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

(11) EP 1 505 217 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
09.02.2005 Bulletin 2005/06

(51) Int Cl.[7]: **E04B 2/52**

(21) Application number: **04425615.4**

(22) Date of filing: **05.08.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL HR LT LV MK

(30) Priority: **06.08.2003 IT RM20030387**

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(54) Brickwork system with combinable modules

(57) It relates to a modular system for building constructions based upon particular modules equipped with joints in order to be dry-assembled onto the wall and with holes and channels (1,1',2,2') apt to receive reinforcement iron and a subsequent cementation by casting integral with the walls themselves, which are respectively shaped specifically for rectilinear wall parts or for both angular and rectilinear parts; they can be transformed even in the sizes and with holes (7) and/or grooves (6) apt to the lightness, insulation, placing of the pipings and/or other; and with special modules (MS) such for the floor containment, the counterthrust walls and a lot more.

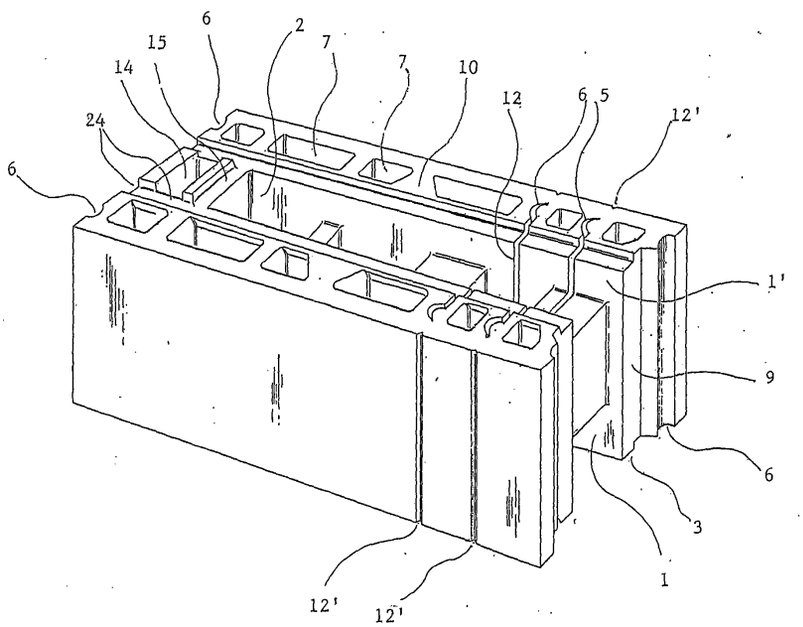

FIG. 3a

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Description

[0001] The invention relates to a brickwork system with combinable and/or adaptable modular elements which are dry-laid and subsequently cemented by casting, in order to implement brickwork constructions of greatest solidity and constructive convenience.

[0002] According to the invention, said modules allow obtaining, inside the masonry, insulated seats for technological services and insulation means.

STATE OF ART

[0003] Several modular masonry proposals are known to the state of art which, nevertheless, have not succeeded in obtaining the same results and convenience connected to the traditional masonries: in fact, modules without practical systems of joint assembly for the different parts of a brickwork construction are utilized, among which:

- systems with a technique of cementation by casting with formwork modules, wherein any structural rationality with respect to the strengths of contained modules, cement and possible iron is wholly absent;
- systems constituted by several special modules, rigidly pre-arranged by single brickwork part such as: angles, crossings, wall-ends, straight parts, etc., which cannot be replaced the ones by the others and therefore which are difficult to be managed in the practical implementation of a building yard;
- modular systems therewith the implemented walls are rigidly limited in length, as they are bound to multiples of the module portion (usually half thereof) corresponding to the staggering between one row and the upper one;

[0004] Therefore, it is strongly felt the need for systems with cementation by casting able, on one side, to meet the several brickwork, executive, structural and insulating requirements and, on the other side, able to house the infrastructure pipes even in walls with small thickness for the inner partitions.

[0005] In a preceding application PCT W097/16610 of the same applicants an improved masonry system with modular elements with building constructions has been illustrated, comprising linear and angular modules equipped, on the bases and on the vertical side faces, with joints of male/female type for the correct and simple positioning thereof in the construction of masonries of rectilinear, curve or broken type; said modules providing on each base at least a central longitudinal channel as well as central holes orthogonal to the bases themselves, the whole thing being arranged so as to form canalizations with the adjacent modules which must be cemented after laying. The central holes, parallel to the side surfaces, are arranged so as to match the holes and/or the canalizations of the elements positioned in the upper and lower rows, thus obtaining a set of canalizations apt to form a structural network, reinforced or not, cast during use and constituted by rafters and small pillars.

[0006] However, a system of such type does not fully meet the market needs because:

1) the holes and vertical channels do not correspond to a sequence suitable for a staggering differing from the "regular" one of half module;
2) it is not possible positioning an angular module onto the linear ones in straight line;
3) it is not possible choosing a wall length not equal to a multiple of the module itself or to more than half module, not being fractionable into submodules;
4) there are not modules suitable to partitions with hollow spaces;
5) there is not a module of last row with hollow space.

[0007] A certain planning rigidity derives from this, involving limitations in the choice of the partition walls' length and the need for calculating in advance the exact number of angular modules in order to avoid the risk of a useless surplus or shortage thereof.

[0008] The object of the present invention is to meet such requirements, by overcoming the technical limitations typical of the systems previously described by providing a modular system wherein the wall distances are not rigidly limited but can be varied, which system comprising:

- base modules equipped with vertical and horizontal canalizations forming, in use, a cement network of small pillars and rafters homogeneous with the modules, wherein said small pillars result regularly equidistant in the wall, and apt to incorporate with the maximum simplicity a bearing, anti-seismic reinforcement, suitable for lintels;
- joints of female/male type, arranged on the contact surfaces of the modules for the exact positioning thereof with horizontal and complementary tappings, grooves from fronton to fronton for the better sealing of the fluid conglomerate and/or isolated tappings for the superimposition, even transversal, of the modules, for angular positionings; complementary grooves of the female part apt both to guide the angular positioning and to receive the longitudinal tappings of the modules;
- holes and/or grooves of the hollow space type with a rational arrangement of the volumes and spaces for the placing of infrastructure services or even for the reinforcing cementation, vertically communicating even in case of using fractioned modules and/or part thereof;
- "polyvalent" elements which can be used in the angles, in the wall-ends and even in the rectilinear ma-

sonry instead of the linear modules;

- holed hollow spaces arranged so that they can be provided with canalization one by one and cemented continuously at brickwork couplings without the casting flow outflow into the adjacent holes;
- modules with a channel composition suitable for partitions and walls with reduced thickness, implemented with cementable holes and corresponding hollow space holes;
- modules for the junction with the floors by means of the union thereof into the wall;
- modules for walls of high constructive efficiency,

said base and polyvalent modules being structured in modular segments so as to be sectional therebetween even if fractioned by keeping the continuity of the vertical canalizations obtained in use and by keeping constant the distance between the centres of the cementable holes.

[0009] The system is further characterized in that it comprises a joint with variable length constituted by a pair of elements which can be moved in a telescopic way.

[0010] The invention will be described in detail herebelow by referring to different embodiments illustrated by way of example and not for limitative purpose in the enclosed drawings, wherein the figures show:

figure 1 shows an axonometric view of a primary "linear" module with hollow spaces and continuous perimetral sheathing joints, formed by four modular segments;

figures 2a and 2b show other two modules as the previous one, but formed by a greater number of segments;

figure 3 shows a bottom view of a "polyvalent" module which is complementary and replaces the linear one shown in figure 1;

figure 3a still shows a bottom view of another "polyvalent" module which can be divided into smaller fractions;

figure 4 shows a brickwork combination with polyvalent modules in regular position;

figure 5 shows an additional auxiliary module constituted by a joint with variable length;

figure 6 shows a module for the floor;

figure 7 shows a module with high supporting capacity;

figure 8 shows a brickwork body with modules for partitions;

figure 9 shows an example of masonry construction wherein the modules shown in the preceding figures are arranged in combination.

