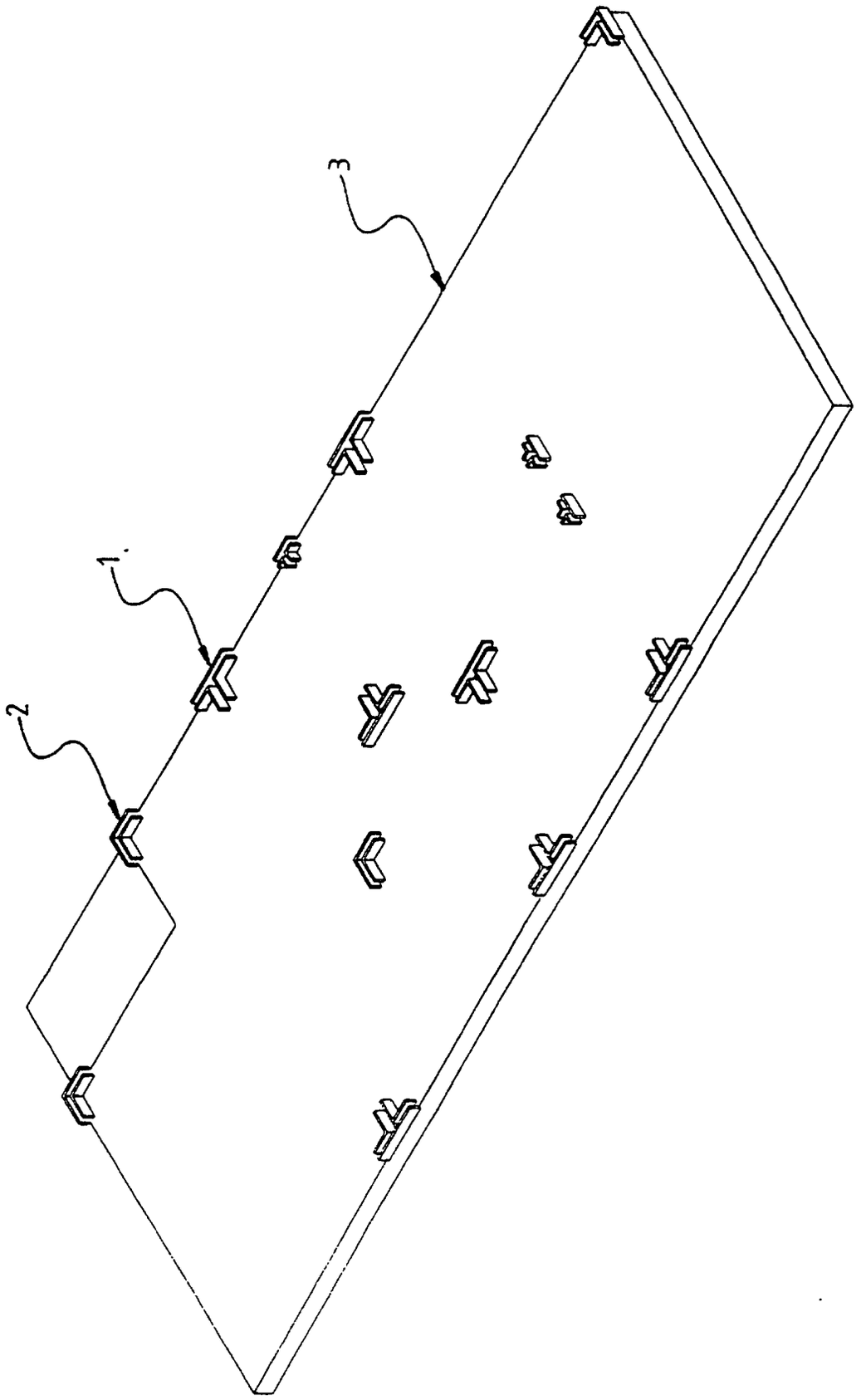


FIG. 1A

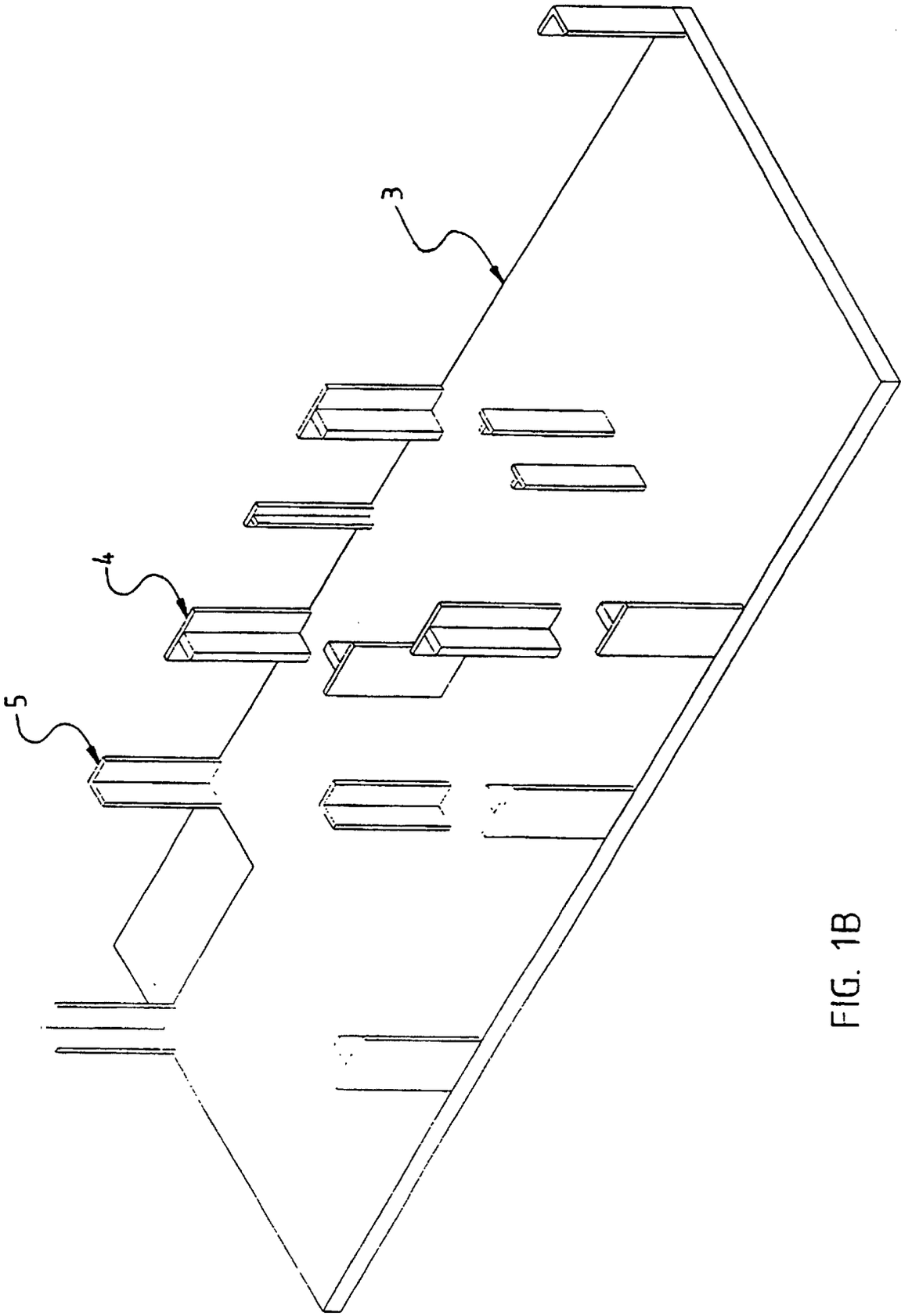


FIG. 1B

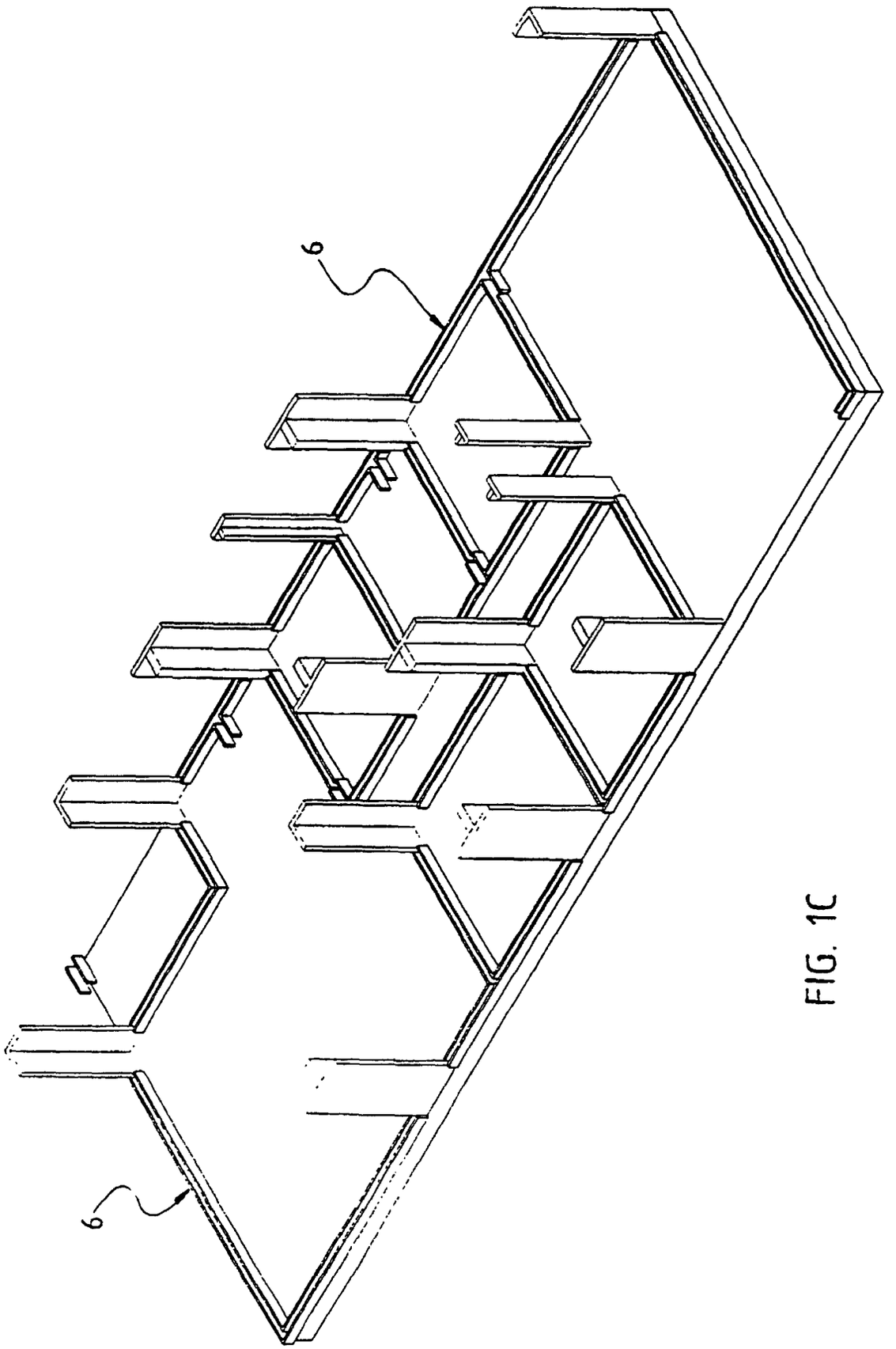


FIG. 1C

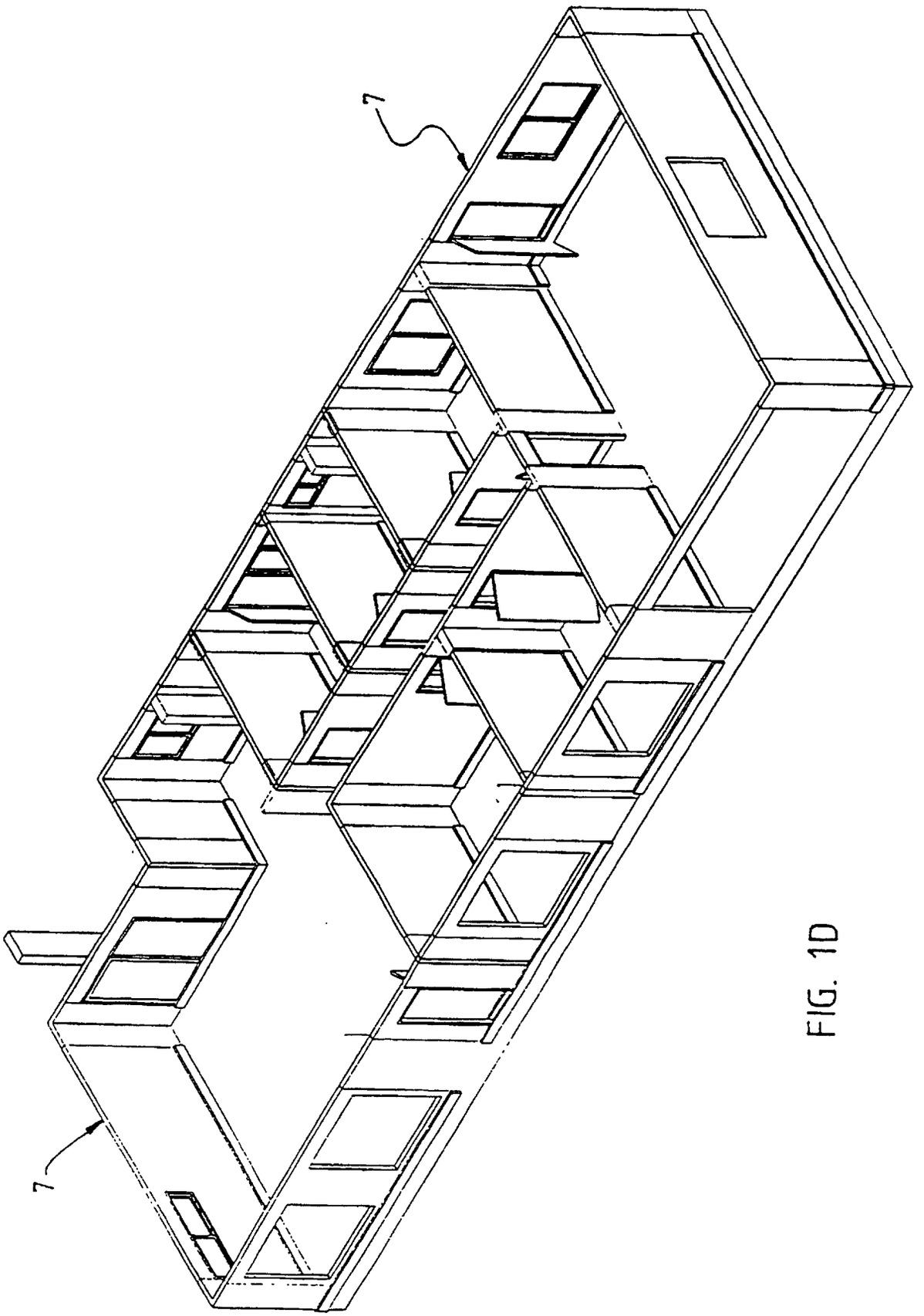


FIG. 1D

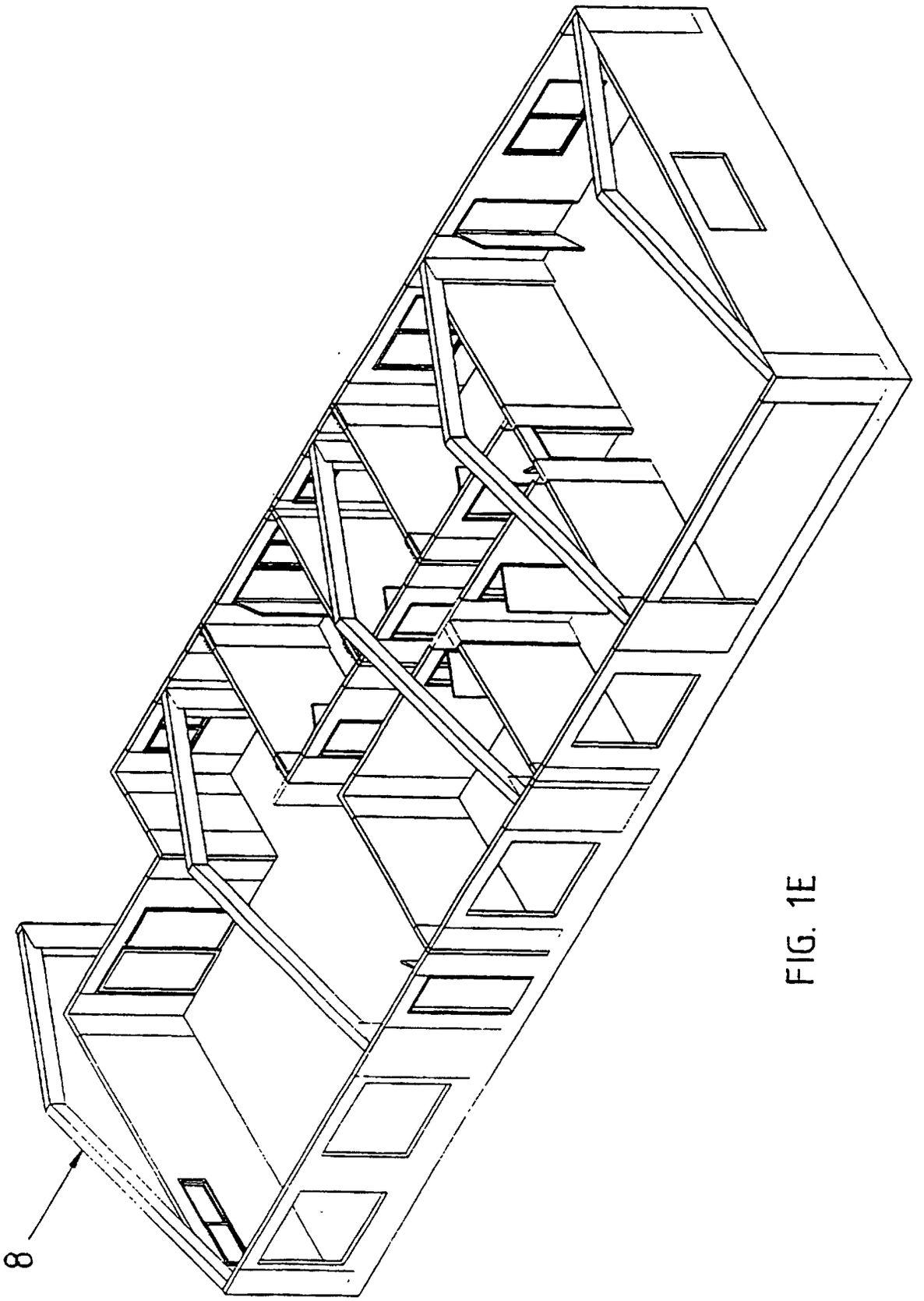


