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

(11) **EP 1 808 543 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.07.2007 Bulletin 2007/29

(51) Int Cl.:
E04C 2/04 *(2006.01)*

(21) Application number: **06077247.2**

(22) Date of filing: **14.12.2006**

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

(30) Priority: **16.01.2006 BE 200600034**
03.08.2006 BE 200600418

(71) Applicant: **Diman, -**
3920 Lommel (BE)

(72) Inventor: **Didden, Marcel Francisca Jackie**
3920 Lommel (BE)

(74) Representative: **Donné, Eddy**
Bureau M.F.J. Bockstael nv
Arenbergstraat 13
2000 Antwerpen (BE)

(54) Method for making wall elements and walls of a traditional building, as well as a building stone and an anchor which can be applied with this method

(57) Method for making wall elements and walls (22) of a building, characterized in that it consists of prefabricating wall parts (11) by stacking and joining stones (1, 5, 15) according to a certain bond pattern, whereby the wall parts (11) are designed to form walls (22) by assembling these wall parts (11) on the building site by putting them against each other and by connecting them.

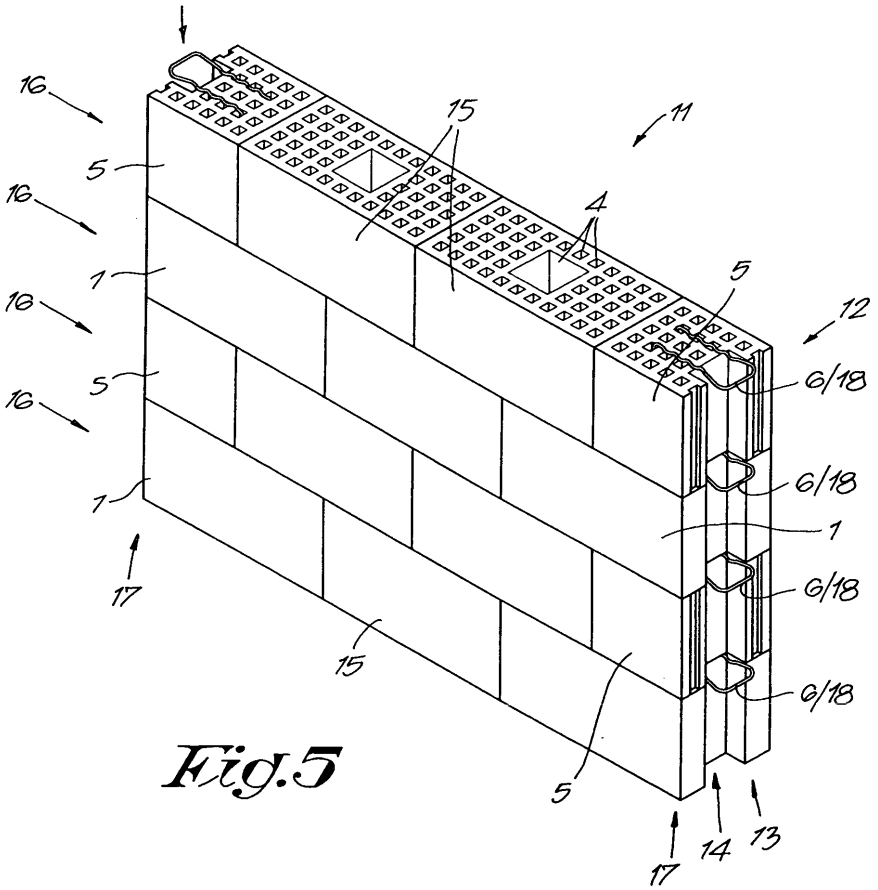


Fig.5

EP 1 808 543 A1

Description

[0001] The present invention concerns a method for making wall elements and walls of a traditional building.

[0002] In particular, the invention concerns a method for making wall elements and walls of a prefab building whereby, after its realisation, the look of the building cannot or can hardly be distinguished from a building built with bricks in a conventional or traditional way.

[0003] It is generally known that, in order to make the walls of a building, stones are normally used which are stacked on top of each other in a counterbracing bond on the actual building site and which are held together by means of mortar.

[0004] A disadvantage of this known method is that the bricklayers and the brickwork are exposed to all types of weather conditions, whereby for example in the case of extreme cold the work must be stopped completely.

[0005] The weather conditions also form an unpredictable factor for the planning of the works, such that arrears are often inevitable, as well as for the estimate of the costs of the execution.

[0006] Another disadvantage of this known method is that the bricklayers often have to work in places that are difficult to access, whereby scaffolds or the like often have to be erected.

[0007] In order to remedy these shortcomings of the traditional building methods, prefab building methods are often applied which according to a known method consist in making the walls of a building or even an entire building with prefab elements, whereby large parts of the building are made in advance in a factory or the like, which are subsequently assembled on the building site.

[0008] An advantage of this known method is that one depends less on the weather conditions and that the works on the building site can be carried out very fast.

[0009] Another advantage of this known method is that a major part of the work can be automated in the factory, such that, naturally, the time required to put up a building on the building site can be strongly reduced, which results in lower costs.

[0010] A disadvantage of this known method, however, is that such prefab buildings are easily recognizable and often have a less good reputation than traditionally made buildings.

[0011] Moreover, the walls of such prefab buildings are far less strong than brick walls.

[0012] The present invention aims to remedy one or several of the above-mentioned and other disadvantages.

[0013] The present invention hereby concerns a method for making wall elements and walls of a building, characterised in that it consists of prefabricating wall parts by stacking and joining stones according to a certain bond pattern, whereby the wall parts are designed to form walls by assembling said wall parts on the building site by putting them against each other and by connecting them.

[0014] An advantage of this method according to the invention is that a building can be made which has all the qualities of a traditional brickwork building, both as far as looks and as far as constructional qualities are concerned, and which is in many ways better than a traditional brickwork building.

[0015] Another advantage of such a method is that the walls of the building are stronger than in the case of the known prefab buildings.

[0016] Another additional advantage of this method is that the works on the building site can be carried out much faster and that people have to work less long under bad weather conditions.

[0017] Another advantage of this method according to the invention is that the wall parts can be easily stacked and joined so as to form a wall by means of a hoist in the shape of a crane or the like, such that no scaffolds need to be erected during the construction of the building.

[0018] Moreover, the pre-manufacturing of the wall parts can be automated and can be carried out under controlled conditions, which again makes it possible to save much time and which results in a better, reproducible quality.

[0019] According to a preferred method of the invention, the wall parts are made by gluing the stones directly onto each other.

[0020] This method is advantageous in that the stones rest directly on each other as they are glued together, which is not the case with the known conventional brickwork.

[0021] The gluing also allows to absorb larger tensile forces than in the case of conventional mortar, so that in this way, wall parts standing as such are made as if it were which can be put up as a whole and which can be used without any risk of impairment.

[0022] The wall parts are preferably provided with coupling elements, for example in the form of anchors, so as to make it possible to mutually connect them, which contributes to the general strength of the construction.

[0023] Moreover, the adjacent wall parts are preferably provided with grooves in the connecting side edges, which together form a shaft which can be filled with shrink-proof liquid concrete, either or not after a reinforcement has been provided through the above-mentioned coupling elements.

[0024] Thanks to this method are obtained concrete columns, either or not reinforced, at the connections between the wall parts, which may contribute to the general rigidity and bearing capacity of the walls.