[0011] By referring to figure 1, the system according to the invention comprises a module for construction having holes and recesses apt to house a cement network of small pillars and rafters, reinforced if necessary, characterized by:

- a central canalization set comprising horizontal channels 1 and 1' and vertical holes and channels 2 and 2' apt to receive and to expand the cement casting inside the formed wall; the vertical holes and channels 2, 2' form in the wall holes with constant sizes and distance between the centres;
- a pair of horizontal joints with longitudinal tappings 3, placed on the two sides of said channel 1, along the resting planes of the module;
- a pair of groovings 4 on the opposite plane, complementary to said tappings 3 which, during use, get into contact for a quick and correct superimposition of the modules;
- a set of front-vertical joints with coupled tappings 5 - 5 and corresponding grooves 6 - 6 on the opposite fronton, which together with the set of horizontal joints forms a complete circuit acting also as a sheath for the fluid conglomerate;
- hollow space holes 7 isolated from said canalization set which can be utilized for the thermal insulation and for housing the service pipings (current, gas, etc.) as well as structural reserve since they can be cemented and reinforced too;
- a throttling 8 at the base of the hollow space holes 7 necessary to compensate the gap of the grooves of the female joint;
- front recesses 9 apt to receive the cement casting uniting opposed frontons;
- median piers 10 placed at the front joint of the modules, with such a thickness so as to receive the cement casting coming from the front recesses 9, so that it does not outflow into the hollow space holes 7.

[0012] As it can be seen in the same figure 1 the module is structured under the form of equal segments 200 each thereof includes two halves of the cementable hole 2 and a pair of hollow spaces 7.

[0013] In a further embodiment the piers 10 are replaced by median recesses 11 - in dotted lines - opened for cementation - but however isolating said hollow spaces.

[0014] In figures 2a and 2b a "linear" module ML and an angular module MP, which will be described in detail later, are plan viewed, respectively. Both ones are constituted by five divisible regular segments, instead of four segments as the previous one. In figure 2a, the module is shown in sequence with another module to point out the regular distribution of the canalizations even in the junction points.

[0015] On the contrary, figure 2b shows the modular configuration with divisible regular segments 200, each one equipped with hollow spaces 7 and channel parts 2 - 2' apt to align vertically in the wall with the respective similar parts, both in case of a full module and in presence of a fraction thereof.

[0016] The partition walls or easy-break transversal slits are designated with 12 which reproduce the joint elements 5 - 5 and 6 - 6, whereas the external breaking lines are designated with 12'.

[0017] The number of said partition walls 12 is obviously variable, as both the division of a single segment 200 and multiples thereof can be provided.

[0018] The utility of said arrangement meets one of the objects of the invention as the possibility of fractioning the module into sub-multiples allows a broader possibility of choosing the partition walls, at the same time by keeping everywhere the continuity of the hollow spaces which is one of the features of the present invention.

[0019] The figures 3 and 4 show an upside-down view and a view with a regular combination of a "polyvalent" module complementary to the "linear" module of figure 1, apt to be used for angles, crossings, wall-ends, etc., having one of the frontons closed like a wall, but also equipped with means suitable for the use thereof - if needed - with the "linear" modules in the straight parts of the wall. Said "polyvalent" module, as a whole, appears like the sum of two distinct parts: a defined "open" part - having the same segments 200 of the linear modules, since during use it will be aligned therewith vertically by following the course of the hollow spaces 7, whereas the other defined "closed" half part is mainly used in the angles, crossings and wall-ends and it has a more complex channel arrangement which will be illustrated later.

[0020] Said module has:

- horizontal channels 1 - 1', interrupted by said closed fronton 100;
- a set of horizontal joints wherein the tappings are of the longitudinal type 3 on the "open" side, whereas on the other half side, the one closed by an insulated tapping 13 surrounding on the inside the adjacent hole 2, and on the external part being surrounded by plane spaces suitable for the transversal resting, of another module, for example to construct an angle;
- a set of groovings 40, which constitute the female joint in the opposite plane, well visible in figure 3, wherein a pair of groovings 4' can be seen flanking the channel 1', as far as the closing barrier, followed by two projections 24 which pass through the closed fronton 100 and end up outside; and, at last, there is a transversal grooving 15 with abutment relief, apt to house and to guide an isolated tapping 13 of a transversally-placed module. The presence of projections 24 further allows the superimposition of the "polyvalent" modules onto the "linear" modules with continuous tapping with the advantages already described previously;
- a pair of grooves 6 - 6 of the vertical joint, even accompanied by additional joint elements 6 - 6, 7 - 7, shown in dotted lines, in the other poles of vertical junction;
- a set of hollow space holes 7 and 14, placed so that on the closed side of the heading some of them, said canalizations 14, in a position substantially orthogonal to the central reference hole 2, act as cement bridge in case of brickwork coupling whereas the adjacent angular hollow spaces 7 remain free, except in case they are voluntarily cemented, according to what has been said by referring to figure 1;
- a front recess 9 on the open side of the module;
- vertical holes and channels 2-2' the central one thereof has an expansion 2" towards the closed side so that in a transversal superimposition it vertically corresponds to one of the cementable hollow spaces 14. Conveniently, this allows to have at disposal an additional reinforcement seat F, as pointed out in figure 2, in a crucial point such as the angle or the wall-end.

[0021] In the modules there are also provided:

- partition walls 12, apt to divide the module at one quarter and three-quarter, respectively, reproducing the vertical joint elements 5-5/6-6, as it can be seen in figure 3, and in additional smaller fractions as illustrated in figure 3a. This with the purpose of having the broadest possibility of choosing the length of the wall which is to be constructed.

[0022] According to an additional feature of the invention, as already mentioned previously, the modular system which is described provides the use of an additional module under the form of a technical joint G constituted by two elements coupled therebetween in a telescopic way thus able to modify the whole length of the ensemble thereof. This expedient allows obtaining any type of wall length.

[0023] The joint G is illustrated in figure 5. As it can be seen, it comprises two parts one thereof, which will be called drawer 50, with reduced width, is slidingly inserted into the second element which will be called portal 52, so that it can be moved forwards or backwards along the wall line, inside an appropriate chamber 54. The greater is the drawer insertion into said chamber, the more reduced is the length of the joint.

[0024] As it can be seen in the figure, in the joint G there are all other union and structural female elements therewith the modules are equipped and therefore it results to be able to be coupled to the other modules as illustrated with dotted lines still in figure 5.

[0025] Figure 6 shows a special module MS structured based upon its function which is that of occupying the last row of the wall, so as to be able to contain the floor. To this purpose said module MS appears with a shape like a "L" wherein the lower part contains the central canalization set with the channels 1 and 1' and the vertical holes and/or channels 2-2', for the structural

continuity with the remaining wall, and the usual pair of joint groovings 4 placed on the sides of said lower channel 1', along the resting planes of the module, apt to house the complementary tappings 3 of the underneath modules. On the frontons, there are on opposite sides, vertical female joints 6-6 and complementary vertical male joints 5-5 in order to guarantee the sealed junction between adjacent modules.

[0026] The upper part of the same module MS has a side wall 60 aimed at containing the casting cement of the floor.

[0027] Preferably said wall 60 on the upper part has a containment recess 61 which allows to the slab SL to extend beyond the inner face of the same wall 60 so as to increase as much as possible the structural homogeneity of the same slab. The module of figure 6 further has the hollow space holes 7 both on the base and along the wall, apt to complete the insulation of the walls even at the floor. It is to be noted that said hollow space holes 7 are conveniently placed in horizontal way so as to prevent the casting cement infiltration and at the same time to protect the whole hollow space set of the underneath wall.

[0028] Figure 7 represents a module equipped with a multiple channel apparatus, suitable for walls with great thickness and weights. In the drawing it is illustrated in two versions, the one with the whole drawing comprises a central, horizontal 115 and/or vertical 107 hollow space, apt for the placing of pipes or wires, properly isolated from the lateral cementing canalizations by the presence of additional, inner sheathing joints 5-5 and 6-6, which in the opposite way can protect the outer holes from a central casting.

[0029] The other version delimited by the dotted lines is instead constituted by canalizations connected inside a great collateral expansion 16, so as to be able to contain an even transversal and therefore three-dimensional reinforcement.

[0030] In figure 8 an exemplificative brickwork body constituted by modules for partitions is represented, for which the invention provides an articulated channel apparatus in order to have, even in a wall with small thickness:

- holes and channels able to receive the insertion of the cement conglomerate;
- hollow spaces on both faces in order to place the services on both sides of the wall.

[0031] The requirements described above are solved by means of a horizontal canalization with alternated course 30-30' following the wall now on one side now on the other side and with:

- holes/hollow spaces 7 and grooves 70 aimed at transforming themselves, once the construction is finished, into hollow spaces placed alternatively on the side opposite to the channel and vertically corresponding, apt to house the service wires S;
- vertical holes and channels 2-2' with wide section, wherein the horizontal channel parts converge now on one side now on the other side; said brickwork example comprising also a variant V with a horizontal zigzag-arranged canalization.