FIG. 1E

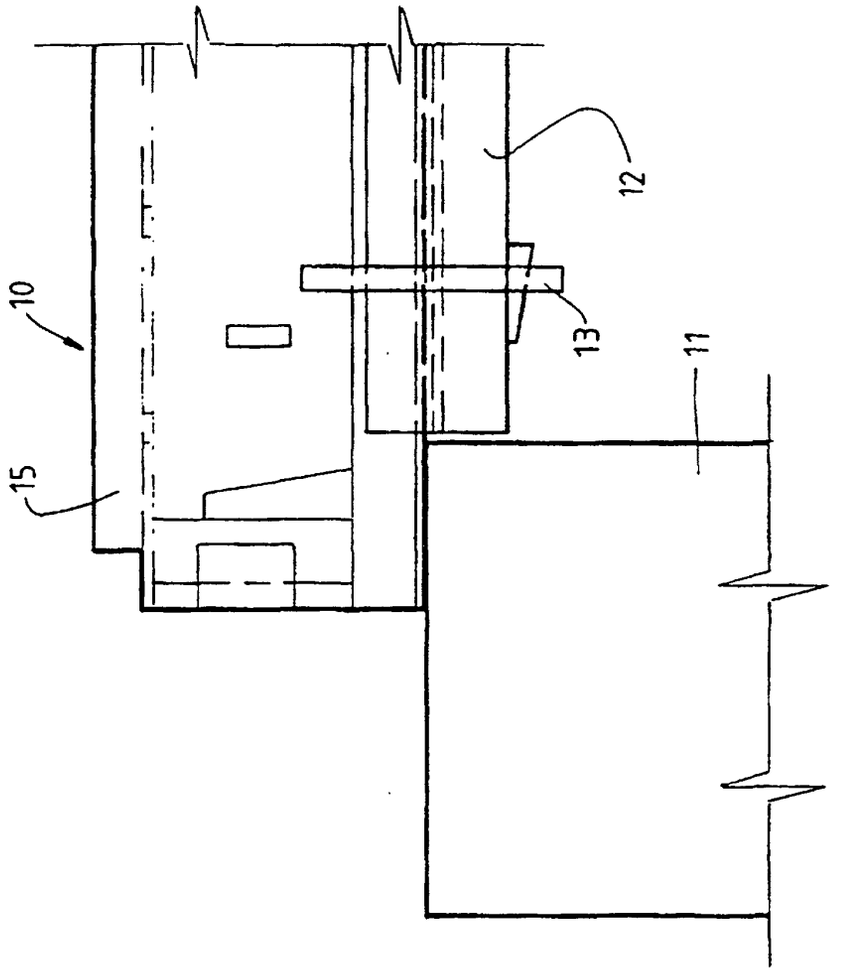


FIG. 2B

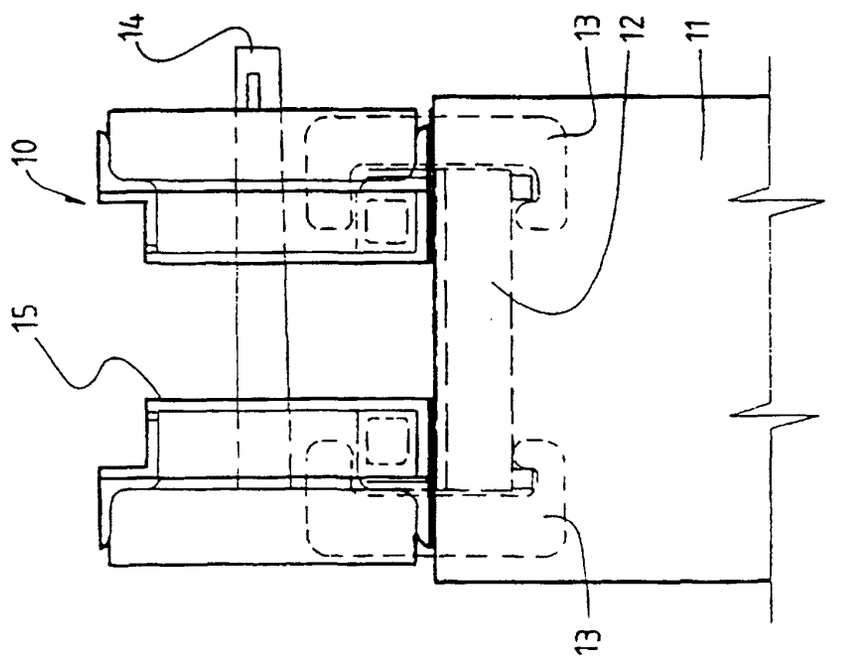


FIG 2A

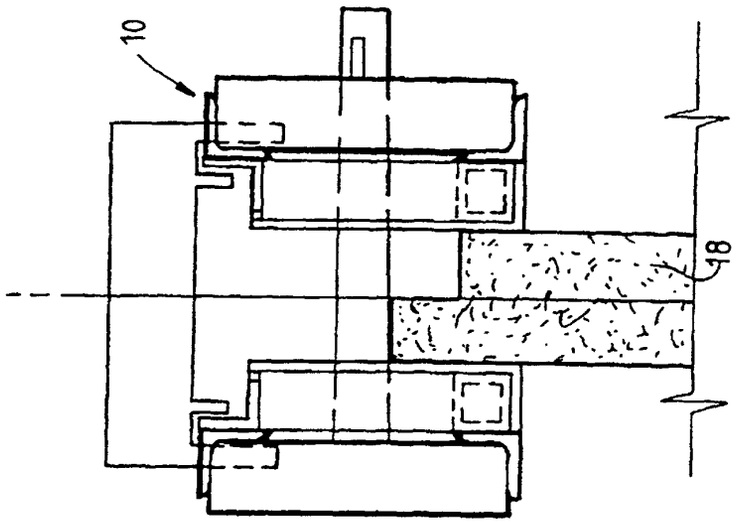


FIG. 3C

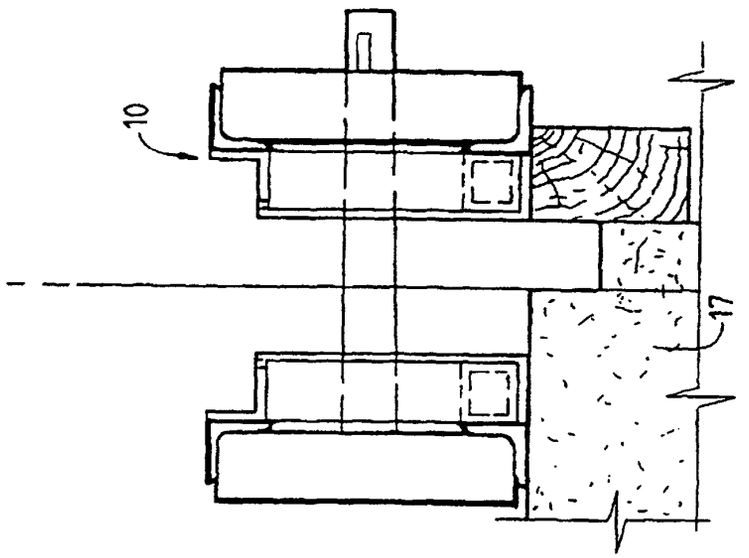


FIG. 3B

