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Canadian Intellectual Property Office

CA 2988652 A1 2016/12/29

(21) 2 988 652

(12) DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION

(13) A1

(86) Date de dépôt PCT/PCT Filing Date: 2016/06/22
(87) Date publication PCT/PCT Publication Date: 2016/12/29
(85) Entrée phase nationale/National Entry: 2017/12/07
(86) N° demande PCT/PCT Application No.: CA 2016/000174
(87) N° publication PCT/PCT Publication No.: 2016/205922
(30) Priorité/Priority: 2015/06/23 (GB1510996.0)

(51) Cl.Int./Int.Cl. *E04C 1/41* (2006.01), *E04C 1/00* (2006.01)

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(54) Titre : BLOC DE CONSTRUCTION
(54) Title: CONSTRUCTION BLOCK

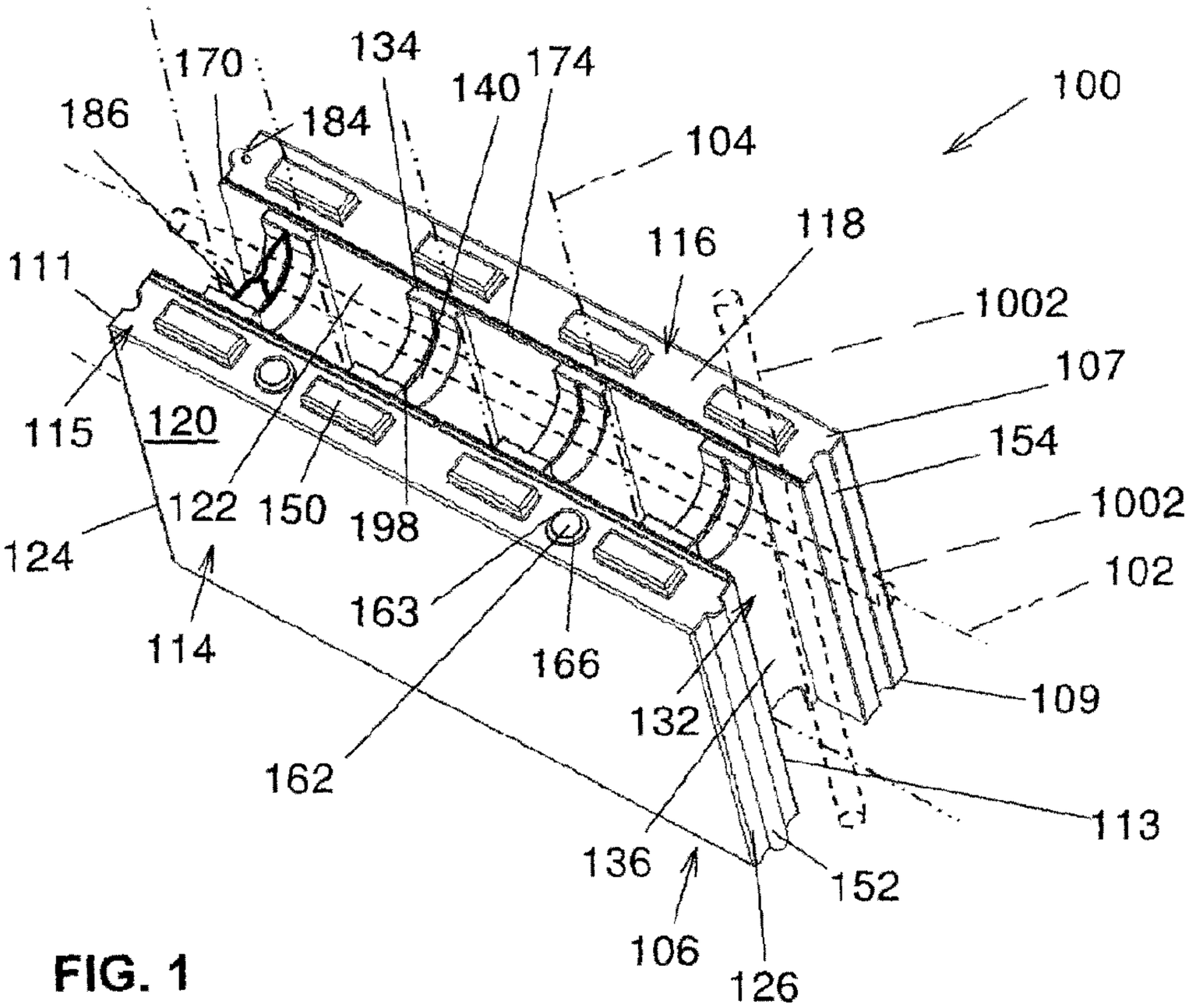

FIG. 1

(57) Abrégé/Abstract:
A construction block (100) including a rigid outer shell (106) and a thermally insulating insert (112). The outer shell (106) defines a pair of outer shell side elements (114, 116) extending substantially vertically and substantially parallel to each other and at least one outer shell transversal element (132) extending between the outer shell side elements (114, 116). The outer shell side and transversal elements (114, 116, 132) are hollow and together define an outer shell cavity (110) delimited by the outer shell (106). The insert (112) is contained inside the outer shell cavity (110).

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
29 December 2016 (29.12.2016)

WIPO | PCT

(10) International Publication Number
WO 2016/205922 A1

(51) **International Patent Classification**:
E04C 1/41 (2006.01) *E04C 1/00* (2006.01)

(21) **International Application Number**:
PCT/CA2016/000174

(22) **International Filing Date**:
22 June 2016 (22.06.2016)

(25) **Filing Language**: English

(26) **Publication Language**: English

(30) **Priority Data**:
1510996.0 23 June 2015 (23.06.2015) GB

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(81) **Designated States** *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

WO 2016/205922 A1

(54) Title: CONSTRUCTION BLOCK

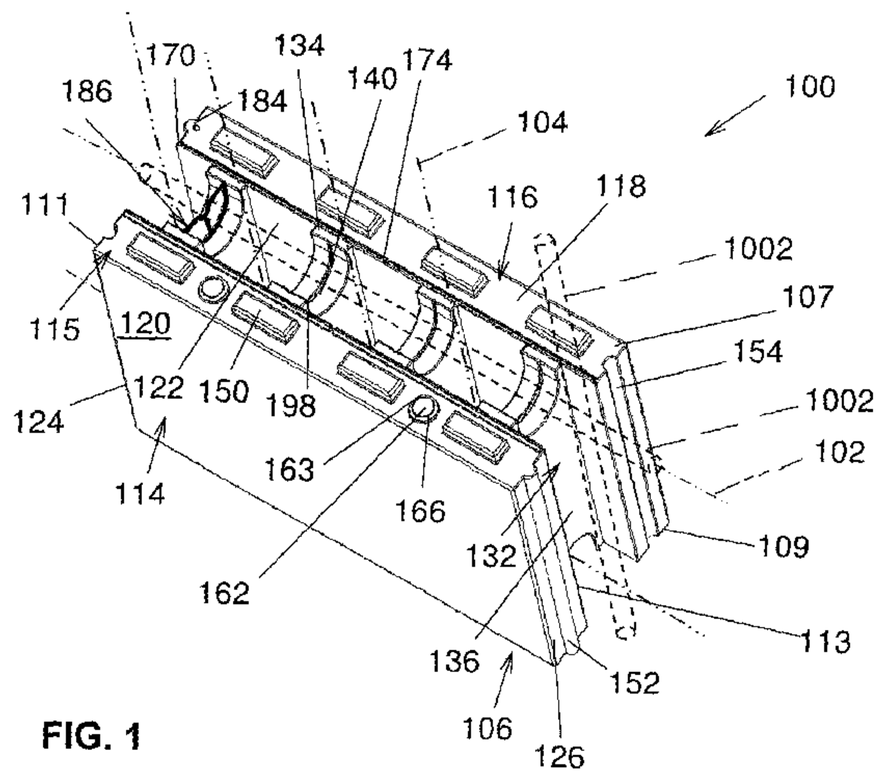

FIG. 1

(57) Abstract: A construction block (100) including a rigid outer shell (106) and a thermally insulating insert (112). The outer shell (106) defines a pair of outer shell side elements (114, 116) extending substantially vertically and substantially parallel to each other and at least one outer shell transversal element (132) extending between the outer shell side elements (114, 116). The outer shell side and transversal elements (114, 116, 132) are hollow and together define an outer shell cavity (110) delimited by the outer shell (106). The insert (112) is contained inside the outer shell cavity (110).

TITLE OF THE INVENTION

CONSTRUCTION BLOCK

FIELD OF THE INVENTION

[0001] The present invention relates generally to the field of building construction, doors and, more particularly, to a construction block.

BACKGROUND

[0002] Construction blocks, such as stay-in-place insulated concrete form blocks, are known in the art and are usable to erect reinforced concrete walls and other construction elements on top of a conventional foundation. These form blocks of the prior art are typically represented by a rectangular shaped form block having the general outer length, height and width dimensions of a standard building block made of concrete commonly used to erect the walls of an average size house. Structurally, the typical insulated concrete form blocks generally comprises a pair of longitudinal side members extending in a parallel and spaced apart relationship. The longitudinal side members are joined to one another through a plurality of transversal members extending laterally in an equidistantly spaced apart relationship between the side panels.

[0003] The transversal members typically have a relatively smaller height than the pair of longitudinal side members at each end thereof. Furthermore, the horizontal and vertical peripheral edges of each longitudinal side member are generally provided with interlocking means configured to mate with the adjacent block in a

wall construction.

[0004] Thus, with the insulated concrete form blocks stacked in a conventional manner in staggered rows to erect a wall, with each new horizontal row of form blocks longitudinally overlapping halfway the previous row, vertical passageways, or hollow posts configurations are formed within the wall construction by the vertically corresponding spaces between the transversal members of each row of form blocks. Furthermore, horizontal passageways are also formed within the wall construction between the vertically corresponding transversal members due to their relatively smaller height compared to the adjacent longitudinal side wall panels. These vertical and horizontal passageways within the wall construction cooperatively form a matrix of communicating passageways through which can be selectively positioned elongated reinforcement rods, followed with pouring in fresh concrete through the upper ends of the vertical passageways in a conventional manner as with any block wall constructions.

[0005] Thus this type of wall system is based on posts and beams that are secured to each other with concrete and rebar through typically horizontal and vertical passageways. Such walls do not represent a monolithic concrete wall structure, but rather represent a matrix of posts and beams made of reinforced concrete that is embedded in an insulating material.

[0006] Once the poured concrete has cured, the insulated concrete form blocks are left in place to provide improved thermal insulation and sound proof characteristics to the wall construction, compared to a comparable wall construction made solely of standard concrete blocks. The insulated concrete form blocks further provide the benefit of sealing any concrete dust that sometimes

sheds off conventional concrete block walls.

[0007] The outer side surfaces of the form blocks may represent, as is, the exterior and interior wall surfaces, or may be used as a support base on which it is relatively easy to install and attach exterior siding, bricks, interior drywall panels, stucco/plastering, shelves, cupboard and the likes, compared to a wall construction made of standard concrete blocks.

[0008] The plurality of known insulated concrete form blocks of the prior art differ from one another mainly through the material, or combination of materials used in their production, and/or through particular shape configurations of the whole block or of individual parts thereof such as the longitudinal side members, the transversal members, the interlocking means or other particular elements thereof.

[0009] For example, some of the known insulated concrete form blocks of the prior art are typically represented by a single piece block, including the longitudinal side members, transversal members and integrally formed interlocking means, that are entirely made of substantially rigid polystyrene, or an equivalent insulating material using a conventional polystyrene injection molding process.

[0010] Another typical example of known insulated concrete form blocks comprises two individual longitudinal side members each represented by a single piece made of rigid polystyrene that are joined in parallel to one another through a plurality of individual transversal members. Each transversal member, in turn, is typically represented by single piece brace or frame made of rigid plastic or metal having opposed ends thereof embedded or otherwise engaged in the polystyrene material of each longitudinal side members.

[0011] Another typical example of known insulated concrete form blocks is represented by a single piece hollow shell made of rigid plastic or an equivalent polymeric material using any known manufacturing process such as an injection molding process, a thermoforming process or a roto-molding process. Some of these block forms only have the thickness of their structural walls as insulating material, while other further integrate empty compartments along inner wall surface portions thereof acting as thermal and sound insulating elements.

[0012] While these form blocks can generally fulfill the main objective of providing a stay-in-place insulated concrete form block for erecting a wall construction as described above, they also entail one or more of the following disadvantages.

[0013] For example, the stay-in-place insulated concrete form blocks solely composed of bare polystyrene, or the ones including two longitudinal side members formed out of polystyrene and joined through transversal members made of plastic braces or frames, are particularly prone to cracks or having pieces thereof chipped or broken away in the typically harsh environment of large and active construction sites. These polystyrene pieces and chips are then scattered all over the site by wind. Furthermore, the relatively weak hollow form blocks made of polystyrene are limited in the number of rows that can be stacked between pours and cure operations of concrete, which significantly increases construction time and cost. Furthermore, bare polystyrene in the open environment is also prone to mold and growth observable as a green hue along surfaces thereof in contact with tossed soil around a new house foundation.

[0014] Additional disadvantages of polystyrene only form blocks of the prior art are as follow: gusts of wind can blow down any partially erected unsupported wall;

they generally need to be secured in place with vertical wall braces at every four feet prior to pouring concrete in the form; the wall braces used, which are often rented, have several additional costs attached to them, like added build time on the job site, as well as requiring a significant amount of time to set the wall braces in place, to align the wall, and eventually remove the braces; a wall built using these form blocks is generally difficult to align after the pouring process; the concrete pressure inside these polystyrene only form blocks can often burst open, thus letting the concrete flow out freely, which stops the whole job site while the opening is being fixed; during construction, you must add sidings without delay because the polystyrene is highly flammable and toxic.

[0015] The relatively more robust insulated concrete form blocks solely composed of plastic can be stacked higher between pours and cure operations of concrete than the polystyrene only versions, yet, they provide significantly less interesting thermal and sound insulating qualities than the latter.

[0016] Technically, an insulated concrete form blocks comprising a relatively sturdy plastic hollow shell having double-walled side panels filled with an insulating material provides the best qualities of both previously described polystyrene only and plastic only versions of an insulated concrete form block. On the other hand, the closed compartments of these form blocks generally require a relatively lengthy and expensive roto-molding manufacturing process or, alternatively, a complex injection molding and bonding assembly line of multiple plastic parts to form the closed compartments.

[0017] In view of the above, there is a need in the industry for an improved construction block.

[0018] An object of the present invention is to provide such a construction block.

SUMMARY OF THE INVENTION

[0019] In a broad aspect, the present invention provides a construction block, the construction block including a substantially rigid outer shell, the outer shell defining substantially vertically opposed outer shell top and bottom ends and substantially horizontally opposed outer shell first and second ends; the outer shell including a pair of outer shell side elements extending substantially vertically and substantially parallel to each other between the outer shell first and second ends; and at least one outer shell transversal element extending between the outer shell side elements; the outer shell side and transversal elements being hollow and together defining an outer shell cavity delimited by the outer shell; the outer shell side and transversal elements together delimiting at least one block passageway extending vertically through the construction block; and an insert made of a thermally insulating material, the insert being contained inside the outer shell cavity.

[0020] The invention may also provide a construction block wherein the outer shell further defines at least one utility conduit extending vertically therethrough.

[0021] The invention may also provide a construction block wherein the utility conduit extends through one of the outer shell side elements and through a portion of the insert located in the one of the outer shell side elements.

[0022] The invention may also provide a construction block wherein the outer shell further defines at least one other utility conduit extending vertically therethrough, each of the utility passageways extending through a respective one

of the outer shell side elements.

[0023] The invention may also provide a construction block wherein the outer shell defines an outer shell top wall at the outer shell top end, the utility conduit opening through the outer shell top wall at a utility conduit upper aperture, a utility conduit lip protruding upwardly from the outer shell top wall around the utility conduit aperture.

[0024] The invention may also provide a construction block wherein the utility conduit is delimited by a utility conduit tube extending downwardly trough the insert from the utility conduit top aperture, the utility conduit tube being configured and sized so that when two of the constructions blocks are superposed in an operative configuration with their utility conduits vertically aligned, the utility conduit lip of a bottom one of the construction blocks engages the utility conduit tube of a top one of the construction blocks.

[0025] The invention may also provide a construction block wherein the outer shell defines an outer shell top wall at the outer shell top end and an opposed outer shell bottom aperture at the outer shell bottom end leading into the outer shell cavity, the insert defining an insert bottom surface, the insert bottom surface being exposed through the outer shell bottom aperture at the outer shell bottom end.

[0026] The invention may also provide a construction block wherein the outer shell defines a plurality of outer shell vertical walls extending substantially vertically downwardly from the outer shell top wall, the outer shell top and vertical walls together delimiting the outer shell cavity.

[0027] The invention may also provide a construction block wherein the outer shell defines at least one coupling protrusion protruding upwardly from adjacent portions of the outer shell top wall and the insert defines at least one coupling recess extending upwardly into the insert bottom surface relative to adjacent portions of the insert bottom surface, the coupling protrusion and recess being complementarily shaped and sized and being located such that when two of the construction blocks are superposed in an operative configuration, the coupling protrusion of a bottom one of the two construction blocks is fittingly received in the coupling recess of a top one of the two construction blocks for frictionally engaging the coupling recess.

[0028] The invention may also provide a construction block wherein the outer shell defines two rows of coupling protrusions each protruding upwardly from the outer shell top wall along a respective one of the outer shell side elements and the insert defines two rows of coupling recesses extending upwardly into the insert bottom surface, each coupling recess being vertically aligned with a respective coupling protrusion and shaped complementarily to the respective coupling protrusion.

[0029] The invention may also provide a construction block wherein the two rows of coupling protrusions include coupling protrusions having substantially similar configurations.

[0030] The invention may also provide a construction block wherein the two rows of coupling protrusions include coupling protrusions having configurations that differ between the two rows of coupling protrusions.

[0031] The invention may also provide a construction block wherein the two rows of coupling protrusions include coupling protrusions that differ in their length in a direction parallel to a direction leading between the outer shell first and second ends.

[0032] The invention may also provide a construction block wherein the outer shell top wall is recessed in the outer shell transversal element relative to the outer shell side elements to define a substantially upwardly facing top recess.

[0033] The invention may also provide a construction block further comprising a rod support for supporting a reinforcement rod in a predetermined relationship relative to the construction block, the rod support being selectively insertable in the top recess.

[0034] The invention may also provide a construction block wherein the outer shell top wall defines a support receiving groove in the top recess receiving part of the rod support thereinto when the rod support is inserted in the top recess.

[0035] The invention may also provide a construction block wherein the top recess has a substantially arc segment shaped configuration.

[0036] The invention may also provide a construction block wherein the top recess has a substantially rectangular configuration.

[0037] The invention may also provide a construction block wherein the insert and outer shell together are recessed in the outer shell transversal element relative to the outer shell side elements to define a downwardly oriented bottom recess.

[0038] The invention may also provide a construction block wherein the at least one outer shell transversal element is spaced apart from the outer shell first and second ends.

[0039] The invention may also provide a construction block wherein the at least one outer shell transversal element is provided at one of the outer shell first and second ends.

[0040] The invention may also provide a construction block wherein at least one of the outer shell side elements defines an end groove extending thereinto at the outer shell first end and an end ridge protruding therefrom at the outer shell second end, the end groove and end ridge being complementarily shaped and being located such that when two of the construction blocks are abutted against each other in an operative configuration with the outer shell first end of one of the construction blocks abutting against the outer shell second end of an other one of the construction blocks, the end ridge of the second one of the construction blocks is fittingly received in the end groove of the first one of the construction blocks.

[0041] The invention may also provide a construction block wherein the outer shell side elements have substantially similar vertical heights.

[0042] The invention may also provide a construction block wherein the outer shell side elements have substantially different vertical heights.

[0043] The invention may also provide a construction block further defining a beam receiving aperture extending transversally through one the outer shell side elements substantially parallel to the outer shell transversal element.

[0044] The invention may also provide a construction block wherein at least one of the outer shell side elements is crenelated at the outer shell top end.

[0045] The invention may also provide a construction block wherein the at least one of the outer shell side elements also defines a utility groove extending laterally thereinto, the utility groove originating at the outer shell bottom end and terminating short of the outer shell top end.

[0046] The invention may also provide a construction block wherein the outer shell side elements are substantially rectilinear.

[0047] The invention may also provide a construction block wherein the outer shell side elements are substantially L-shaped.

[0048] The invention may also provide a construction block wherein the outer shell top surface slopes between the outer shell first and second ends so that the height of the construction block away from the outer shell bottom end varies between the outer shell first and second ends.

[0049] The invention may also provide a construction block wherein the outer shell is made of a polymer and the insert is made of a foam or other suitable type of insulation.

[0050] The invention may also provide a construction block wherein the insert is made of foam, the coupling protrusion comprising a locking element extending therefrom and penetrating the foam when the coupling protrusion of the bottom one of the construction blocks is operatively inserted in the coupling recess of the

top one of the construction blocks .

[0051] The invention may also provide a construction block wherein the outer shell top wall defines a pin engaging bore extending from the support receiving groove and the rod support defines a rod support pin configured and sized for engaging the pin engaging bore when the rod support is operatively inserted in the top recess.

[0052] In some embodiments, the proposed construction block is usable for building wall structures comprising an assembly of form blocks cooperatively defining an inner matrix of horizontal and vertical passageways through communicating inner horizontal and vertical hollow channel portions thereof. Within these horizontal and vertical passageways, reinforcement rods may be user selectively positioned, followed with fresh concrete poured in through the top end of the vertical passageways to form an insulated concrete wall structure complying with known building construction standards.

[0053] Alternatively, the construction block of the present invention may be used to build a temporary construction by using metal or wooden posts positioned vertically through selected vertical passageways of wall constructions made of construction blocks of the present invention.

[0054] Advantageously, the proposed construction block is relatively easily manufactured using many manufacturing processes and is structured to allow assembly of a relatively large number thereof before concrete needs to be poured to secure the resulting assembly. When present, the utility conduit facilitates installation of utilities in a building including the proposed construction block.