[0032] Figure 9 shows an example of brickwork construction with the "linear" ML, "polyvalent" MP modules and fractions thereof 200 in use, wherein it is mainly pointed out how the so-called "angular" element is combined in the straight wall with the "linear" modules, which can be replaced in case of need, so as to make the brickwork implementation more practical. Furthermore, after the placing of the reinforcement iron F, the brickwork construction is implemented according to the invention with a core of self-supporting small pillars and rafters, with the maximum implementation simplicity due to the joints and to the adaptability of the modules and with the possibility of having the wished length of the partition walls of various sizes, thanks to the fractioning of the modules. It is also pointed out the use of special modules MS for containing the floor, as well as the use of joints G with variable length described previously.

[0033] It is useful noting that, according to the present invention, it is advantageously possible to implement buildings wherein all walls, both inner and outer ones, are equipped with insulating hollow spaces 7 on both sides, useful for the passage of the services in any point of the building. Furthermore, the presence of the hollow space canalizations involves even the outer part of the walls at the floors.

[0034] The present invention has been described and illustrated according to some preferred embodiments, but it is clear that any person skilled in the art could apply equivalent modifications and/or replacements, however comprised within the protective scope of the present industrial invention.

Claims

1. Brickwork system with combinable and/or transformable modules which can be dry-laid and, after laying, cemented by cement casting, **characterized in that** the modules are substantially parallelepiped shaped and which comprises:

   base modules properly formed for implementing rectilinear masonry parts;
   polyvalent modules properly formed for implementing both not rectilinear and heading masonry parts and rectilinear ones;
   which modules are provided with holes and/or polyfunctional hollow space channels properly arranged to guarantee the volume equilibrium, the maximum lightness and insulation, as well as to provide and appropriate seat for the serv-

ices and/or to provide additional canalizations usable for the special cementation;
said base modules and said polyvalent modules being structured in modular segments so as they can be sectional therebetween even if fractioned by keeping unaltered the continuity of the vertical canalizations obtained, during use, due to the vertical alignment of the cementable holes and/or hollow space channels therewith each module is equipped.

2. Brickwork system with sectional and/or transformable modules according to claim 1, **characterized in that** it provides modules which can be fractioned in length so as to be divided transversally into parts with a lower length than the offset portion among the modules of a row and the ones of the upper and/or lower row in order to allow the broadest choice of the partition walls' length.

3. Brickwork system with combinable modules according to the preceding claims, **characterized in that** each one of said base modules for implementing rectilinear walls provides:

a central canalization set comprising upper and lower horizontal channels (1, 1') facing on both frontons and vertical channels (2, 2') connecting said horizontal channels therebetween to receive and expand the cement casting inside the laid wall, which vertical channels (2, 2') are distributed so as to result, during use, equally sized and regularly spaced in order to keep the exact vertical alignment even in presence of fractioned parts;
a pair of substantially rectilinear horizontal joints (3), of the male type, arranged along the sides of said upper horizontal channel (1) onto the upper resting plane of the module itself;
a pair of substantially rectilinear horizontal joints (4) or groovings, of the female type, arranged along the sides of said lower horizontal channel (1') onto the lower resting plane of the module itself, which female joints are complementary to the upper male joints by guaranteeing a precise superimposition of the module rows;
two series of hollow space holes (7), which are arranged along the two larger sides of the module and are isolated from said central canalization set (1, 1', 2, 2') and which, during use, are vertically corresponding to the ones of the modules of the adjacent rows.

4. Brickwork system with combinable modules according to one of the preceding claims, **characterized in that** said polyvalent module, which is particularly suitable to be used for implementing angles, crossings, wall-ends, etc., has one closed fronton and comprises:

a central canalization set comprising upper and lower horizontal channels (1, 1') interrupted at one end by a fitting closed fronton (100) and vertical channels (2, 2') connecting said horizontal channels therebetween to receive and expand the cement casting inside the laid wall, said vertical channels (2, 2') being distributed so as to result, during use, equally sized and regularly spaced in order to keep the exact vertical alignment even in presence of fractioned parts;
a set of horizontal joints of the male/female type constituted by several upper male bodies (3, 13) one thereof is adjacent to the closed fronton and forms an isolated tapping (13) surrounding the closed end of the upper horizontal channel (1), which bodies are arranged so as to leave plane spaces suitable for the resting of an upper module both longitudinally and transversally, for example to construct an angle, and by a series of female bodies or lower groovings (40) flanking the horizontal lower channel (1') for the whole length of the module including the tract closed by the fronton (100) so as to implement a female coupling complementary to the upper horizontal tappings of the underneath modules, whether they are of the base or polyvalent type, and further comprising a grooving at the closed fronton apt to house and guide the insulated tapping (13) of a lower module arranged longitudinally or transversally; said polyvalent module being usable even with said base modules for implementing rectilinear walls;
a set of hollow space holes (7) and (14), placed so that on the closed side of the heading some of them, said canalizations (14), in a position substantially orthogonal to the central reference hole (2), act as cement bridge in case of brickwork coupling whereas the adjacent angular hollow spaces (7) remain free, except in case they are voluntarily cemented.

5. Brickwork system with combinable modules according to one of the preceding claims, **characterized in that** the modules have vertical full reinforcement piers (10), arranged in the middle, at thereof there are central recesses (11) arranged along the line of the hollow space holes (7).

6. Brickwork system with combinable modules according to one of the preceding claims, **characterized in that**, in order to allow the broadest choice of the partition walls' length, even by guaranteeing the continuity of the horizontal and vertical canalizations apart from the offset portion between the

modules of a row and the ones of the upper and/or lower row, are provided modules equipped with at least a transversal easy-break slit (12) on each one of the larger sides, which allows to implement a precise and definite division of the parts at the middle of the modular segments (200) thereby the module is constituted, so that the resulting module portions can be placed in the wall by keeping the continuity of the vertical canalizations apart from the length thereof.

7. Brickwork system with combinable modules according to claim 1, **characterized in that** it comprises modules apt to form walls with reduced thickness, which modules are equipped with a horizontal channel (30 and/or 30') with zig-zag course following the wall now on one side now on the other one, delimited by holes and/or hollow space canalizations (7, 70) arranged alternatively on the two sides of said horizontal channel; said modules with reduced length, particularly suitable for partition walls, being also equipped with holes and/or vertical canalizations (2, 2') with wide section wherein said zig-zag horizontal canalizations end up.

8. Brickwork system with combinable modules according to one of the preceding claims, **characterized in that** said modules have at least a hollow fronton (9) apt to create a compartment between opposed frontons, wherein the cement casting can be poured.

9. Brickwork system with combinable modules according to one of the preceding claims, **characterized in that** the modules have, on the frontons, at least a pair of male and/or female vertical joints (4, 5, 6) which, in use, guarantees cement casting proof junction between adjacent modules.

10. Brickwork system with combinable modules according to one of the preceding claims, **characterized in that** each one of the fractions thereinto the module can be divided has, in the partition walls (12) at least a pair of vertical joint elements 5-5 and/or 6-6.

11. Brickwork system with combinable modules according to claim 1, **characterized in that** it comprises an additional union and cement-containing module (MS) particularly suitable for implementing floors, comprising:

a base acting as union with the underneath modules, comprising a coiple of joint groovings (4) along the edges of a lower horizontal channel (1') and vertical holes and/or channels (2, 2') vertically corresponding to the ones of the underneath modules;

a side small wall (60) apt to contain the casting cement of the floor, wherein there are the hollow space holes (7); said small wall (60) being equipped with a containment recess (61) allowing to the slab (SL) to expand beyond the inner face of said wall (60).

12. Brickwork system with combinable modules according to claim 1, **characterized in that** it further comprises a module with high supporting capacity having a multiple cementable canalization.

13. Brickwork system with combinable modules according to claim 6, **characterized in that** the transversal easy-break slit (12), arranged on each one of the larger sides, is positioned at 1/4 of its length.

14. Brickwork system with combinable modules according to claim 1, **characterized in that** it further comprises an additional module under the form of a technical joint (G) constituted by two elements which are coupled in a telescopic way thus able to modify the whole length of the ensemble thereof.

15. Brickwork system with combinable modules according to claim 14, **characterized in that** said joint (G) comprises a drawer (50) with reduced width, which is slidingly inserted into a second element or portal (52), so that it can be moved forwards or backwards along the wall line, inside an appropriate chamber (54); and **in that** said joint (G) results to be coupled with the other modules of the system as it is equipped with all other union and structural female and/or male elements therewith all modules of the system are equipped.