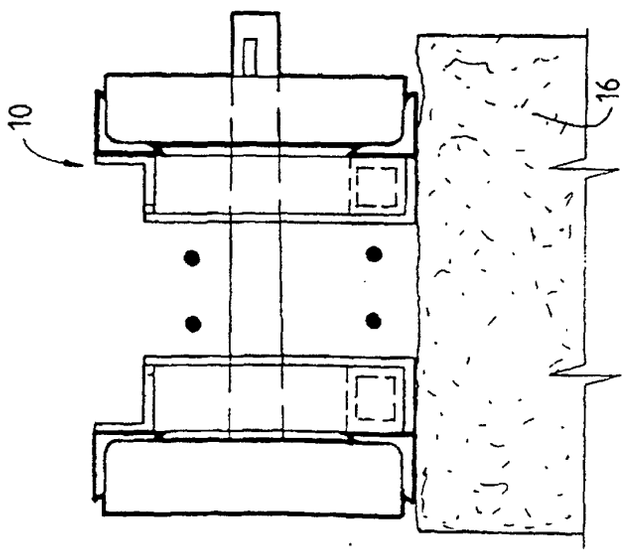


FIG. 3A

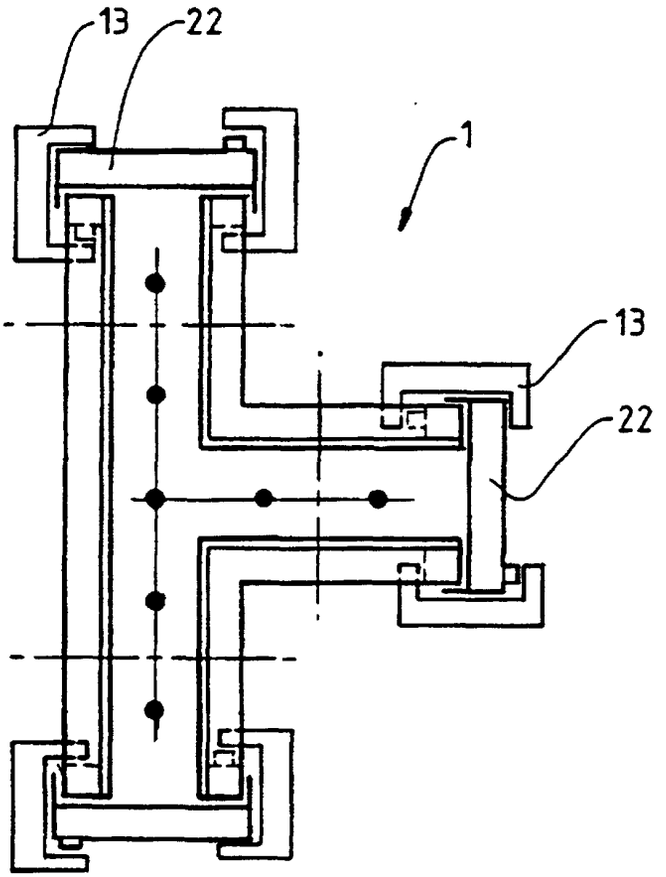


FIG. 4

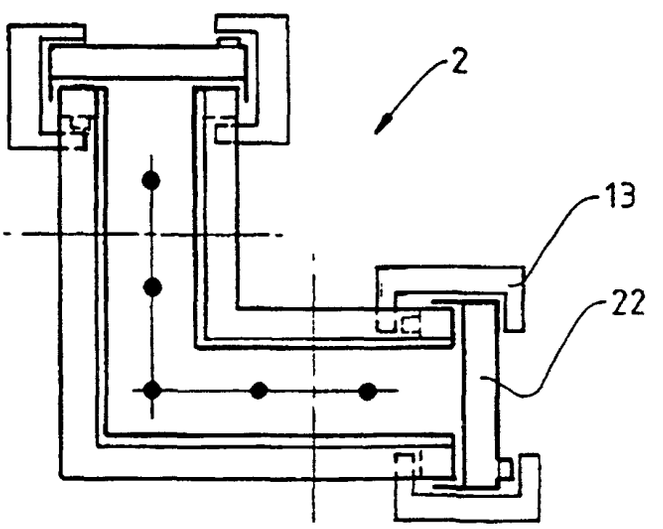


FIG. 5

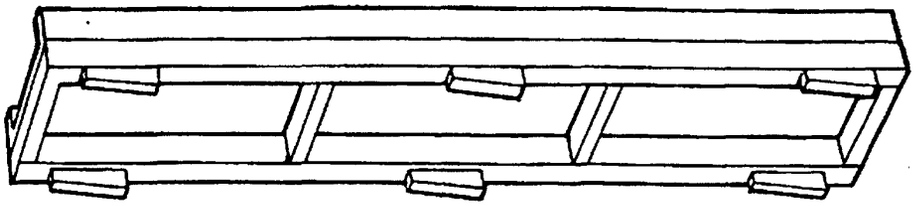


FIG. 6G

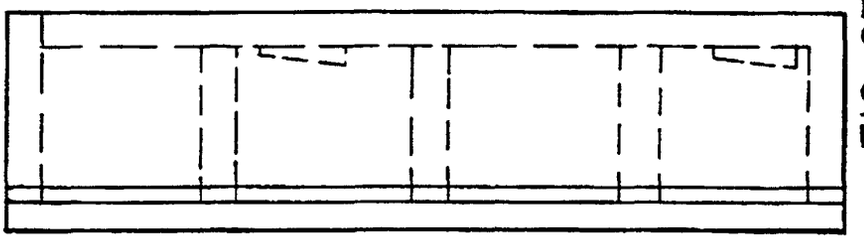