[0055] The present application claims priority from UK Request Application 1510996.0 filed June 23, 2015, the contents of which is hereby incorporated by reference in its entirety. Other objects, advantages and features of the present invention will become more apparent upon reading of the following non-restrictive description of some embodiments thereof, given by way of example only with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0056] Figure 1, in a perspective view, illustrates an embodiment of a construction block according to the present invention;

[0057] Figure 2, in a bottom perspective view, illustrates an outer shell part of the construction block of FIG. 1;

[0058] Figure 3, in a side elevation view, illustrates the construction block of FIG. 1;

[0059] Figure 4, in an end elevation view, illustrates the construction block of FIG. 1;

[0060] Figure 5, in a top plan view, illustrates the construction block of FIG. 1;

[0061] Figure 6, in a bottom plan view, illustrates the outer shell of FIG. 2;

[0062] Figure 7, in a top perspective view, illustrates an alternate embodiment of a construction block based on the construction block of FIG.1, here representing a

full corner construction block;

[0063] Figure 8, in a top perspective view, illustrates an other alternate embodiment of a construction block based on the construction block of FIG. 1, here representing a half block that has a length substantially half of that of the construction block of FIG. 1;

[0064] Figure 9, in a bottom perspective view, illustrates the construction block of FIG. 8;

[0065] Figure 10, in a top perspective view, illustrates yet an other alternate embodiment of a construction block based on the construction block of FIG. 1, here representing a half corner construction block;

[0066] Figure 11, in a top perspective view, illustrates yet an other alternate embodiment of a construction block based on the construction block of FIG. 1, here representing an angled, or sloping, construction block;

[0067] Figure 12, in a transversal cross-section view, illustrates a stack of the construction of FIG. 1 in which concrete has been poured;

[0068] Figure 13, in a front elevation view, illustrates an end cap usable with the construction block of FIG. 1;

[0069] Figure 14, in a side elevation view, illustrates the end cap of FIG. 13;

[0070] Figure 15, in a rear elevation view, illustrates the end cap of FIG. 13;

[0071] Figure 16, in a top plan view, illustrates the end cap of FIG. 13;

[0072] Figure 17, in a perspective bottom view, illustrates an outer shell part of the end cap of FIG. 13;

[0073] Figure 18, in a perspective bottom view, illustrates the end cap of FIG. 13, here showing the outer shell filled with an insert;

[0074] Figure 19, in a front plan view, illustrates a rod (or rebar) support for supporting a reinforcement rod in a predetermined relationship relative to the construction block of FIG. 1;

[0075] Figure 20, in a front plan view, illustrates the rod (or rebar) support of FIG. 19 and the construction block of FIG .1 before the former is inserted in a recess formed in the latter;

[0076] Figure 21, in a front plan view, illustrates the rod (or rebar) support of FIG. 19 and the construction block of FIG. 1 with the former inserted in the recess;

[0077] Figure 22, in a top perspective view, illustrates an alternate embodiment of a rod (or rebar) support;

[0078] Figure 23, in a front plan view, illustrates a wall construction represented by an assembly comprising various embodiments of the construction blocks of FIGS. 1 to 12, along with the end caps of FIGS. 13 to 18;

[0079] Figure 24, in a top perspective view, illustrates an alternate embodiment of

a construction block in accordance with the present invention usable for supporting a floor or roof joist;

[0080] Figure 25, in a side elevation view, illustrates yet an other alternate embodiment of a construction block in accordance with the present invention usable for supporting a floor or roof joist;

[0081] Figure 26, in a perspective view, illustrates the construction block of FIG. 25

[0082] Figure 27, in a bottom plan view, illustrates yet an other alternate embodiment of a construction block in accordance with the present invention, the construction block being provided with transversal reinforcement link members;

[0083] Figure 28, in a top plan view, illustrates yet an other alternate embodiment of a construction block in accordance with the present invention;

[0084] Figure 29, in a top plan view, illustrates yet an other alternate embodiment of a construction block in accordance with the present invention;

[0085] Figure 30, in a perspective view, illustrates yet an other alternate embodiment of a construction block in accordance with the present invention;

[0086] Figure 31, in a perspective view, illustrates yet an other an other alternate embodiment of a construction block in accordance with the present invention;

[0087] Figure 32, in a perspective view, illustrates yet an other alternate

embodiment of a construction block in accordance with the present invention;

[0088] Figure 33, in an alternative perspective view, illustrates the construction block of FIG. 32;

[0089] Figure 34, in a perspective view, illustrates an opening for inserting a screw usable in the blocks of FIGS. 1 to 12 and 24 to 33;

[0090] Figure 35, in a transversal side cross-sections views, illustrates a superposition of the construction blocks of FIG. 1 and of FIG. 32;

[0091] Figure 36, in a top elevation view, illustrates yet an other alternate embodiment of a construction block in accordance with the present invention;

[0092] Figure 37, in a partial transversal cross-sectional view, illustrates two of the construction blocks of FIG. 36 just prior to being coupled to each other on top of each other;

[0093] Figure 38, in a partial transversal cross-sectional view, illustrates the construction blocks of FIG. 37 after being coupled to each other on top of each other;

[0094] Figure 39, in a perspective view, illustrates a locking element part of the construction block of FIG. 36;

[0095] Figure 40, in a perspective view, illustrates an alternate locking element usable in the construction block of FIG. 36;

[0096] Figure 41, in a perspective view, illustrates an other an other alternate locking element usable in the construction block of FIG. 36;

[0097] Figure 42, in a perspective view, illustrates yet an other an other alternate locking element usable in the construction block of FIG. 36;

[0098] Figure 43, in a perspective view, illustrates a starter element usable, for example, with the construction block of FIGS. 1 to 6;

[0099] Figure 44, in a top plan view, illustrates the starter element of FIG. 43; and

[00100] Figure 45, in a side elevation view, illustrates the starter element of FIGS 43 and 44.

DETAILED DESCRIPTION

[00101] The term "substantially" is used throughout this document to indicate variations in the thus qualified terms. These variations are variations that do not materially affect the manner in which the invention works and can be due, for example, to uncertainty in manufacturing processes or to small deviations from a nominal value or ideal shape that do not cause significant changes to the invention. These variations are to be interpreted from the point of view of the person skilled in the art. Also, directional terminology such as "top" and "bottom" is used with reference to a typical use of the invention, with rows of construction blocks superposed on top of each other in a typical orientation. However, this terminology should not be used to limit the scope of the invention and the construction blocks described herein are usable, in some embodiments, in a

different orientation.

[00102] FIGS. 1 to 6 inclusively illustrate various aspects of an embodiment, according to the present invention, of a construction block 100. The construction block 100 is usable, in some embodiment, as a stay-in-place, hollow insulated concrete form block. However, in some embodiments, the construction block 100 is usable without concrete.

[00103] As seen for example from FIG. 12, the construction block 100 includes a substantially rigid outer shell 106 and an insert 112 made of a thermally insulating material. Referring to FIG. 1, the outer shell 106 defines substantially vertically opposed outer shell top and bottom ends 107 and 109 and substantially horizontally opposed outer shell first and second ends 111 and 113. A pair of outer shell side elements 114 and 116 extend substantially vertically and substantially parallel to each other, laterally spaced apart from each other, between the outer shell first and second ends 111 and 113. Typically, in the construction block 100, the outer shell side elements 114 and 116 are substantially rectilinear and have substantially similar vertical heights. At least one outer shell transversal element 132 extends between the outer shell side elements 114 and 116, the outer shell side and transversal elements 114, 116 and 132 together delimiting at least one block passageway 104 extending vertically through the construction block 100. The block passageway 104 may be delimited between adjacent ones of the outer shell transversal elements 132, or may be open at one of the outer shell first and second ends 111 and 113. In the latter case, the outer shell transversal element 132 of another one of the construction blocks 100 added in line with the first construction block may provide a fourth wall enclosing horizontally the block passageway 104. In some embodiments, the block passageways 104 are left empty. In other embodiments, concrete 101 is poured thereinto when a structure

encompassing many of the construction blocks 100 has been assembled, as seen in FIG. 12.

[00104] The outer shell side and transversal elements 114, 116 and 132 are hollow, as seen in FIG. 2, and together define an outer shell cavity 110 delimited by the outer shell 106. The insert 112 (seen in FIG. 2) is contained inside the outer shell cavity 110. The insert 112 and outer shell 106 are manufactured of any suitable material which give a relatively larger rigidity to the outer shell 106 compared to the insert 112. Such rigid materials are typically bulks of solid materials, without air bubbles therein. To provide improved thermal insulation properties to the construction block 100, the insert 112 is made of material that is more thermally insulating than the outer shell 106, such as, for example, one of the many types of foam that are made of a polymeric material filled with gas bubbles.

[00105] The construction block 100 is usable for building wall structures 1000, for example, as illustrated in FIG. 23, comprising an assembly of construction blocks 100 cooperatively defining an inner matrix of horizontal and vertical passageways 102 and 104 through inner hollow portions thereof, as represented for example in FIG. 1. Within these horizontal and vertical passageways 102 and 104, reinforcement rods 1002 may be user selectively positioned, followed with fresh concrete 101 poured in therethrough to form an insulated concrete wall structure 1000 complying with known building construction standards. A cross-sectional configuration of this wall structure 1000 is illustrates in FIG. 12.

[00106] Alternatively, the construction block 100 of the present invention may be used to build a temporary construction by using metal or wooden posts positioned vertically through selected vertical passageways 104, or both horizontal and

vertical passageways 104, of wall constructions made of construction blocks 100.

[00107] Referring to FIG. 1, the construction block 100 generally comprises an outer shell 106 having a double-walled open container configuration. The outer shell 106 defines an outer shell top wall 115 at the outer shell top end 107 and an opposed outer shell bottom aperture 108 (seen in FIG. 2) at the outer shell bottom end 109 leading into the outer shell cavity 110, which extends upwardly inwardly therefrom. The insert 112 is engaged in the outer shell cavity 110 of the outer shell 106 (as best illustrated in FIG. 12). Thus, the insert 112 defines an insert bottom surface, 155, the insert bottom surface 155 being exposed through the outer shell bottom aperture 108 at the outer shell bottom end 109.

[00108] The outer shell 106 is for example made of a suitably rigid and UV proof polymeric material such as, for example, a suitable thermoplastic, a thermoset plastic, PVC, ABS, Teflon®, a sufficiently rigid Nylon® based material, or equivalent. Further, in some embodiments, the polymeric material used offers certified fire retardant characteristics. The outer shell 106 may be produced using any known suitable manufacturing process such as a conventional injection moulding process, a thermosetting process, a thermoforming process, or the likes.

[00109] The insert 112 is for example made of a relatively rigid insulating material such as, for example, a relatively dense polystyrene foam material or equivalent, which is less rigid than the material making the outer shell 106. Likewise the polymeric material used for the outer shell 106, the insulating material used for the insert 112 typically has fire retardant characteristics. As it will be described further below, the insert 112 may be moulded directly into the outer shell cavity 110 or, alternatively, using an individual polystyrene injection moulding process followed

with the insertion of the resulting insert 112 thereof in the outer shell cavity 110.

[00110] Closely similar embodiments of a construction block, all based on the outer shell 106 and insert 112 combination as mentioned above, will be described further below.

[00111] As best illustrated in FIG. 1, the outer shell 106 includes a pair of outer shell side elements 114 and 116. Each one of the outer shell side elements 114 and 116 has a generally rectangular, box-shaped configuration defined by a typically generally planar side element top wall portion 118, a side element outer side wall portion 120, a side element inner side wall portion 122 extending in a parallel spaced apart relationship relative to the side element outer side wall portion 120, opposed first and second side element end wall portions 124 and 126, and a side member bottom edge portion 128 extending at the bottom of the side element outer side, inner side and end wall portions 120, 122, 124 and 126. Thus, as seen in FIG. 2 for example, each one of the outer shell side elements 114 and 116 defines a longitudinal inner cavity portion 130 extending upwardly between their respective side element bottom edge portions 128.

[00112] The outer shell 106 further includes one or more outer shell transversal elements 132. Each one of the one or more outer shell transversal elements 132 extends laterally, typically in an equidistantly parallel spaced apart relationship relative to one another, between the oppositely facing side element inner side wall portions 122.

[00113] Furthermore, typically, each one of the one or more outer shell transversal elements 132 that is adjacent to one of the first or second side element

end wall portions 124 and 126 is spaced apart relative thereto a distance that is substantially equivalent to half the distance between two adjacent outer shell transversal elements 132. Thus, a series of construction blocks 100 arranged in a horizontal end-to-end configuration defines a series of equidistantly spaced apart and similarly dimensioned vertical passageways 104.

[00114] Each outer shell transversal elements 132 has a generally rectangular, box-shaped configuration defined by a transversal element top wall portion 134 (seen for example in FIG. 1), opposed transversal element side wall portions 136 (seen for example in FIG. 2) extending in a substantially parallel spaced apart relationship relative to one another, and parallel transversal element bottom edge portions 138 (seen for example in FIG. 2) extending at the bottom of the transversal element side wall portions 136.

[00115] The side element top wall portion 118 and transversal element top wall portions 134 together define the outer shell top wall 115.

[00116] Furthermore, in some embodiments, one or both the transversal element top wall portion 134 and the transversal element bottom edge portions 138 each define respective a transversal element top arcuate surface 140 and transversal element bottom arcuate edge portions 142 respectively, that are substantially oppositely inwardly extending relative to the vertical dimension of each outer shell transversal element 132. More generally in some embodiments, the outer shell top wall 115 is recessed in the outer shell transversal elements 132 relative to the outer shell side elements 114 and 116 to define a substantially upwardly facing top recess, such as the one delimited by the top arcuate surface 140, in which case the top recess has a substantially arc segment shape configuration. Also, in some

embodiments, the insert 112 and outer shell 106 together are recessed in the outer shell transversal element 132 relative to the outer shell side elements 114 and 116 to define a downwardly oriented bottom recess, at the bottom arcuate edge portions 142.

[00117] Thus, referring to FIG. 2, each one in the one or more outer shell transversal elements 132 defines a transversal inner cavity portion 146 extending upwardly between their respective transversal element bottom edge portions 138. Furthermore, each one of the transversal inner cavity portions 146 communicates respectively with the longitudinal inner cavity portions 130 at each distal ends thereof to cooperatively form the outer shell cavity 110.

[00118] Typically, the construction block 100 includes either a single outer shell transversal element 132 or an even number of outer shell transversal elements 132. Thus, as would be obvious to someone familiar with masonry work, a horizontal row of construction blocks 100 assembled in an end-to-end fashion may horizontally overlap an underlying row of construction blocks 100 the equivalent length of a quarter, one half, three-quarter or a full length construction block 100 while still preserving the vertical alignment of the vertical passageways 104 between stacked rows of construction blocks 100. However, three or other odd numbers of outer shell transversal element 132 are within the scope of the invention.

[00119] Referring to FIG. 1 for example, the outer shell 106 further defines one or more coupling protrusions 150 protruding upwardly from adjacent portions of the outer shell top wall 115. More specifically, each coupling protrusion 150 extends substantially upwardly a predetermined height dimension from each side element

top wall portions 118. Correspondingly, as seen for example in FIG. 9 for construction block 300, the insert 112 defines at least one coupling recess 151 extending upwardly into the insert bottom surface 155 relative to adjacent portions of the insert bottom surface 155. The coupling protrusion 150 and coupling recess 151 are complementarily shaped and sized and located such that when two of the construction blocks 100 or 300 are superposed in an operative configuration, the coupling protrusion 150 of one of the two construction blocks 100 or 300 is fittingly received in the coupling recess 151 of another one of the two construction blocks 100 or 300 for frictionally engaging the coupling recess 151.

[00120] Typically, each coupling protrusion 150 is configured and sized for engaging in a substantially snug-fit relation a correspondingly positioned one of a coupling recess 151. Typically, as seen in FIG. 1 for example, the outer shell 106 defines two rows of coupling protrusions 150 each protruding upwardly from the outer shell top wall 115 along a respective one of the outer shell side elements 114 and 116. Typically also, as seen in FIG. 9 for example, the insert 112 defines two rows of coupling recesses 151 extending upwardly into the insert bottom surface 155. Typically, each coupling recess 151 is vertically aligned with a respective coupling protrusion 150 and shaped complementarily to the respective coupling protrusion.

[00121] In some embodiments, as for the construction block 100 and as seen in FIG. 1, the two rows of coupling protrusions 150 include coupling protrusions 150 having substantially similar configurations. However, in other embodiments, as in the construction block 1500 seen in FIG. 28, the two rows of coupling protrusions include respectively coupling protrusions 150a and 150b having configurations that differ between the two rows. For example, the coupling protrusions 150a and 150b differ in their length in a direction parallel to a direction leading between the outer

shell first and second ends 111 and 113. However, these differences in configuration may be due to other characteristics of the coupling protrusions 150a and 150b, such as their shape, height or width, among other possibilities. The coupling recesses 151 vertically aligned with each coupling protrusion 150a, 150b have a corresponding shape and size, which ensures that proper orientation of two superposed construction blocks 1500 can be ensured on a typically busy construction site. Having the correct orientation is important in some embodiments, as described hereinbelow.

[00122] As best illustrated in FIGS. 1 and 6, the outer shell 106 further includes an arrangement of compatibly shaped end wall locking ridges 152 and end wall locking grooves 154 extending substantially vertically along typically a whole central vertical portion of the first and second side element end wall portions 124 and 126. The end wall locking ridges 152 and end wall locking grooves 154 are arranged so as to have a horizontal series of construction block 100 longitudinally engage to one another when assembled in an end-to-end fashion. For example, the first and second side element end wall portions 124 and 126 at a same longitudinal end of a construction block 100 have one of an end wall locking ridges 152 and the other one of an end wall locking grooves 154 respectively.

[00123] Alternatively, in some other embodiments, the first and second side element end wall portions 124 and 126 at a same longitudinal end of a construction block 100 may both have an end wall locking ridges 152 and the opposed longitudinal end thereof an end wall locking grooves 154.

[00124] Referring, as an example, to the construction block 300 shown in FIGS. 8 and 9, which is half the length of the construction block 100 and thus commonly

referred to as a half block, the insert 112 is suitably shaped and sized to conform to, and substantially fill, the whole outer shell cavity 110 up to, and substantially in register with, the shell bottom edge portions cooperatively formed by the side and transversal element bottom edge portions 128 and 138 respectively, including the substantially arcuate configuration of the transversal element bottom arcuate edge portions 142. This is also shown in FIG. 12, which is a cross-section of a stack of the construction blocks 100.

[00125] The insert 112 thus defines insert component longitudinal and transversal bottom surface portions 156 and 158, seen in FIG. 9. The pair of parallel insert component longitudinal bottom surface portions 156 are typically generally planar and each defines one or more coupling recess 151 in corresponding number, dimension and position relative to the coupling protrusions 150 extending upwardly from the side element top wall portions 118 of the outer shell 106, as described previously.

[00126] Thus, a horizontal row of construction blocks 100 or 300 assembled in a conventional end-to-end fashion, may be lockingly engaged on top of another row of construction blocks 100 or 300.

[00127] In some embodiments, as best illustrated respectively in FIGS. 8 and 9, the thus correspondingly shaped and positioned pairs of coupling protrusions 150 and coupling recess 151 each have a compatibly sized rectangular box-shaped configuration having a length dimension that is for example and non-limitingly, roughly equivalent to the width of a (an) outer shell transversal element 132. Furthermore, a corresponding pair of coupling protrusion 150 and coupling recess 151 along each longitudinal member 114 and 116 occupies a position along the

side element top wall portion 118 thereof that is located transversally at each end of each outer shell transversal element 132.

[00128] Typically, all the walls defined by the outer shell 106 that extend from the outer shell top wall 115 are outer shell vertical walls that extend substantially vertically downwardly from the outer shell top wall 115, and the outer shell top and vertical walls together delimitate the outer shell cavity 110. More specifically, the vertically extending inner side surface portions of the outer shell side elements 114 and 116, and outer shell transversal elements 132 of the outer shell 106, namely the side element outer side wall portions 120, side element inner side wall portions 122 and transversal element side wall portions 136 are typically substantially planar and vertical. Thus, as mentioned further above, a polystyrene injection moulding process may be used to form the insert 112 in situ (e.g. directly into the open container configuration of the outer shell cavity 110) using a suitable bottom cap and injection head combination. Alternatively, an individual polystyrene injection moulding process, thus separate from the outer shell 106, may be used, followed with inserting the insert 112 into the outer shell cavity 110 in a snug-fit relation.

[00129] The availability of two alternate processes for producing the construction block 100 may allow a manufacturer much needed flexibility to alternate between the two processes in certain economic context where one process may be more economical to use than the other.

[00130] Furthermore, the open ended container configuration of the outer shell 106, in cooperative relation with the multiple outer shell transversal elements 132 thereof, provides a substantially rigid construction block 100 that allows a number

of stacked horizontal rows of construction blocks 100 between concrete pouring operations that is comparable to existing stay-in-place hollow insulated form blocks having a fully enclosing shell component around its insert component.

[00131] The construction block 100 may be sized and configured to suit a particular wall construction. Advantageously, in some embodiments, the construction block 100 may be sized and configured to conform to well-known standard sizes of conventional concrete blocks commonly used in the construction industry. For example, the construction block 100 may be sized and configured to substantially duplicate the overall dimension of the common "8x8x16", "8x4x16", "6x8x16", "8x8x8", "6x8x8", "9x16x24", "9x16x12", "12x16x24" concrete blocks (in inches), and the likes. However, other dimensions are within the scope of the present invention.

[00132] Advantageously, in some embodiments, the relatively lightweight construction block 100 may have a length that is substantially equivalent to a standard four feet (48 inches) transport palette, thus optimizing the transport, as well as the speed of assembling a large wall structure 1000.

[00133] In some embodiments, as illustrated in FIGS. 1 and 2 for example, the construction block 100 further includes one or more utility conduits 162 extending substantially vertically through the outer shell 106 for advantageously allowing installation, or fishing therethrough, user selected elements of utility services such as, for example, water pipes, drain pipes, electrical, phone, computer and\or media network cabling, and the likes. The utility conduits 162 thus provide service holes that extend vertically inside walls assembled using the constructions blocks 100. The utility conduit 162 typically extends through one of the outer shell side

elements 114 or 116 and through a portion of the insert 112 located in the one of the outer shell side elements 114 and 116. Thus, in opposition to the block passageways 104, which may be filled with concrete in use, the utility conduits 162 remain free of such concrete in a typical use.

[00134] In some embodiments, the utility conduits 162 are present in only one of the outer shell side elements 114 or 116. However, in alternative embodiments, such as in the construction block 1200 shown in FIG. 29, the utility conduits 162 are present in both of the outer shell side elements 114 and 116, making the construction block 1200 reversible. In yet other embodiments, as in the construction block 600a of FIG. 31, no utility conduits 162 are provided. There variants in the number and location of utility conduits 162 are applicable to all the construction blocks described in the present document.