16. Building implemented with modules of the brickwork system according to the preceding claims, **characterized in that** all walls, both inner and outer ones, are equipped with insulating hollow spaces (7) on both sides.

17. Brickwork system with combinable and/or transformable modules which can be dry-laid and, after laying, cemented by cement casting, according to anyone of the claims 1 to 15 **characterized in that** it has a series of vertical and horizontal canalizations able to contain the reinforcement made of vertical and horizontal irons united to the cement casting.

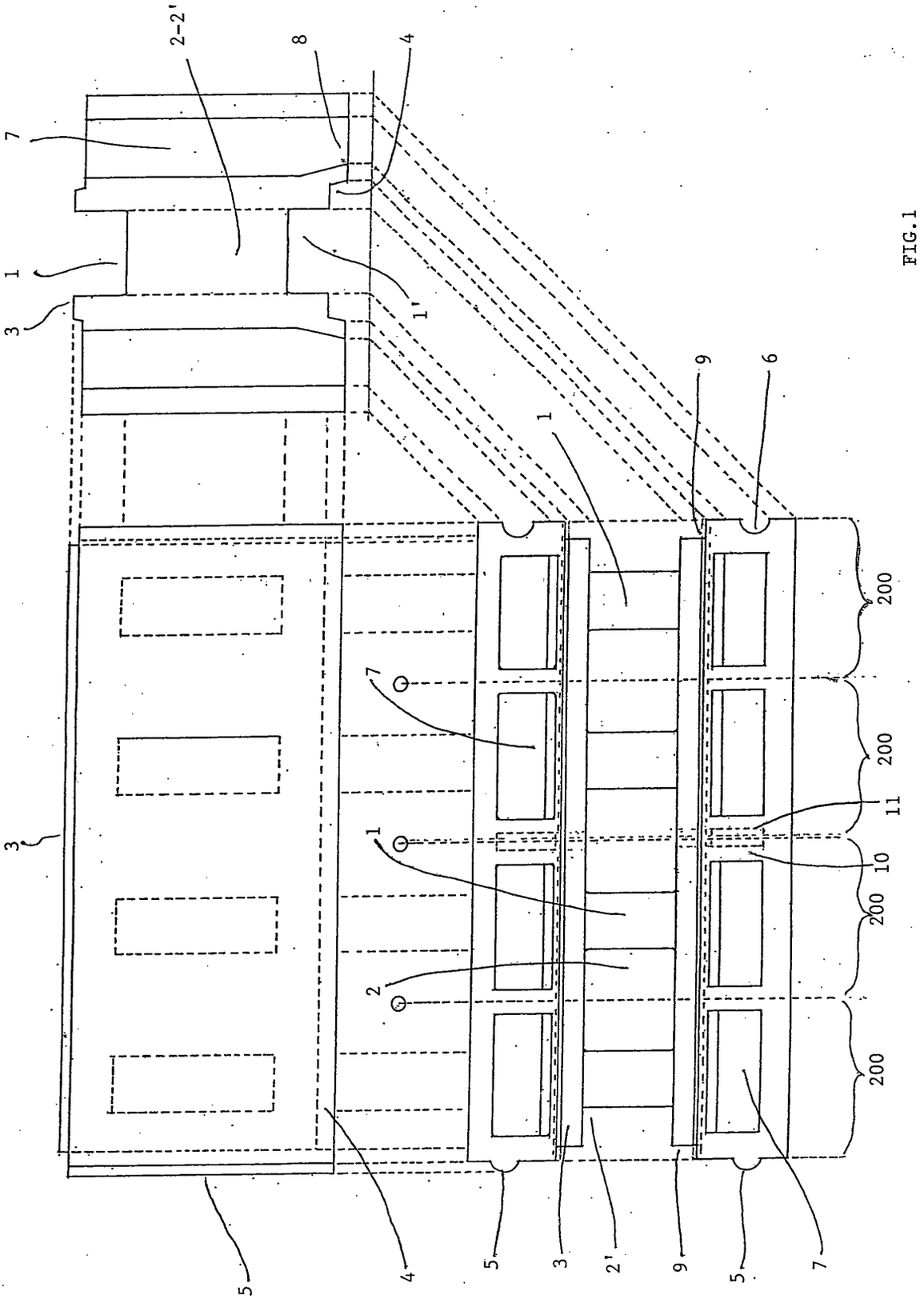


FIG.1

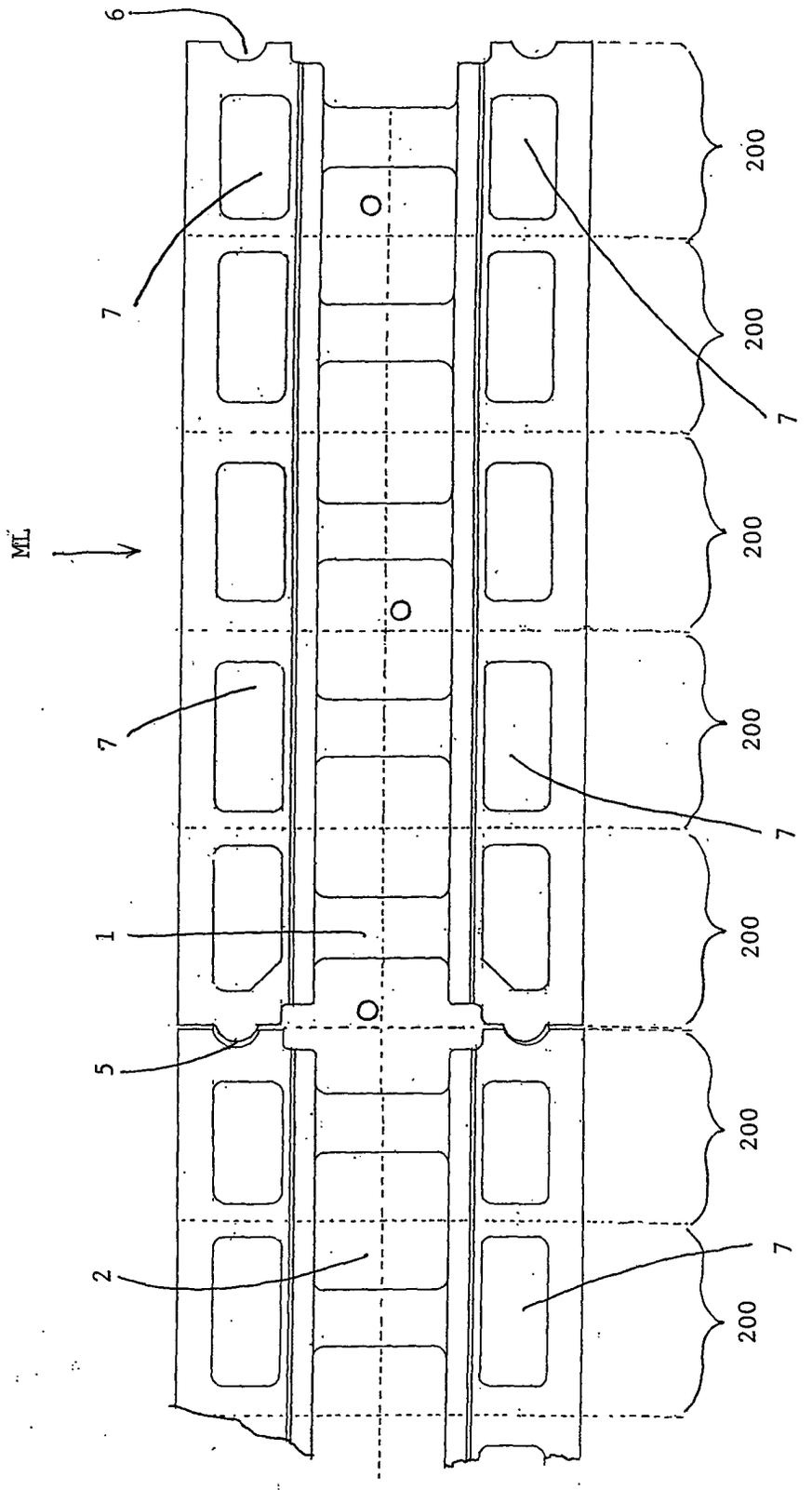


FIG.2a

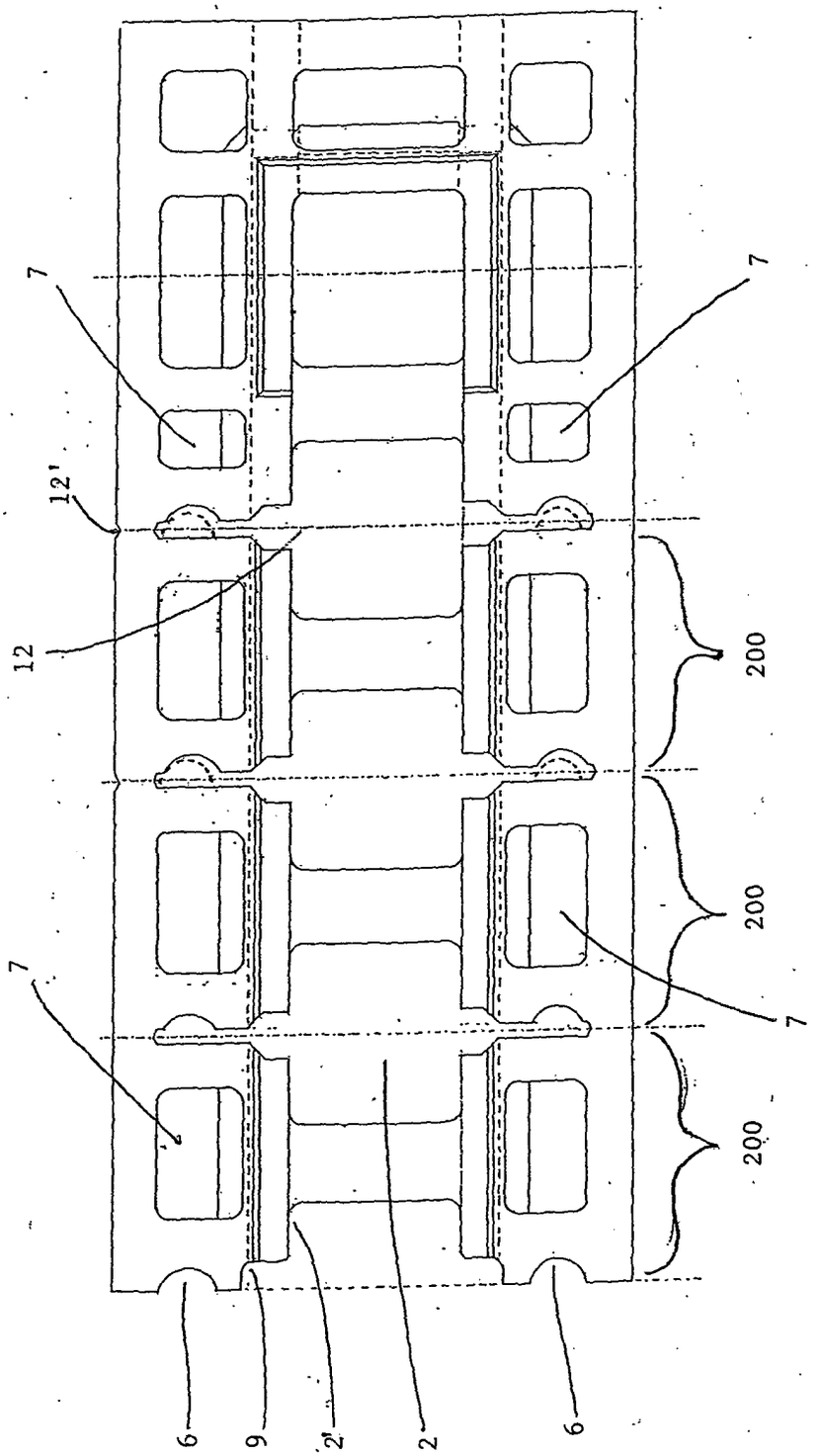