FIG. 6E

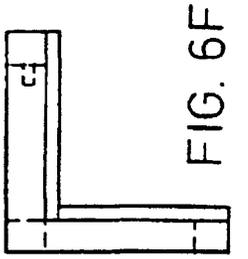


FIG. 6F

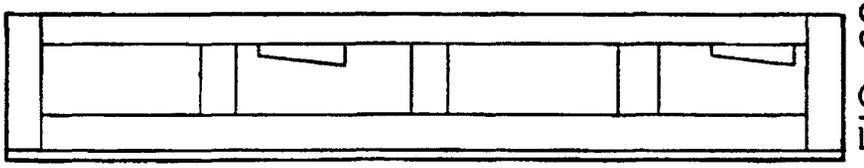


FIG. 6C

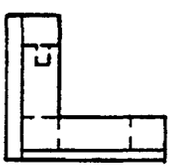


FIG. 6D

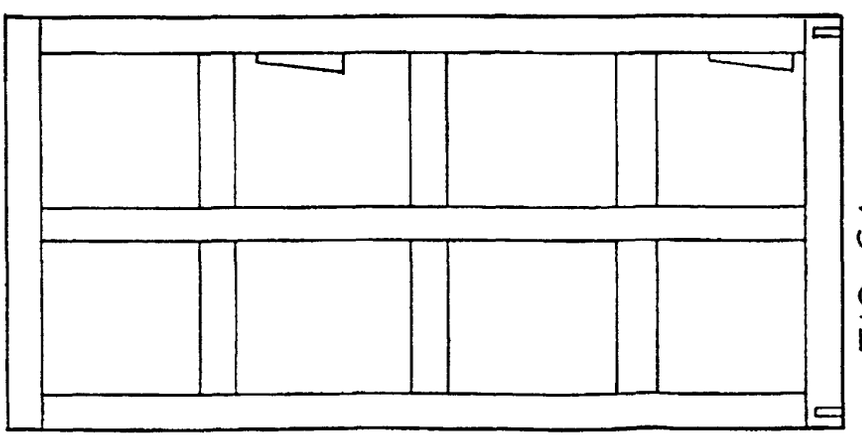


FIG. 6A