[00135] The utility conduits 162 each open through the outer shell top wall 115 at a utility conduit upper aperture 163, as seen in FIG. 1 for example. In some embodiments, a utility conduit lip 166 protrudes upwardly from the outer shell top wall 115 around the utility conduit upper aperture 163. In some embodiments, the utility conduit 162 is delimited by a utility conduit tube 164 extending downwardly trough the insert 112 from the utility conduit upper aperture 163, the utility conduit tube 164 being configured and sized so that when two of the constructions blocks 100 are superposed in an operative configuration with their utility conduits 162 vertically aligned, the utility conduit lip 166 of one of the construction blocks 100 engages the utility conduit tube 164 of the other one of the construction blocks 100 at the bottom thereof. In some embodiments, the utility conduit lip 166 blends with the surrounding surface of the side element top wall portion 118 through a tapered annular edge portion.

[00136] The utility conduit tube 164 extends within the longitudinal inner cavity portion130 typically substantially vertically downwardly so as to have its opposed tubular member lower end 168 substantially in register (e.g. horizontal flush) with the side element bottom edge portion 128 of the side element inner side wall portion 122.

[00137] The utility conduit tube 164 is thus dimensioned so as to have its tubular member lower end 168 in register with the utility conduit lip 166 so that they engage each other to, in some embodiments substantially seal the junction between a series of vertically stacked utility conduits 162 in a wall construction made of construction blocks 100.

[00138] Each one of the one or more utility conduits 162 is for example located substantially centrally between two adjacent coupling protrusions 150. For example, as exemplified in the drawings, two utility conduits 162 may be provided along a same one of the two outer shell side elements 114 or 116 of a standard size construction block 100. The outer shell side elements 114 or 116 that is provided with one or more utility conduits 162 is typically positioned on the interior side of a building construction. In such embodiments, proper orientation of the construction blocks 100 is required to align vertically the utility conduits 162 or superposed construction blocks when the utility conduits 162 are only provided in one of the outer shell side elements 114 or 116.

[00139] Referring more particularly to FIGS. 1 and in some embodiments, the construction block 100 further includes a top sealing ridge 170 extending along the inner longitudinal edge of each one of the side element top wall portions 118.

[00140] The construction block 100 further defines a bottom chamfered edge 172, better seen in FIG. 9 for the construction block 300, extending along the longitudinal junction between the side element inner side wall portion 122 and the insert component longitudinal bottom surface portion 156. Each one of the two top sealing ridges 170 is suitably shaped and sized to sealably conform with, and abut against in tight fit relationship, a corresponding one of the two bottom chamfered edges 172.

[00141] Thus, the top sealing ridge 170 and bottom chamfered edges 172, in cooperative relation with the end wall locking ridges 152 and end wall locking grooves 154 of each construction blocks 100 in a temporary wall structure 1000 that includes vertical posts instead of poured concrete, substantially seals any air infiltration and exfiltration or liquid from cement leakage that may occur through the wall.

[00142] In some embodiments, each one of the two top sealing ridges 170 further define a relatively small open gap 174 at a substantially centred portion therealong, and extending transversally therethrough, for allowing the construction blocks 100 to be assembled in staggered rows.

[00143] In some embodiments, with collective reference to FIGS. 1, 3, 5, and 7, the construction block 100 further includes an attachment means, for example a screw 182 (as illustrated in FIG. 3) securable at an angle through an angled screw head concealing depression 184 defined along an end surface portion of the side element top wall portion 118 that is located substantially adjacent the end wall locking ridge 152 (as best illustrated in FIG. 5). The angled screw head concealing depression 184 is sufficiently sized and shape to conceal the head portion of a

standard size screw 182, and defines a screw aperture along an inner portion thereof that extends substantially longitudinally at an angle through an adjacent portion of the end wall locking ridge 152. As seen in FIG. 34, the screw head concealing depression 184 may also be formed in one of the end wall locking ridge 152.

[00144] Thus, a horizontal series of construction blocks 100 may be user selectively mechanically secured to one another using screws 182 that do not hinder the rectilinear assemblies of stacked rows of construction blocks 100.

[00145] Alternative or additional positions of a plurality of screw attachment means along selected surface portions of the outer shell 106 are also possible. For example, head concealing depressions 184 and suitable screw apertures may be located adjacent to the opposed vertical end edges, as well as along the bottom edge of both side element outer side wall portions 120 of a construction block 100. Thus, the plurality of screw attachment means may advantageously allow a substantially rigid pre-assembly of whole sections of self-standing walls prior to positioning the latter's in place on a construction site. The screw attachment means visible along the side surface of the wall may then be concealed under finishing wall cladding. For example, a short 1/2" or 5/8" inch screw will be hidden, while the head will dissimulate itself in the insert underneath the next row.

[00146] Referring to FIGS. 1 and 19 to 21, in some embodiments, the construction block 100 further includes a rod support 186, also called a rebar support, usable for supporting elongated horizontal reinforcement rods 1002 through the horizontal passageways 102 defined between stacked rows of assembled construction blocks 100, as illustrated in FIG. 1. When present,

Horizontal rebars installed at every row reinforce the wall structure by avoiding spreading / cracking of the cement due to unstable soil, from external soil pressure if the block were to be used as a foundation wall or earthquakes.

[00147] The rod support 186 is for example represented by an assembly of suitably rigid and relatively narrow frame members made of, for example, plastic or metal stems. Referring to FIG. 19, the rod support 186 includes a substantially U-shaped frame portion 188, a horizontal frame portion 190 extending between the opposed ends of the U-shaped frame portion 188 and including a centred and at least slightly inwardly extending arcuate portion 192, and a vertical frame portion 194 having one end joined to a centred portion of the arcuate portion 192 and extending at least slightly past a centred portion of the U-shaped frame portion 188 to form a support member engaging pin 196.

[00148] The U-shaped frame portion 188 and support member engaging pin 196 are user selectively engageable in a snug fit relation in a suitably sized and shaped arcuate groove 198 seen in FIG. 1, and centred pin engaging bore 200, seen in FIG. 5, respectively, that are defined longitudinally along the transversal element top arcuate surface 140 of at least one, but typically each one of the outer shell transversal elements 132 of the construction block 100.

[00149] Referring to FIG. 22, in some embodiments of the rod support 186a, the latter further includes an extension member 202 having one end integrally formed or otherwise attached to one lateral side of the junction between the support member arcuate portion 192 and the support member vertical frame portion 194, and extends therefrom a length that is for example at least slightly smaller than half the distance between two adjacent outer shell transversal elements 132. The

extension member 202 is terminated with a loop member 204, for example of substantially oval or ellipsoidal configuration, extending laterally that is suitably sized to freely encompass the diameter of, for example, three average size reinforcement rods 1002 positioned side by side.

[00150] Thus, additionally to supporting at least one horizontal reinforcement rod 1002 centrally along a horizontal passageway 102, the rod support 186a may further maintain one or two reinforcement rods 1002 in a centrally upright attitude within a vertical passageway 204. Optionally, a user may cut off the extension member 202 at its base when not required using a suitable tool such as pair of cutters. Other equivalent configurations of an extension member 202 and loop member 204 are also possible. Also, in an alternate embodiment of the construction block 100, the rod support 186 is integrally formed with the outer shell 106.

[00151] In some embodiments, as illustrated in FIG. 2 for example, the outer shell 106 further includes inner reinforcement ribs 206 extending along selected inner surface portions thereof for allowing the assembly of relatively high wall construction stages between concrete pouring operations.

[00152] The inner reinforcement ribs 206 may be represented by a plurality of spaced apart and vertically extending members integrally formed, glued, thermo-bonded, or otherwise attached to inner side surface portions of the side element outer side wall portion 120. Thus, the vertically extending inner reinforcement ribs 206 still allow the two possible manufacturing processes of the construction block 100 as mentioned further above.

[00153] As would be obvious to someone familiar in the art of construction blocks, the vertically extending inner reinforcement ribs 206 may have a differently shaped cross-section than the ones illustrated in the figures such as, for example, a square, rectangular or triangular shaped tubular cross-section, a U-shaped cross section, or the likes.

[00154] Alternate embodiments of the construction block 100 will now be described. These alternate embodiments are all based on the general shape and configurations of the construction block 100 as described above, for providing common complementary block components to complete entire wall construction configurations in a conventional manner. Unless specified, all these alternative construction blocks may have a construction similar to the construction block 100 in the form of an outer shell 106 and insert 112.

[00155] One such alternate embodiment, as illustrated in FIGS 8 and 9, is the construction block 300. Likewise the first or full length embodiment of a construction block 100 described above, the construction block 300 includes a suitably shaped and sized outer shell 106 and an insert 112 engaged in the outer shell cavity 110 of the outer shell 106.

[00156] Another such alternate embodiment, as illustrated in FIG. 7 represents a full corner block 400, which is essentially a combination of two full length construction blocks 100 joined at right angle to form a common vertical passageway 104 at the junction thereof. Thus, the corner block 400 includes outer shell side elements that are substantially L-shaped. As exemplified in the drawings, the common vertical passageway 104 may be proportionally greater in a horizontal cross-section thereof, relative to the other vertical passageways 104 of

the full form corner block 400, for allowing the formation of a relatively stronger vertical concrete corner post therein or, alternatively, having a relatively stronger vertical post positioned therein for securing upright a temporary wall structure 1000. In a similar configuration as the full corner block 400, a half corner block 500 is illustrated in FIG. 10.

[00157] Another alternate embodiment, as illustrated in FIG. 11, represents an angled construction block 600 for completing the wall structure 1000 along an angled roof top or the like, for example. The angled construction block 600 is essentially a full length construction block 100 cut along an imaginary plane extending laterally and diagonally between an upper end corner of a side element outer side wall portion 120 and the diagonally opposed lower end corner thereof. Substantially planar side element top wall portions 118 and transversal element top wall portions 134 closes the top portions of the outer shell 106 of the construction block 600, while the insert component bottom surface (not shown in FIG. 11), including the coupling recesses 151 and the utility conduit 162 are identical to the full length construction block 100. Other equivalent shape configurations of an angled construction block 100 are also possible such as an angled half construction block 600a of FIG. 31.

[00158] FIG. 24 illustrates yet another embodiment of a construction block represented by a joist support construction block 700. Likewise the other embodiments of a construction block described above, the joist support construction block 700 includes a outer shell 106 and an insert (not shown in FIG. 24) and has a general configuration substantially similar to the first construction block 100 described further above. The difference of the joist support construction block 700 resides in that the latter defines an enlarged upper horizontal passageway 102 that is suitably sized and shaped for longitudinally receiving

therein a support beam 1006. As exemplified in the drawings, the horizontal passageway 102 may have a substantially square or rectangular cross-section that is suitably shaped and sized for longitudinally receiving therein, in a snug fit relation, for example, a standard "5x8" inches support beam 1006. In such embodiments, the top recess of the outer shell transversal elements 132 has a substantially rectangular configuration.

[00159] The joist support construction block 700 further defines a substantially square or rectangular shaped side cut-out 702, or beam receiving aperture, extending perpendicularly laterally through at least one of the outer shell side elements 114 or 116, parallel to the outer shell transversal elements 132. The side cut-out 702 is suitably sized and configured for receiving therein, for example, a "2x3" or "2x4" floor or roof support joist 1008 for support a floor or roof structure 1010.

[00160] One familiar with housing constructions would readily appreciate the joist support construction block 700 since it is advantageously usable for mounting a floor or roof joist 1008 to a side portion of a wall structure 1000 without having to erect a temporary support scaffolding structure, as is typically the case in conventional construction procedures.

[00161] FIGS. 25 and 26 illustrate yet another embodiment of a construction block represented by a joist support construction block 800. The joist support construction block 800 is substantially similar to the previously described embodiment of a joist support construction block 700. The difference therewith resides essentially in that the joist support construction block 800 has one of its outer shell side element 114 or 116 that is relatively shorter in height compared to

the other outer shell side elements 114 or 116 so as to allow a floor or roof structure 1010 to extend laterally on top of cooperatively the floor or roof joist 1008, the shortened outer shell side element 114 or 116, and the outer shell transversal elements 132.

[00162] FIG. 27 illustrates, in a bottom plan view, yet another embodiment of a construction block represented by a reinforced construction block 900. The reinforced construction block 900 is substantially similar to the first embodiment of a construction block 100 described further above. The difference resides essentially in that the reinforced construction block 900 further includes at least one reinforcement link member 902 extending transversally between inner surface portions of the outer shell cavity 110. The at least one reinforcement link member 902 is, for example, integrally formed with the outer shell 106.

[00163] For example, a reinforcement link member 902 may be represented by a relatively thin inner wall partition member extending vertically at least a portion of the full height dimension of the outer shell cavity 110. Furthermore, a reinforcement link member 902 may extend transversally through the cavity of each outer shell transversal elements 132 and between inner surfaces of opposed side elements outer side wall portions 120. Each reinforcement link member 902 defines a centrally disposed inwardly upwardly arcuate portion 908 and a pair of rectangular recesses 910 along suitable lower edge portions thereof that correspond in position, shape and dimensions to the transversal element bottom arcuate edge portions 142 and the coupling protrusions 150. Additional reinforcement link members 904 may extend transversally between side element outer side wall portion 120 and side elements inner side wall portion 122, including on each sides of the utility conduits 162.

[00164] Referring to FIGS. 13 to 18 inclusively, in some embodiments, the construction block 100 further includes an end cap 1100 for closing one or both longitudinal ends thereof. The end cap 1100 is typically usable for sealably closing a vertical end edge of a wall structure 1000 such as a side edge of a doorway or window, as illustrated in FIG. 23.

[00165] The end cap 1100, likewise the construction block 100, includes an outer shell 1106 and an insert 1112 engaged in the outer shell cavity 110 of the outer shell 1106, as seen in FIG. 18.

[00166] The end cap 1100 has a substantially U-shaped cross-section along a horizontal plane that is suitably shaped and sized for joining the outer shell side elements 1114 and 1116, including compatibly shaped end cap end wall portions 1124 and 1126 provided with end wall locking ridges 152 and end wall locking grooves 154 respectively, an end cap top wall portion 1118 including a top sealing ridge 170, an end cap bottom wall portion 1156 including a bottom chamfered edge 172, and an end cap outer end wall portion 1102.

[00167] Preferably, the U-shaped cross-section of the end cap 1100 is further suitably sized and shaped for defining a vertical passageway 104 between an end cap inner end wall portion 1104 thereof and the adjacent outer shell transversal element 132, so as to be, in some embodiments, identical in cross-sectional dimensions as a vertical passageway 104 between two adjacent outer shell transversal elements 132.

[00168] As exemplified in the drawings, the end cap outer end wall portion 1102 is for example substantially planar, but it is to be understood the latter may have

other shape configuration such as, for example, rounded in cross-section, provided with suitable vertical grooves for engaging a door frame, a window frame, or the likes.

[00169] In some embodiments, a construction block 1200, shown in FIG. 29, integrates the end cap 1100 so that one of the transversal elements 132a thereof is provided at one of its ends.

[00170] FIG. 30 illustrates another corner block 1300 in which the coupling protrusions 150 are omitted from the inside corner portion of the outer shell top wall 115 and replaced by a groove 1302. The groove 1302 may be shaped to facilitate concrete pouring in the corner block 1300. The groove 1302 also helps seal from any leakage during concrete pouring.

[00171] FIGS. 32 and 33 illustrate yet another block 1400 usable to support a joist 1008. The block 1400 is similar to the joist support construction block 700 with two differences. First, at least one of the outer shell side elements 114 or 116 is crenelated in the outer shell top wall 115, at the outer shell top end 107. More specifically, portions of the crenelated outer shell side elements 114 or 116 have a smaller height than adjacent portions thereof, to receive therein the joist 1008, as seen in FIG. 32. Also, the crenelated outer shell side element 114 or 116 also defines a utility groove 1402 extending laterally thereinto, the utility groove 1402 originating at the outer shell bottom end 109 and terminating short of the outer shell top end 107. The utility groove 1402 is shaped to communicate with the utility conduit 162 of an other construction block, such as construction block 100, on which it stands and is useful to allow exit of electrical wires 163 or plumbing (not shown in the drawings) therethrough from a wall, as seen in FIG. 35. FIG. 35 also

illustrates that the construction block 100 may be provided with an access 165, covered with a removable cover 167, that leads from the side element outer side wall portion 120 into the utility conduit 162. The access 165 may be manufactured in the construction block 100, or may be formed in situ, on a construction site, as needed using conventional construction tools.

[00172] In some embodiments, as in construction block 1600 shown in FIG. 36, the coupling protrusion 150 is provided with a locking element 1602 extending therefrom and penetrating the foam of the insert 112 of another construction block 1600 when the coupling protrusion 150 is operatively inserted in the coupling recess 151 thereof, as seen in FIG. 38. In a specific embodiment, the locking element 1602 is provided on only some of the coupling protrusions 150, for example two diametrically opposed ones of the coupling protrusions 150, but any other suitable configuration is within the scope of the invention. For example, the locking element 1602 may take the form of a metal pin extending laterally outwardly, for example horizontally, from the coupling protrusion 150 in a spaced apart relationship from the outer shell top wall 115, as seen in FIG. 37. Referring to FIG. 38, when the coupling protrusion 150 is operatively inserted in the coupling recess 151 of another one of the construction blocks 1600, the locking element 1602 penetrates the insert 112 with relative ease due to the foam structure of its insert 112. The locking element 1602 may also bend downwardly. Thus, pulling the two construction blocks 1600 apart becomes more difficult due to the presence of the locking element 1602 which engages the foam of the insert 112 and, when bent, works similarly to a staple.

[00173] The locking element 1602 is better seen in FIG. 39 and is typically inserted through the locking protrusion 150, for example transversally therethrough, as seen in FIG. 37. As seen in FIGS. 40 to 42, other configurations

of the locking elements, respectively locking elements 1602a, 1602b and 1602c, among others, are also within the scope of the invention. The locking element 1602a of FIG. 40 is a thin elongated metal strip with pointed ends. The locking element 1602b of FIG. 41 is a thin piece of miniature loop material. The locking element 1602c of FIG. 42 is a thin elongated metal strip provided with flaps 1606 that have been punched from the locking element 1602 while remaining attached at one end thereto. The flaps 1604 are oriented at about 45 degrees relative to the locking element 1602b and face towards the bulk of the construction block 1600 when in use. The angle may differ from 45 degrees in alternative embodiments. Flaps 1604 thus penetrate with relative ease the foam of the insert 112, while making removal of the locking element 1602c from the insert 112 difficult by engaging the foam material of the insert 112.

[00174] The reader skilled in the art will appreciate that all the features of the above-described blocks can be combined with each other when appropriate.

[00175] As would be obvious to someone versed in the art of stay-in-place construction blocks, alternatively or in combination with, the screw attachment means described further above, wall constructions comprising one or more of the embodiments of construction blocks may be further secured to one another using one of a double-sided adhesive tape, a suitable glue, a thermal bonding process, or a combination thereof applied between selected contacting surface portions of the construction blocks.

[00176] Advantageously, in some or all of the embodiments described above, the inner and outer corners defining the outer shell transversal elements 132, and along edges thereof with the side element inner side wall portions 122, are

substantially rounded as opposed to ninety degree angles. As would be well known to someone familiar with injection molding processes, such rounded corners may facilitate the production of the outer shell 106 and insert 112. The rounded corners may further advantageously minimizes the formation and subsequent growth of cracks along these edges of the components and also along intersections within the matrix of cured concrete inside the construction blocks 100 due to, for example, geological causes, particularly in tempered regions of the world.

[00177] In an alternate embodiment of the present invention, the construction block 100 and the plurality of closely similar embodiments thereof, as described above, are provided as a system of construction blocks 100 usable for building a complete housing construction, or the like.

[00178] As one familiar with block constructions would appreciate, the system of construction blocks 100 may be advantageously used in cooperative relation with concrete foundations and suitably sized and shaped lintel members for doors and windows.

[00179] Also, additional block and starter element shapes incorporating the features described hereinabove may include arches as seen above windows and doors, as well as blocks forming angles of 22.5 degree, 45 degree or other angles to create hexagonal or octogonal shapes, as well as arc shaped blocks to create rounded walls and towers.

[00180] In some embodiments, the outer shell 106 may also contribute to insulation of a building made using the constructions blocks described in the

present document, when compared to conventional concrete form blocks.

[00181] With reference to FIGS. 43 to 45, there is shown a starter element 1700 usable with suitably configured construction blocks, such as, non-limitingly, the construction block 100 (not show in FIGS. 43 and 44. The starter element 1700 may be used, for example, in a first row when the construction blocks 100 are to be assembled in rows over a concrete foundation (not shown in FIGS. 43 and 44). More specifically, the starter elements 1700 can be assembled end to end on top of a concrete foundation before the concrete has completely set. This allows forming a starting row that can be secured to the concrete and which is well aligned to allow assembly of a straight walls from the construction blocks 100, with properly spaced apart construction blocks 100.

[00182] With reference to FIG. 43, the starter element 1700 includes a bottom wall 1702 from which extend generally upwardly laterally opposed side walls 1704, typically at the lateral edges of the bottom wall 1702. The distance between the side walls 1704 is such that the construction blocks with which the starter element is to be used, for example construction block 100, may be snuggly or fittingly received therebetween.

[00183] The bottom wall 1702 is provided with upwardly facing coupling protrusions 1706 similar in shape and dimensions to the coupling protrusions 150, with the exception that the coupling protrusions 1706 are open so that they cannot trap air between the coupling protrusions 1706 and the concrete below. For example, the coupling protrusions 1706 are similar to coupling protrusions 150 from which the top horizontal portion thereof has been removed. The bottom wall 1702 is also provided with conduit apertures 1708 and associated lip 1710, which

together form a structure similar to the portion of the construction block 100 at the top of utility conduit 162.

[00184] The bottom wall 1702 defines coupling tongues 1712 and 1714 respectively at its first and second ends 1716 and 1718. The coupling tongues 1712 and 1714 each define a tongue aperture 1717 extending vertically therethrough, as seen for example in FIG. 44. The coupling tongues 1712 and 1714 are each longitudinally aligned with a row of the coupling protrusions 1706 so that each coupling tongue 1712 is longitudinally aligned with one of the coupling tongues 1714. As seen in FIG. 45, the coupling tongues 1714 are vertically slightly offset relative to the coupling tongues 1712 so that when two of the starter elements 1700 are abutted end-to-end against each other, the coupling tongues 1714 of one of the starter elements 1700 are in register with the coupling tongues 1712 of the other one of the starter elements 1700 with their tongue apertures 1717 in register with each other. This allows insertion of a fastener, such as a screw (not shown in FIGS. 43 to 45), through both tongue apertures 1717, and, if desired, through freshly poured concrete, which thus secures the two starter elements 1700 in a predetermined relationship relative to each other, and to the concrete foundation.