FIG.2b

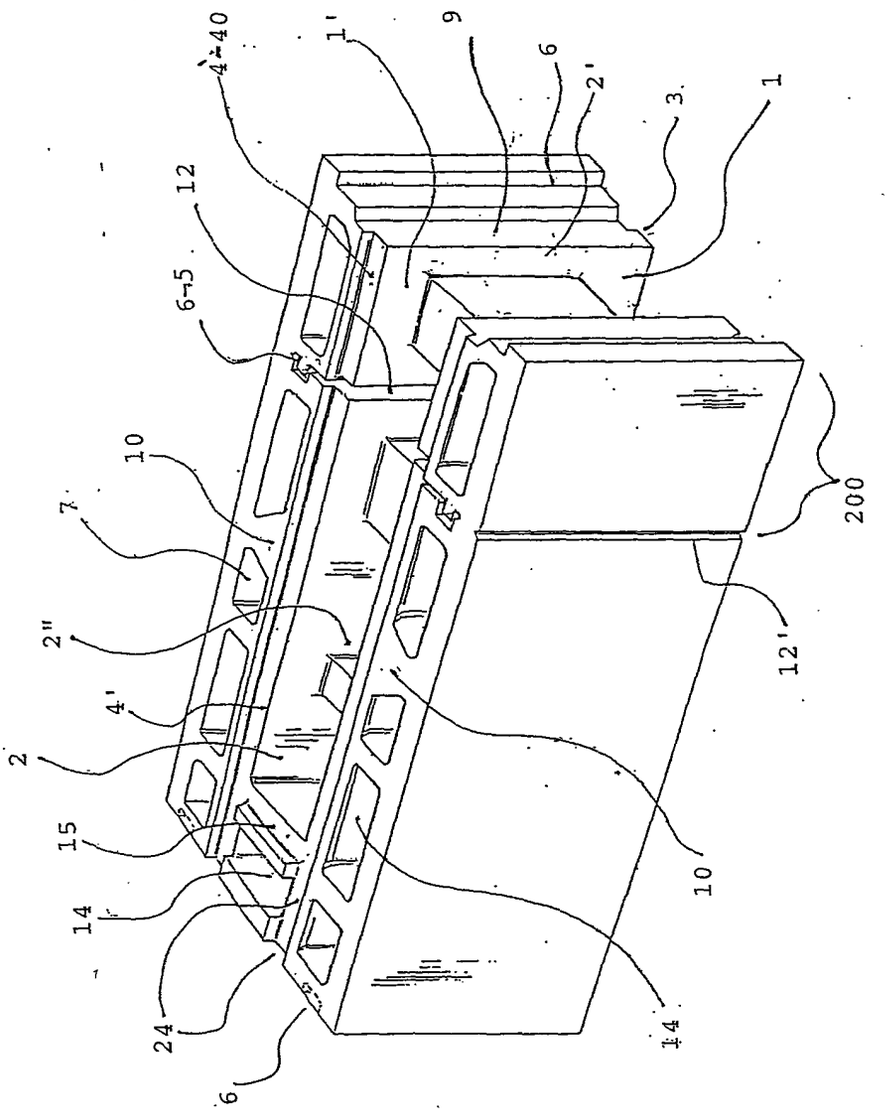


FIG. 3

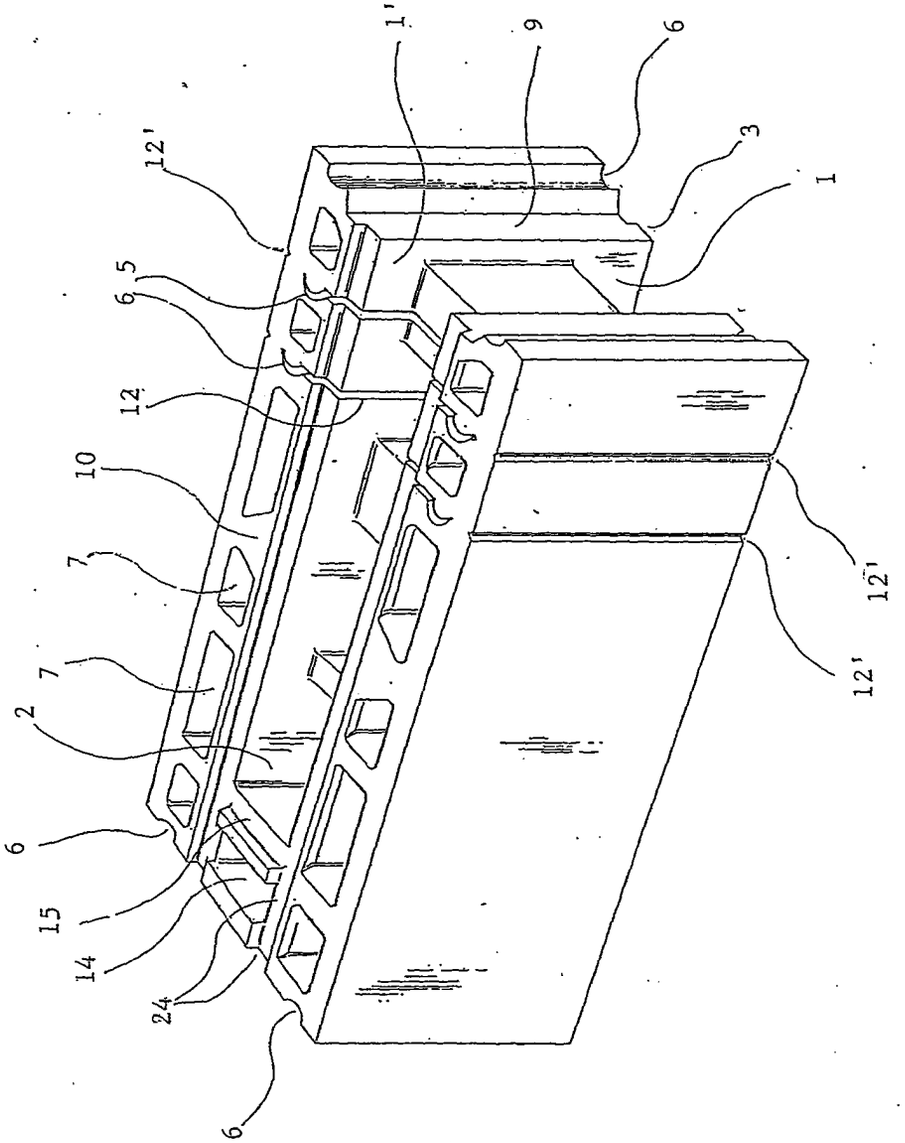


FIG. 3a

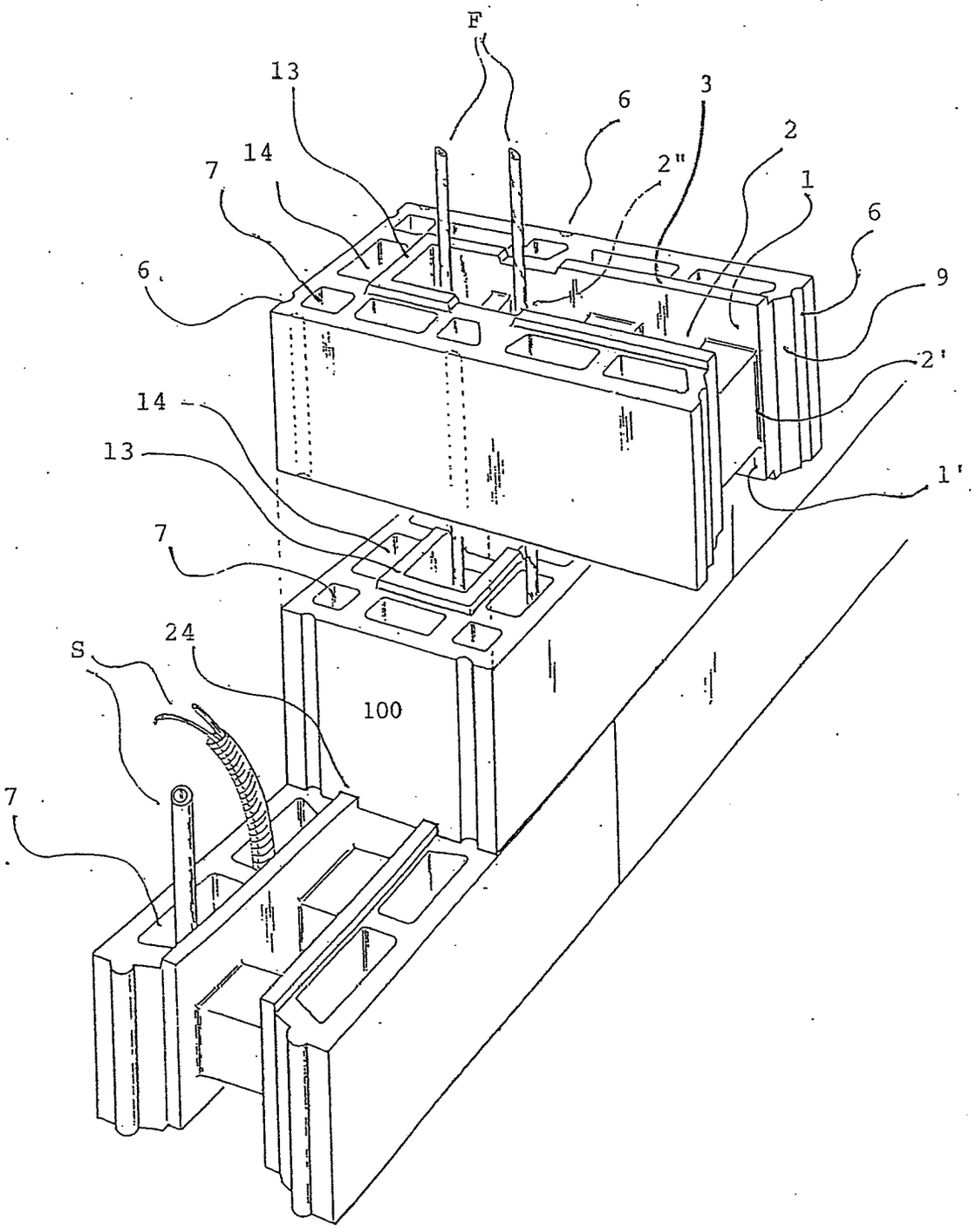


FIG. 4

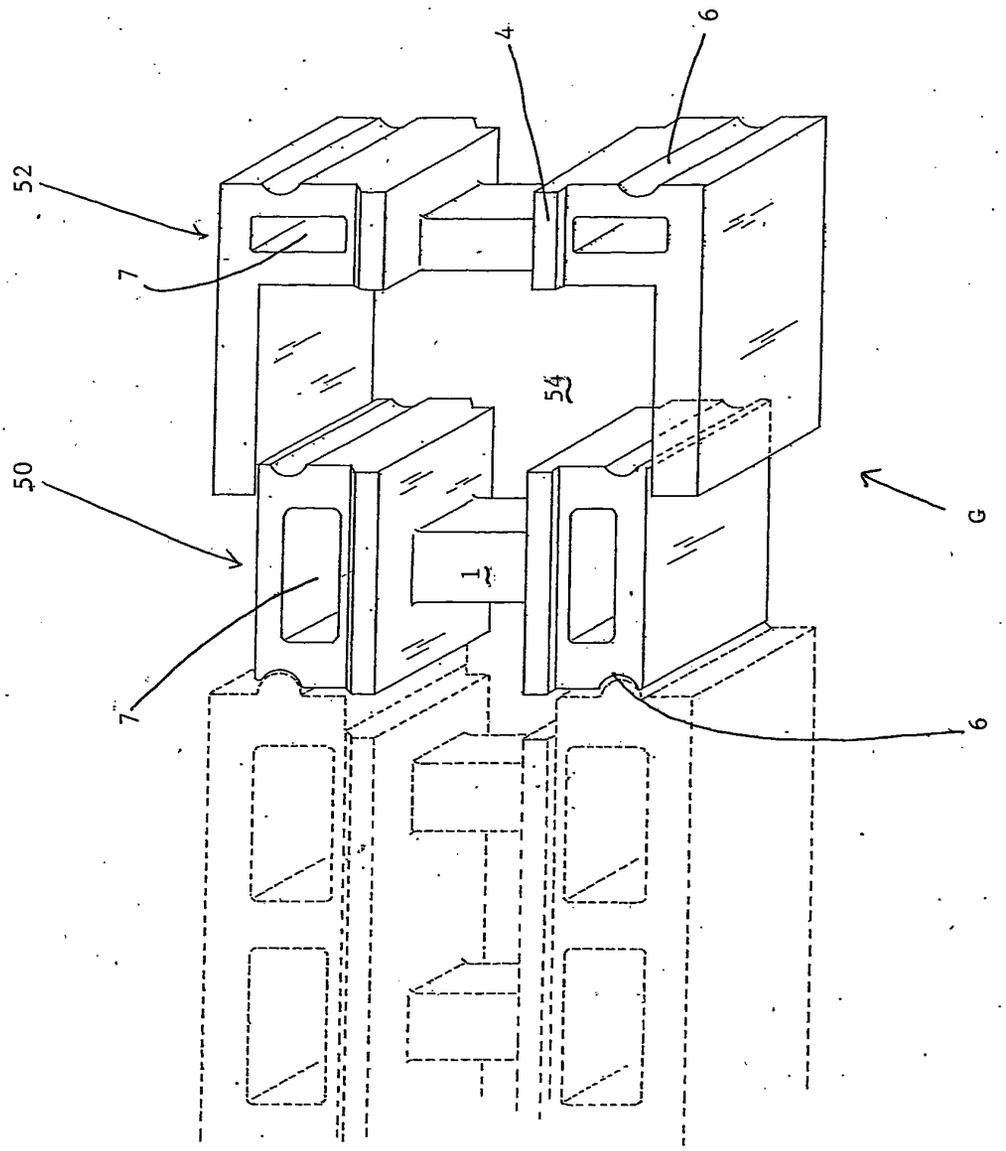
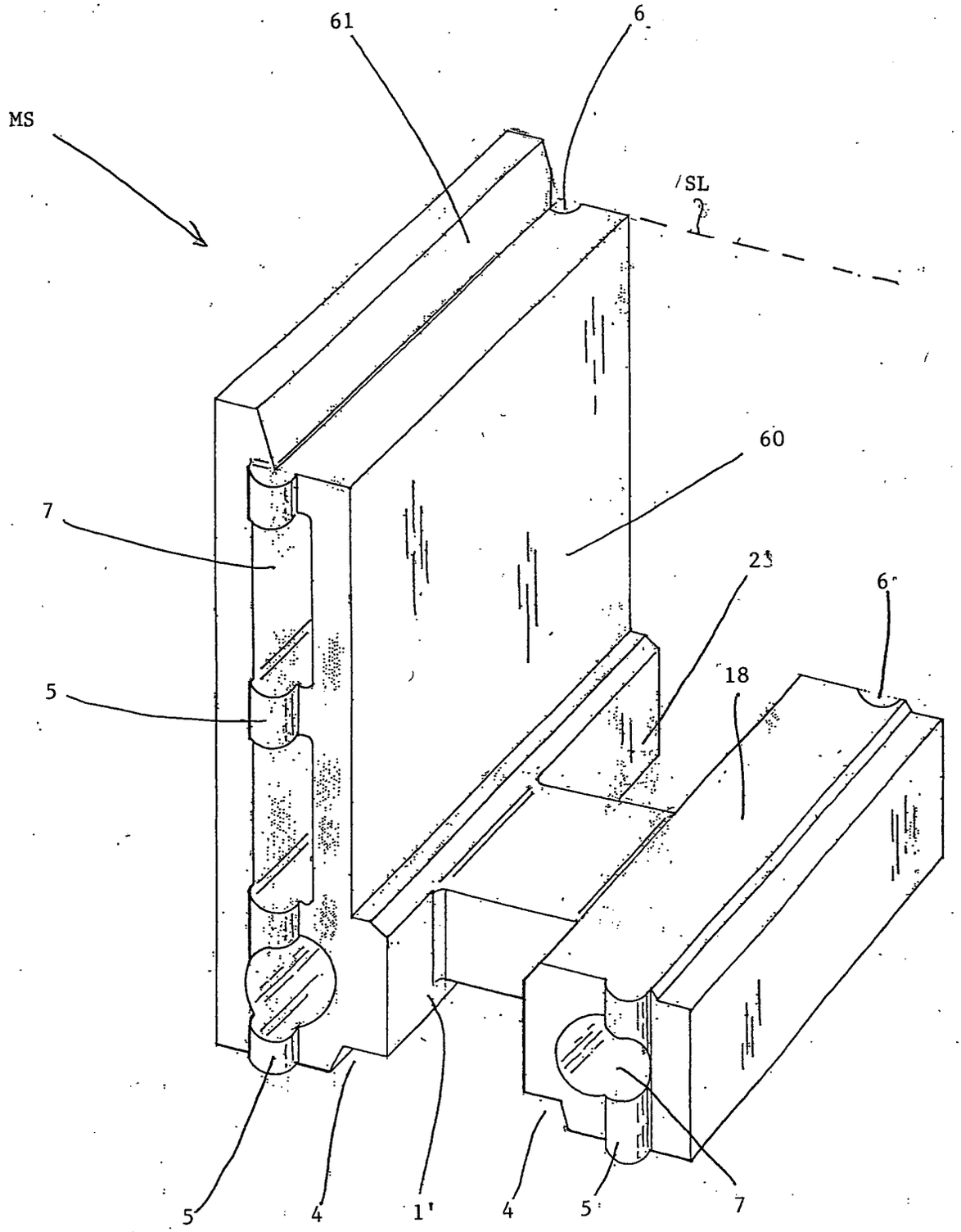