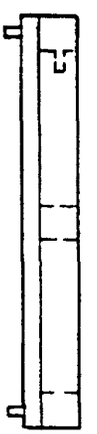


FIG. 6B

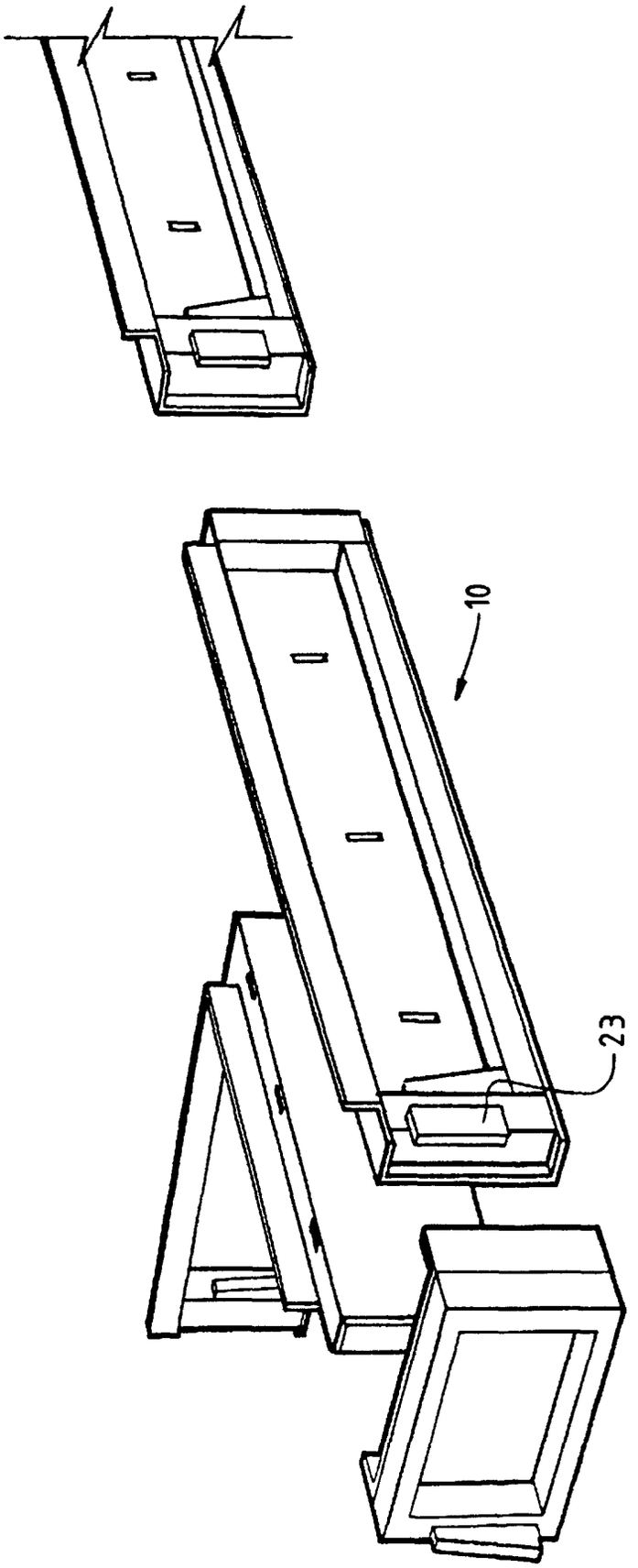


FIG. 7

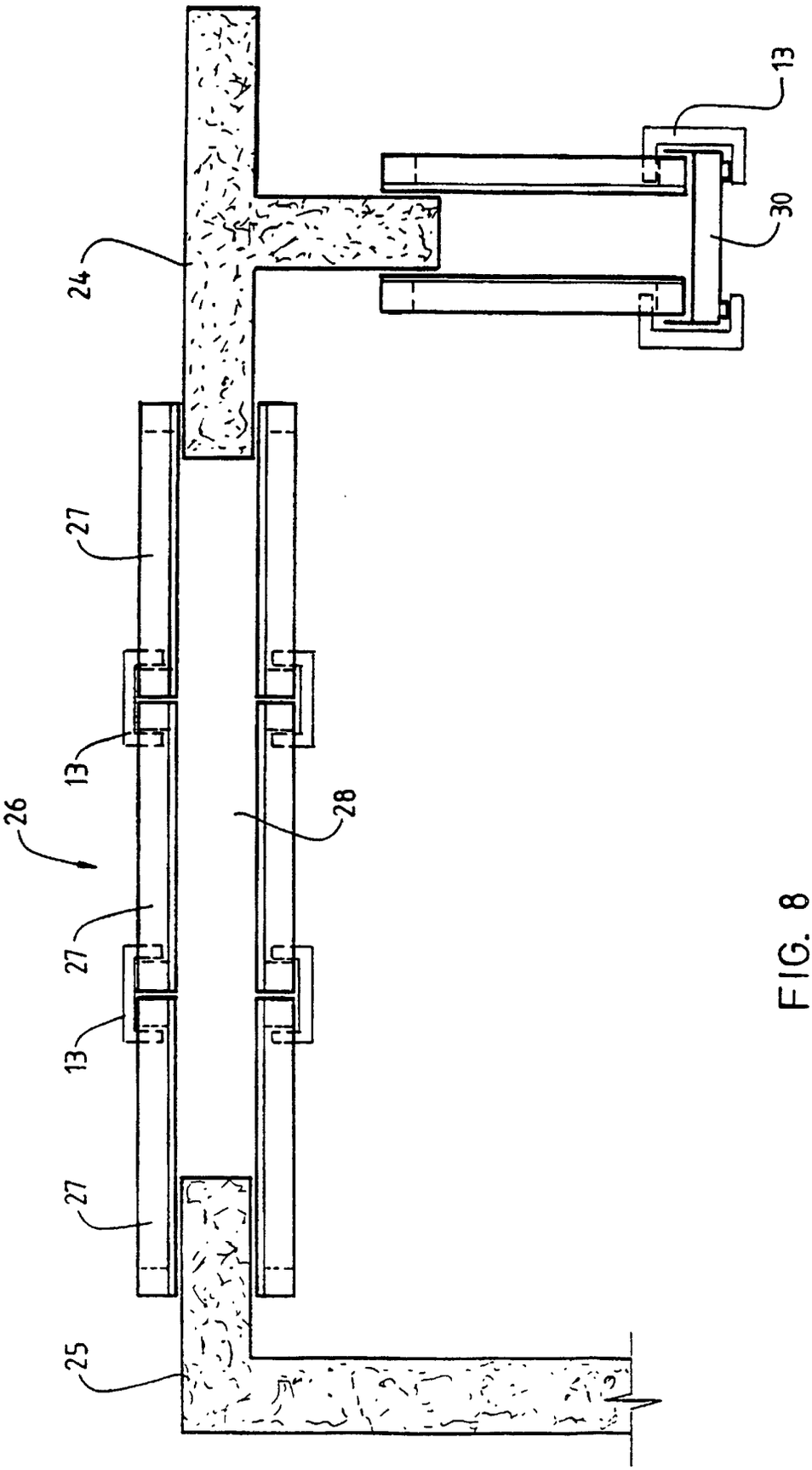
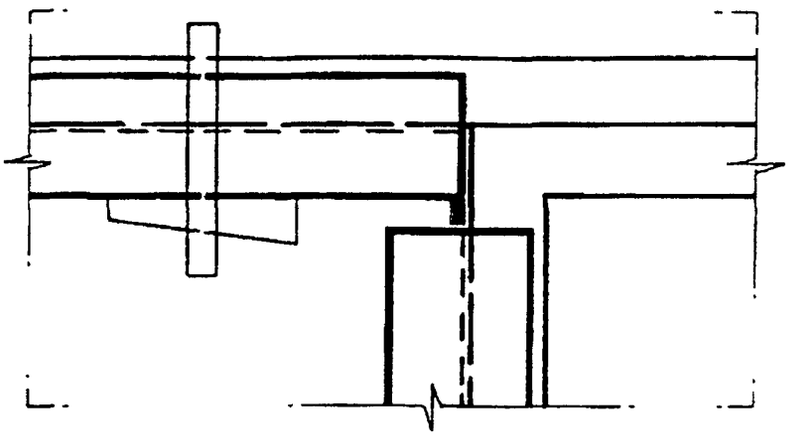
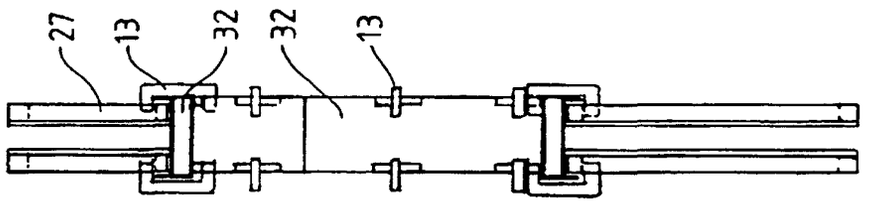