[00185] As seen in FIGS. 43 and 45, in some embodiments, the starter element 1700 is provided with drain apertures 1722 at the junction between the bottom and side walls 1702 and 1704. The drain apertures 1722 are for example vertically oriented through the side walls 1704 and allow drainage of water that may exude from fresh concrete.

[00186] The starter element 1700 is also provided with central apertures 1720

extending through the top wall 1702 and configured and shaped in cross-section similarly to the block passageway 104. The drain apertures 1722 are for example each in register with one of the central apertures 1720.

[00187] While the starter element 1700 is rectilinear, corner shaped starter elements are also within the scope of the invention, to support for example the construction block 1400.

[00188] The starter element 1700 may be rigid, like the outer shell 106, or it may be made of a flexible material, such as urethane polymer.

[00189] Although the present invention has been described hereinabove by way of exemplary embodiments thereof, it will be readily appreciated that many modifications are possible in the exemplary embodiments without materially departing from the novel teachings and advantages of this invention. Accordingly, the scope of the claims should not be limited by the exemplary embodiments, but should be given the broadest interpretation consistent with the description as a whole. The present invention can thus be modified without departing from the spirit and nature of the subject invention as defined in the appended claims.

WHAT IS CLAIMED IS

1. A construction block, the construction block comprising:

- a substantially rigid outer shell, the outer shell defining substantially vertically opposed outer shell top and bottom ends and substantially horizontally opposed outer shell first and second ends, the outer shell including;
  - a pair of outer shell side elements extending substantially vertically and substantially parallel to each other between the outer shell first and second ends; and
  - at least one outer shell transversal element extending between the outer shell side elements;
  - the outer shell side and transversal elements being hollow and together defining an outer shell cavity delimited by the outer shell;
  - the outer shell side and transversal elements together delimiting at least one block passageway extending vertically through the construction block; and
- an insert made of a thermally insulating material, the insert being contained inside the outer shell cavity.

2. The construction block as defined in claim 1, wherein the outer shell further defines at least one utility conduit extending vertically therethrough.

3. The construction block as defined in claim 2, wherein the utility conduit extends through one of the outer shell side elements and through a portion of the insert located in the one of the outer shell side elements.

4. The construction block as defined in claim 3, wherein the outer shell further

defines at least one other utility conduit extending vertically therethrough, each of the utility passageways extending through a respective one of the outer shell side elements.

5. The construction block as defined in any one of claims 2 to 4, wherein the outer shell defines an outer shell top wall at the outer shell top end, the utility conduit opening through the outer shell top wall at a utility conduit upper aperture, a utility conduit lip protruding upwardly from the outer shell top wall around the utility conduit aperture.

6. The construction block as defined in claim 5, wherein the utility conduit is delimited by a utility conduit tube extending downwardly trough the insert from the utility conduit top aperture, the utility conduit tube being configured and sized so that when two of the constructions blocks are superposed in an operative configuration with their utility conduits vertically aligned, the utility conduit lip of a bottom one of the construction blocks engages the utility conduit tube of a top one of the construction blocks.

7. The construction block as defined in any one of claims 1 to 6, wherein the outer shell defines an outer shell top wall at the outer shell top end and an opposed outer shell bottom aperture at the outer shell bottom end leading into the outer shell cavity, the insert defining an insert bottom surface, the insert bottom surface being exposed through the outer shell bottom aperture at the outer shell bottom end.

8. The construction block as defined in claim 7, wherein the outer shell defines a plurality of outer shell vertical walls extending substantially vertically downwardly from the outer shell top wall, the outer shell top and vertical

walls together delimiting the outer shell cavity.

9. The construction block as defined in claim 7 or 8, wherein the outer shell defines at least one coupling protrusion protruding upwardly from adjacent portions of the outer shell top wall and the insert defines at least one coupling recess extending upwardly into the insert bottom surface relative to adjacent portions of the insert bottom surface, the coupling protrusion and recess being complementarily shaped and sized and being located such that when two of the construction blocks are superposed in an operative configuration, the coupling protrusion of a bottom one of the two construction blocks is fittingly received in the coupling recess of a top one of the two construction blocks for frictionally engaging the coupling recess.

10. The construction block as defined in claim 9, wherein the outer shell defines two rows of coupling protrusions each protruding upwardly from the outer shell top wall along a respective one of the outer shell side elements and the insert defines two rows of coupling recesses extending upwardly into the insert bottom surface, each coupling recess being vertically aligned with a respective coupling protrusion and shaped complementarily to the respective coupling protrusion.

11. The construction block as defined in claim 10, wherein the two rows of coupling protrusions include coupling protrusions having substantially similar configurations.

12. The construction block as defined in claim 10, wherein the two rows of coupling protrusions include coupling protrusions having configurations that differ between the two rows of coupling protrusions.

13. The construction block as defined in claim 12, wherein the two rows of coupling protrusions include coupling protrusions that differ in their length in a direction parallel to a direction leading between the outer shell first and second ends.

14. The construction block as defined in any one of claims 5 to 13, wherein the outer shell top wall is recessed in the outer shell transversal element relative to the outer shell side elements to define a substantially upwardly facing top recess.

15. The construction block as defined in claim 14, further comprising a rod support for supporting a reinforcement rod in a predetermined relationship relative to the construction block, the rod support being selectively insertable in the top recess.

16. The construction block as defined in claim 15, wherein the outer shell top wall defines a support receiving groove in the top recess receiving part of the rod support thereinto when the rod support is inserted in the top recess.

17. The construction block as defined in claim 14, 15 or 16, wherein the top recess has a substantially arc segment shaped configuration.

18. The construction block as defined in claim 14, 15 or 16, wherein the top recess has a substantially rectangular configuration.

19. The construction block as defined in any one of claim 14 to 18,

wherein the insert and outer shell together are recessed in the outer shell transversal element relative to the outer shell side elements to define a downwardly oriented bottom recess.

20. The construction block as defined in any one of claims 1 to 19, wherein the at least one outer shell transversal element is spaced apart from the outer shell first and second ends.

21. The construction block as defined in any one of claims 1 to 19, wherein the at least one outer shell transversal element is provided at one of the outer shell first and second ends.

22. The construction block as defined in any one of claims 1 to 21, wherein at least one of the outer shell side elements defines an end groove extending thereinto at the outer shell first end and an end ridge protruding therefrom at the outer shell second end, the end groove and end ridge being complementarily shaped and being located such that when two of the construction blocks are abutted against each other in an operative configuration with the outer shell first end of one of the construction blocks abutting against the outer shell second end of an other one of the construction blocks, the end ridge of the second one of the construction blocks is fittingly received in the end groove of the first one of the construction blocks.

23. The construction block as defined in any one of claims 1 to 22, wherein the outer shell side elements have substantially similar vertical heights.

24. The construction block as defined in any one of claims 1 to 22, wherein the outer shell side elements have substantially different vertical heights.

25. The construction block as defined in any one of claims 1 to 24, further defining a beam receiving aperture extending transversally through one of the outer shell side elements substantially parallel to the outer shell transversal element.

26. The construction block as defined in any one of claims 1 to 25, wherein at least one of the outer shell side elements is crenelated at the outer shell top end.

27. The construction block as defined in claim 26, wherein the at least one of the outer shell side elements also defines a utility groove extending laterally thereinto, the utility groove originating at the outer shell bottom end and terminating short of the outer shell top end.

28. The construction block as defined in any one of claims 1 to 27, wherein the outer shell side elements are substantially rectilinear.

29. The construction block as defined in any one of claims 1 to 27, wherein the outer shell side elements are substantially L-shaped.

30. The construction block as defined in any one of claims 1 to 27, wherein the outer shell top surface slopes between the outer shell first and second ends so that the height of the construction block away from the outer shell bottom end varies between the outer shell first and second ends.

31. The construction block as defined in any one of claims 1 to 30, wherein the outer shell is made of a polymer and the insert is made of an insulating foam.

32. The construction block as defined in claim 7, wherein the insert is made of foam, the coupling protrusion comprising a locking element extending therefrom and penetrating the foam of the top one of the construction blocks when the coupling protrusion of the bottom one of the construction blocks is operatively inserted in the coupling recess of the top one of the construction blocks.

33. The construction block as defined in claim 16, wherein the outer shell top wall defines a pin engaging bore extending from the support receiving groove and the rod support defines a rod support pin configured and sized for engaging the pin engaging bore when the rod support is operatively inserted in the top recess.

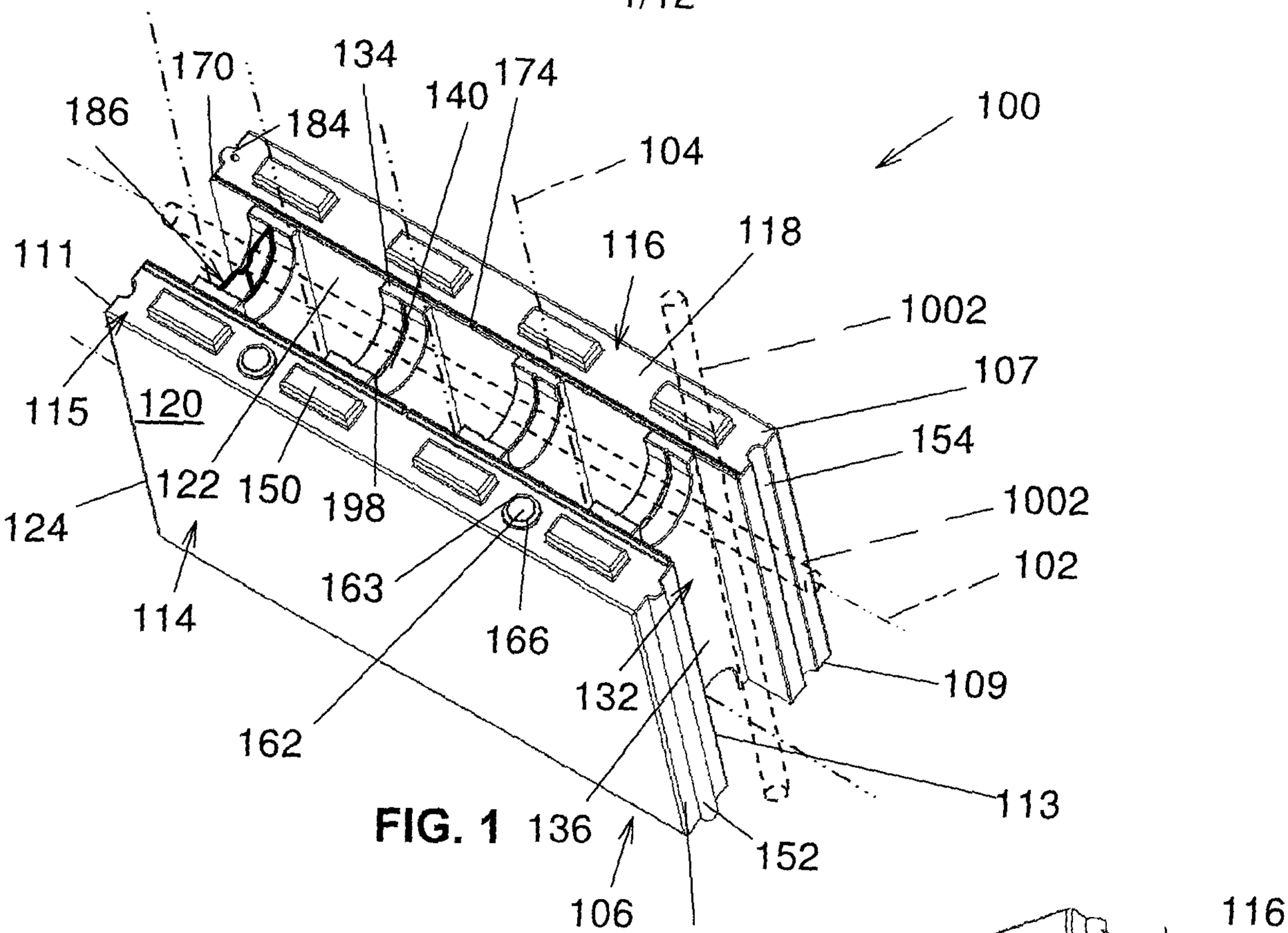
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FIG. 1

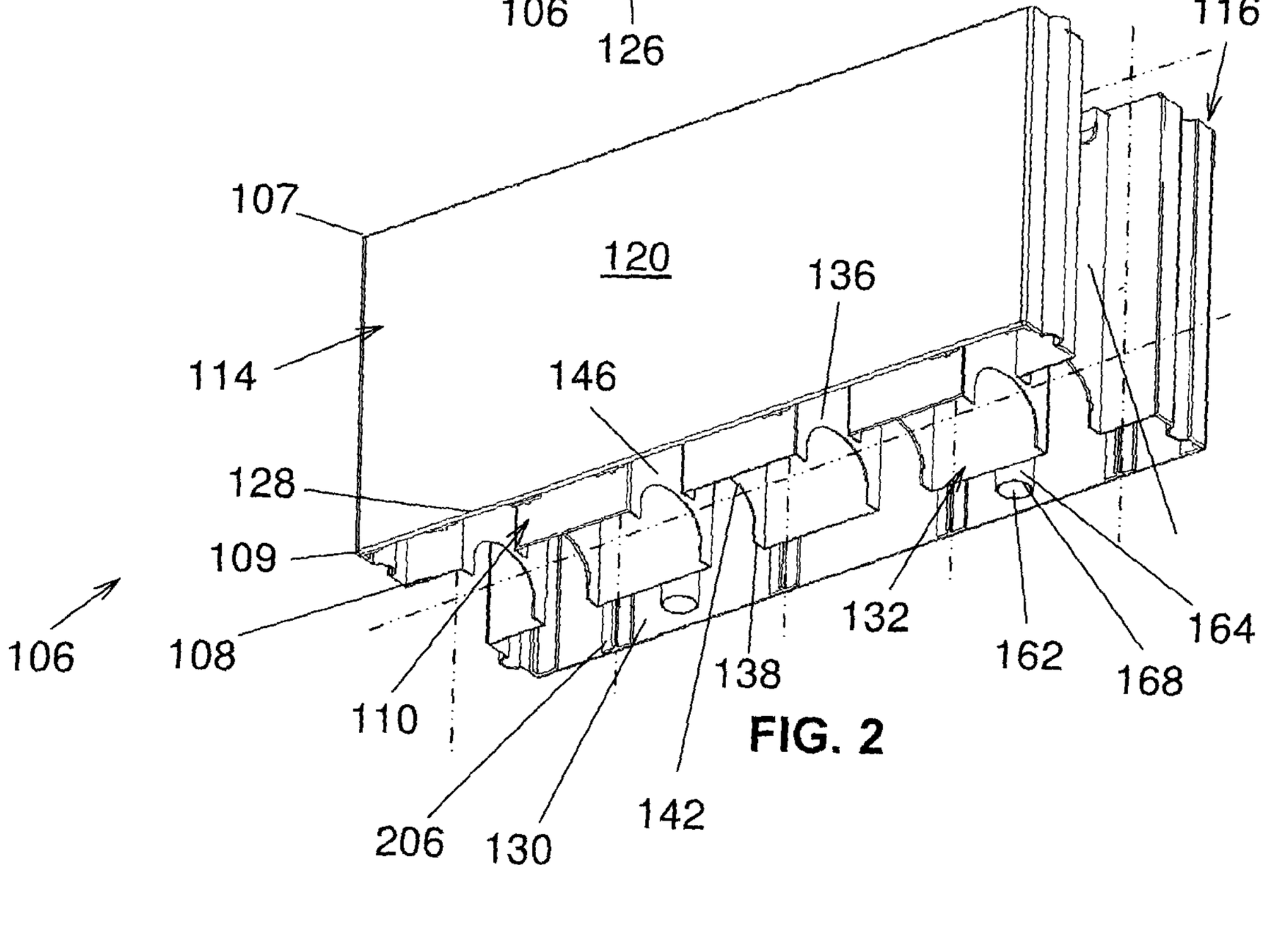
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FIG. 2