[0025] The invention also concerns a building stone and an anchor which can be used with an above-mentioned method according to the invention.

[0026] According to the invention, such a building stone is provided with a groove on a crosscut side edge, whereby also vertical passages are preferably provided in the building stone.

[0027] Such a building stone according to the invention is particularly interesting for the above-mentioned method of the invention, as it makes it possible to provide a

groove along the side edge of the wall parts, whereby the wall parts can be connected in a simple manner with this groove so as to form a wall.

[0028] An anchor according to the invention consists of a wire which is folded into a two-legged element, whereby the legs can be clamped in an opening of an above-mentioned building stone according to the invention.

[0029] An advantage of such an anchor according to the invention is that the coupling elements can be easily formed with it so as to couple wall parts according to a method of the invention.

[0030] Another advantage is that such anchors can be provided with one part between the stones that are glued onto each other, such that they provide for a strong connection with the wall part concerned.

[0031] In order to better explain the characteristics of the invention, the following preferred methods for making walls of a prefab building are described as an example only without being limitative in any way, as well as some preferred embodiments of a high-speed building brick which can be applied with such a method, with reference to the accompanying drawings, in which:

figures 1 and 2 show two embodiments of a building stone according to the invention, seen in perspective;
figure 3 shows an anchor according to the invention, seen in perspective;
figures 4 and 5 represent successive phases of building a wall part according to a first embodiment of a method of the invention by means of building stones according to figures 1 and 2, and anchors according to figure 3, seen in perspective;
figure 6 represents a wall in perspective which is built of several wall parts according to the above-mentioned method of the invention, as represented in figure 5;
figure 7 represents the part indicated by F7 in figure 6 to a larger scale;
figure 8 shows an alternative realisation of a wall, made according to the above-mentioned method of the invention, seen in perspective;
figure 9 illustrates the assembly of wall parts according to the above-mentioned method of the invention so as to form a T-shaped wall, seen in perspective;
figure 10 illustrates an alternative embodiment of a method according to the invention for making walls; and
figures 11 and 12 illustrate the realisation of the wall part of a gable wall according to a method of the invention.

[0032] The embodiment of a building stone 1 according to the invention, represented in figure 1, differs from the known building stones in that it is provided with a groove 3 on at least one crosscut side edge 2.

[0033] The building stone 1 according to the invention is also provided, just as the known high-speed building bricks, with vertical passages 4.

[0034] Such building stones 1 can be made for example of burnt clay or a hardened mortar or the like.

[0035] The outside dimensions of the building stone 1 of figure 1 are preferably the same as in the case of conventional high-speed building bricks.

[0036] This means that the length L is preferably about 29 cm and the width B, as well as the height H, approximately have one of the following values: 9 cm, 14 cm or 19 cm.

[0037] With a method according to the invention for making the walls of a prefab building, use is preferably made of whole building stones 1, as represented in figure 1, as well as of half building stones with only half the length L/2, as represented in figure 2.

[0038] Figure 3 represents an anchor 6 according to the invention which can also be used with a method according to the invention for making walls.

[0039] The anchor 6 consists of a wire which is folded into a shape with two legs 7 and 8.

[0040] This shape makes it possible to clamp the anchor 6 in a vertical passage 4 of a building stone 1 or 5 from figures 1 and 2.

[0041] Further, the part 9 of the anchor 6 which is situated at the transition from one leg 7 to the other leg 8, is folded at about 90° in relation to the legs 7 and 8.

[0042] The legs 7 and 8 also represent a certain undulation 10, which simplifies the clamping of an anchor 6 in a passage 4 or between several building stones.

[0043] Building stones 1 and 5, as represented in figures 1 and 2, as well as anchors 6, as represented in figure 3, can be used to make the walls of a prefab building according to the method of the invention described hereafter.

[0044] A first step of this method consists in prefabricating wall parts 11, for example in a shed, a workshop or the like.

[0045] According to a preferred embodiment, the wall parts 11 are provided with coupling elements 13 on at least one side edge 12 with which the wall parts 11 can be coupled to each other.

[0046] In the given example of figures 4 and 5, these coupling elements 13 are formed by providing a groove 14 in the side edges 12 of the wall parts 11, and by providing anchors 6 in this groove 14.

[0047] To this end, as represented in figures 4 and 5, conventional stones, for example conventional high-speed building bricks 15, as well as whole and half high-speed building bricks 1 and 5 according to the invention are stacked on top of each other in a counterbracing bond and are connected.

[0048] Every row of stones 16 is hereby finished at the far ends 17 with a high-speed building brick 1 or 5 according to the invention, whereby the groove 3 is always provided on the outside in these high-speed building bricks 1 or 5.

[0049] In order to form a wall part 11 with straightened

side edges 12 in which is provided one continuous groove 14, a whole high-speed building brick 1 and a half high-speed building brick 5 are alternately used for every two successive rows of stones 16 according to the invention.

[0050] In order to realise the coupling elements 13, while building the wall part 11, an anchor 6 is preferably provided in a passage 4 of the high-speed building brick 1 or 5, preferably at the far ends 17 of every row 16, or at least on a part of these far ends 17.

[0051] As represented in figures 4 and 5, the legs 7 and 8 of the anchor 6 are hereby put in the passage 4, whereas the part 9 between the legs 7 and 8 which is folded at some 90° in relation to the legs 7 and 8, is situated more or less parallel to the top of the high-speed building brick 1 or 5.

[0052] Thus, a loop 18 is formed in the groove 3 which protrudes from the wall part 1.

[0053] It is important hereby that the loops 18 of wall parts 11 placed next to each other and protruding from the wall parts 11 overlap.

[0054] The wall parts 11 are preferably realised by gluing the stones directly onto each other.

[0055] Better still, the stones of the wall parts 11 are connected to each other by means of a binding agent in the form of a glue or the like, with which a connection is obtained which is strong enough to be able to carry the weight of the wall part 11, for example to lift such a wall part 11 by means of a hoist which is provided for example with suction cups.

[0056] A second step of the above-mentioned method according to the invention consists in assembling the wall parts 11 on the building site by putting them against each other and by connecting them.

[0057] As is illustrated by means of figures 6 and 7, the wall parts 11 are preferably coupled by providing a reinforcement, after the assembly of the wall parts 11, for example in the form of a reinforcement bar 19, through the overlapping loops 18 of the anchors 6 and by subsequently filling the shaft 20 formed by the two connecting grooves 14 with mortar 21.

[0058] Thus is obtained a piece of wall 22, as shown in figure 6, but it is clear that walls 22 in all sorts of shapes can be made in a fast and simple manner by putting several wall parts 11 next to and onto each other, and by coupling them according to the above-described method.

[0059] Naturally, wall parts 11 that are situated on top of each other can be connected, as in the conventional building methods, by providing mortar between the different wall parts 11, but preferably a form of gluing is used hereby as well.

[0060] For preference, a wall part 11 is made which is no longer than 4 meter, and it is made sure that the weight of a wall part 11 does not amount to more than 800 kg, such that this wall part 11 can be easily moved and lifted by hoists having capacities that are usually available on a building site.

[0061] If the stones of the wall parts 11 are glued together in a sufficiently strong way, then it will be possible to pick up the wall parts 11 with hoists which are provided with suction cups.

[0062] In this manner, a single person can easily put different wall parts on top of each other and next to each other by means of hoists that are usually available.