FIG. 8



Detail 9:1

FIG. 9C



A-A

FIG. 9B

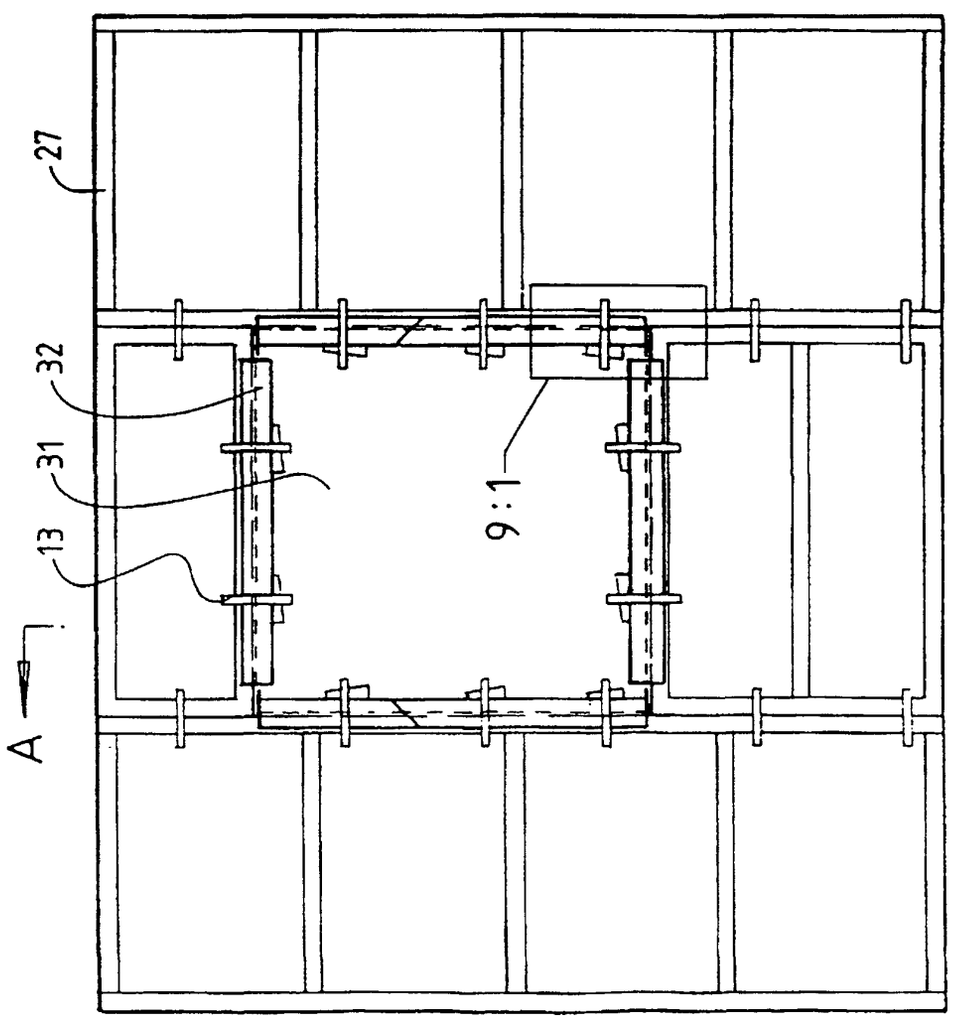


FIG. 9A

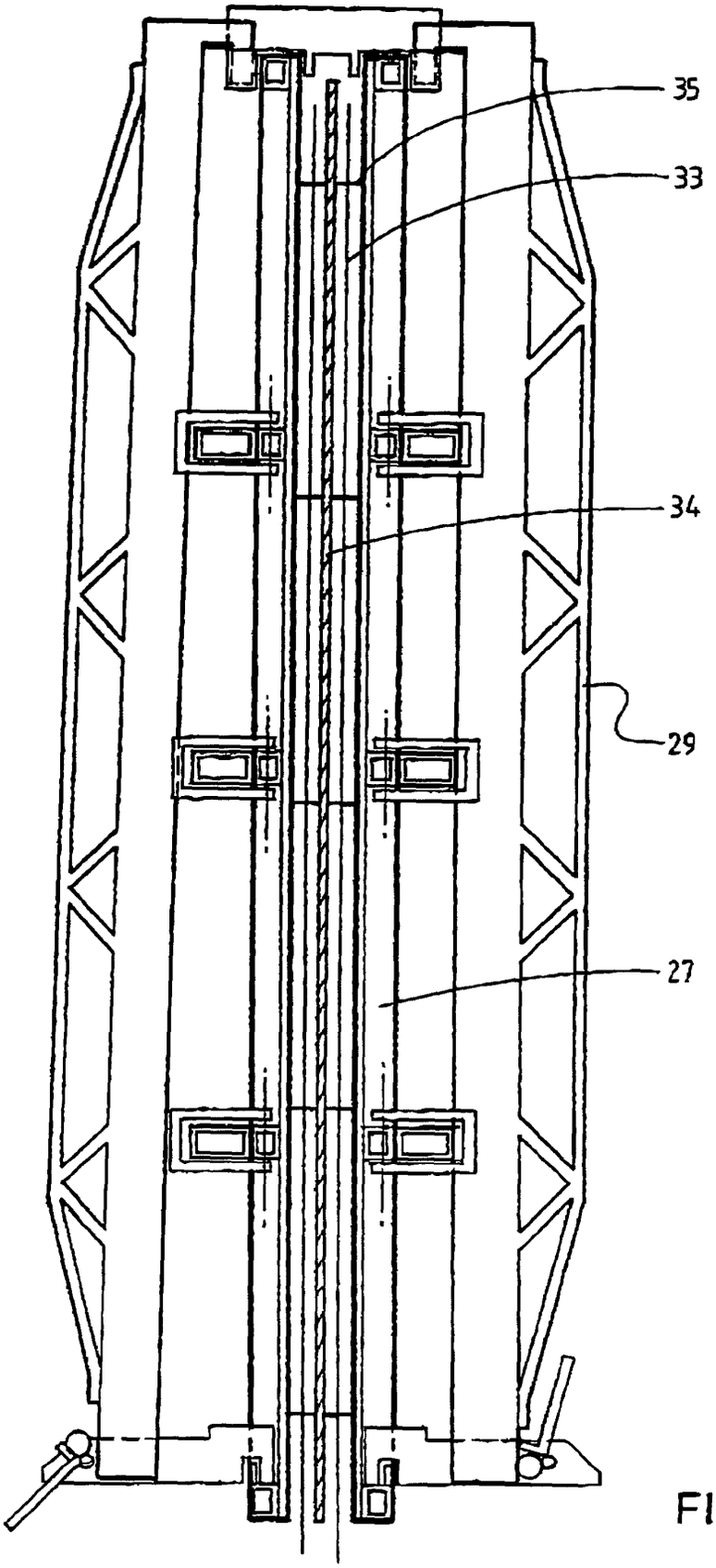


FIG. 10

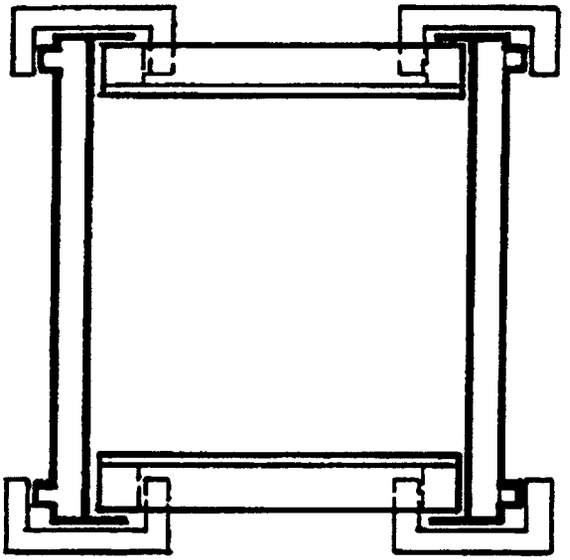


FIG. 11A

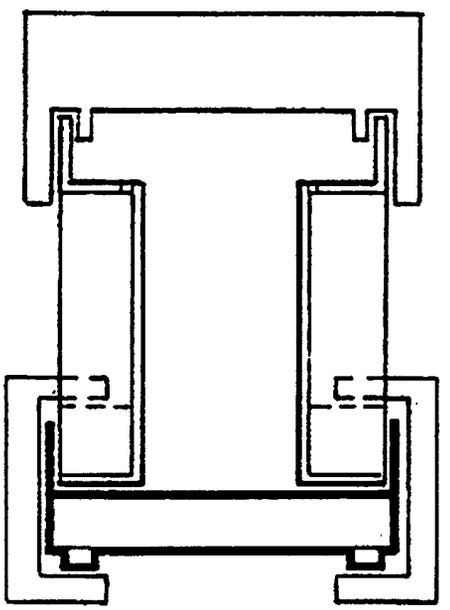