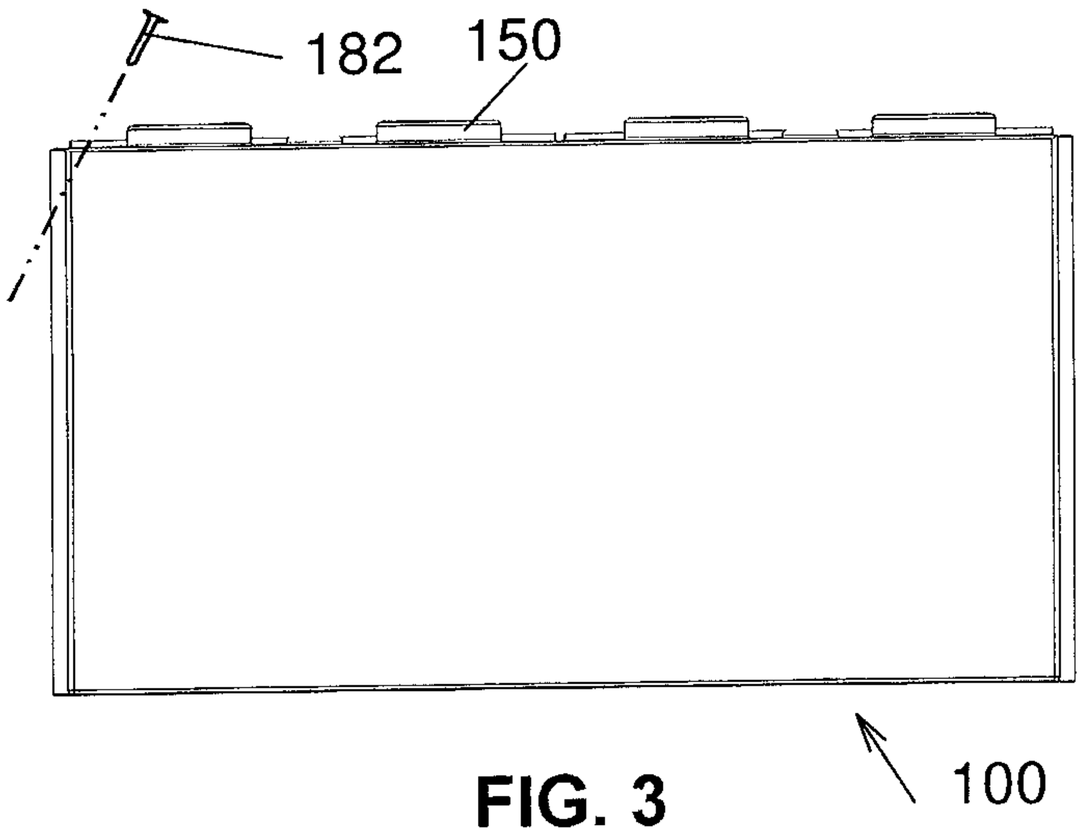


FIG. 3

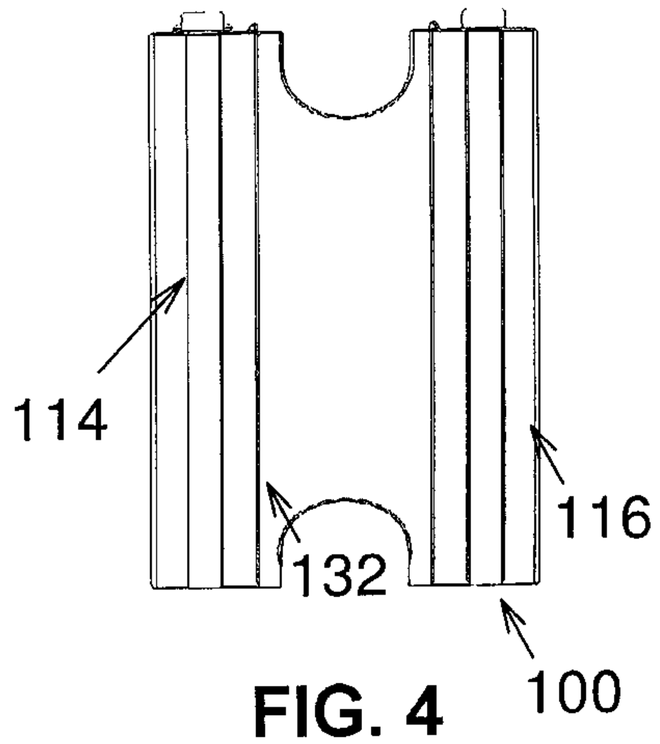


FIG. 4

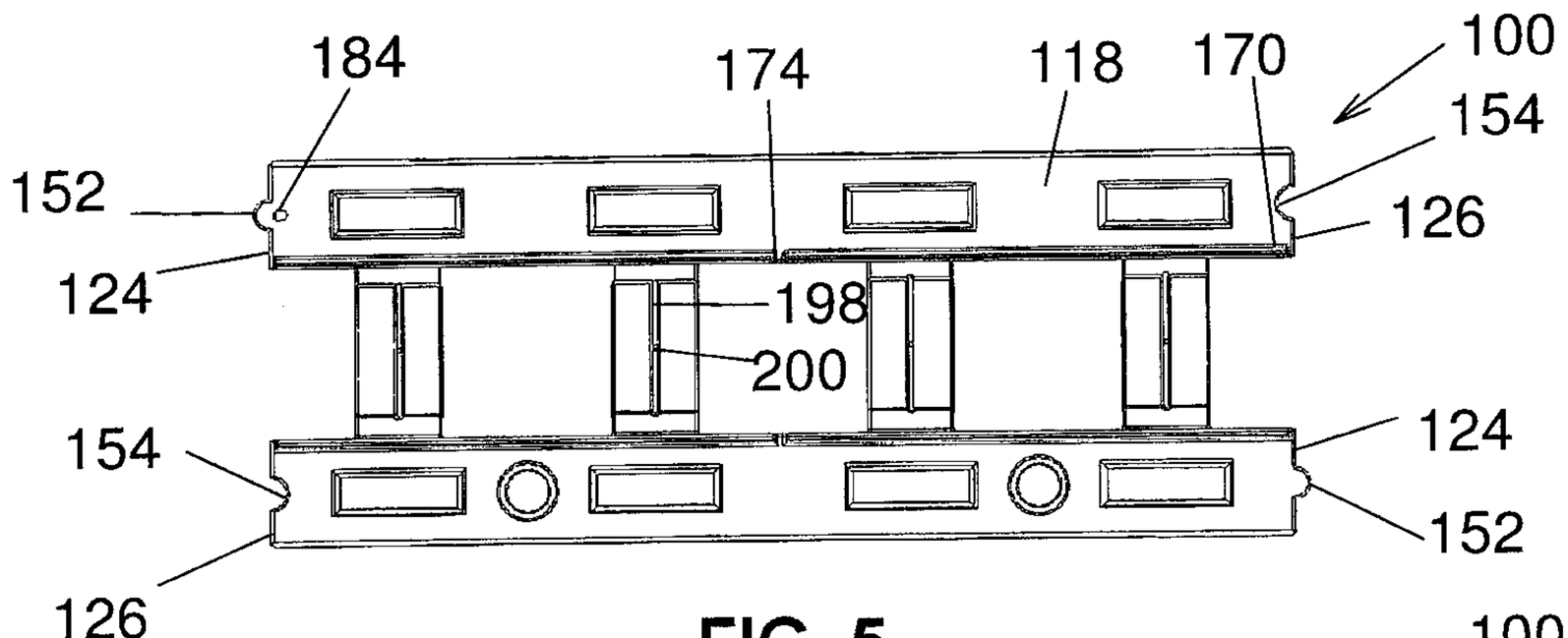


FIG. 5

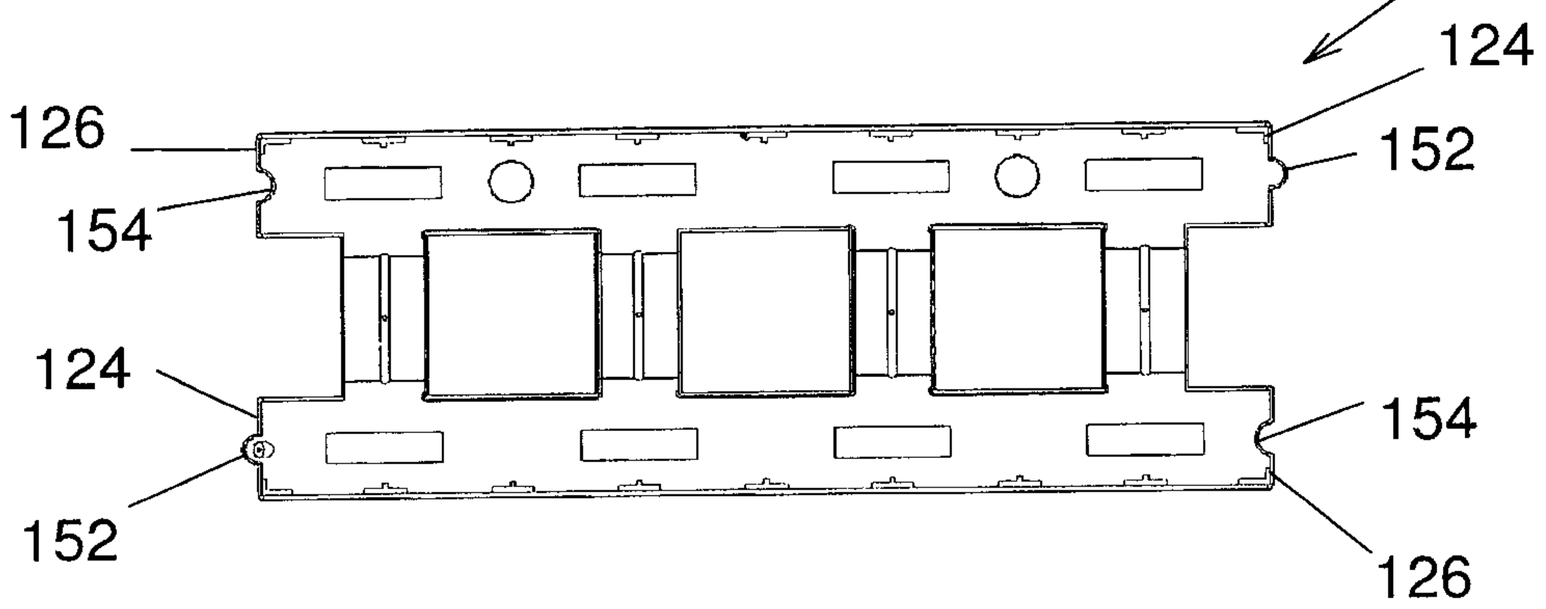


FIG. 6

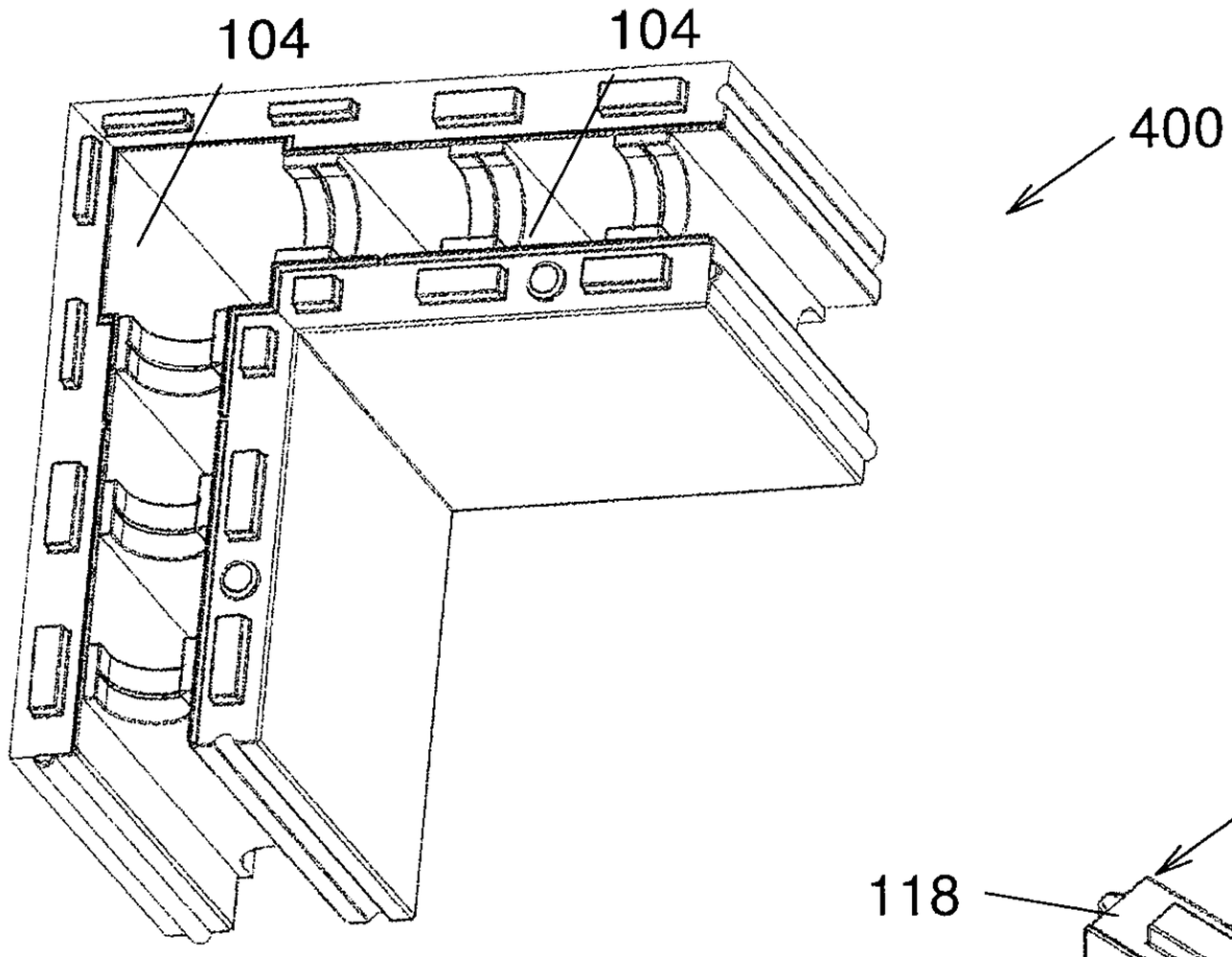


FIG. 7

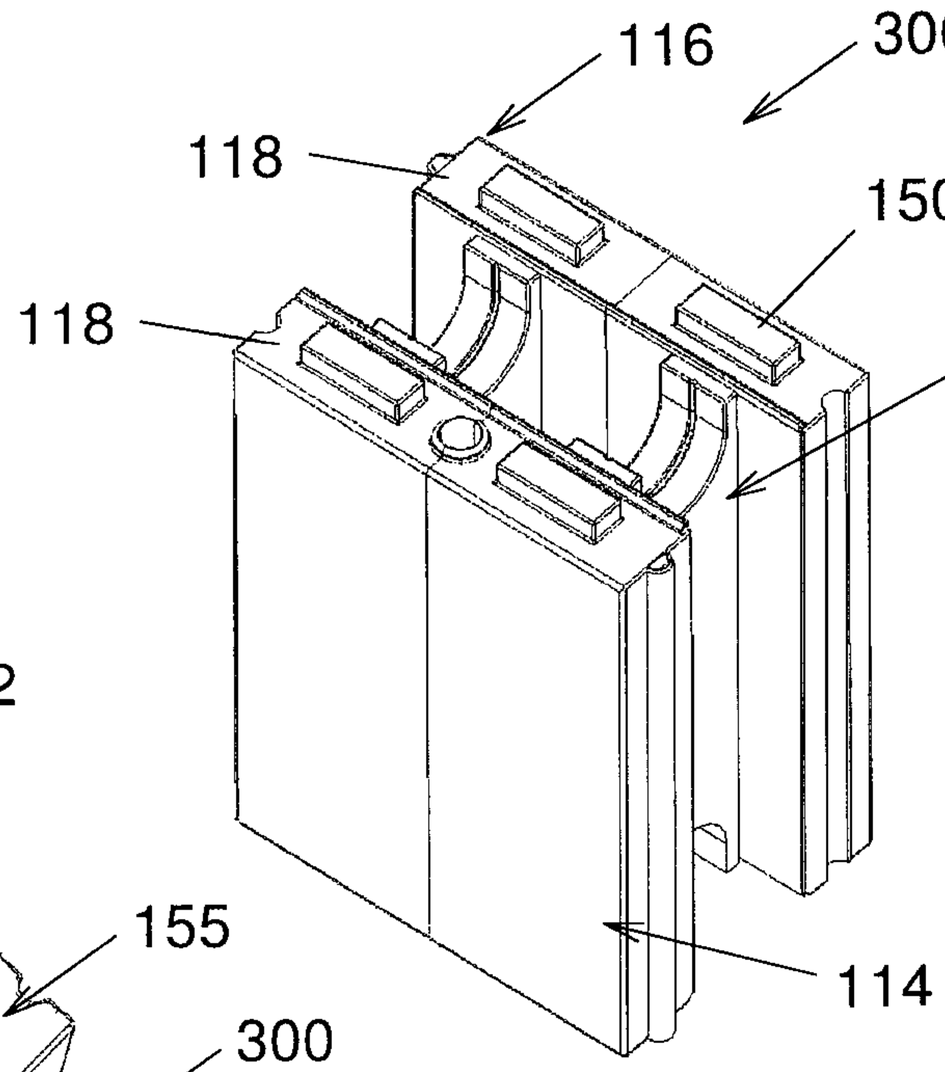


FIG. 8

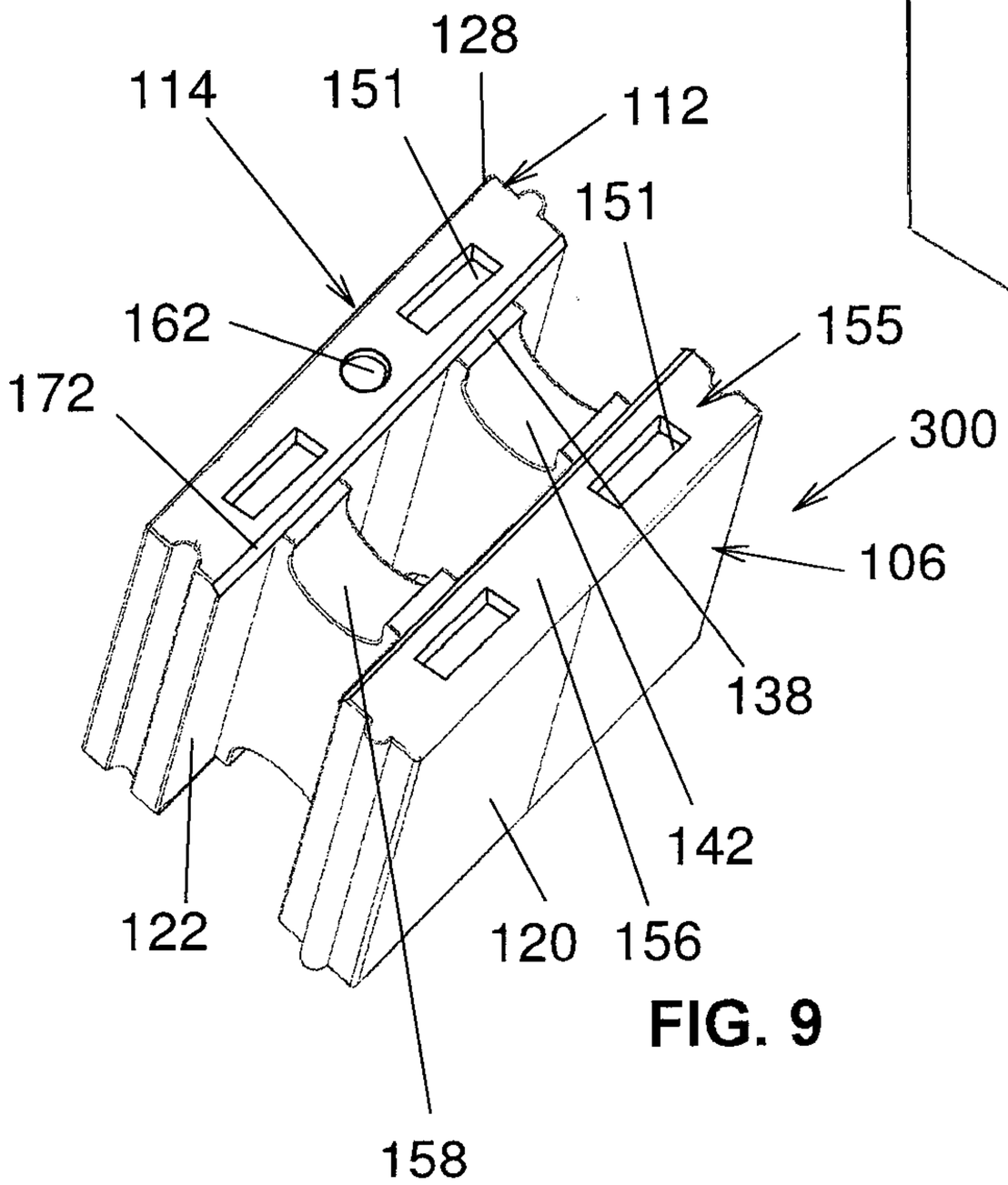


FIG. 9

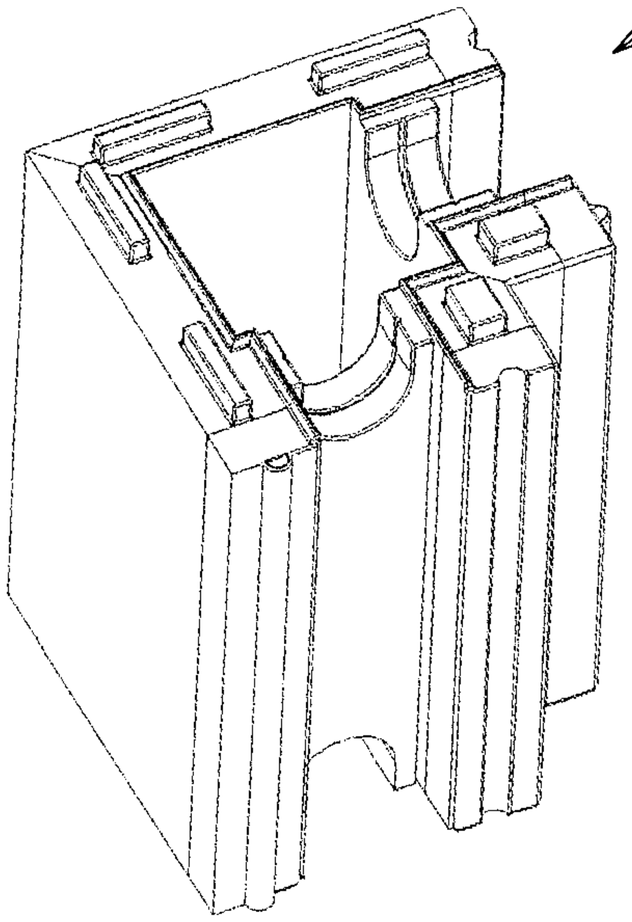


FIG. 10

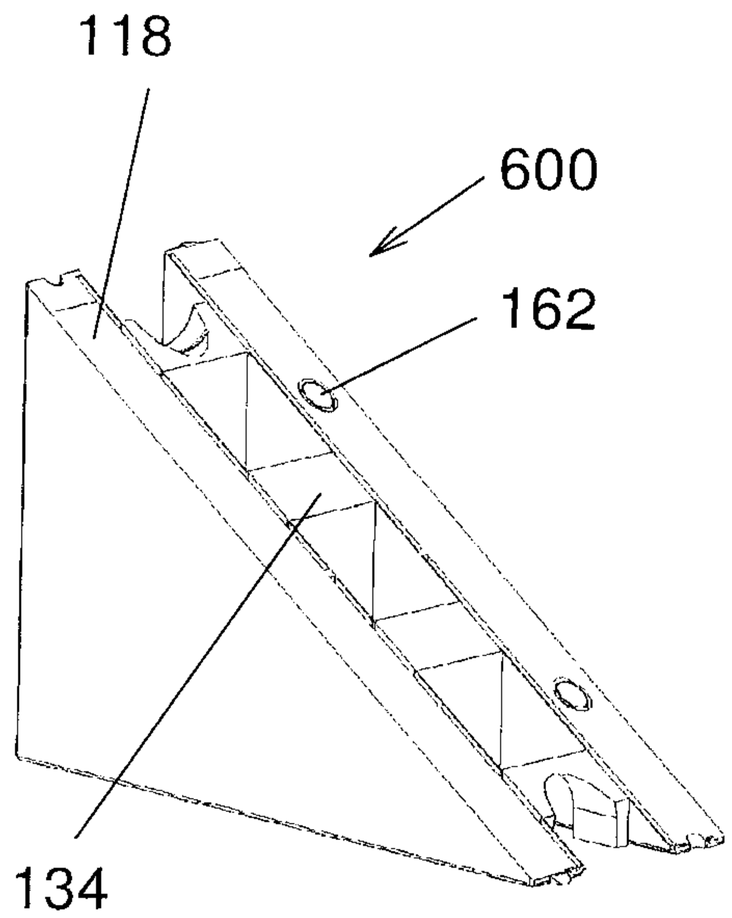