[0063] According to the above-described method of the invention, a workman will typically be able to build a wall surface of some 80 to 100 m^2 per day, whereas, according to the conventional methods, only 8 to 10 m^2 can be built.

[0064] Moreover, it should be noted that the combination of the reinforcement 19, the anchors 6 and the mortar 21 provides a very strong connection between the different wall parts 11 of the wall 22, such that a construction is obtained which is certainly not inferior to conventional constructions as far as strength is concerned, but which, on the contrary, is rather stronger.

[0065] Figure 8 illustrates how, for example, a window opening can be made in a wall by coupling different wall parts 11 according to the above-mentioned method of the invention.

[0066] It is hereby possible to already provide the necessary openings in a prefabricated wall part 11.

[0067] As an alternative, wall parts 11 having different widths could just as well be put on top of each other in order to obtain such a window opening.

[0068] Figure 9 illustrates how, according to an alternative method of the invention, a T-shaped wall 22 can be built by realising the coupling elements 13 somewhat differently.

[0069] A wall part 11 is hereby provided beforehand with anchors 6 in a groove 14, as in figures 4 and 5, on the one hand, and a wall part 11 is assembled on the other hand, whereby the anchors 6 are placed such that they do not protrude from the wall part 11 on the crosscut side 2, but somewhere in the middle 23 of the surface of the wall part 11.

[0070] The anchors 6 of this latter wall part 11 are provided in the groove 14 wile the wall 22 is being assembled, after which, analogous to the preceding embodiments, a reinforcement bar 19 is put in the groove 14 through the loops 18, and the groove 14 is filled with mortar 21.

[0071] Figure 10 illustrates yet another method according to the invention.

[0072] In this embodiment, the wall parts 11 are realised by stacking high-speed building bricks in a counterbracing bond as well.

[0073] However, the high-speed building bricks are provided with at least two vertical passages 24 placed off centre, which are provided such that when several high-speed building bricks are laid in a counterbracing bond, one continuous vertical shaft is formed, in which a mortar 21 and possibly a reinforcement bar 19 can be provided so as to form a vertical supporting column.

[0074] Moreover, the side edges 2 of the wall parts 11 are toothed in order to form coupling elements 13, whereby the height H of the teeth 25 is somewhat smaller than

the height H' of the high-speed building bricks on at least one side edge.

[0075] In figure 10, two such wall parts 11 are coupled at 90 ° so as to form an angle, whereby the teeth 25 are pushed into each other, and a reinforcement bar 19 is provided in the vertical passage 24 at the angle, after which the vertical passage 24 is filled with mortar 21.

[0076] As is represented in figures 11 and 12, an alternative method according to the invention can be applied to realize gable walls, for example.

[0077] A first course of bricks 26 is hereby realized by providing connecting pieces 27 between facing bricks 28 and by connecting them, preferably by means of gluing.

[0078] Afterwards, a strip 29 is provided on this first course of bricks 26 and fixed thereto, also preferably by means of gluing, and a fresh course of bricks 26 is subsequently provided on the latter, whereby the above-mentioned connecting pieces 27 and the strips 29 make sure that joints 30 are formed between the facing bricks 28.

[0079] Thus, a gable wall part 11 is built layer after layer with intermediate joints 30.

[0080] As in the embodiment of figure 10, such a gable wall part 11 is toothed on the crosscut side edges 2 so as to form coupling elements 13.

[0081] The connecting pieces 27 and the strips 29 preferably have a width B' which is somewhat smaller than the width B" of the facing bricks 27, such that the joints 30 can be definitively pointed, either beforehand or after the assembly of the gable wall parts 11, so as to obtain a look which cannot be distinguished from that of traditional gable constructions.

[0082] If the facing bricks 27 are not perfectly beam-shaped, as is often the case with hand-made stones or with stones made by crafting method, the course of bricks 26 can be levelled first, before the strips 29 are provided, which levelling 31 is at least as wide as the above-mentioned strips 29, for example by face milling the course of bricks 26 over at least a width B', such that the strips 29 have a better bearing capacity and can be glued more easily.

[0083] The gable wall parts 11 are assembled and connected in a manner which is entirely analogous to that of the embodiment of figure 10 by fitting the teeth 25 on the side edges 2 into each other and by gluing them together, for example.

[0084] The invention is by no means restricted to the method described as an example, nor to the building stones and anchors applied thereby; on the contrary, such a method and building stones, as well as the anchors, can be made according to different variants while still remaining within the scope of the invention.

Claims

1. Method for making wall elements and walls (22) of a building, **characterized in that** it consists of prefabricating wall parts (11) by stacking and joining stones (1, 5, 15) according to a certain bond pattern, whereby the wall parts (11) are designed to form walls (22) by assembling these wall parts (11) on the building site by putting them against each other and by connecting them.

2. Method according to any one of the preceding claims, **characterized in that** the wall parts (11) are made by gluing the stones (1,5,15) directly onto each other.

3. Method according to any one of the preceding claims, **characterised in that** the stones of the wall parts (11) are connected to each other by means of a binding agent with which a connection is obtained which is strong enough to be able to bear the weight of the wall part.

4. Method according to any one of the preceding claims, **characterised in that** the wall parts are provided with coupling elements so as to be able to couple them.

5. Method according to any one of the preceding claims, **characterized in that** a continuous groove (3) is provided on at least one side edge (2) of the wall parts (11).

6. Method according to claim 4 or 5, **characterised in that** the coupling elements (13) are formed of anchors (3).

7. Method according to claims 5 and 6, **characterised in that** anchors are provided in the groove.

8. Method according to any one of claims 6 or 7, **characterized in that** the anchors (6) are provided while the wall parts (11) are being made.

9. Method according to any one of claims 6 to 8, **characterized in that** the anchors (6) are folded in the form of a loop (18) which protrudes from the wall part (11).

10. Method according to any one of claims 6 to 9, **characterized in that**, of walls (22), the anchors (6) of wall parts (11) placed next to each other overlap.

11. Method according to claims 9 and 10, **characterised in that** a reinforcement (19) is provided through the overlapping loops (18) of the anchors (6).

12. Method according to claims 7 and 11, **characterised in that**, after the wall parts (11) have been put next to each other, they are connected by filling the shaft (20) formed of two connecting grooves (3) with mortar, preferably shrink-proof liquid concrete (21).

13. Method according to any one of the preceding claims, **characterised in that** the wall parts (11) are prefabricated in a shed, a workshop or the like, and are transported to a building site afterwards.

14. Method according to any one of the preceding claims, **characterized in that**, in order to move the wall parts, use is made of a hoist with suction cups.

15. Method according to any one of the preceding claims, **characterised in that**, in order to realise gable walls (22), a first course of bricks (26) is first formed by providing connecting pieces (27) between facing bricks (28) and by fixing them thereto, after which a strip (29) is provided on this first course of bricks (26) and a fresh course of bricks (26) is subsequently provided on it, whereby this process is repeated such that, layer after layer, a wall part (11) is built which is provided with intermediate joints (30), whereby several wall parts (11) are finally assembled to form a gable wall (22) on the building site, and the joints (30) are further pointed.

16. Method according to claim 15, **characterised in that** the above-mentioned connecting pieces (27) and strips (29) are prefabricated and are fixed between the facing bricks (28) by means of gluing.

17. Building stone (1,5) which can be used with a method according to any one of the preceding claims, **characterized in that** it is provided with a groove (3) on its crosscut edge (2).