FIG. 11B

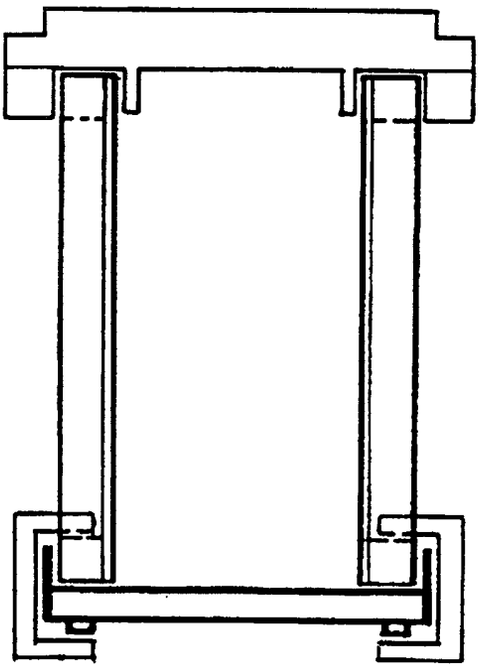


FIG. 11C

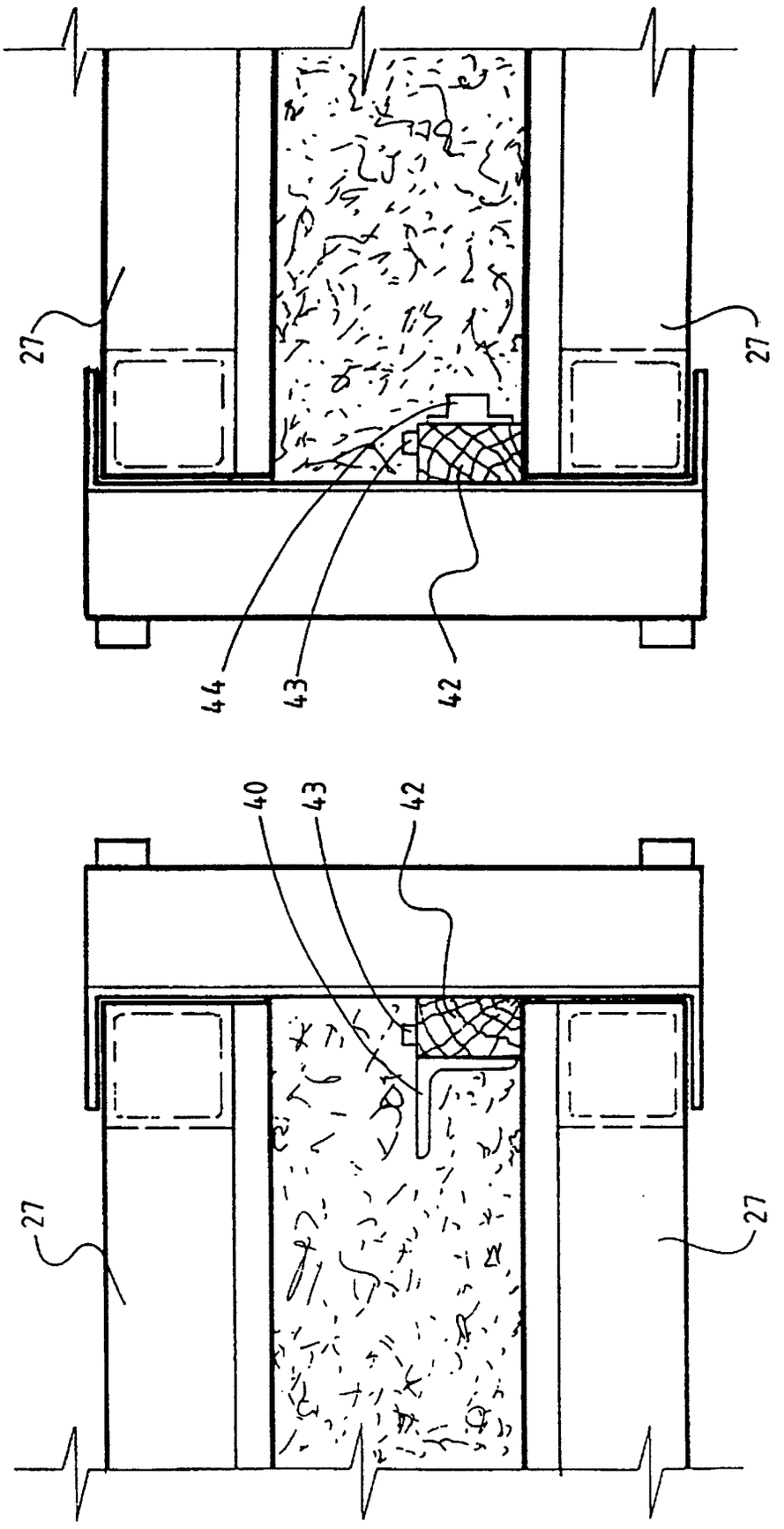


FIG. 12

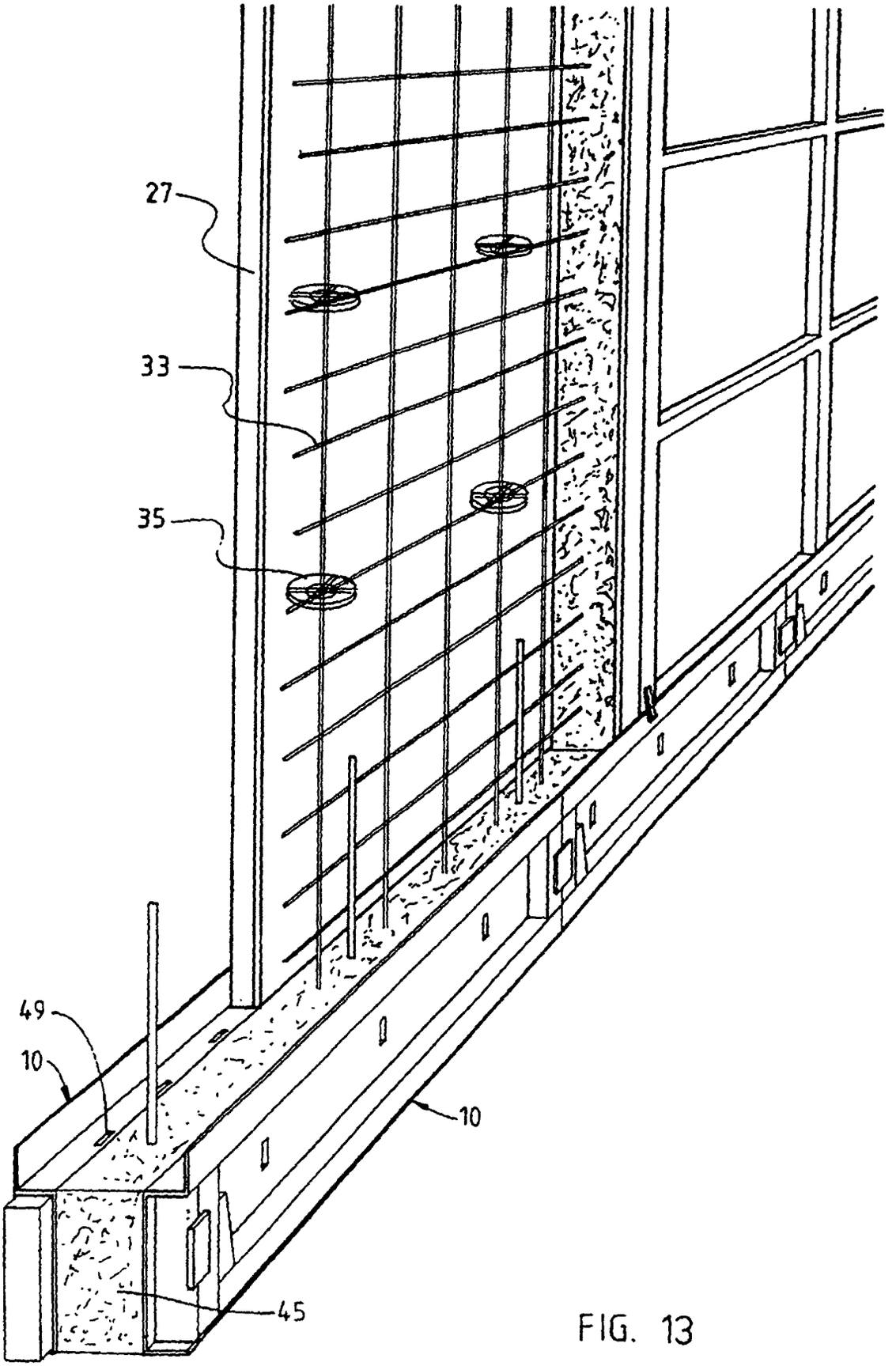


FIG. 13

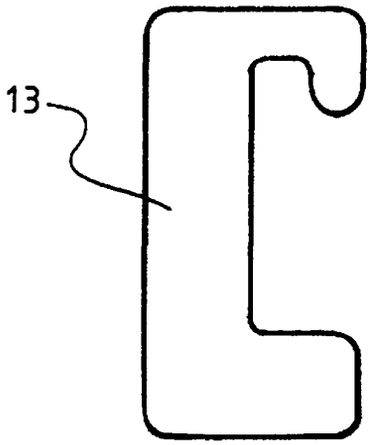