FIG. 11

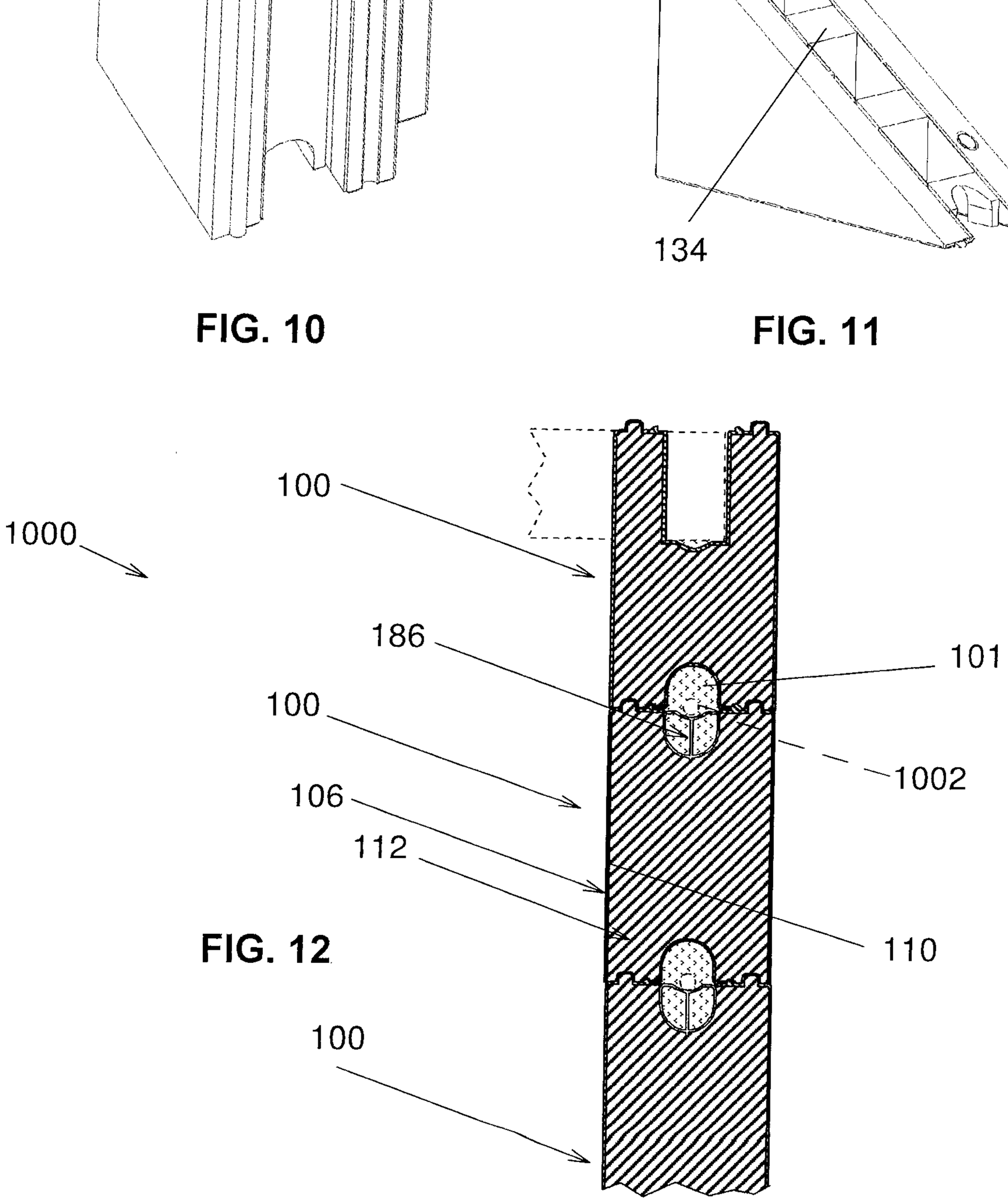


FIG. 12

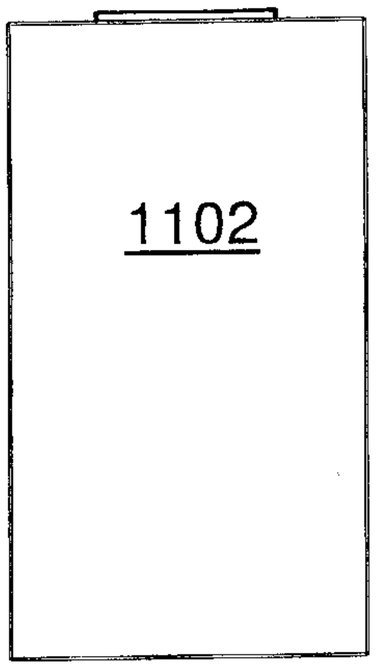


FIG. 13

FIG. 14

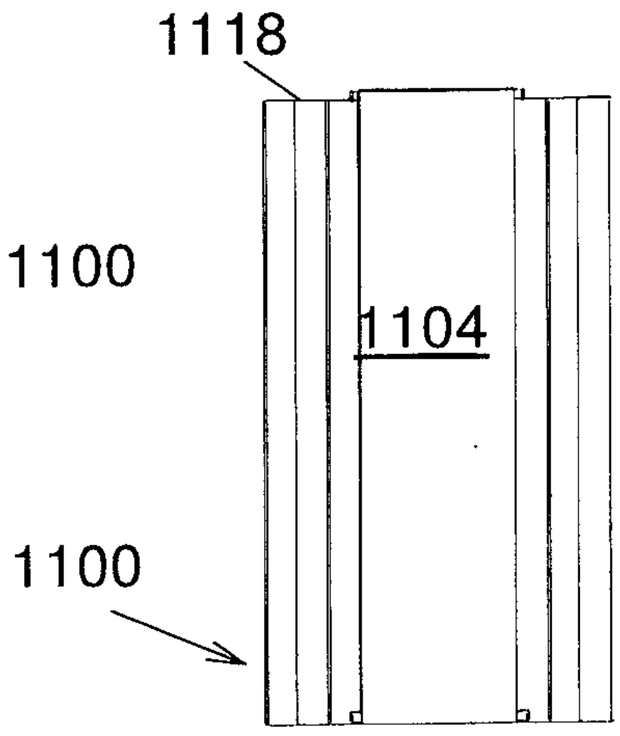


FIG. 15

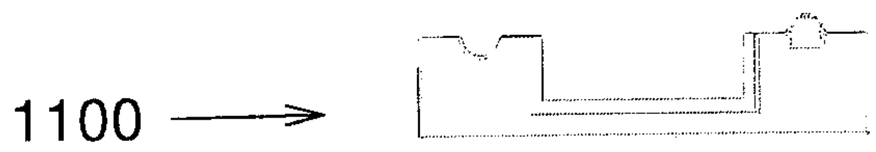


FIG. 16

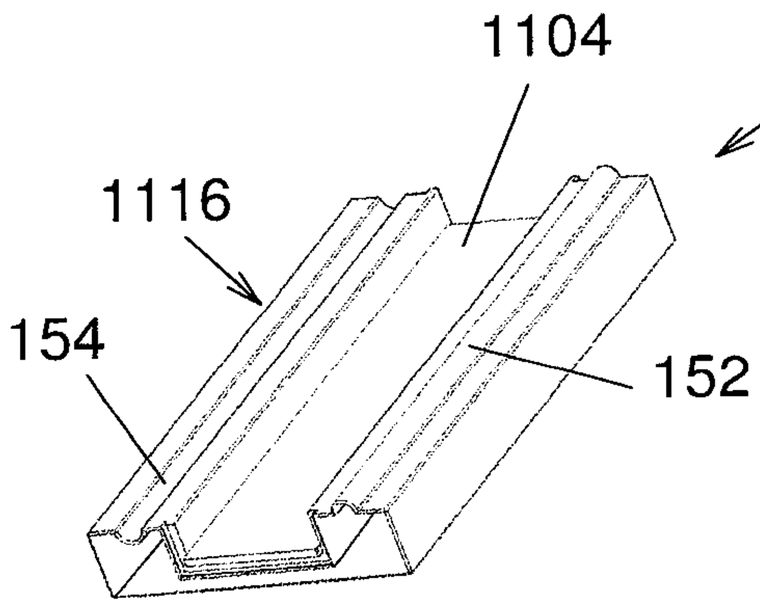


FIG. 17

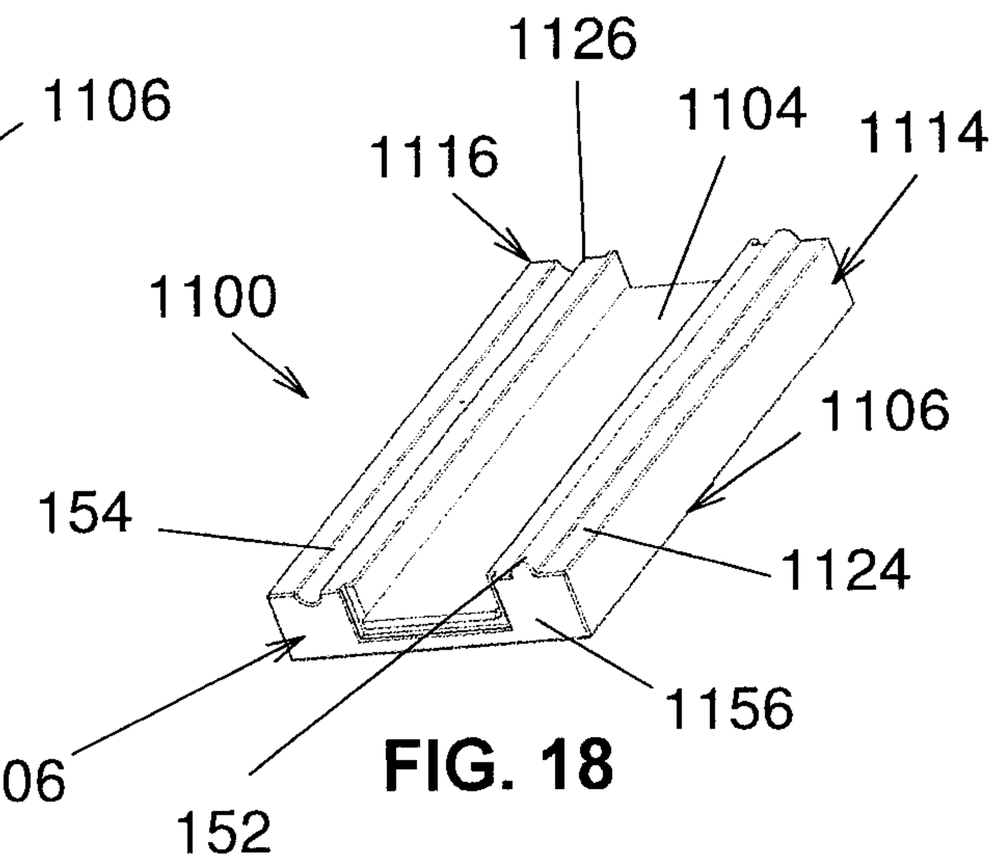


FIG. 18

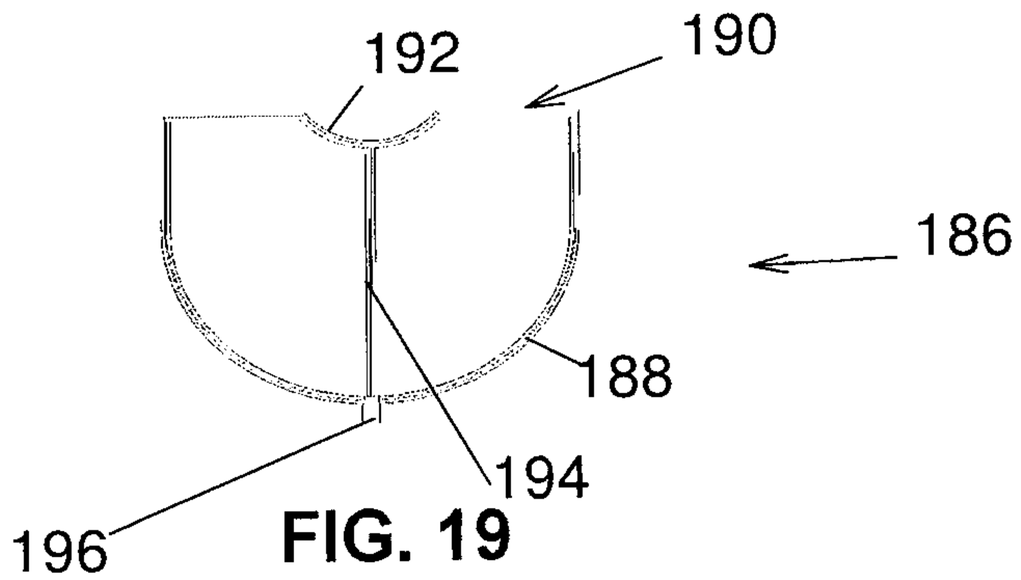
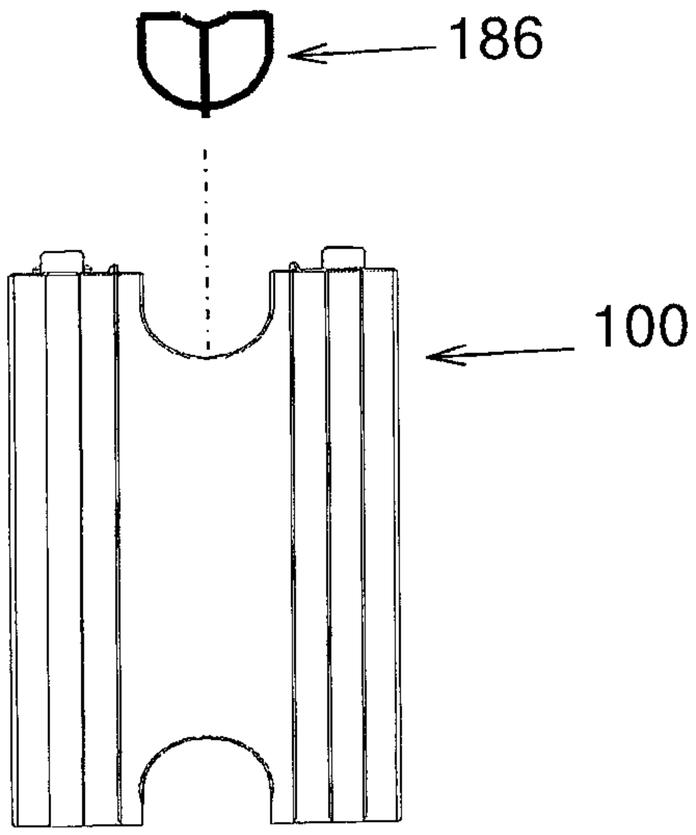