FIG. 5

FIG. 6



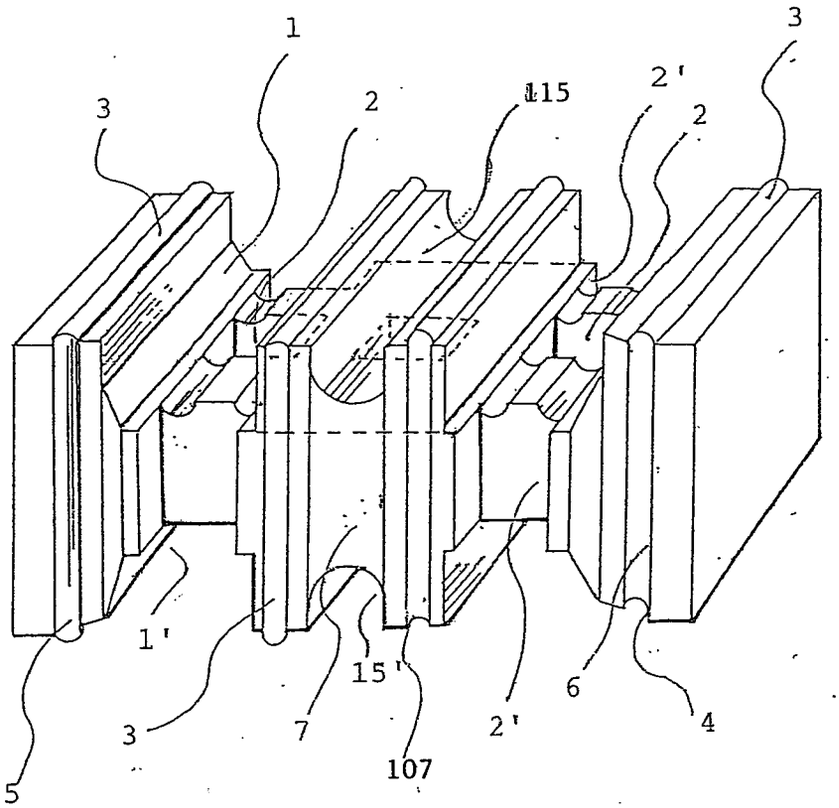


FIG. 7

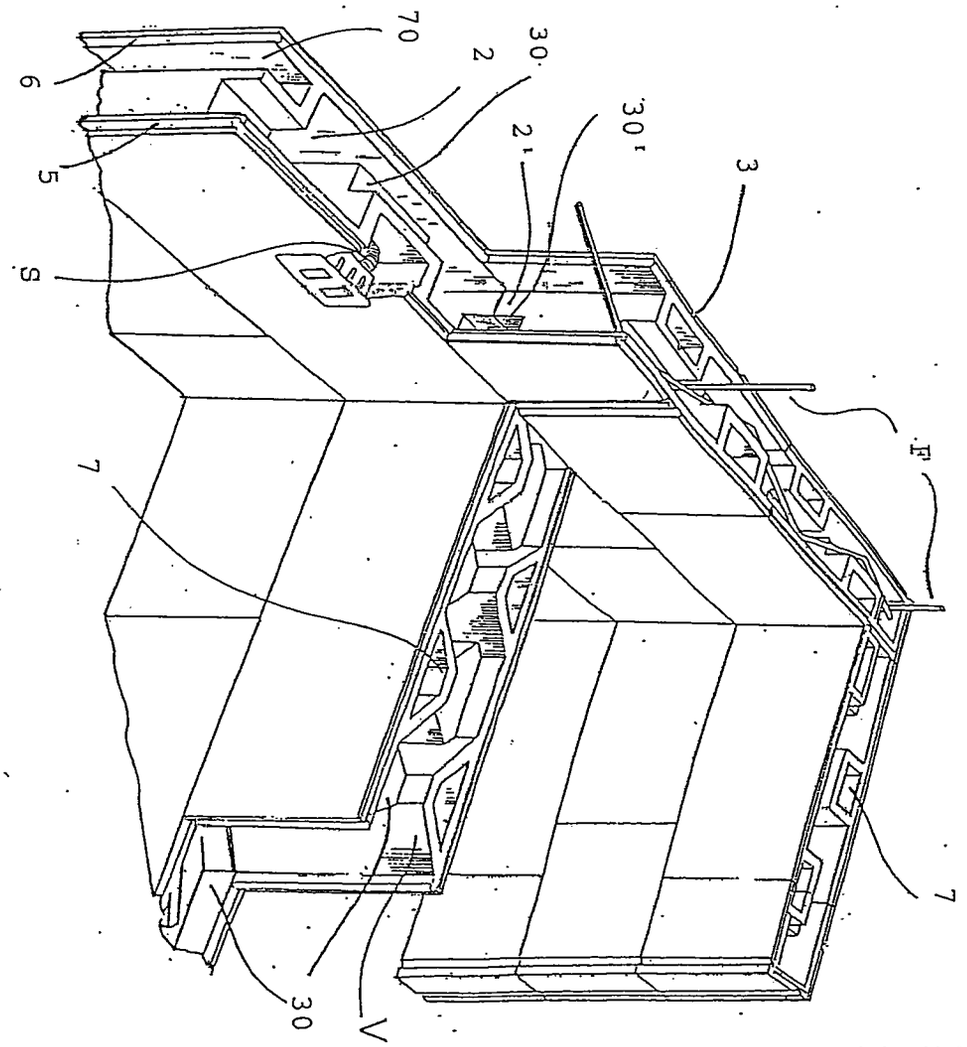


FIG.8

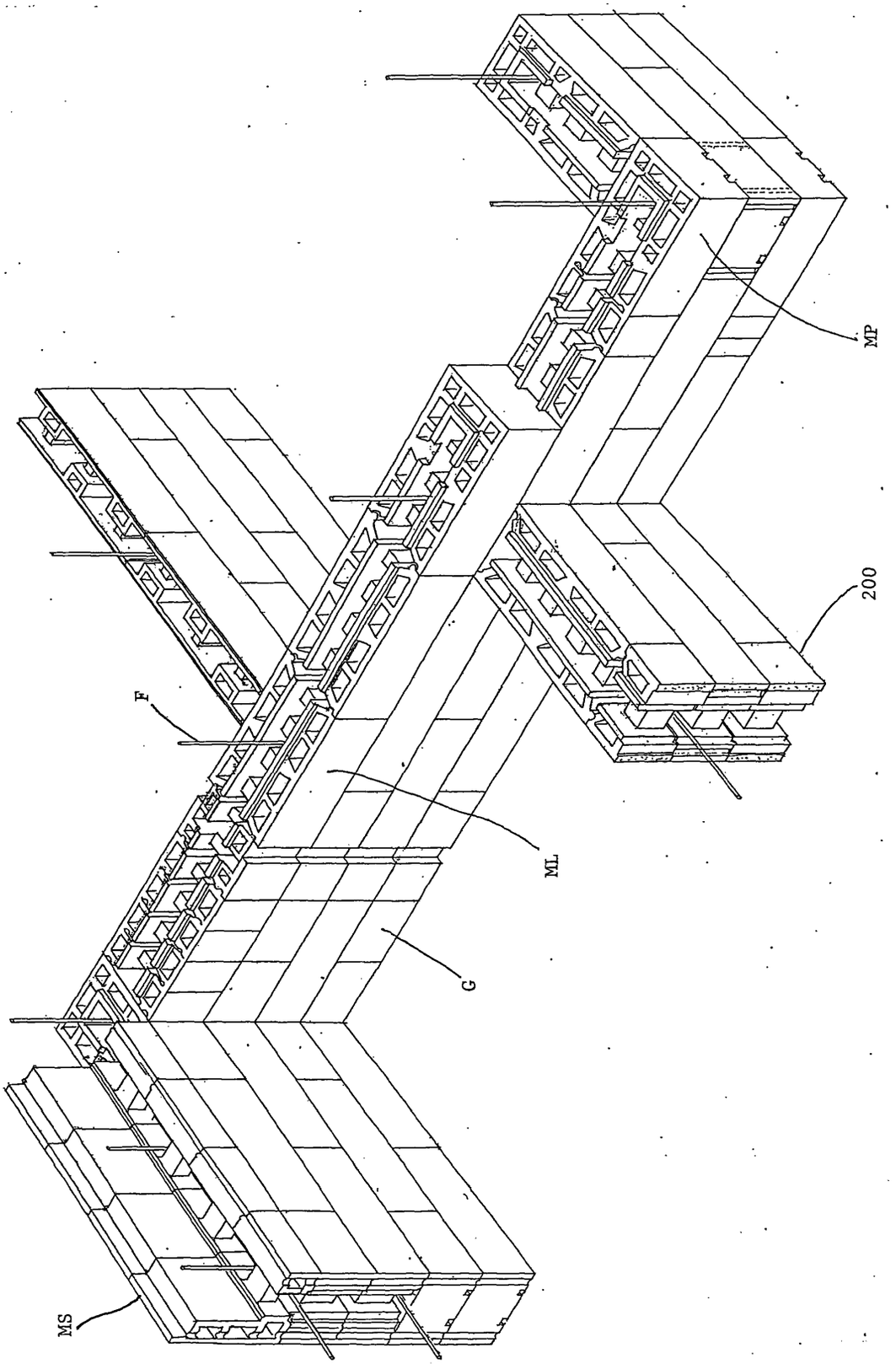


FIG. 9

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 42 5615

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
D,X Y	WO 97/16610 A (PALAMARA GIOVANNI ; PALAMARA ROCCO (IT)) 9 May 1997 (1997-05-09) * figures 1,4,5 *	3-6, 8-10,12, 16,17 11,14,15	E04B2/52
X	US 4 485 604 A (PALAMARA GIOVANNI ET AL) 4 December 1984 (1984-12-04) * figure 8 *	1,2	
X	US 5 548 938 A (SCHEIWILLER RENE) 27 August 1996 (1996-08-27) * figures 3a,3b *	1,2,10, 13	
A	FR 1 079 296 A (SEGUIN,JEAN) 29 November 1954 (1954-11-29) * figures 4,7 *	7	
Y	CH 408 366 A (FILIPPI LUIGI) 28 February 1966 (1966-02-28) * figures 1,7 *	11	
Y	US 5 466 150 A (ALBERSDOERFER GERNOT ET AL) 14 November 1995 (1995-11-14) * figure 3 *	14,15	TECHNICAL FIELDS SEARCHED (Int.Cl.7) E04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 November 2004	Rosborough, J

CATEGORY OF CITED DOCUMENTS

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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08-11-2004

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9716610 A	09-05-1997	IT 1276584 B1	03-11-1997
		AU 3993095 A	22-05-1997
		BR 9510660 A	26-01-1999
		CA 2236106 A1	09-05-1997
		EP 0858539 A1	19-08-1998
		WO 9716610 A1	09-05-1997
		PL 327509 A1	21-12-1998
US 4485604 A	04-12-1984	IT 1218259 B	12-04-1990
		AT 15706 T	15-10-1985
		DE 3266274 D1	24-10-1985
		EP 0060230 A1	15-09-1982
		IN 157971 A1	09-08-1986
US 5548938 A	27-08-1996	AT 137287 T	15-05-1996
		CA 2114731 A1	06-01-1994
		CZ 9400323 A3	13-07-1994
		DE 4320234 A1	23-12-1993
		DE 9218155 U1	04-11-1993
		DE 59302364 D1	30-05-1996
		WO 9400648 A1	06-01-1994
		EP 0600065 A1	08-06-1994
		HU 66400 A2	28-11-1994
		NO 940529 A	16-02-1994
		PL 302344 A1	11-07-1994
		SK 19694 A3	06-07-1994
FR 1079296 A	29-11-1954	NONE	
CH 408366 A	28-02-1966	NONE	
US 5466150 A	14-11-1995	DE 4119320 C1	07-01-1993
		AU 652248 B2	18-08-1994
		AU 1647292 A	12-01-1993
		BR 9206127 A	31-10-1995
		CA 2110177 C	29-10-1996
		WO 9222780 A1	23-12-1992
		GB 2272505 A ,B	18-05-1994
		HU 64620 A2	28-01-1994
		JP 7092341 B	09-10-1995
		JP 6503160 T	07-04-1994
		NO 933398 A ,B,	23-09-1993

EPO FORM P0459

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