18. Building stone (1,7) according to claim 17, **characterised in that** it is provided with vertical passages (4).

19. Anchor (6) which can be used with a method according to any one of claims 1 to 16, **characterised in that** it consists of a wire which is folded into a two-legged element (6), whereby the legs (7,8) can be clamped in a passage (4) of a building stone (1,5) according to claim 17 or 18.

20. Anchor according to claim 19, **characterized in that** the part (9) of the anchor (6) which is situated at the transition from one leg (7) to the other leg (8) is folded at about 90° in relation to the legs (7,8).

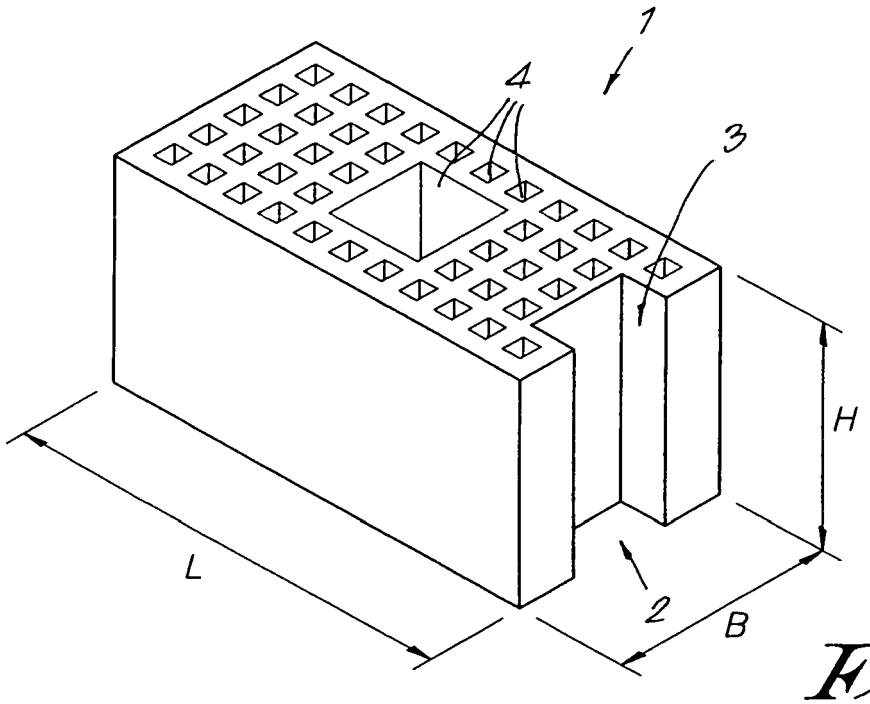


Fig. 1

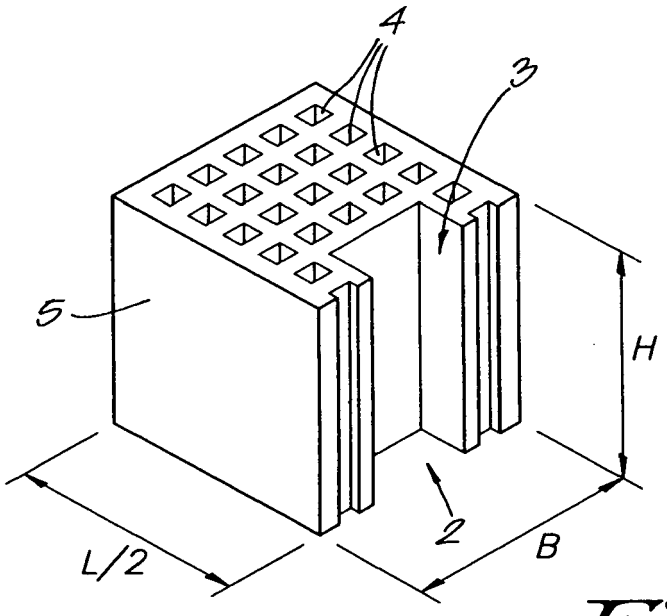


Fig. 2

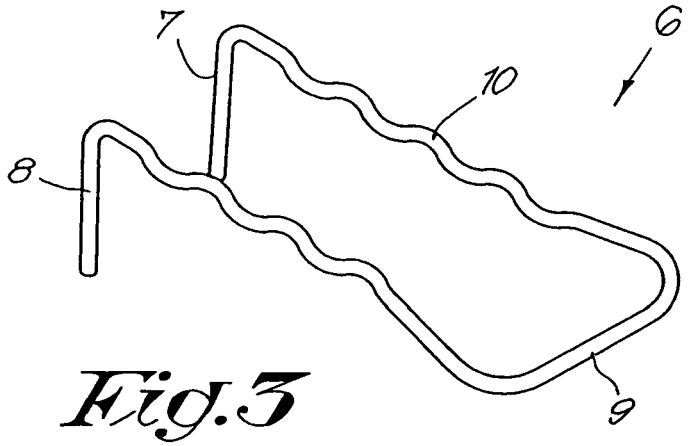