FIG. 19



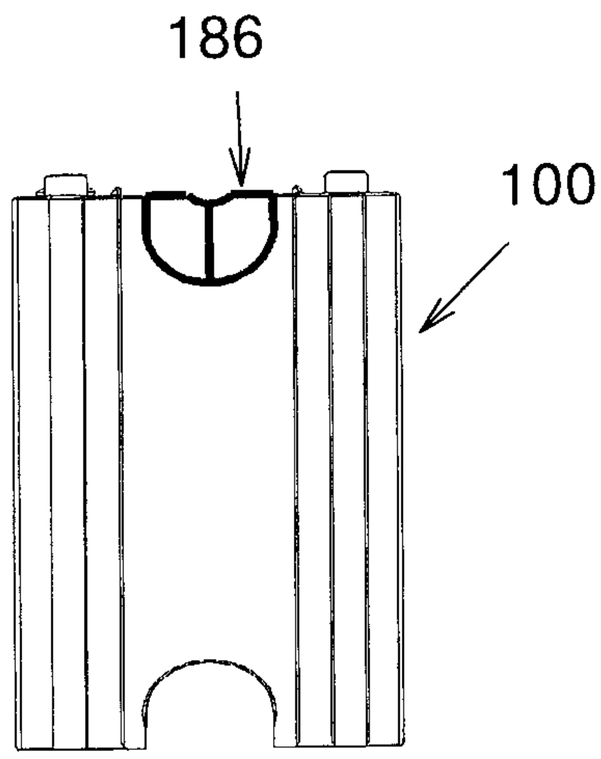


FIG. 20

FIG. 21

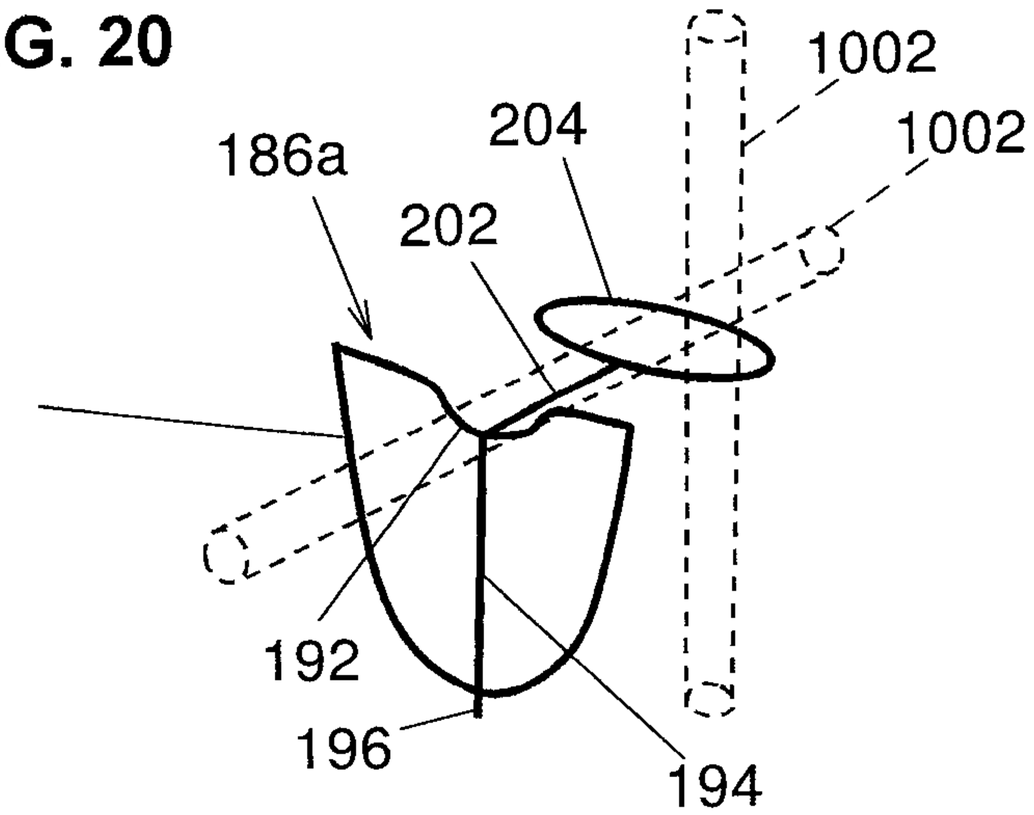


FIG. 22

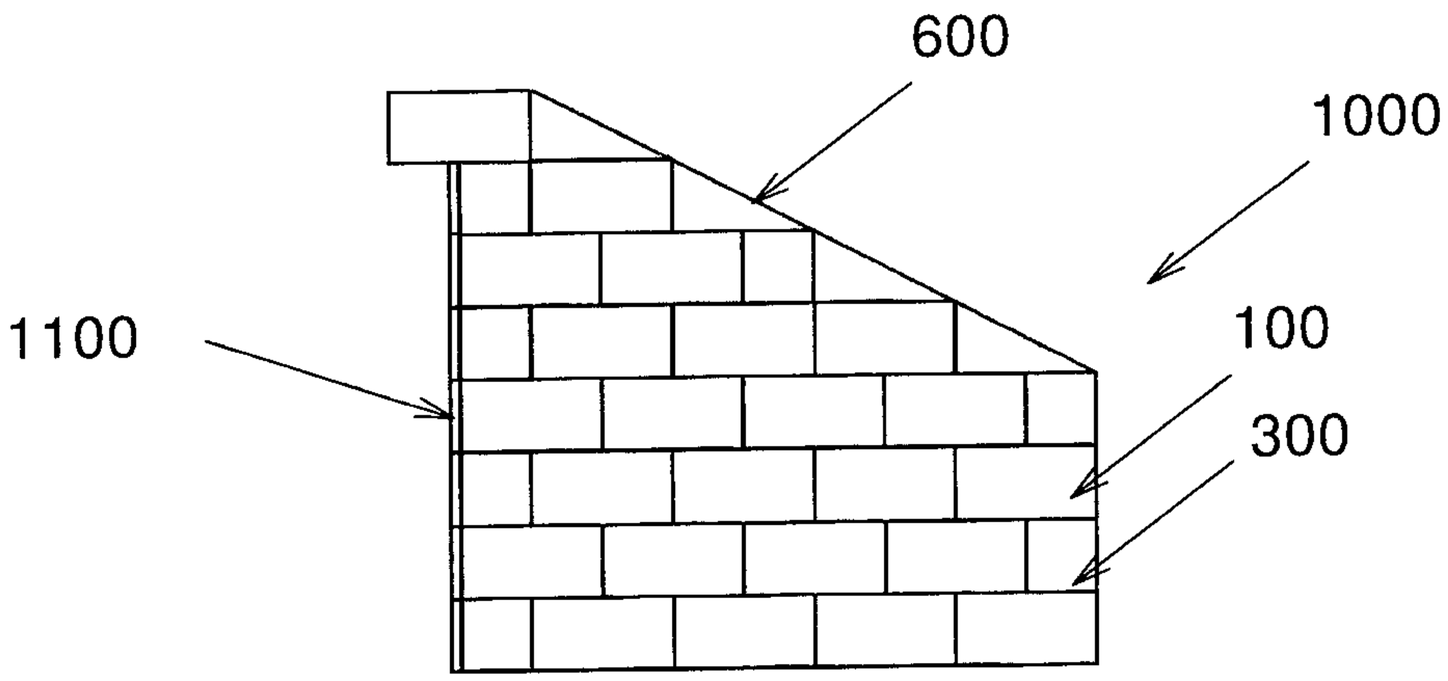


FIG. 23

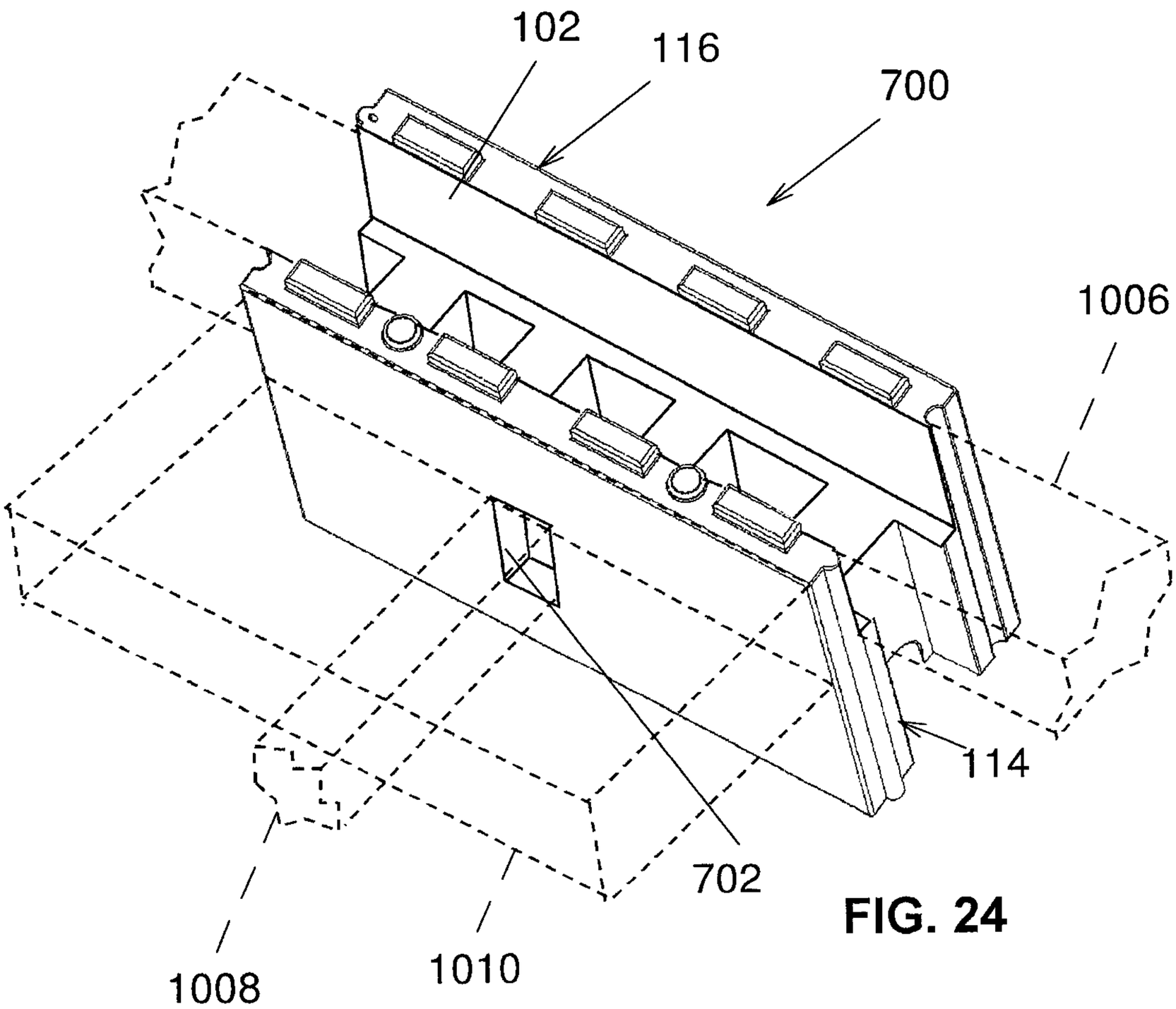


FIG. 24

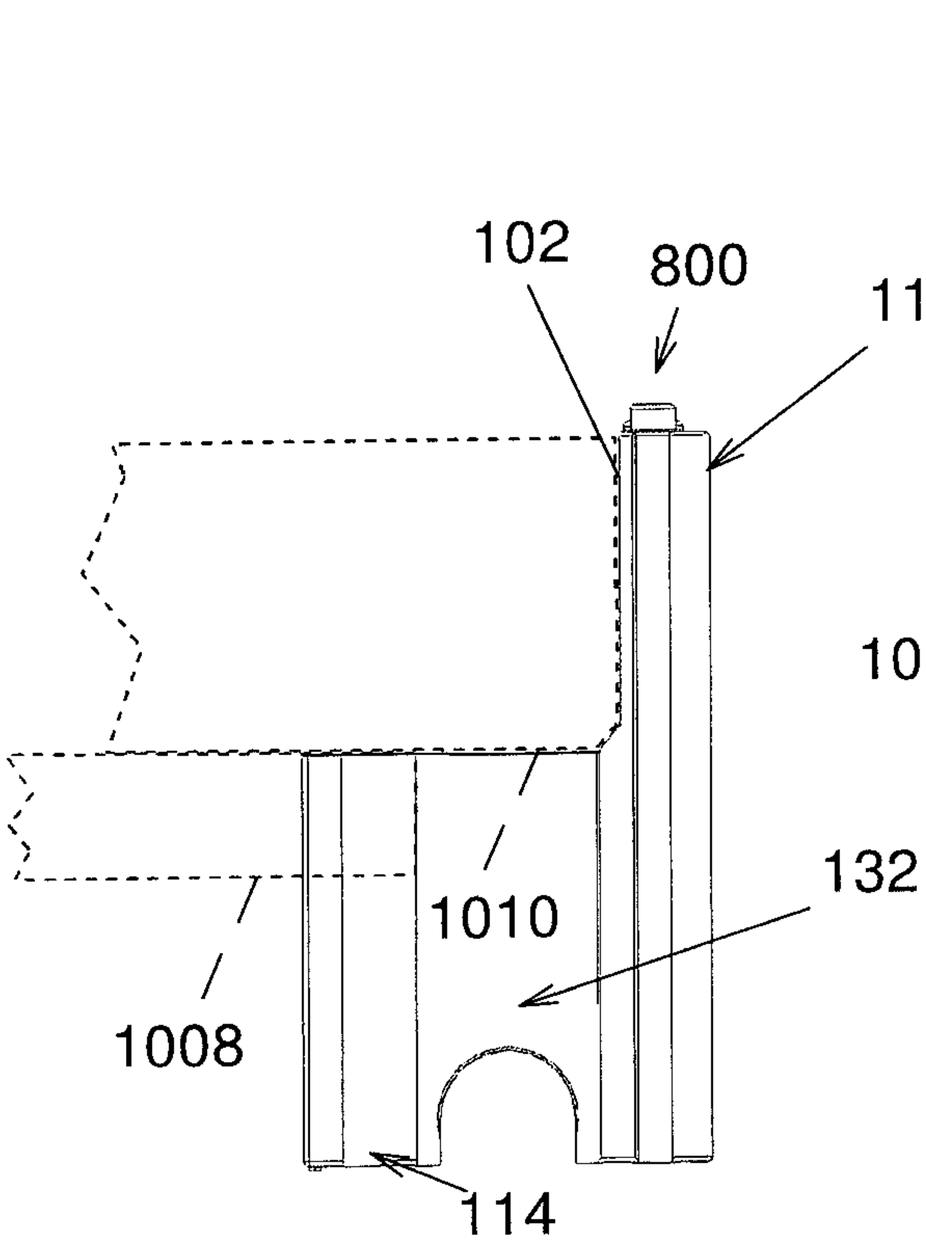


FIG. 25

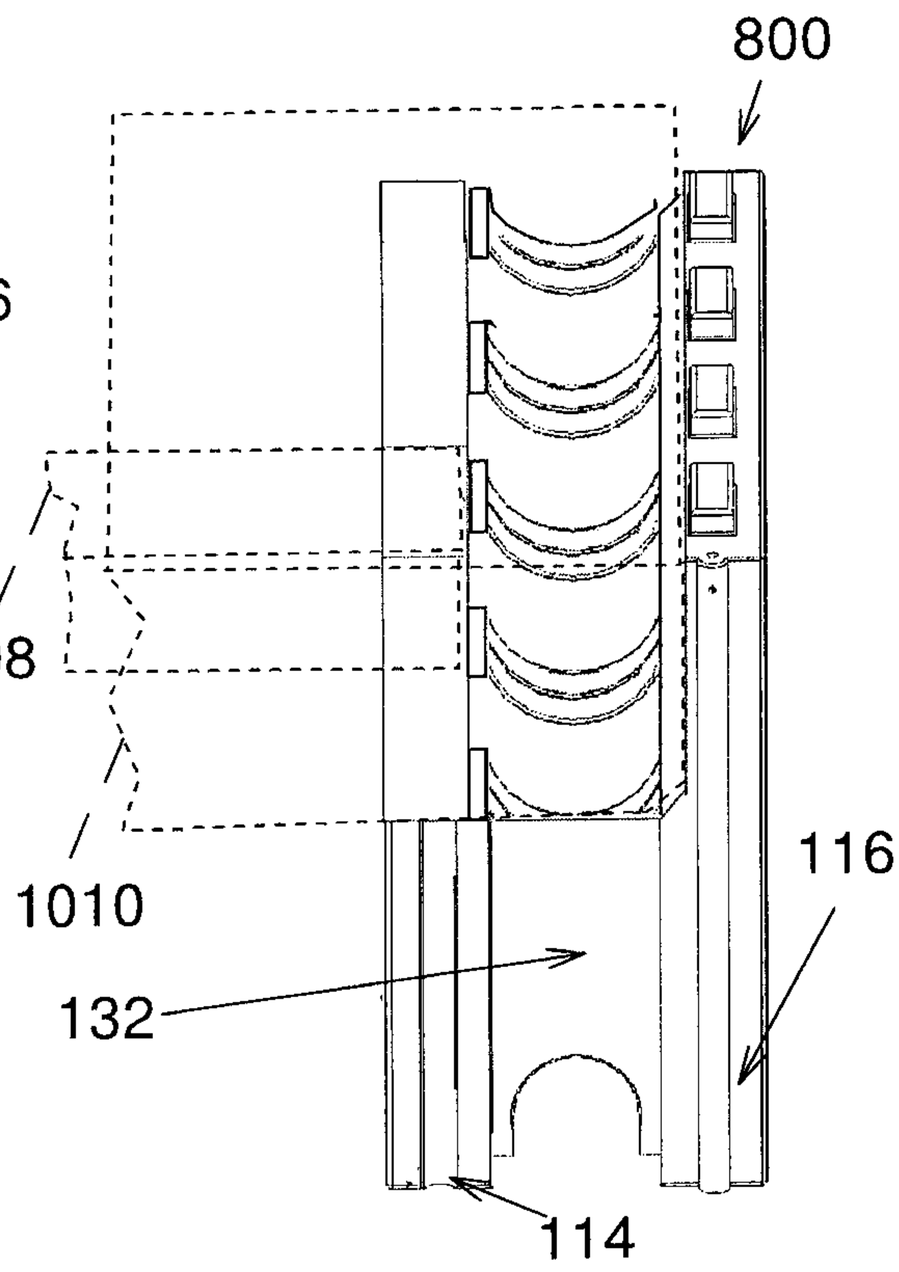


FIG. 26

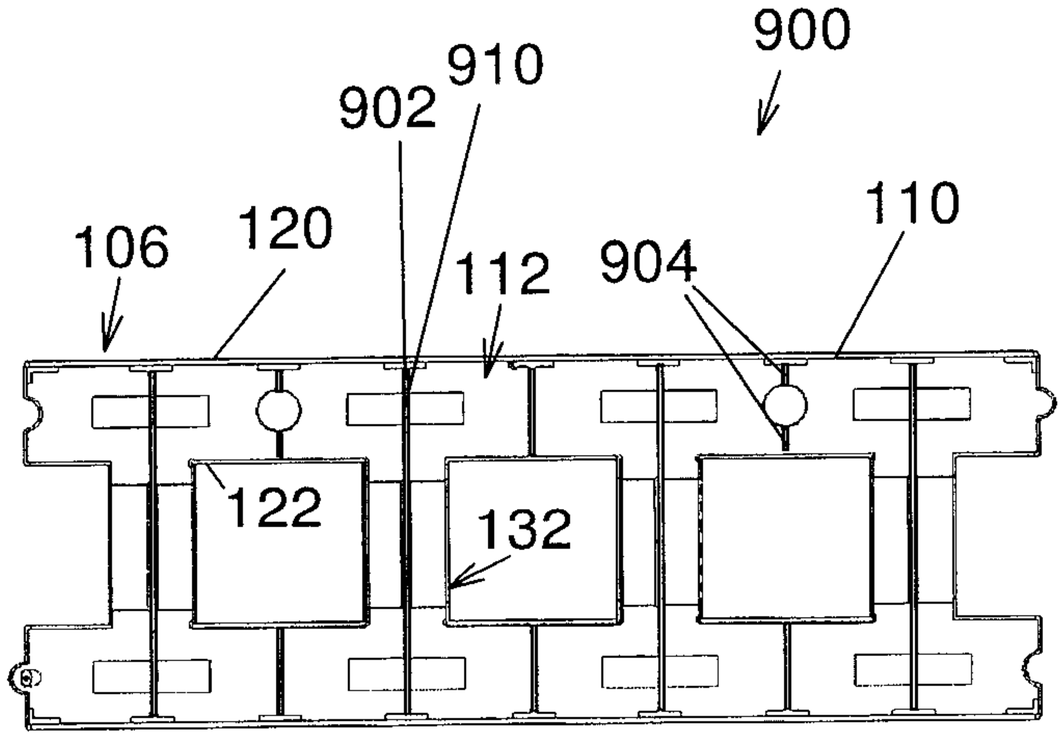


FIG. 27

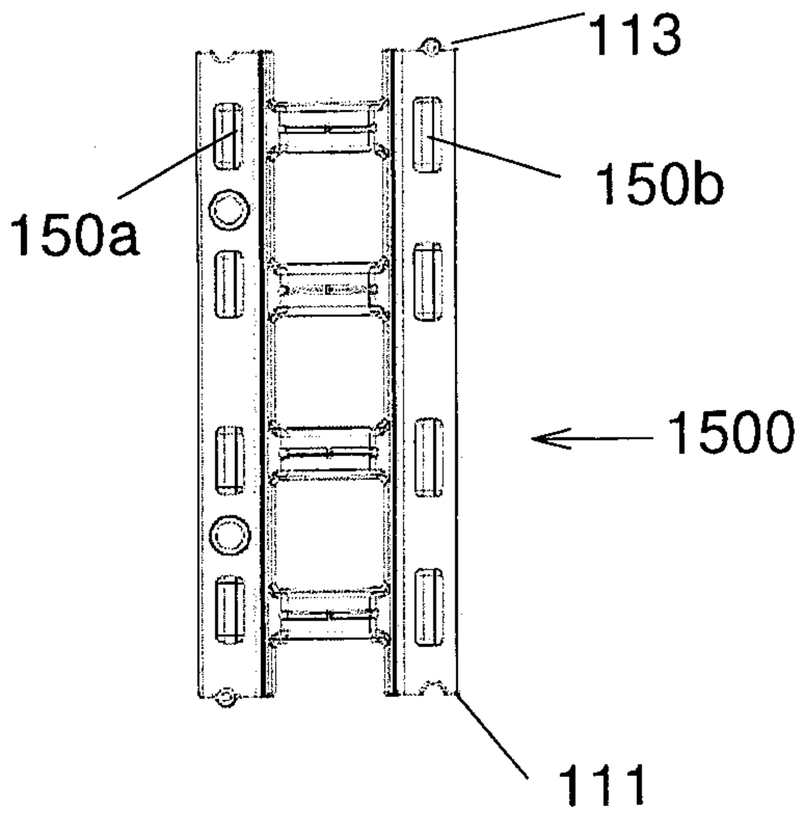


FIG. 28

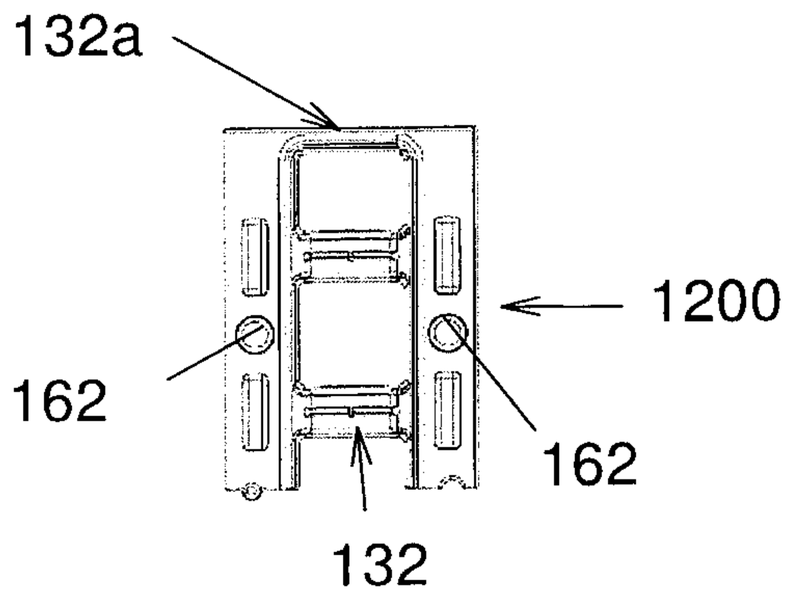


FIG. 29

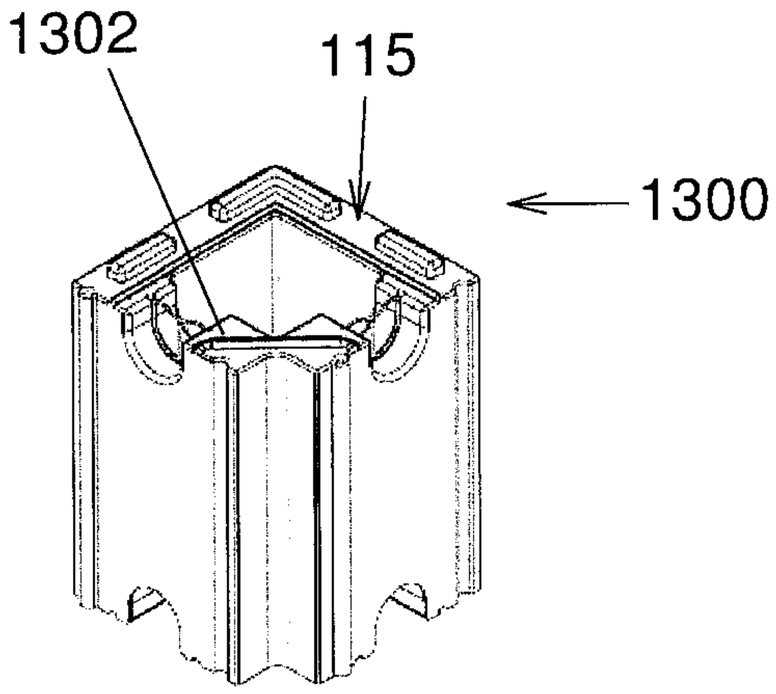


FIG. 30

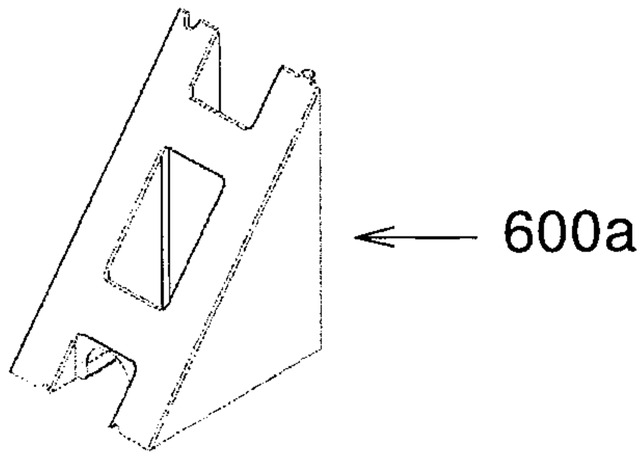


FIG. 31

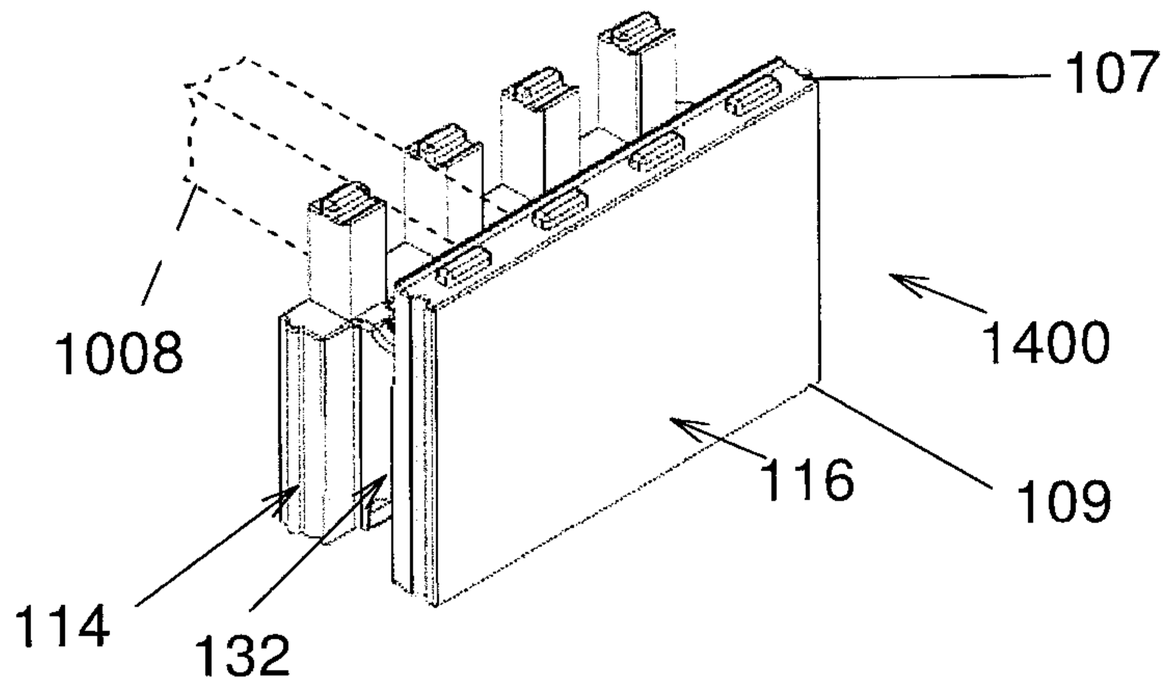


FIG. 32

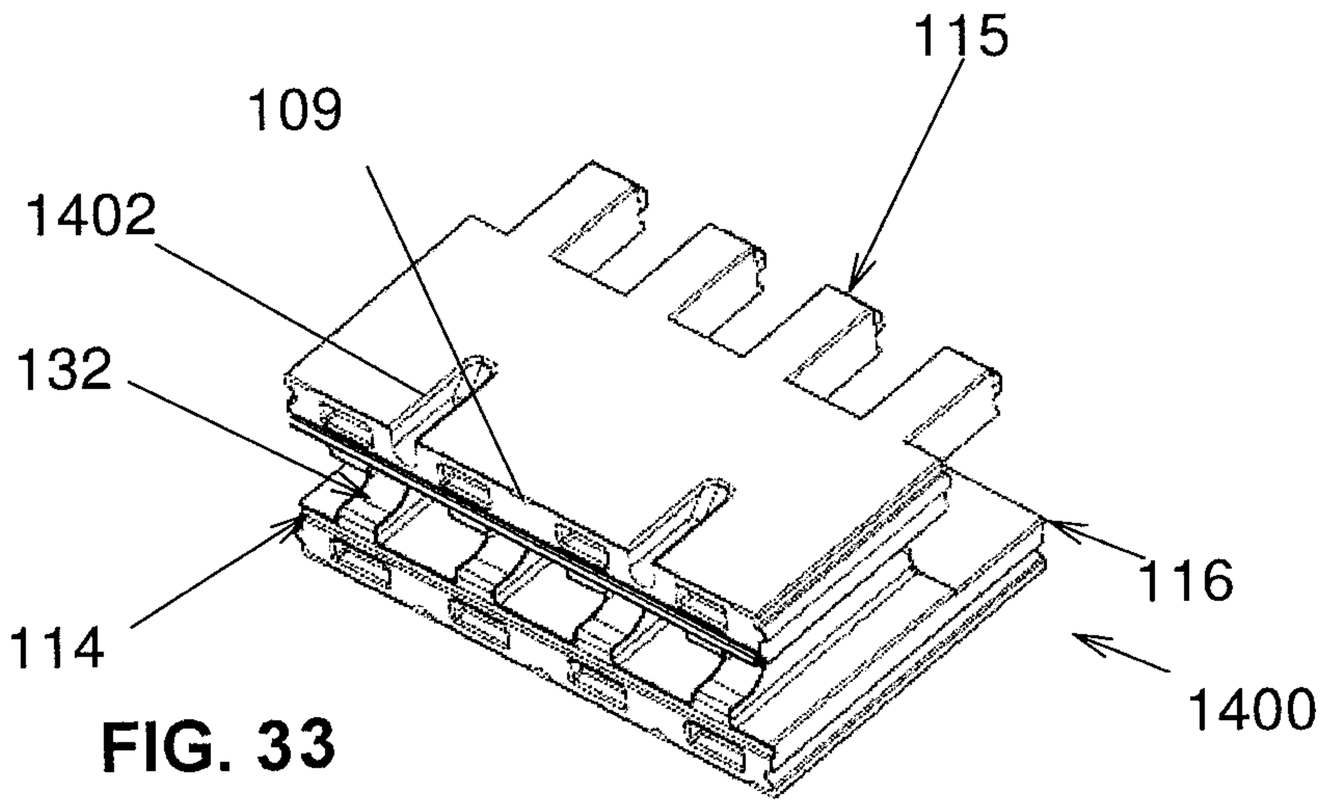


FIG. 33