FIG. 14A

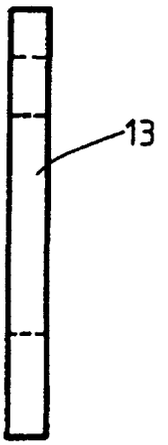


FIG. 14B

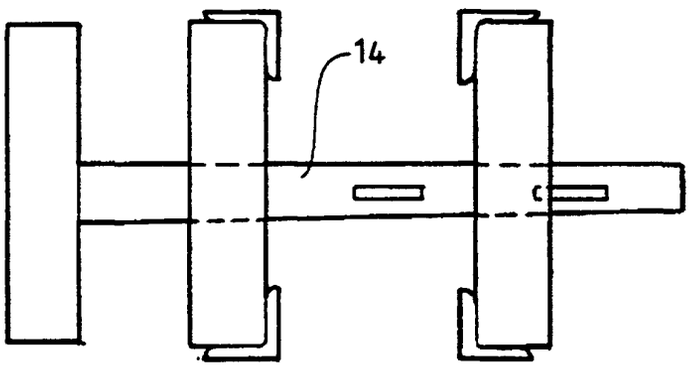


FIG. 15A

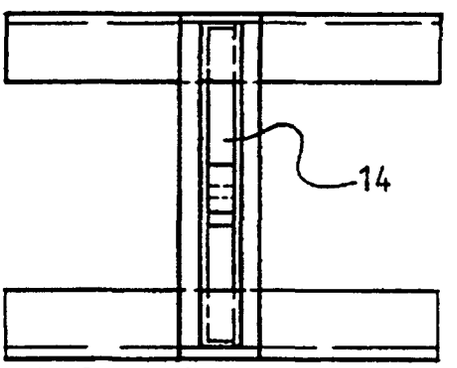


FIG. 15B

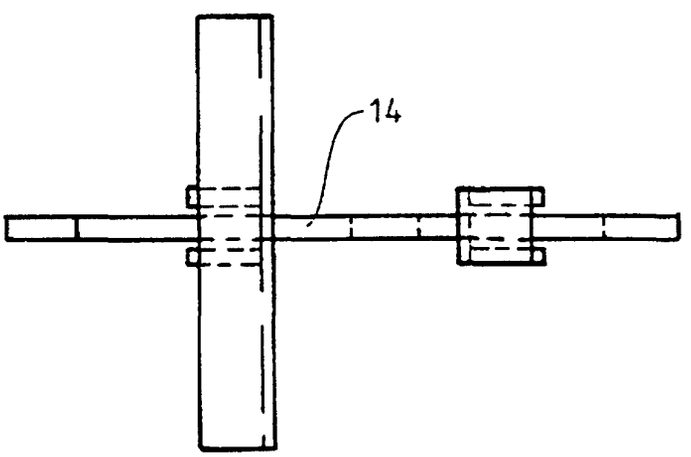


FIG. 15C