Fig.3

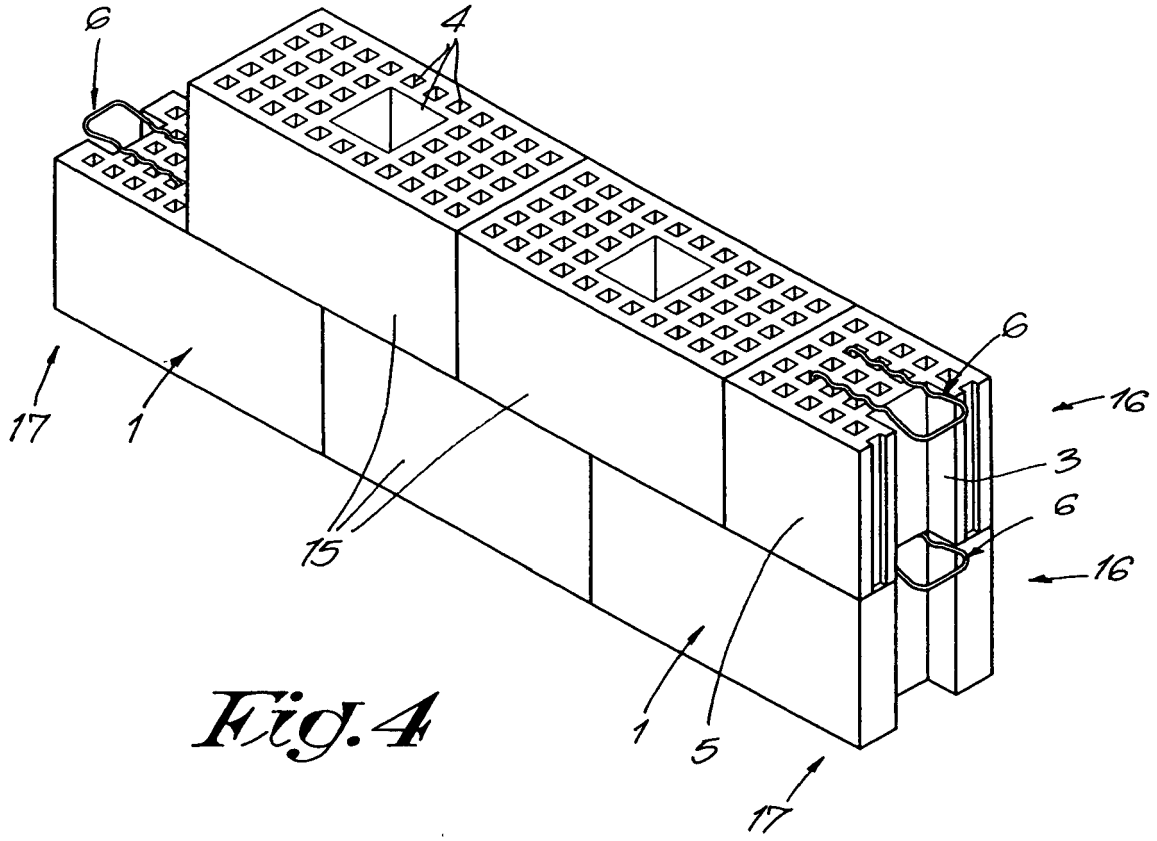


Fig.4

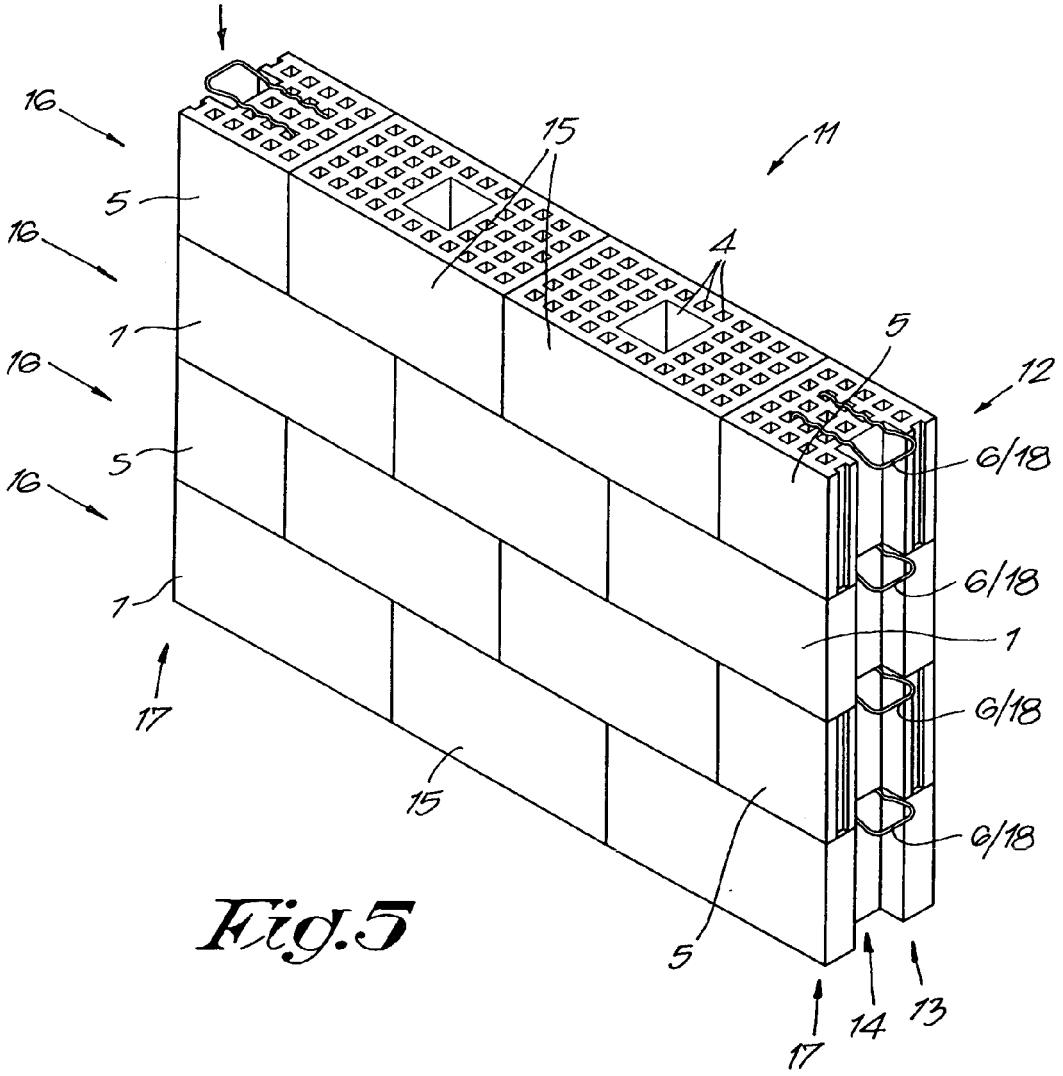

16
5
16
1
16
5
16
1
17
15
11
15
4
5
12
6/18
6/18
1
6/18
6/18
5
17
14
13

Fig.5

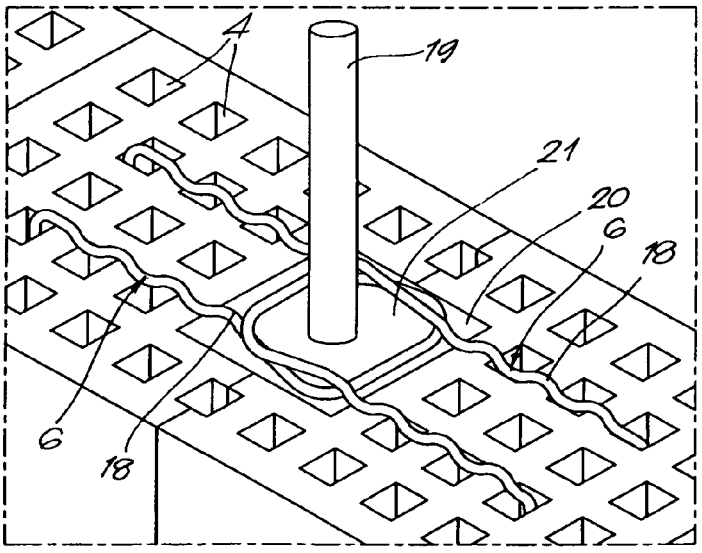

4
19
21
20
6
18
6
18

Fig.7

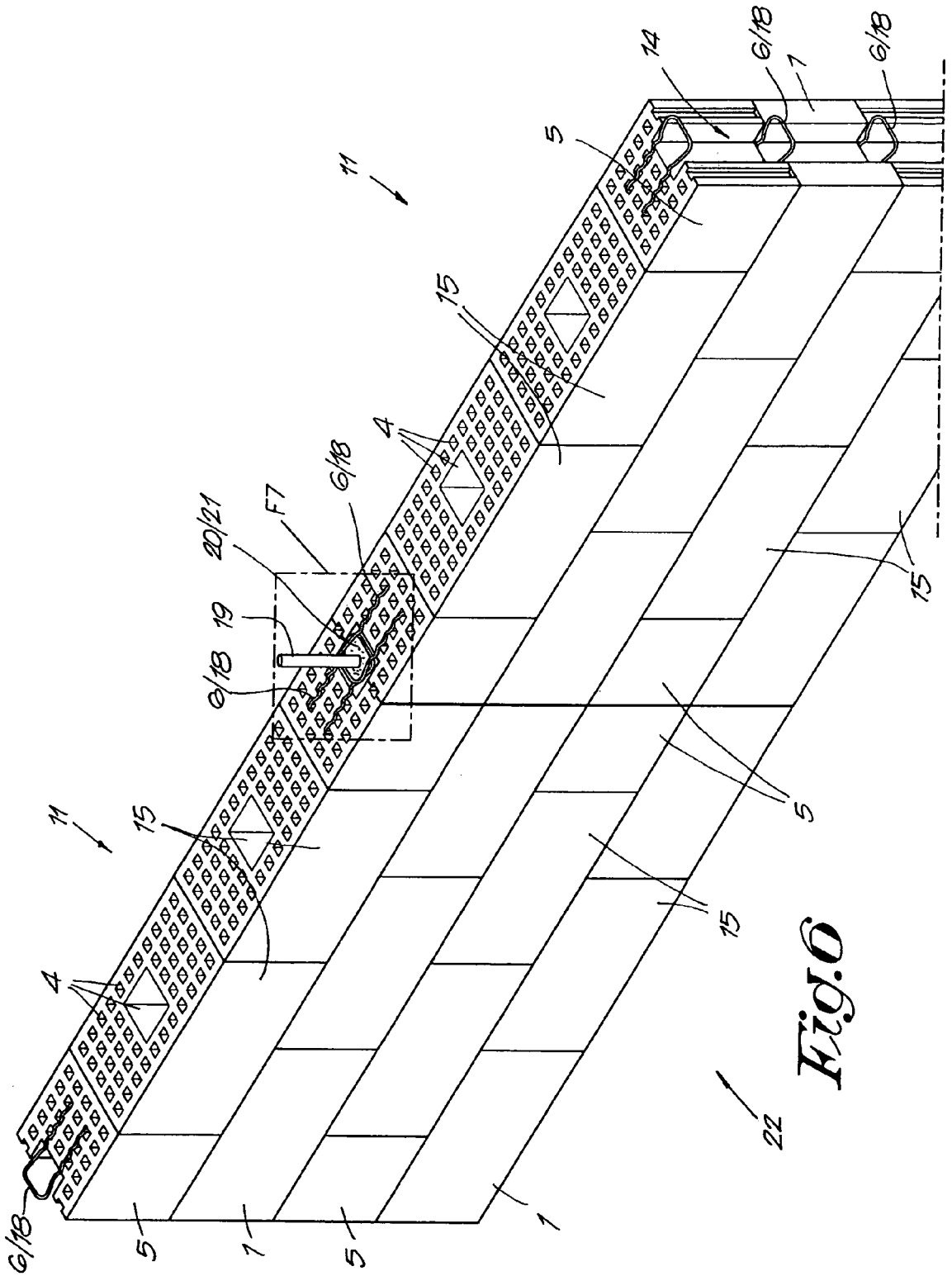


Fig.6

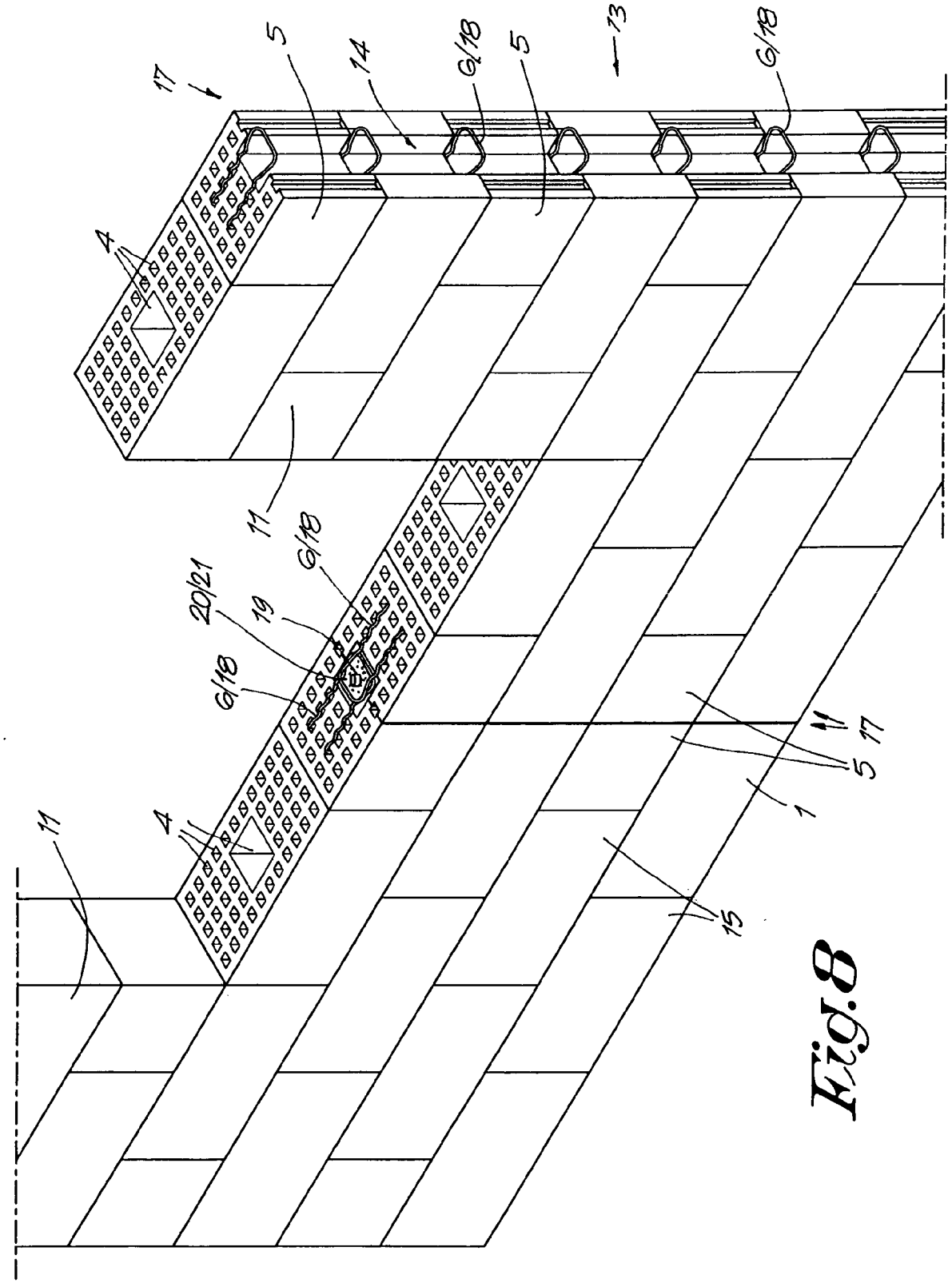
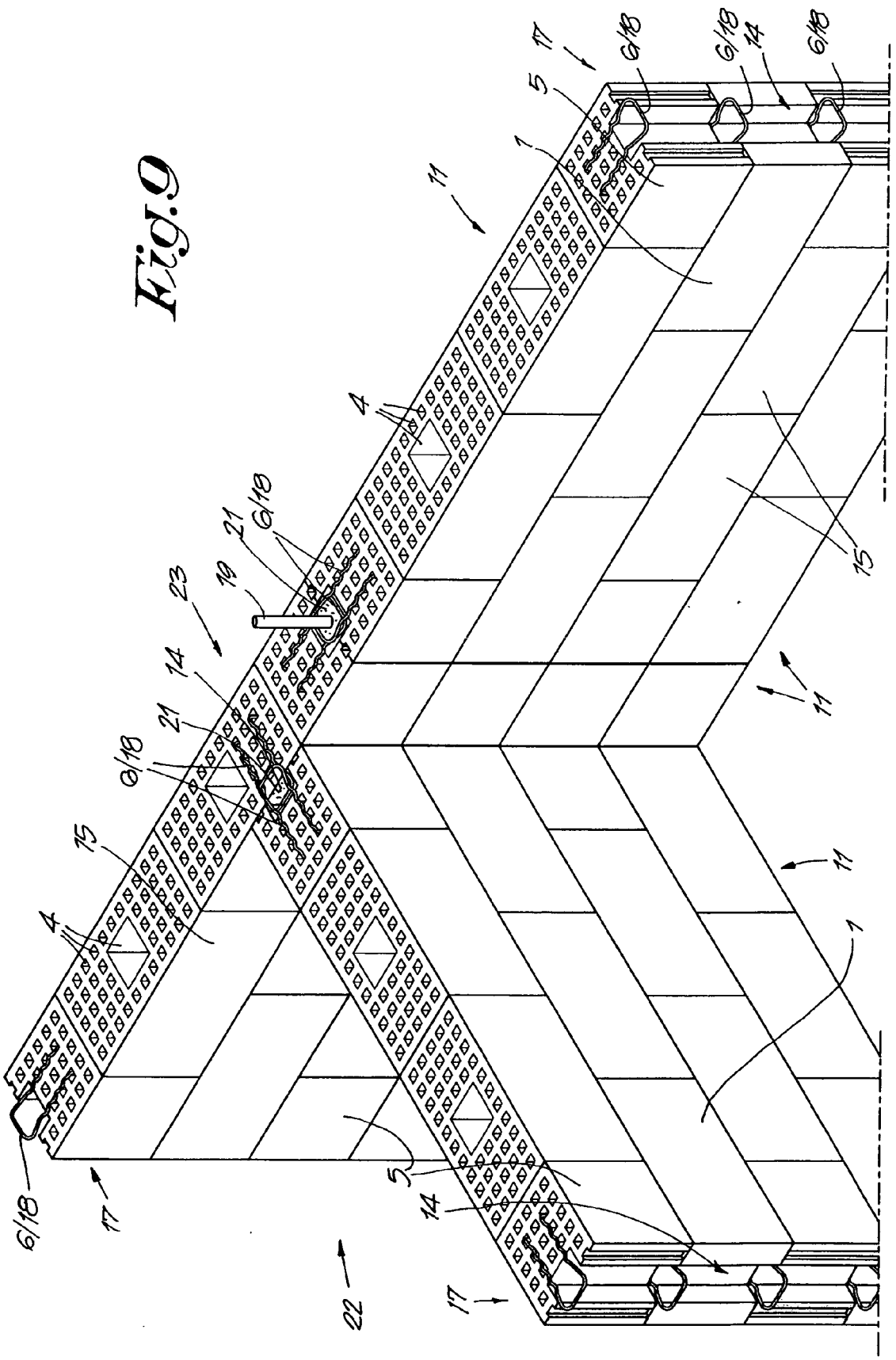