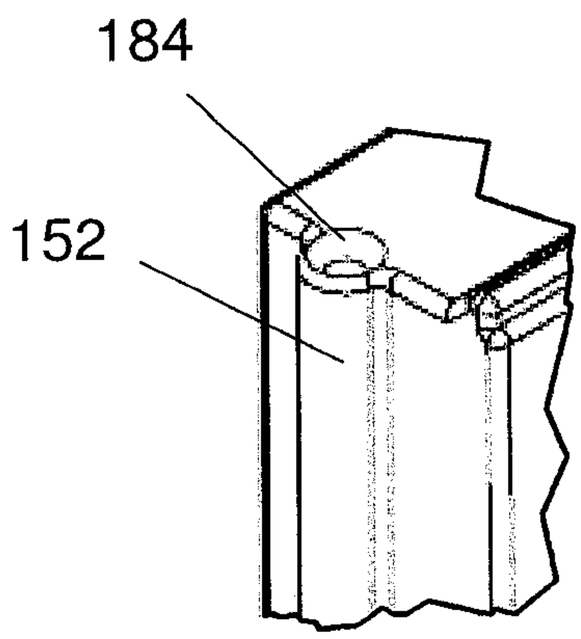


FIG. 34

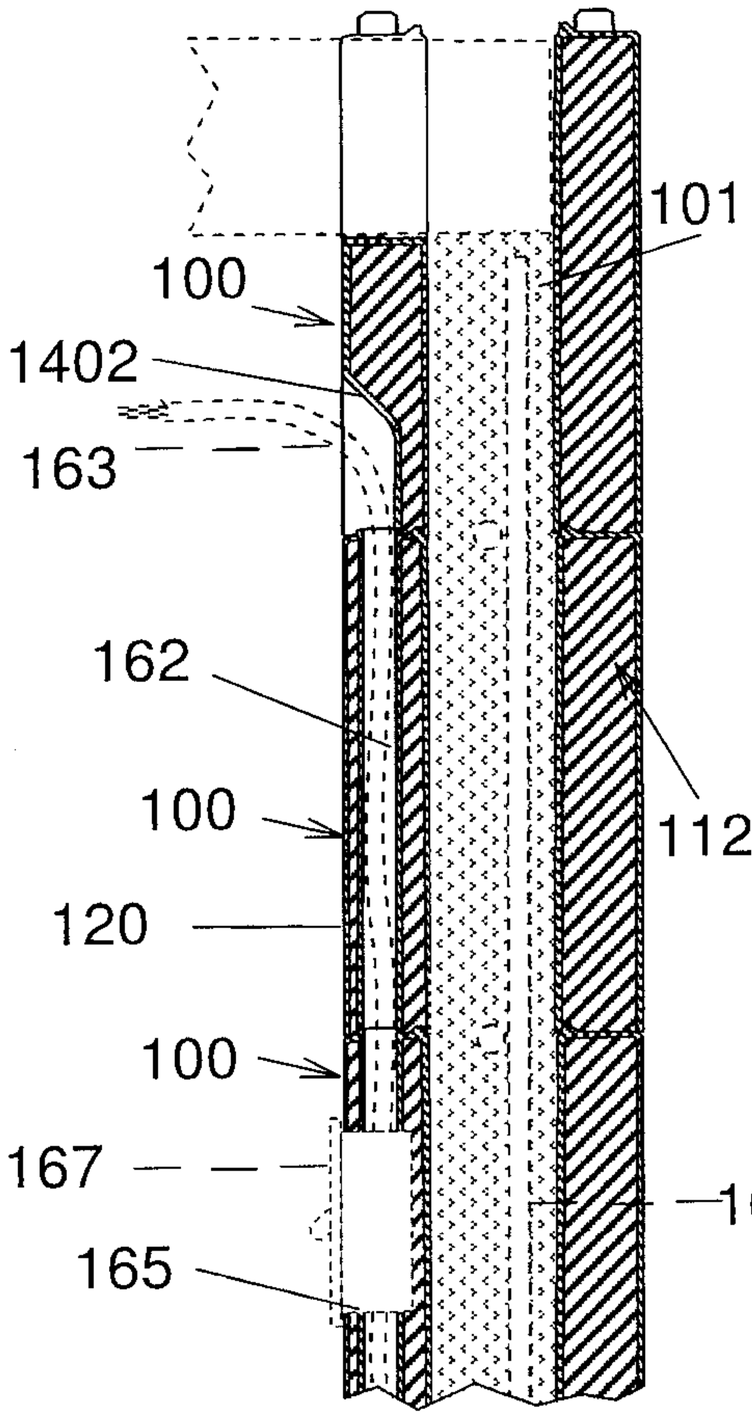


FIG. 35

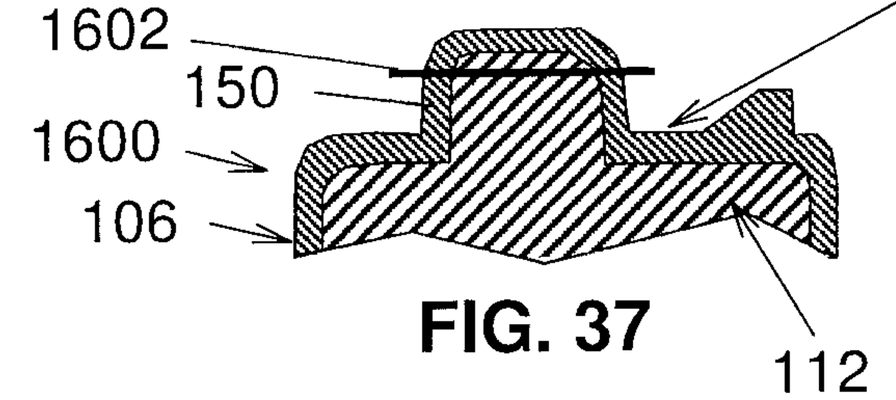


FIG. 37

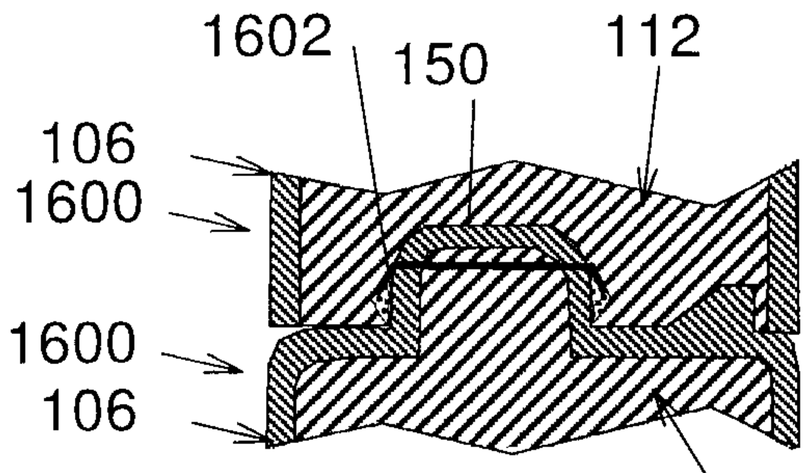


FIG. 38

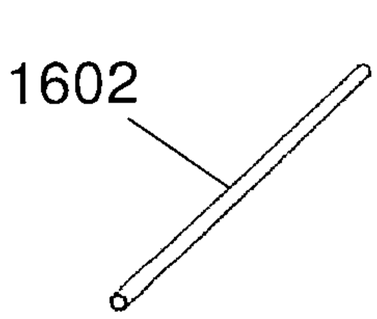


FIG. 39

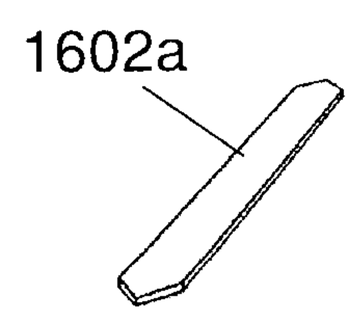


FIG. 40

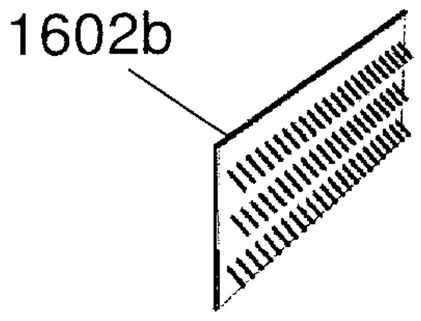


FIG. 41

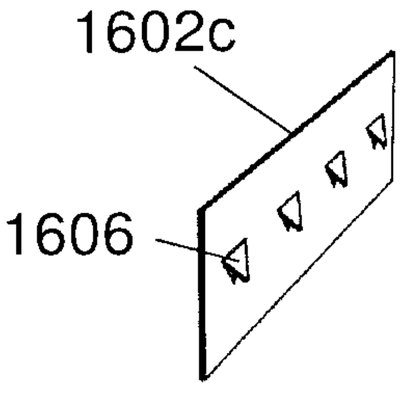


FIG. 42

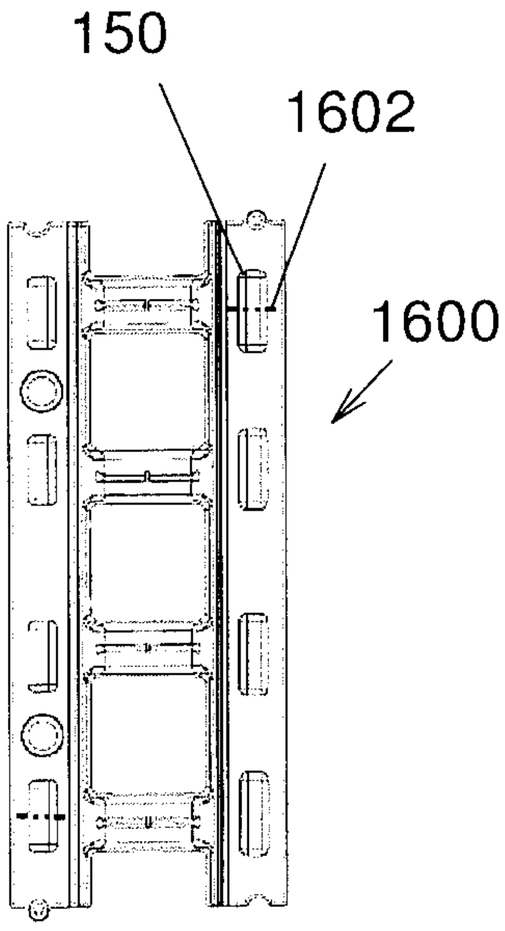


FIG. 36

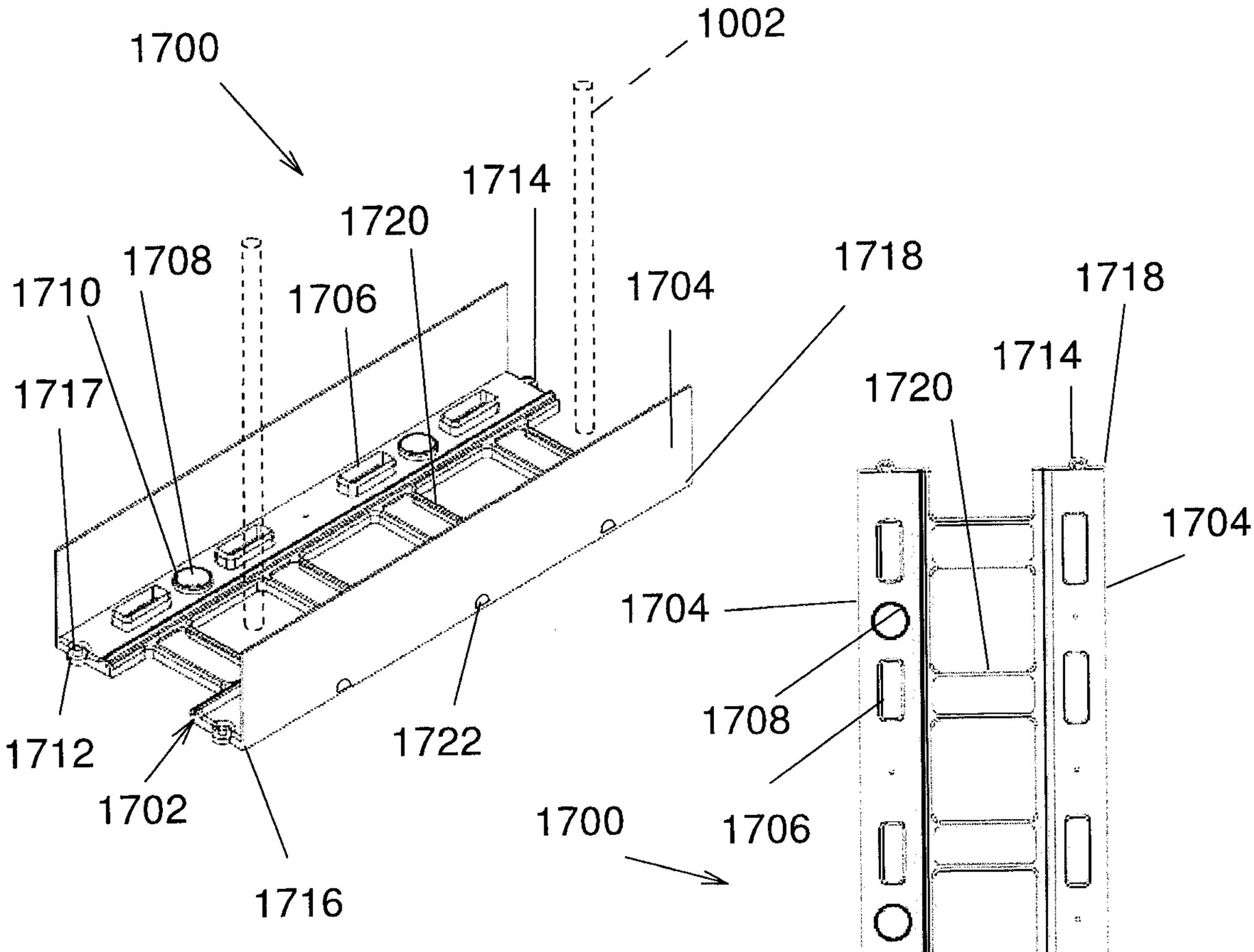


FIG. 43

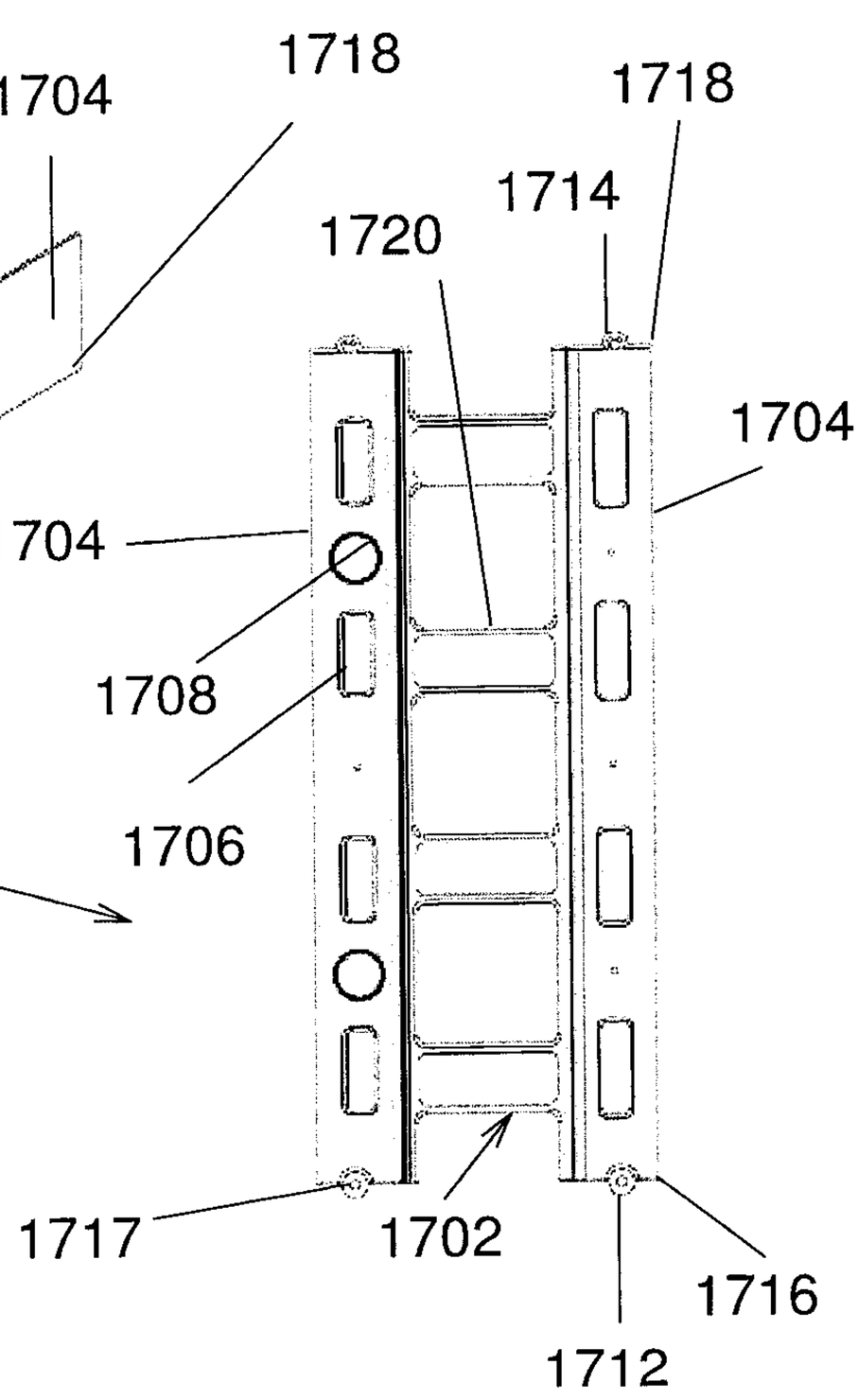


FIG. 44

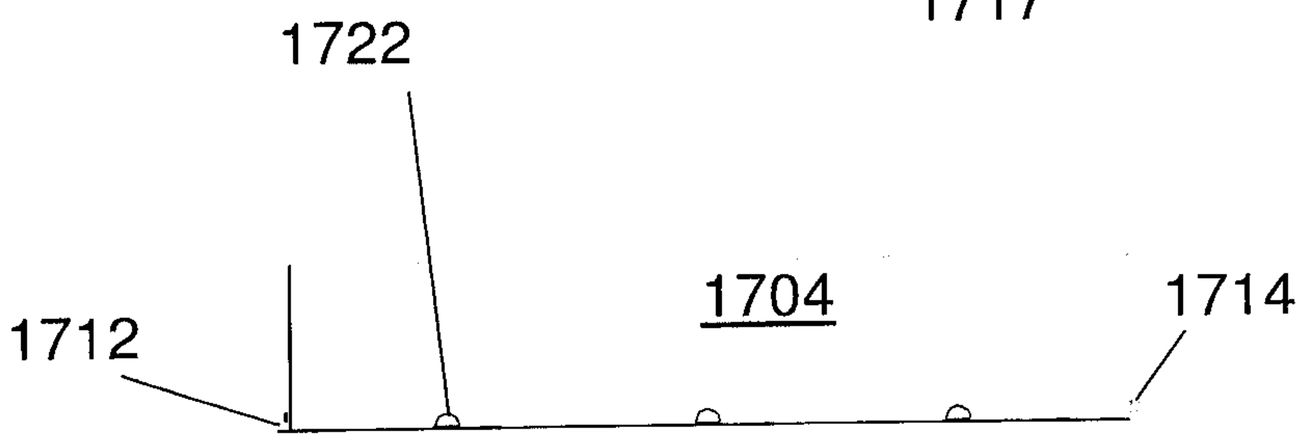


FIG. 45

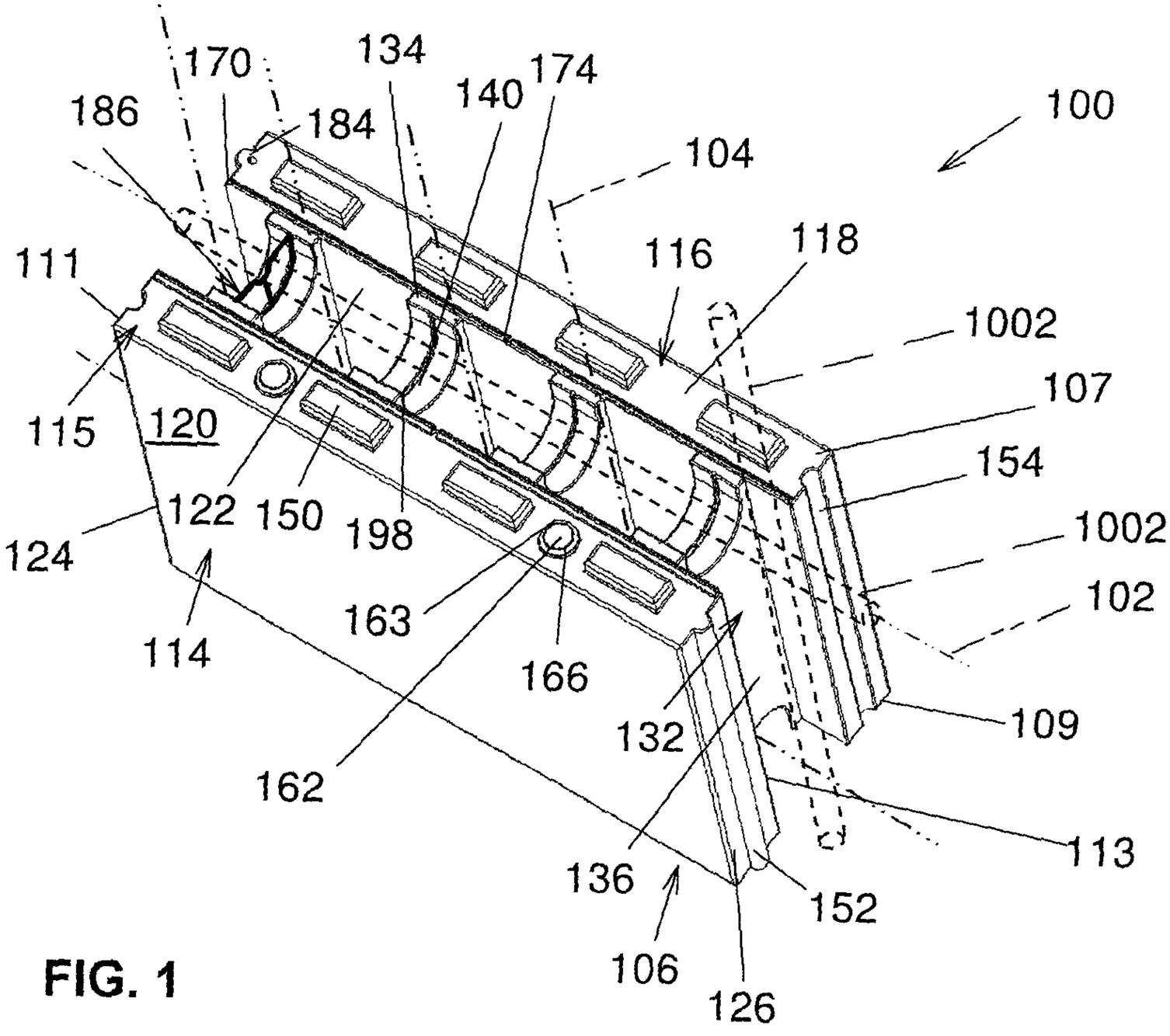

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FIG. 1