Fig.8

Fig.9


17
6/18
6/18
14
6/18
5
1
11
4
6/18
21
19
23
14
21
6/18
15
4
15
11
11
1
6/18
17
5
14
22
17

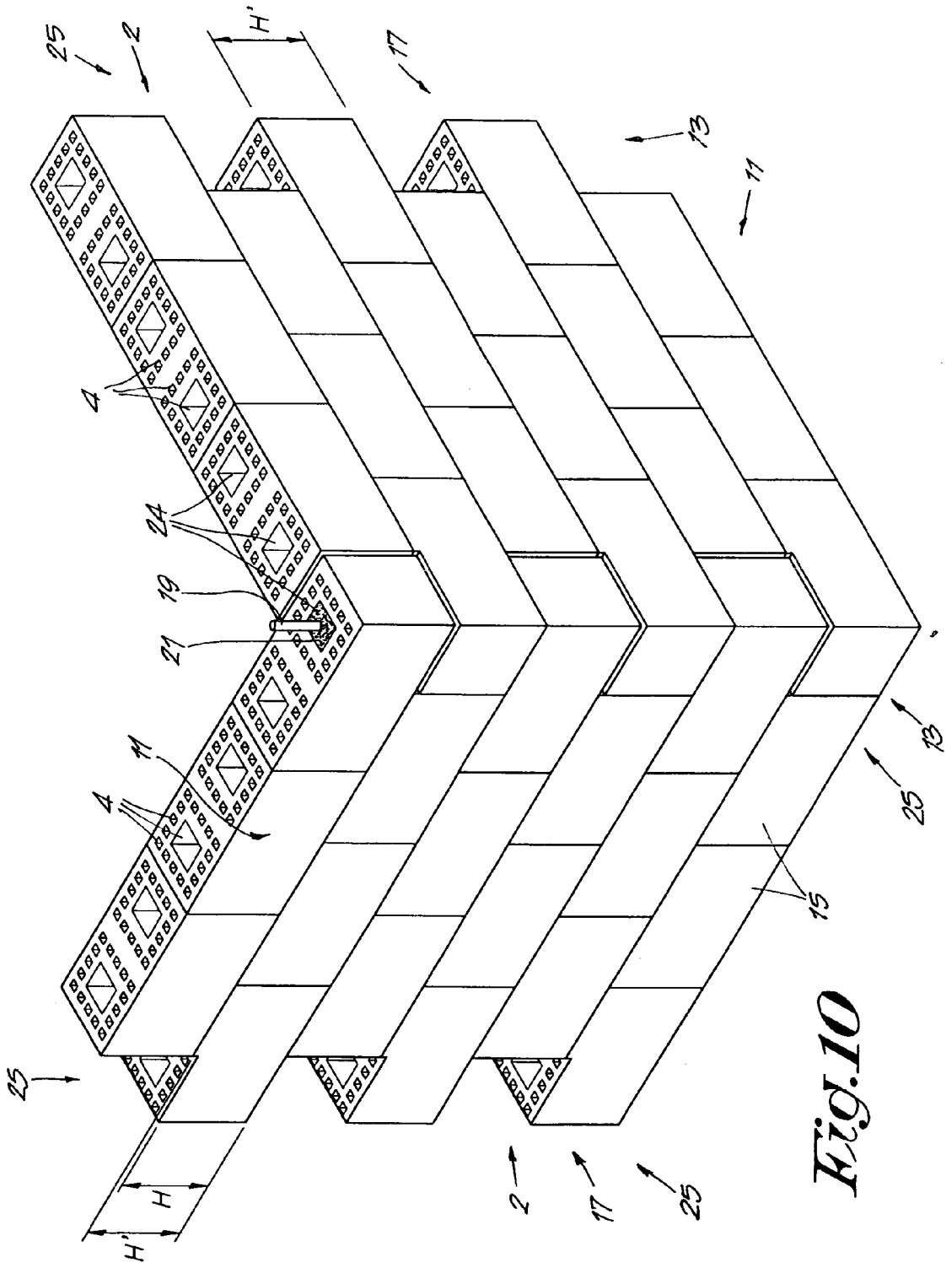


Fig.10

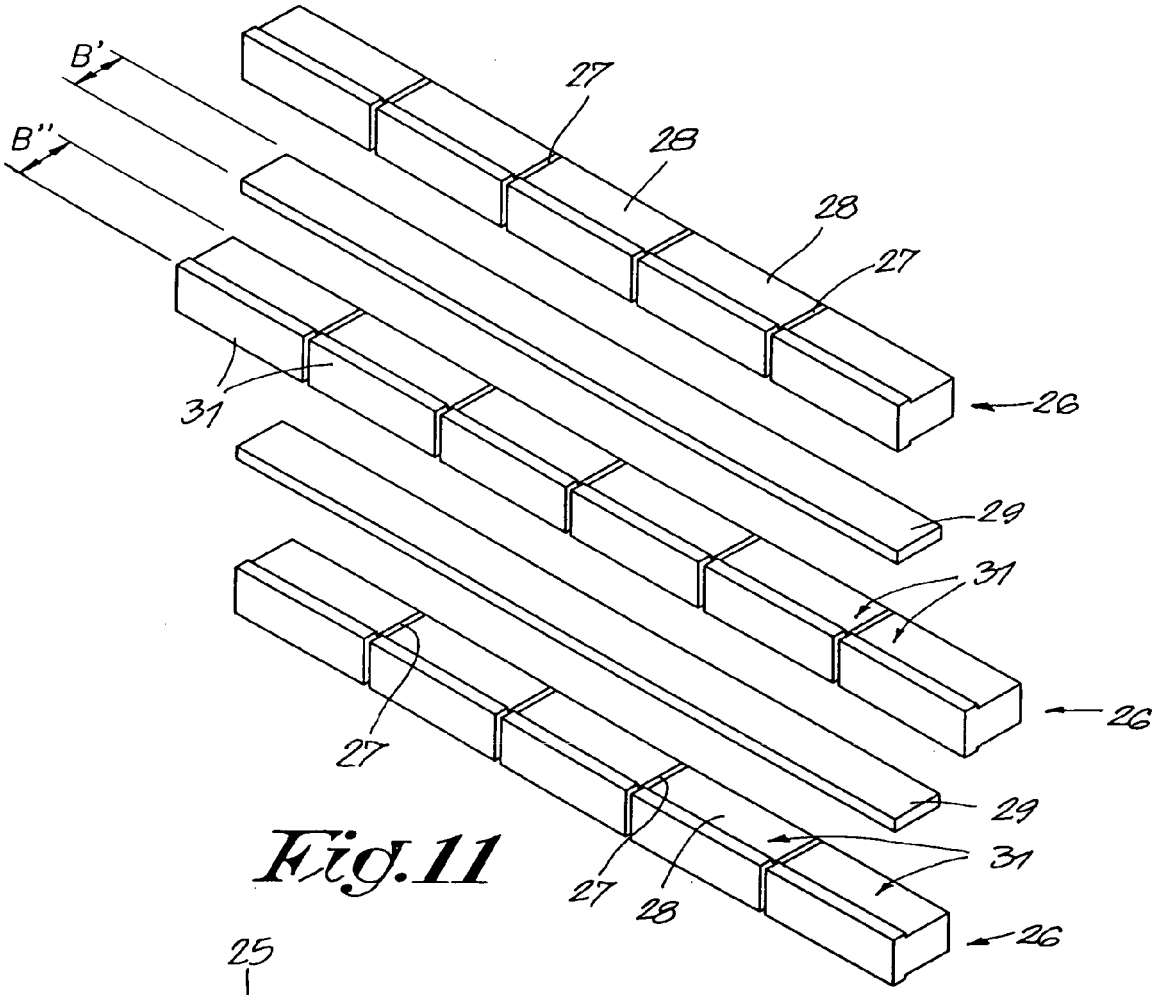

B'
B''
27
28
28
27
31
26
29
31
26
27
29
31
27
28
26

Fig.11

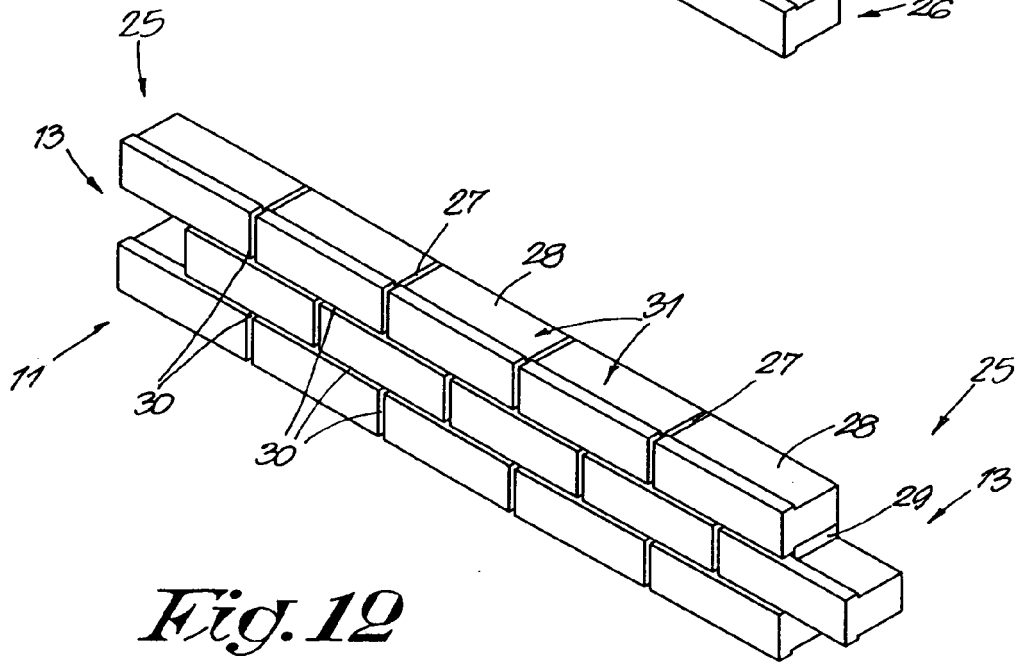

25
13
27
28
31
11
27
25
30
28
30
29
13

Fig.12

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 07 7247

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 25 20 773 A (BRENNER) 27 November 1975 (1975-11-27)	1,4,6, 8-10,13, 19,20	INV. E04C2/04
Y		2,3	
A	* page 7, line 11 - line 19; claim 1; figures 7-9 *	14	

X	US 3 855 752 A (AYLON) 24 December 1974 (1974-12-24)	17,18	
Y	* column 5, line 24 - line 26; figures 1-4 *	2,3	
A		4,5,12	

A	FR 1 351 388 A (DELOUPY) 7 February 1964 (1964-02-07) * column 2, line 7 - line 16; figures 1,2 *	5,12	

A	FR 2 687 711 A (BEAUVAIS) 27 August 1993 (1993-08-27) * figure 5 *	7,11	
	-----		TECHNICAL FIELDS SEARCHED (IPC)
A	FR 2 372 940 A (BOUYGUES) 30 June 1978 (1978-06-30) * page 3, line 10 - line 33; figure 1 *	15,16	E04C E04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	23 May 2007	Mysliwetz, Wolfgang

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

4

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 06 07 7247

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

23-05-2007

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 2520773 A	27-11-1975	AT 332063 B	10-09-1976
		AT 405074 A	15-12-1975
US 3855752 A	24-12-1974	NONE	
FR 1351388 A	07-02-1964	CH 401420 A	31-10-1965
FR 2687711 A	27-08-1993	NONE	
FR 2372940 A	30-06-1978	NONE	

EPO FORM P0459

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